Espérance&
Algorithmes

Entrepreneurship in the era of algorithms to serve without enslaving

COLLÈGE DES BERNARDINS

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The think tank 'Hope & Algorithms', is a network of entrepreneurs, venture capitalists, and professional experts in algorithm-driven businesses and artificial intelligence, founded in 2018. It draws insights from biblical anthropology and fosters fraternal sharing among creators to discern and work with hope for the common good.

MANIFESTO

BENEFIT - Algorithms are a boon to the responsible co-creator, who discerns their proper uses.

SHARED MASTERY - By cleverly and sparingly combining human intelligence with algorithms, we ensure their clarity for the widest audience, promoting autonomy and sovereign control by humans: there is no inevitability to elitist, enslaving, uncontrollable, or mind-numbing algorithms.

GARDEN - Algorithms hold great promise for us to become better gardeners, managing natural resources and the beauty of Creation.

SUBSIDIARITY - Individuals and organizations must have the means to understand and decide for themselves on algorithmic preferences for decision-making assistance; these should not be regulated by more powerful entities, nor implicitly pre-configured by third parties without their knowledge.

VOCATION - The unique creativity of entrepreneurs is essential to harness algorithms for the greater good.

PERSON - Only human beings are created in the image of God, a sacred horizon of unalienable dignity: artificial intelligence is merely a tool for which humans remain solely responsible.

RISK - We are called to venture into deep waters as we embark on the journey of artificial intelligence, taking calculated risks.

HUMAN RELATIONSHIP- The balanced support of smart machines can, when their liberating efficiency is well-directed, rejuvenate meaningful personal interactions and compassion within economic and social relationships.

WORK - Humans need to work to grow: let's engage with algorithms not to create a leisure society, but to enable everyone, through balanced work, to better serve the common good and their fellow humans.

FREEDOM OF CONSCIENCE - Beyond mere consent, it's crucial to respect and awaken each individual's personal and free conscience, especially concerning data sharing and decision-making preferences. This should be a fundamental principle for any elevating algorithmic service.

CONTEMPLATION - Humans need peace and contemplation to grow; balanced algorithmic services should safeguard significant time for life without digital mediation and should never, regardless of future AI capabilities, reduce a human being to mere data or computational determinations.

PARTICIPATION - Algorithms hold great promise for empowering everyone, including the poorest, to take control of their destinies and to participate in collective responsibility in a spirit of brotherhood.

COMPETITION - Free, fair, and loyal competition, along with proactive resistance to the growing temptation of algorithmic monopolies, serves as an imperfect yet crucial barrier for balanced and collaborative pursuit of the common good.

UNIVERSAL DESTINATION - While partial ownership of algorithmic services is essential for the creative contributions of entrepreneurs, algorithms naturally tend to be shared with the largest number of people; open source and open data beautifully illustrate the universal destination of goods.

Key Proposals

MULTIDISCIPLINARY CHAIR - Delve into the ethics and spiritual calling of algorithmic entrepreneurship through a multidisciplinary training/research seminar involving researchers, theologians, entrepreneurs, engineers & investors.

FRATERNAL ALGO-ENTREPRENEURSHIP SUPPORT - Promote algo-entrepreneurial practices that serve the common good through a fraternal discernment program and personal support, engaging entrepreneurial makers so that everyone, including the most disadvantaged, can reinvent their work with these technologies and contribute to the common endeavor.

TRAINING and DISCERNMENT - Provide extensive training, including innovative pedagogy powered by algorithms and hands-on field internships, for current or future entrepreneurs, investors, and engineers among the youth, to gain a comprehensive multidisciplinary and anthropological understanding.

TESTIMONIAL EVENTS - Raise awareness among entrepreneurial communities, investors, programmers/developers, and data scientists, as well as believers, about the universe of possibilities through testimonial events.

LABEL and INVESTMENT - Establish a "Hope & Algorithms" label to promote inspired and creative entrepreneurial initiatives through investment capital resources guided by algorithmic ethics.

ENHANCED PERSONAL COACHING (e.g., in INTEGRAL ECOLOGY) - Equip individuals with algorithms for concrete discernment on ethical dilemmas for the common good, such as individual responsibility in integral ecology, by providing specialized AI tools and human moderation.

HUMAN-AI BALANCE - Offer proven anthropological and societal benchmarks for a pragmatic vision of the human/machine relationship and humans at work, to inform the design & ergonomics of balanced "human-AI" partnerships in assisted decision-making.

SDC PROJECT - Contribute to the Social Doctrine of the Church to discern benchmarks and encourage vocations, through algorithmic entrepreneurial transformation inspired by evangelical wisdom.

Contents

God created humans in His own image, both male and female. He blessed them and said: 'Be fruitful and multiply, fill the earth and govern it. Rule over the fish of the sea, the birds of the sky, and every living creature that moves on the ground.'

Genesis 1:27-28

Indeed, creation eagerly awaits the revealing of the children of God. Creation was subjected to futility, not by its own choice, but by the will of the one who subjected it, in hope that it would be liberated from its bondage to decay and brought into the freedom and glory of God's children. We know that the whole creation has been groaning as in the pains of childbirth right up to the present time. Not only so, but we ourselves, who have the firstfruits of the Spirit, groan inwardly as we wait eagerly for our adoption to sonship, the redemption of our bodies. For in this hope we were saved.

Romans 8:19-24

How many things are done for uncertainty, like voyages across the sea or battles! (...) If nothing were to be done for what is certain, (...) then nothing at all should be done because nothing is certain (...) Yet when we work for tomorrow and for the uncertain, we act rationally: for one must work for the uncertain according to the rule of parties that is demonstrated.

(...)
God either exists or doesn't. But which side will we lean toward? Reason cannot decide this for us. There is an infinite chaos that separates us (...) Yes, but we must wager. It is not a choice, you are already on board. So which will you choose? (...) And you would be reckless, when forced to play, not to risk your life to win three at a game where there is an equal chance of loss and gain. But there is an eternity of life and happiness. (...)

Thoughts, Pascal

The term hope here isn't used in the everyday sense (...) Instead, it's about how the desire for the best is moderated or diminished by the fear that the worst might happen; so much so that something in between is always implied by a value between the best we hope for and the worst we fear...

Ars conjectandi, J. Bernoulli, 1713 posth.

True uncertainty explains the unique earnings of the entrepreneur. Risk, Uncertainty & Profit, F. Knight 1921

Pope John Paul II saw enterprise as a divine activity, reflecting the Creator's image in humanity. This image is evident in the way men and women use intellect (mind), resources (material things), and effort (work) to create goods and services that benefit and complete individuals within a community. He viewed enterprise and the entrepreneur's role as fundamental rights, on par with religious freedom: « the level of well-being society experiences today wouldn't be possible without the vibrant entrepreneur, who organizes human labor and production means to create goods and services. » An entrepreneur is a caretaker of a nation's resources, meant to support labor and be accessible to everyone in society.

The Entrepreneurial Calling, Perspectives from Rahner, W. J. Toth

We are about to free a society of workers from the chains of labor, yet this society has lost touch with higher, enriching activities worth gaining this freedom for. In an egalitarian society, where work unites people, there are no more classes or political or spiritual aristocracy to reignite other human faculties. Even presidents, kings, and prime ministers see their roles as necessary jobs for society's life, and among intellectuals, only a few solitary figures regard their work as artistic endeavors rather than just a means to earn a living. What we

face is the prospect of a society of workers without work, essentially deprived of their only remaining activity. It's hard to imagine anything worse.

The Human Condition, H. Arendt

Our era has its unique mission [...] the creation of a civilization rooted in the spirituality of work. The thoughts that relate to this vocation's intuition [...] are the only ones [...] we did not borrow from the Greeks.

The Need for Roots, S. Weil

Always be ready to explain your hope, but do so with gentleness and respect.

1 Peter 3:15-16

Introductory Note

P. Étienne Grieu sj, Rector of Centre Sèvres
Jesuit Faculties of Paris

Through the use of algorithms and the development of artificial intelligence, humanity faces a daunting question about the relationship it wishes to establish with its own tools. Algorithms and artificial intelligence, with their influential power over human life, pose a challenge to our societies and renew the question of responsibility in the face of the unprecedented and considerable power of technology, as Hans Jonas foresaw in the late 1970s. Algorithms and artificial intelligence can be employed for the common good of humanity or, conversely, for the benefit of a few, leading to the subtle control of the many. The dystopias of Aldous Huxley and George Orwell regain relevance as humanity becomes aware of possible misuse of algorithms and artificial intelligence.

It is fortunate that this white paper can help foster questions and best practices, allowing algorithmic creativity to support the overall development of humanity and the common good. It's crucial for entrepreneurs, data scientists, and investors in the algorithm sector to gather within the 'Hope and Algorithms' Think Tank to share their experiences and engage in interdisciplinary discussions about the underlying ethical and anthropological challenges.

Christian hope is quite distinct from dreams that endlessly extend our achievements towards perfection. It comes into play, mischievous and elusive, when we recognize our often impoverished, narrow, and violence-prone reality; and simultaneously, we are given the chance to experience what, despite this, brings life and existence. The Church, in its tradition, acknowledges the most vulnerable as hope experts: they frequently operate outside established norms, and their lives often resemble miracles. A society that ignores them and fails to consider them in its forecasts risks heading straight towards despair.

Here lies a significant challenge facing humanity. Will the hopes of the underprivileged be embraced at the very core of cutting-edge algorithmic and AI research, or will they be disregarded, trampled as worthless? Throughout history, Christians have endeavored to tackle challenges posed by new innovations, drawing on their tradition of reflection and discernment to identify promising paths that don't devalue living beings but rather respect their dignity and invite them to freedom. This is how the social doctrine of the Catholic Church has gradually developed. Often, this has stemmed from the thoughts of those closest to emerging realities. It seems to me that this white paper attempts precisely this gesture.

I am pleased with the commitment of the Centre Sèvres-Jesuit Faculties of Paris to this interdisciplinary research endeavor, especially within a training and research seminar connected to the Think Tank 'Hope and Algorithms', alongside the Bernardins College, and with many players from business and civil society. Let's nurture together the mission to bring the Gospel and Christian anthropology close to crucial decisions for the future of humanity and our societies.

Foreword

by Mgr Rougé, Bishop of Nanterre

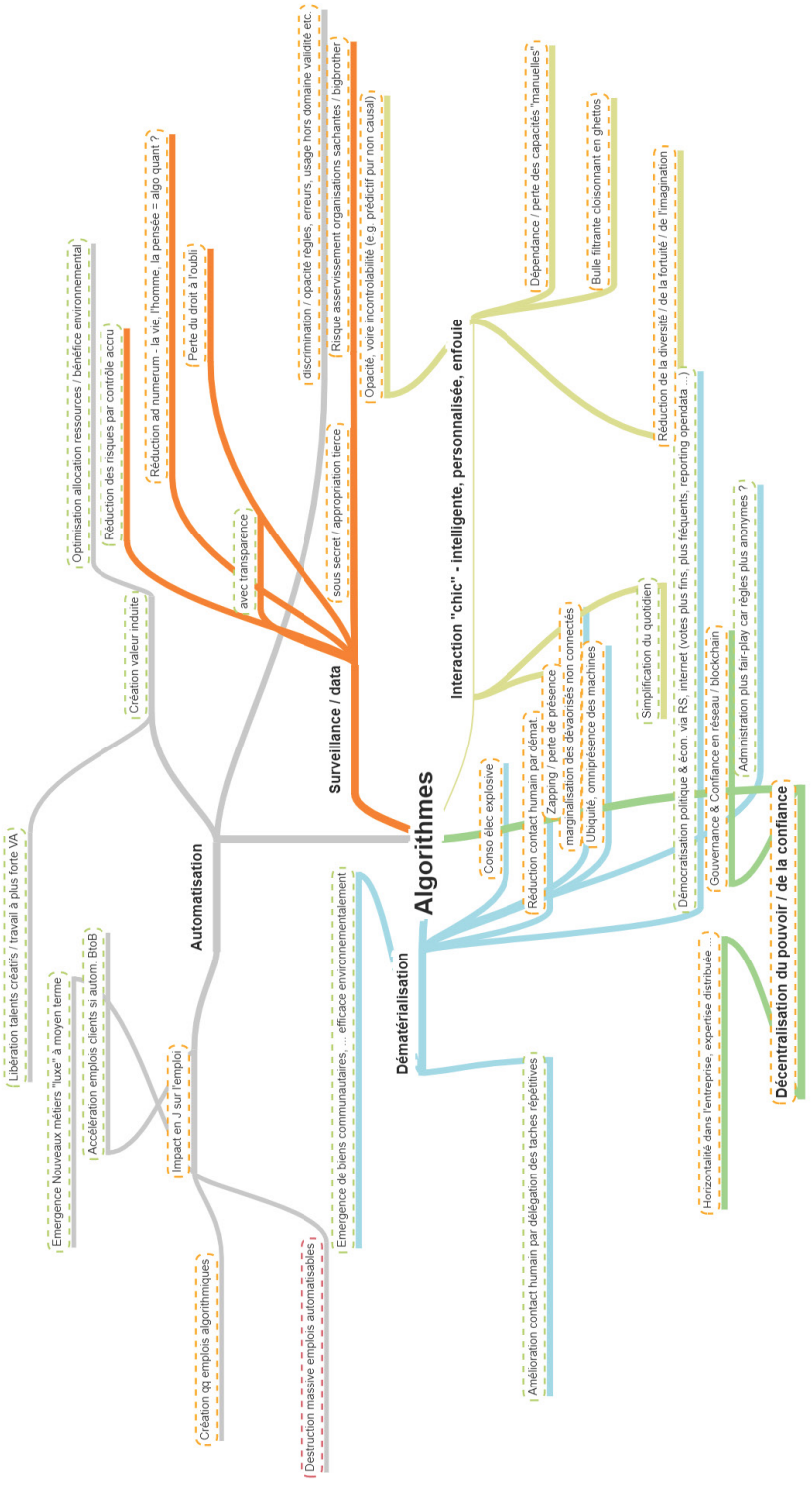
Innovating with the Courage of Discernment

This manifesto of Hope and Algorithms is indeed uplifting news! For many, the unchecked and soulless expansion of algorithms and artificial intelligence is a cause for concern and even despair. To others, new technological possibilities open up hopes of surpassing all boundaries. The authors of the manifesto believe that serious and grounded discernment can harmonize ambition with humility, the excitement of research with the enduring service to the principle of human dignity.

Hope, for Christians, isn't about a pressing desire or the illusion of bringing about a flawless, limitless world within history, even if it means major ethical violations. Instead, hope unfolds a horizon of universal brotherhood and personal fulfillment, especially for the most vulnerable. It allows us to embrace the ups and downs of history, the delightful surprises of human creativity, as well as the threats in health, economics, ecology, politics, and ethics, all viewed through the lens of a world continually striving for justice and peace.

The biblical and evangelical tradition consistently shows its ability to illuminate the present and pave the way for the future. Today, Jews and Christians often stand together as witnesses. The pandemic crisis we just endured highlighted the ongoing relevance of warnings like that of the Tower of Babel and the colossus with feet of clay. The opening pages of the Bible: "God created man in His own image, in the image of God He created him; male and female He created them" (Genesis 1:27) serve as an enduring call to honor every human being, in the wholeness of body and heart, within the unity of the human condition that requires safeguarding, and in the fruitful distinction between man and woman.

May the efforts of Hope and Algorithms unite many who innovate boldly and wisely, and contribute to a future of justice and peace.



Extended Introduction - Algorithms and AI: Neither Angel nor Demon, a Practical Resource for Enterprising with Hope Amidst the Crisis

The COVID crisis has highlighted the crucial importance of models, data, and algorithms, bringing AI's promises down to real-world issues.

The global COVID-19 crisis, both health and economic, has upended all predictions.

Before this, algorithms and artificial intelligence held a prominent place in the news: since 2018, no media has failed to showcase the hopes, achievements, or controversies stirred by algorithms, artificial intelligence, and big data. On the one hand, they were adorned with all virtues, with humanity marching inexorably towards a rational and supremely desirable future of enhanced humanity; on the other hand, they were seen as demons, with machines allegedly destroying 30% of jobs and subjecting citizens to unlimited surveillance and obscure discrimination.

Neither angel nor demon, but part of daily life: it's probably time to return to reality... algorithms and AI haven't eradicated the inherent fragility of humanity by creating a technological shield against plagues as old as history. Nevertheless, there has never been so much focus on data, mathematical models, and forecasts—the fundamental language of machine learning—during the global information overload of the crisis months; rarely has public policy been so dominated by decision-making support based on learning in the face of uncertainty, and massive data technologies (tracking); never have the internet, video conferencing, remote work, and content recommendation engines been so utilized as during these months of lockdown for nearly a third of the planet, in a sudden embodiment of Teilhard de Chardin's noosphere, including in liturgy.

AI is here: we're already using it, and we're going to keep using it... But now, we're looking for real promises on urgent issues: a productivity boost to counteract a deflationary economy that many businesses will depend on for survival; a crucial tool for crisis management and forecasting; and a way to reshape human interaction during times of enforced social distancing.

Like those before it, this new industrial transformation affects how humans relate to the world, carrying an undeniable spiritual dimension that is still rarely discussed as such today. It seems that social and economic reflections from Christian or Jewish perspectives have yet to fully engage with this topic, at least in France, even though general guidelines are provided by Rome and some ecclesiastical or rabbinical authorities. We also believe that in this area, economic practices, especially those at the forefront driven by innovative entrepreneurs, are increasingly outpacing the development of ethical, institutional, or deontological guidelines.

A technological reality central to global management of the health crisis

Perhaps it's worth considering just how central data, models, and so-called 'intelligent' algorithms have been and continue to be in managing the pandemic since early 2020 in China.

Models, data & algorithms - What are we talking about?

At the heart of transformation lie models, big data, and algorithms, forming a fundamental mathematical-computational trio underpinning applications of artificial intelligence, automation, and/or robotics. By model or modeling, we mean any method of representing a system or process that allows us to 'work' on reality: a sketch, a map, a scale model, a contract template, an image, an ordered classification... and of course any model in the logical, cognitive, or scientific sense, particularly mathematical or computational. Their commonality is representing - by definition, imperfectly1 - a reality to help understand, imagine, compare, train, design, recommend, and assist in decision-making, control, or even make decisions autonomously. The fundamental case is that of digital models because they are repeatable, systematic, and distributable at high volume and low cost: they rely on data formatting - observations quantified more or less precisely of physical, social reality, etc. - through logical, formal, and computational concepts, thus mathematizable and hence automatable through the integration of algorithms - a clearly specified and limited set of instructions to implement a method or process applied to digital objects, at the intersection of mathematics and computer science. Algorithms thus enable the operational implementation of models to estimate, simulate, optimize, visualize, automate, etc., relying on increasingly intensive computing infrastructure and interacting with connected objects and humans via a human-machine interface (HMI or UI - User Interface).

1 Think of the perfect, yet utterly unusable map imagined by J.L. Borges: "(...) the Cartographers' Colleges drew a map of the Empire, which was the size of the Empire and coincided with it, point for point (...)", J.L. Borges, The Author and Other Texts, Paris, Gallimard, 3rd edition, 1982

The news has inundated everyone with daily counts of morbidity statistics and global mortality; even those among us less familiar with the subject have come to realize the importance of pairing these raw data with mathematical models for both interpretation and forecasting or decision support. First, interpreting them: because, of course, data are always imperfect, partial, and heterogeneous observations of reality, varying by country and counting methods, a statistical model is a very useful means of understanding the associated uncertainty, or even questioning their quality. But even more, these models are necessary to rely on these imperfect data to predict and make decisions under uncertainty: most epidemiological models are based on a more or less detailed description of viral transmission rates from one person to another, which, as long as they remain approximately stable, naturally lead to a dangerous exponential growth until it plateaus in an S-shape, either by exhausting available targets if the epidemic is not controlled, or through confinement measures to obstruct these rates: hence the Ro coefficient, a very uncertain quantity, as central to epidemic spread forecasting models as it is to public policy decisions on confinement, especially regarding impacts on hospital emergency services.

Regarding testing policies and tools, we experienced firsthand the ethical choices raised by decisions supported by models, data, and algorithms (the reader will find a detailed bibliography in the appendixhere).

Uncertainty, first and foremost, at many levels

Uncertainties about the effectiveness of tests and treatments led to the central question of the balance between false positives and false negatives, a common issue in the use of statistical learning models (machine learning), currently the most popular form of artificial intelligence; this leads to significant challenges in assessing a person's risk level and thus choosing the appropriate treatment. This also presents dangers in calibrating social risk levels—such as the virus's prevalence at a certain time and place, transfer rates among carriers, patients, recovered individuals, etc.—which depend heavily on the quality of statistical sampling. Even greater uncertainties arise from the socioeconomic behavior of individuals and the severe consequences of distancing measures on the economy, impacting the survival of people and families, which required

macroeconomic models inevitably need to quantify the uncertain underlying costs and benefits. Without waiting for more data to reduce uncertainty, decisions must be made *here and now*.

The delicate task of balancing ethical considerations in pursuit of the common good

While ethical debates about data and AI often focused only on personal data protection or anti-discrimination efforts, the crisis has brought to light much more severe ethical dilemmas. First, balancing restrictions on individual freedoms to reduce virus transmission from one person to another, amidst significant uncertainties in epidemiological models and scarce, imprecise data. Then, the allocation of inherently limited hospital resources to patients whose disease progression remains uncertain despite tests, who have varying life expectancies, family responsibilities, or dependents, and may even have differing personal consent regarding the nature and extent of care. Balancing the use of data acquired with or without individuals' free consent, which carries information not solely related to health but also impacts public health benefits and the return to work of entire populations, requiring detailed information and targeted quarantine. These balances require decisions guided by differing ethical paradigms, such as utilitarian, deontological, and others.

What are we really discussing when we talk about 'artificial intelligence' in this context?

The current economic bubble is blurring the lines around artificial intelligence (AI), which has become a real catchphrase in communication. Initially, the goal was to understand, formalize, and replicate human cognitive processes such as intelligence, language, and learning through dedicated models, algorithms, and human-machine interfaces. However, today's objectives are more focused on developing machines that solve certain problems 'better' than humans, using any available means, not necessarily through imitation. 'Neural networks' are now understood as highly effective mathematical and computational structures, rather than mimicking the human brain's physiology. It's a blend of the ancient oracle—predicting the future possibly through keen psychological insight and wit honed over thousands of consultations—and the learned parrot, taught nearly as much information as contained in the Library of Congress. Thus, algorithmics and AI can be seen as a set of concepts and tools to help rationally process information and automate processes. But AI is interested in the most advanced among these machines, intelligent agents characterized by 'learning' and 'interactive' approaches, potentially handling significant complexity. For instance, beating chess players, proving mathematical theorems... AI doesn't necessarily cover all mathematical models and algorithms. Conversely, AI draws from disciplines beyond just models and algorithms. Several branches in AI can be distinguished, but the machine learning branch is a critical aspect of current AI. It indeed hosts the largest number of startups and marks a major efficiency breakthrough compared to historical AI approaches that emerged with data commoditization. Instead of programming 'expert' rules to accomplish a task (a process often far more complex than expected and costly to maintain), machines can now discover these rules themselves... provided there's a sufficiently deep volume of data and computational power to operate massive algorithms. A fundamental point in statistical learning is selecting the cost function to optimize in a program, which models the balance of minimal discrepancies between imperfect real-world observations and algorithm predictions, with major implications for decision-making balances for those using such models, as was the case with COVID regarding the false negative/false positive ratio.

2 The machine learning branch generally encompasses learning across all types of alphanumeric data. Other branches also include learning, such as natural language processing (NLP), vision, and pattern recognition (image, speech...). There are also branches for robotics, interaction, and reasoning. The important domain of interactive machines, such as chatbots, involves NLP and techniques for language generation and interaction.

Numerous attempts were made during the crisis, and some say even before it, to enhance surveys, tests, and decision-making models with artificial intelligence in response to the health crisis:

- detecting early warning signals through social media, even before official announcements;
- measuring body temperature in crowd videos or analyzing lung images of individuals, with interpretations sped up by algorithms;
- contact tracing tools using mobile data;
- online diagnostics supported by probabilistic models, Bayesian networks, etc., possibly implemented via mobile apps;
- chatbots to speed up diagnostic processes supporting medical personnel overwhelmed by massive waves of calls, or even replacing them with pre-screening;
- AI predicting COVID-19 complications to aid treatment decisions, and even the delicate prioritization of patients;
- machine learning algorithms dedicated to rapidly exploring active ingredients or molecules with treatment potential;
- predictive algorithms identifying cluster locations and severity levels over future timeframes.
- etc.

Of course, algorithmic technologies were leveraged during the crisis well beyond health issues: starting with a surge in digital services that often discreetly incorporate algorithms (video conferencing and other cloud tools forming a crucial infrastructure for remote work, including virtual site visits, remote consultations; online signatures and contracts...) and also a boom in the use of online cultural content platforms (video streaming) and e-commerce platforms largely based on recommendation algorithms and automated bidding, as well as optimization of logistical planning under tight lockdown constraints.

Technologies and business models that will see their dominance grow in the economic crisis

In fact, beyond the health crisis itself, algorithms are far more than just a pre-COVID-19 tech bubble or a lively philosophical and technical debate: they're at the heart of the rapid transformation of nearly the entire global economy and society, and this transformation is set to speed up during the crisis.

Why is this so crucial? Economically speaking, the digital transition began with an overwhelming surge of data flooding every field, driven by a massive drop in data costs and the daily emergence of millions of micro-services and applications reshaping daily life, from the bustling western metropolises to the far reaches of the Sahel through mobile payments. The lockdown of nearly a third of the planet only accelerated this connected digitization, with almost a billion people relying solely on teleconferencing apps, streaming audiovisual content, or using digital educational materials for remote learning to stay connected.

The rapid adoption of user-favored apps is largely due to plummeting costs. Data, storage, and computing are nearly free; more importantly, open-source platforms like R, Python, and GitHub have slashed the costs of algorithms that provide real-time, personalized, and large-scale responses, creating a revolutionary infrastructure. Where hundreds of engineers were once needed to optimize electricity in real-time or airline ticket prices, now a motivated handful of startup entrepreneurs can implement a new service for individuals or businesses within months. There are few barriers left to reinventing and revolutionizing most professions in this environment.

Algorithms are deeply embedded in the strategic core of the digital economy's phenomena and the rise of the new giants like GAFAM (Google, Amazon, Facebook, Apple, Microsoft) and China's BATX (Baidu, Alibaba, Tencent, Xiaomi): learning and statistical models are necessary for

Advanced methods for processing and monetizing Big Data, graph theory to derive value from social networks, geostatistical models or time series for fully leveraging massive networks of connected devices, and stochastic optimization to balance the business models of the collaborative economy... Until now, modeling didn't seem 'accessible': algorithmics was solely the domain of large industrial engineering (energy, transport, telecom...). However, the digital age is seeing their ubiquitous spread to everyone, offering huge opportunities for personalized services and radical automation of business functions.

The Role of Big Data

While there are AI models, algorithms, and techniques that theoretically require almost no data to implement, there's a very close relationship between AI models, algorithms, and technologies and the availability of massive volumes of data (big data) made possible by the plummeting cost of data since the 2000s, initially via web navigation data providing massive and personalized information, then via the widespread use of connected devices delivering unprecedented amounts of industrial, environmental, health, and private information. Historically, the first AI models, algorithms, and applications were mainly built and programmed from ad hoc gathered knowledge or expertise3 : nonetheless, the major phenomenon since the late 2000s is undoubtedly the widespread adoption of statistical or machine learning, through an increasingly data-focused approach, with fewer and fewer predefined rules or laws, the logical extension of which is deep learning4 . Notice how when DeepBlue defeated Garry Kasparov, or when Watson won on Jeopardy, it was a computational feat using massive memory and the addition of complex rules (Regex) with immense combinatorial depth, but not necessarily yet a feat of learning. When

3 Traditional predictive methods are developed through: (a) modeling and simulating large industrial or living systems by incorporating physical laws or engineering sciences into numerical models and solvers to predict an aircraft's resistance or the weather for the coming days based on relatively limited data of parameters or initial conditions, and (b) expert systems, rule bases, and other Regex from the 80s encoding business expertise, pre-determined patterns on labels, dictionaries, etc., automating recognition, classification, or decision-making in business processes.

4 Deep learning, or deep learning, refers to the broad adoption of learning techniques through neural networks, which are non-linear, tree-like structures that have proven incredibly effective, especially in image recognition.

The AlphaGo program by DeepMind defeated the world's top Go players (Fan Hui in 2015, Lee Sedol in March 2016, and Ke Jie, the world number 1, in 2017), showcasing that learning algorithms have become truly indispensable, far surpassing a mere 'brute force' approach that wouldn't have been as effective.

In reality, as this white paper will further explore, there is a fundamental convergence in today's economic and social landscape that unites services based on models and algorithms that use varying amounts of data in more or less connected ways, effectively creating agents that are more or less capable of learning and/or interacting, thus more or less rightfully deemed 'artificial intelligence' in the traditional sense. All of these are accompanied by a breathtaking wave of automation, typically delivering both unprecedented operational efficiency and remarkable personalization, where past industrial revolutions combined automation with standardization. Therefore, we will be discussing the algorithm phenomenon in a condensed manner, implicitly including models, big data, and artificial intelligence systems according to the context.

This is crucial because there's no doubt that the technological surge extends far beyond a mere media event. What is unfolding before our eyes is a radical transformation of all professions through massive data and algorithms, a faster industrial revolution than previous ones, with its array of economic and social changes. It's essential to first recognize that algorithms are the underlying infrastructure of the world's largest market capitalizations: Google, Amazon, Facebook, Uber, etc., are fundamentally algorithmic companies, a point we will elaborate on below. Furthermore, it's important to note the palpable excitement in the startup sector, where the authors of this white paper are active, both in France and the United States or elsewhere, where the .ai suffix or 'predictive' promises have played a significant role in recent years in attracting venture capital investors and the most talented individuals to build young companies that grow from 0 to several dozen or even more than 100 employees in less than 2 years.

Open Data, Open Source, and the Universal Destination of Algorithmic Resources

Open takes on many forms in the realm of algorithms: open source (software that enables the execution of algorithms like R, and others for processing large volumes of data like Hadoop), large freely accessible datasets (open data from public or private entities, availability of datasets for research), and educational modules and tutorials (MOOCs). All these open forms are freely accessible, providing entrepreneurs with resources for innovation, productivity, and a model for large-scale collaboration and coopetition. Open in all its dimensions is a resource and opportunity for algo-entrepreneurs. It lowers the barriers to entry for building activities that use algorithms. Freely accessible algorithms, datasets, and training are available. So, identifying a problem and finding the algorithm to solve it ultimately rely on those who have the "desire and ability" to leverage them. Open source is primarily a technical issue in that it facilitates the development of information systems, not only because it's free but also because it facilitates collaboration among engineers5. But it's also a social and even philosophical reality, closely linked to one of the key concepts of the Church's Social Doctrine, which is the Universal Destination of Goods.

Initiatives launched by some of us over the past five years with Bpifrance towards regional SMEs and ETIs show just how universal the impact will be, and it calls on entrepreneurs and business leaders of all sizes and sectors to take advantage. The initial feedback is powerful. Enabling an SME from the Vosges with three generations of history to reinvent business services through artificial intelligence. Transforming a company in Orléans exporting 100% to Africa, facing fierce low-cost Indian competition, into a service operator ensuring real-time water usage in African villages over 20 years through connected devices and powerful predictive maintenance algorithms. Reinventing agricultural logistics with a service as flexible as ride-sharing, equipping an agro-industrial ETI in the face of the dramatic disappearance of quotas. Each time, several hundred regional jobs are at stake. The first goal is to prevent them from dying out and laying off everyone by resisting new industrialization. Then, to enable them to invent new services that customers will love by blending tradition

5 Collaboration among engineers happens recursively, relying on a particular type of collective behavior (see Christopher Kelty's work in "Two Bits").

the unmatched speed of learning and innovation through data, and the mathematical ingenuity applied to algorithms, without waiting for daring Americans or Chinese to do it for the Vosges industry.

Why insist that despite the global crisis and the wave of disinvestment due to financial difficulties faced by businesses, algorithms will retain or even increase their significance? Because algorithmic transformation is deeply embedded in the core realities of the crisis:

- the surge of remote work has broken down psychological barriers to digital transformation, necessitating collaboration and interaction capitalization through digitally equipped process models, otherwise the risk of deviation is significant;
- the ongoing need for social distancing has, for instance, led to the acceptance of digital signatures for notarial acts;
- the urgency of productivity margins has become a matter of survival, where automation of tasks, in whole or in part, is an essential lever.

It was first in hospitals, facing the massive wave of COVID diagnoses, that online tests and bots were finally mobilized to greatly enhance medical responsiveness. But this is equally true in diverse traditional economic sectors like geotechnical expertise, notary services, real estate transactions, etc., where SMEs and mid-sized enterprises decided to sustain or even accelerate their algorithmic transformation in response to the crisis, right from the start of lockdown.

Algo-companies can also be agents of dominance, dependence, or even malicious manipulation - the debate on tracking apps

The public is also drawn into the major debates about the potential subjugation by data and algorithms. Recent economic history has quickly turned bold, creative entrepreneurs into massive empires with oligopolistic control over data—thanks to their sheer talent, much to the chagrin of 20th-century industrial giants. Who would've guessed that Mr. Zuckerberg, J. Bezos, or L. Page, once obscure students, sometimes not even graduated, would rise and seize the place of near-centennial industrial empires in less than a decade? The deep economic nature of the algorithmic revolution carries the risk of becoming a de facto monopoly. It's crucial to understand that algorithms now virtually automate most services and production functions within a company—from marketing, product design, and sales, to logistics, recruitment, engineering, production, maintenance, and administration. These algorithms often possess the virtue of 'scalability.' A tenfold increase in customers or revenue doesn't entail a proportional rise in operating costs but rather enhances the network effect value of their services. This grants those who dare to experiment, invest, and convince first, rapidly growing margins and a natural tendency toward dominance (*'winner takes all'*). Such are the formidable forces of 'algorithmic companies' now dominating the world's largest market capitalizations. These are also the hyper-concentrations of economic value in the hands of algorithmic entrepreneurs who've most opportunely capitalized on their talents, unlike the parable's unwise servant who buried his, despite the enormous risks of failure or disgrace when it comes to radical innovation.

This now raises fears that the unparalleled creativity of these bold entrepreneurs—blessed by the Lord?—might transform into near-Orwellian domination. For beyond social pastimes or

digital shortcuts for daily tasks like finding a book, an address, or reconnecting with an old acquaintance, it's the deep roots of modern power that now depend on algorithms and data governed by these new lords. As F. Pasquale explains in ' *The Black Box Society, 2016* ,' everyone's reputation, access to information & key resources throughout life—from daycare, university admissions, loans, jobs, clients, to romantic encounters, and legal investigations—are increasingly under the direct or indirect control of these vast computational machines, whose rules are becoming ever more obscure and whose managers are generally out of reach.

Hence the discussion on sharing value among stakeholders within the realm of quasi-monopolistic platforms born from algorithmic economies of scale, sometimes suspected of creating new economic subjugations that challenge the universal purpose of goods. Additionally, there are possible threats to personal freedom: a crucial point concerns the relationship between individuals and data, especially data known as personal data. Stemming from the digitization of daily life services, the exponential growth in the volume of data collected by businesses, organizations, and public institutions has fueled the rise of algorithms aimed at improving decision-making and predicting events. However, these data, captured in their native forms, can contain sensitive personal information belonging to individuals, whose privacy might be compromised throughout the collection/treatment/analysis chain. The Cambridge Analytica-Facebook scandal is an example of the risks posed by this development in the analysis and exploitation of personal data.

The introduction of the GDPR (General Data Protection Regulation) in May 2018 significantly changed the European framework for using personal data, which directly pertains to an individual, notably with the creation of a right to data portability. This right allows each person to obtain in a directly usable form the data that a company has collected about them. In the spirit of European lawmakers, this document, especially with this provision, aims to strengthen individuals' "power" over their data. Existing regulations - including French laws that specify and sometimes supplement the GDPR - do not exhaust the ethical reflection on data control (see especially CNIL, 2017). Should individuals have full sovereignty over their data?

Should we establish usage rules that incorporate the role of data and their exchange in forming connections between people?

The topic of tracing apps has reshaped this debate, probing the delicate balance sought in pursuing the common good, especially during a severe health crisis. While digital privacy is crucial, respecting human dignity and autonomy does not fully address the pursuit of the common good. Detailed tracking of movements and health status might significantly benefit public health, but only within a defined, temporary context with strict proportionality and decisive guarantees on limited use and organizational oversight, even if these organizations have political authority, which does not shield them from temptations.

In its significant report on developing and governing technological solutions for exiting the COVID crisis, the organization OPTIC, founded by Dominican Father E. Salobir, identifies key principles for balanced use of the many tracing apps tested worldwide. These principles warn against reductionism (equating data with complete reality, map with territory), technological solutionism, and emphasize the need for 'ethics by design': respecting privacy, protecting personal data, and adhering to the intrinsic characteristics of technologies such as necessity, proportionality, transparency, loyalty, etc. The authors affirm, despite caricatured debates, that there is no conflict between data protection and pandemic control, or between individual and general interests, as long as the pursuit of the common good does not preclude the use of personal data, provided responsible collective processes handle the data and protective measures for individuals are implemented:

- **transparency as a must**, including details on technology (storage locations, who manages the system, which sub-population would be actually affected or excluded, ...) ;
- **reasoning** in terms of **overall relative value** of one solution over another (technological or otherwise), incorporating health, economic, and "psychological well-being of populations" ... ;
- **principle of autonomy**, not as a selfish choice but as a "capacity for personal development" to encourage responsibility for the common good ;
- social justice and respect for dignity against discrimination or ostracism of affected individuals ;
- inclusive assessment not limited to experts or a paternalistic authority; with shared responsibility - neither 100% collective nor 100% individual;
- proportionality of uses, especially regarding the scope and duration of data retention, which requires possible verification by the citizens themselves; and principle of necessity (the application is not actually effective below 60%, is it still strictly necessary?).

Algorithms can be sources of confusion, mystification, and uncertainty that need to be managed, or they can lead to socio-cultural isolation.

One of the fundamental issues is understanding these systems and databases, or making algorithms more explainable. The promise of artificial intelligence is to simplify daily services as much as possible, but this inherently hides the complex mechanisms of the underlying calculations from users. It's precisely because these services appear so much simpler 'on the surface' compared to traditional systems that they are widely embraced. Entrepreneurs are at the forefront of creative efforts to make services more straightforward and intuitive, securing user buy-in swiftly: why elaborate on search keywords when a social network naturally suggests the 'best movie' to watch based on what is known about you from your interaction history, your friends, and those similar to you?

As algorithmic entrepreneurs and mathematicians ourselves, we understand that beyond the media hype surrounding 'artificial intelligence,' most algorithmic systems are merely 'oversized parrots' trained with extensive collections of languages almost as vast as the largest library in the world. Algorithms are automata programmed to replicate statistical or functional patterns, even if the complexity of

The aggregation of these can be immense and incredibly rich in modeling potential. Of course, the choice of mathematical programming rules and, for some, even more so, the choice of the training database is crucial for the outcome's impact. Almost deliberately 'mystified' by a seemingly intelligent service, do we, as users, make the effort to question the reasons leading to such automatic recommendations? Indeed, as we'll see below, in extreme cases, algorithms can be more or less explainable, even to their own creators; however, in many instances, they are built on fairly simple rules and a database with well-defined characteristics. The universe of choices and resource allocation conditioned by algorithms are strongly influenced by these rules: it's a true challenge in knowledge, training, and empowerment to take hold of it, by making the effort to open the black box and take responsibility.

Let's finally note that a major scientific and technological challenge engaging the experts themselves is controlling algorithms. Over the past decade, the remarkable usage and strong trend have highlighted the branch of algorithms linked to statistical learning (machine learning), especially deep learning. These have undeniably transformed certain applied challenges, like specific image recognition types. This mathematical branch is likely one of the most reliant on the unique characteristics of the databases underlying their calibration. It promises to break free as much as possible from rule structures or expert models by learning independently through powerful non-linear layers. Learning to statistically mimic vast complexities without preconceived notions, the risk of generalizing this to other data categories and applications than those it was calibrated for is tricky to manage. It's even trickier because the complex, autonomous underlying structures are inherently hard to interpret, far more than traditional phenomenological or expert models built on explanatory theories. In extreme cases, the intelligibility—or even complete explainability—of algorithms may elude their creators, the coders, or data scientists who may not take the necessary critical distance due to lack of awareness, time, or being overwhelmed by their machine's computational enormity. With an emerging awareness especially in 2017-2018 about these issues, recent efforts have been initiated to understand and at least locally 'explain' them.

The parametric logic of an algorithm and how it responds to changes in a user's parameters.

Beyond the risk of incomprehensibility, the algorithmic and connected world also carries significant vulnerability to malice, hacking, and all sorts of intrusions: from keys to large industrial systems to vaults of sensitive data, including remote control of implants within human bodies, it's easy to fear a corruption of connected algorithmic automation. In reality, rather than worrying about futuristic robots rebelling 'on their own' against humans, isn't it more about the heightened vulnerability to criminal manipulation by humans of the programming of very powerful machines? We must anticipate deep uncertainties regarding their use in human or industrial systems, which will require a whole array of regulations and codes of good practice, but above all, awareness, training, and technological innovation in detection, simulation, control, and certification of robustness or more robust design (rule systems enriching and securing learning). Perhaps akin to attempts to avert risks in the large industrial systems of the 20th century, whose unit complexity was probably not less high, but whose dissemination was vastly less widespread.

The risks of discrimination have already been discussed in public policy. The risks of 'cultural confinement' might be even trickier: faced with mechanisms reproducing statistical regularities and a certain laziness of use, behaviors can quickly concentrate cultural realms into a 'filter bubble.' By continually following the opinions and recommendations of my Facebook friends, mechanically promoted by underlying algorithms aiming to showcase 'what is most likely to appeal to me,' I risk viewing and experiencing the world only through the lens of my segment and only experiencing it through digital mediation. Without suspecting the underlying models of recommendations, whether sponsored or driven by 'reproductive statistics' on variables selected by a third party. Are we more or less confined than we were in a century with rarer information and fewer media, controlled by an elite of professional journalists? How do we design algorithms that can open up and elevate

6 Cf. notably SHAP - Shapley additive local explanation, in updating in a certain way to machine learning algorithms the rich field of sensitivity analysis methods, uncertainty & meta-models, initially developed on numerical models of large industrial systems.

cultural plan rather than amplifying divisions and discord? We'll see in the chapter: Cultural Goods: the impact of recommendation engines that it is possible to offer recommendation services that are inherently more open, as entrepreneurial experiences prove.

The delicate question of intelligence & the strong artificial intelligence hypothesis

In light of the astounding achievements in games like Go, the remarkable efficiency of certain image recognition and voice interaction tools, medical diagnostics, and online behavior predictions, including suicide rates, one might wonder: is this genuine 'intelligence'? As Luc Julia notes (see Artificial Intelligence Doesn't Exist, 2019), these algorithms can be seen as programmed computational tools, merely automating well-known deterministic tasks with incredible speed and depth, without genuine innovation or improbable inferences. They lack multidisciplinary intersections or visionary conjectures at the crossroads of different realms, which curious and passionate humans have historically achieved in scientific advancements7. Finally, we can argue that algorithms fall short of 'emotional intelligence.' Therefore, many attributes of intelligence, or even more so the human soul, remain beyond AI's reach, as evidenced by numerous experts in the field (cf. Y. Le Cun, Facebook R&D, conference at the Vatican, 2016).

Nevertheless, the debate over the hypothesis of 'strong artificial intelligence' or 'singularity,' notably advocated by R. Kurzweil, has been raging for many years: the theory suggests it is possible: (i) that at some uncertain point during the 21st century, learning machines will acquire cognitive abilities surpassing those of humans, and (ii) that they will develop such a potent level of interaction

7 However, let's note that the deliberate combination of connected devices and massive data sources remains programmable. Computational power assesses so many possibilities that human lifetimes wouldn't suffice to explore them all; it sometimes uncovers impressive empirical rules that had never been identified, such as in Go, where the novel strategies of AI have astonished grandmasters.

including in 'emotional intelligence' that they might change the course of history by taking - whether it be emotion, will, consciousness, or merely simulation of these - initiatives beyond the control and mastery of humanity.

This forward-looking technical debate deeply challenges the Christian anthropology of intelligence and the soul. It traditionally distinguishes between the body, soul, and spirit to unite them better; also highlighting the capacity to relate to God - the 'fine point of the soul', intelligence and will, and on the other hand, imagination, sensory phenomena and passions, emotions, and feelings in the broad sense of the term; and finally, the capacity for self-reflection, self-awareness, and one's own thinking. These are all attributes that a machine might at best simulate but not possess: yet even the ability to simulate them could create a significant shift in human-machine relationships and lead a human to experience feelings toward it. Lastly, human intelligence also has the capacity for abstraction in its relation to reality.

In this white paper, however, we've chosen not to delve deeply into this debate: although it has already engaged many voices, including some of the most prominent figures in the global digital economy (Bill Gates, Elon Musk, Stephen Hawking, ...) and various spiritual entities including the Vatican, we believe that the algorithmic phenomenon produces ***here and now*** consequences that are infinitely more significant and urgent to address today than this conjecture, which is certainly fundamental but also uncertain and distant: the role algorithmic companies play in nearly all of today's economy and society.

Entrepreneurship: A Special Calling to Contribute to the Common Good in the Era of Algorithms and Crisis

Economic analysis teaches the central role entrepreneurs play in economic and social innovation. It is likely through Schumpeter's work, his Theory of Economic Evolution published in 1911 and 1926, that the figure of the entrepreneur-innovator became the most popular. Recent history of algorithms shows striking examples through the GAFAM oligarchies, all stemming from the creativity of a few entrepreneurial figures from just over 20 years ago, but equally for Uber, Airbnb, or closer to home Blablacar or Doctolib.

But more importantly, in these times of crisis, it is good to remember that the distinctive characteristic of an entrepreneur is to face uncertainty with reason and hope.

Without a doubt, Blaise Pascal stands as a true beacon of inspiration in this regard. His profound 'Pensées' are celebrated as a masterpiece of literature, even by many non-Christians, serving as an apologetic of Christian faith. Mathematicians are grateful for his pivotal contributions, even if not for the genuine creation of probabilities, which have such a central role in AI. Meanwhile, IT experts recognize his machine as a real, tangible algorithm. Few are aware that he was also a brilliant entrepreneur, successfully marketing his Pascaline before creating a thriving Parisian transport service. Pascal noted in his 'Pensées':

> *Consider how many things are done for uncertainty, like sea voyages and battles! (...) If nothing should be done for certainty, (...) nothing would be done at all because nothing is truly certain (...) However, when we work for tomorrow and face uncertainty, we act wisely: as one must work for uncertainty, as demonstrated by the rule of parties (...).*

Richard Cantillon was one of the earliest to highlight the pivotal role of the entrepreneur—alongside the entrepreneurial investor and the 'poor independent' he associates with—in his 'Essay on the Nature of Trade in General,' published posthumously in 1755:

> *All the residents of a state can be divided into two groups: entrepreneurs and wage earners. Entrepreneurs face uncertain wages, while the others have fixed wages for the duration they enjoy them, even though their roles and status might vary greatly. The general with a salary, the courtier with a pension, and the servant with wages all fall into the latter category. The rest are entrepreneurs, whether they start with capital to run their business or are self-employed without any capital, living with uncertainty; even beggars and thieves are entrepreneurs of this sort.*

In Risk, Uncertainty & Profit, a 1921 publication crucial to the history of economic science and the science of risk, F. Knight emphasizes:

> *True uncertainty accounts for the unique earnings of the entrepreneur.*

By making profit the legitimate and specific reward for the entrepreneur, it's like a 'wage of uncertainty.' This notion finds a spiritual echo in the work Money, Master or Servant by P. de Lauzun, an economist and Christian essayist who previously led the federation of financial markets. He even introduces the entrepreneurial spirit as a privileged path to sanctification:

> *In a sense, as free individuals responsible for our choices (under God's guidance), we are all called to embrace some form of entrepreneurial spirit. (...) Because to undertake is to take risks—a form of self-giving—and to collaborate with others by betting on them; it is, ultimately, a way of creating. In business, as in our entire human life, we encounter uncertainties about events that must be overcome in the name of a completely different perspective: the promise of eternal life. In professional life, undertaking is the most accomplished stage of action—some perceive this early on, others more gradually—and it can take many forms.*

The Social Doctrine of the Church8 rightly focuses on this figure of the entrepreneur (numbers 343, 344, 345), which indeed finds its roots in the Bible, both in female characters (the 'strong woman, mulier fortis' Proverbs 31, 10-31) and male characters, especially in the many parables of Jesus where management (the talents...), construction ('The one who wants to build a tower...') and investment (the merchant who found a pearl...) are discussed.

> *343 Economic initiative is an expression of human intelligence and the need to creatively and collaboratively meet human needs... 344 The roles of the entrepreneur and leader hold central importance from a social perspective, as they are at the heart of the network of technical, commercial, financial, and cultural links that characterize the modern reality of business.*

To the intrinsic qualities of the entrepreneur and the assumed risk-taking, the exercise of cardinal virtues in the entrepreneurial context must necessarily be added: prudence, the key to the other three, strength, justice, and temperance, meaning the right measure. Combined with discernment, these are essential to avoid the pitfalls of excess, justice without charity which is merely hardness of heart, and charity without justice which is merely complacency. Without cowardice, the entrepreneur's prudence operates in three dimensions: political—that is, strategic—economic—that is, operational—and human—that is, relational.

Our time of crisis, which questions the status quo and established habits, due to both the health and economic shock and the technological-economic disruption of artificial intelligence, is particularly socially demanding of entrepreneurial vocations aimed at the common good. Interestingly, algorithmic resources are a fundamental means today for such vocations and contributions to the common good.

Let's first take a look at how these technologies have helped make economic initiatives and entrepreneurship more accessible, especially through several major algo-entrepreneurial innovations that are highly practical for small businesses, such as:

- the partial automation of accounting, billing, and management through bank account scraping algorithms 43

8 Compendium of the DSE (Social Doctrine of the Church), 2005, 7th chapter on "Economic Life,"

and automatic annotations of transactions (see Tiime, ipaidthat, Dougs, Georges,...), editing and reconciliation of invoices, etc.;

- semi-automated legal service platforms (captaincontrat, legalstart...);
- semi-automated or automatable recruitment and business networking platforms; digital marketing, online sales;
- platforms that industrialize nearly all support functions and business contributions for sector-specific verticals;
- platforms that industrialize fundraising/crowdfunding through loans or equity;
- countless open-source resources for software development, algorithms, data;
- and so on.

It's rarely been so affordable and straightforward to start your own venture—first as an independent and often evolving into a micro-entrepreneurial, and eventually full-fledged entrepreneurial activity. These are ample opportunities to embrace the creative and empowering freedom of deep-water entrepreneurship: this is evidenced by the rising trend of self-employed independents, which calls for a deeper ethical and spiritual reflection beyond mere social critique inherited from a world dominated by the salaried workforce of 20th-century major industries. Entrepreneurs, especially amidst the vibrant Millennial generations driven by a quest for meaning and an innate sense of digital collaboration, naturally aspire to reimagine new complementarities between modern work forms and intelligent machines.

Perhaps, in the expanded role given to 'user experience' and design thinking in the digital and algorithmic economy, along with the industrialized collection and analysis of user data to better serve them, we might witness a genuine shift in economic balance compared to the 20th century when major companies, through their expert knowledge, created products distributed en masse to clients rendered far more passive by mass marketing and perfectly standardized. The breaking down of barriers to entrepreneurship, along with algorithmic tools, are means to 'listen' in a personalized and massive way, to invent creative solutions for the common good. If one embraces it, there is a renewed spiritual call to be attentive to others.

Finally, let us note that through their technological assembly in the form of blockchains, algorithms can even underpin systems for controlling, transmitting, and storing information without any centralized body. Thus, it becomes possible

to reinvent in a novel way a significant portion of socio-economic relationships, which are fundamentally based on trust through micro-contracts, economic associations, and everyday exchanges among individuals. Hence, the surge of entrepreneurial creativity at the community level using blockchain to tackle issues where slow and cumbersome centralized authorities have struggled. Doesn't this powerful engine of new horizontals in human communities deserve a Christian impulse, perhaps even inspired by *koinonia*, that communion etymologically related to *koinonos*, which also meant business associate in Greek, a term St. Paul likely surrounded himself with?

Algorithms: A Beacon of Hope - Sectoral Examples

It's certainly worth reiterating the substantial potential algorithms bring, which are often so hidden that many forget their numerous benefits. We'll successively present some entrepreneurial examples, broadly divided into three areas:

- integral ecology, in terms of applications that provide environmental benefits in areas like construction, agriculture, or energy;
- health, especially in early detection of diseases or decision-making support during pandemics;
- work, focusing both on job creation initiatives and innovations in social relations.

These examples will be supplemented by two areas where maintaining diversity and competition is crucial for the common good in the face of monopolistic temptations: cultural goods and consumer usage data.

Integral Ecology - Good News for Stewardship of the 'Garden of Creation'

Integral ecology has become one of the most significant issues of our time, illuminated by the anthropological and spiritual perspective of the famous encyclical Laudato Si, which draws from a long biblical tradition before the encyclical, shedding light on issues long associated with sustainable development. Models, data, and algorithms provide an impressive instrumental rationality: in the fields of energy, agriculture, waste, or transportation, thousands of new companies have now demonstrated the full potential for reducing the waste of natural resources through connected objects and mathematical models that diversify transport routes to relieve traffic, timely prevent harvests, silo degradation or fertilizer needs, coordinate millions of home heaters to reduce harmful peaks in electricity consumption, etc. Alongside the promise of a more rational and creative optimization of managing the 'Garden of Creation,' modeling, simulation, and automation technologies also offer better risk anticipation (weather,

climatic, health, etc.) and an increasingly intelligent understanding of the realities of this world. Moreover, these technologies even enable the acceleration of 'community' uses of goods: it is thanks to algorithms that large-scale deployment of shared systems for housing occupancy, automobiles, etc., has been possible, significantly reducing the massive environmental impact of manufacturing under-utilized industrial goods and, in a way, giving material meaning to the principle of the Universal Destination of Goods.

TheGreenData - decision support, funding & risks in agroecological transition9

Although relatively less affected by the COVID crisis as essential activities, the agricultural and agri-food sectors have been undergoing a deep transformation crisis for over a decade: changes in consumer tastes, new societal demands for sustainability, traceability, animal welfare, economic shock from the removal of guaranteed prices in Europe or public aid mechanisms on other continents, and the shift from primarily industrial agriculture to a wide variety of concepts, from organic to short supply chains, rational fertilization, HVE or carbon labels.

The vision of TheGreenData, a startup founded in 2015: to ensure transformations go beyond mere curiosity, it's crucial to work on financing transitions and addressing associated uncertainties (climate, yields, price volatility, diseases, consumer variability, and agri-food requirements, ...) ; this should be seen as an opportunity for true entrepreneurs, the farmers, without whom the sector won't evolve. Cooperatives and companies in the sector (agro suppliers, banks, insurers, agro-industrials) must reinvent their relationship with farmers through personalized contracts and services for advice, supply, and/or purchase.

In this regard, data sharing and algorithmic decision support applications are tools offered by TheGreenData to the sectors, enabling farmers to broaden their horizons and take control of their destiny through: (i) advanced benchmarking functions of the best agricultural practices, provided each farmer consents to share their experience, functions

9 Contribution by Jérémie Wainstain and Etienne de Rocquigny, co-founders of TheGreenData

made possible by advanced algorithms dealing with the high technical and economic diversity; (ii) tools for personalized forward-looking simulation using individual exploitation data (iii) more tailored financing and insurance options, based on risk modeling and a proactive partnership among bank-insurance institutions, management control, and even downstream industries; (iv) management tools aggregating all farmers in a production area/region, including monitoring agroecological guidelines and economic viability. Some ethical questions encountered in the field include: balancing and consenting to data sharing; transparency and fairness in the models and criteria for financing, risk analysis, and performance; the accuracy of incentives for environmental benefits and carbon impact management and income insurance.

Accenta - Decarbonizing Buildings with AI10

The building sector accounts for 44% of energy consumption in France, far ahead of the transport sector (31%); and heating and cooling needs make up three-quarters of this sector's total CO2 emissions. It is on this basis that the startup Accenta was founded in 2017, offering solutions that combine the design of low-carbon energy systems incorporating geothermal storage and renewable energy, alongside artificial intelligence to learn from actual usage and sustainably optimize their application.

Because much is wasted unnecessarily: through the heat produced by air conditioning in the summer that's lost for winter; through the cold extracted by heating pumps in winter, which unfortunately is lost for summer; through the inherent intermittency of renewables like solar thermal, which generates in summer days when demand is low; through heavy construction investments wasted in buildings that end up poorly managed or whose long-term use gradually diverges from the initial plans.

Many algorithms need to be utilized to address these wastes: continuous learning through machine learning to accurately serve real usage, forecasting weather to anticipate and leverage the thermal inertia reserve of buildings (the tool

10 Contribution from Pierre Trémolières, founder and CEO of Accenta.ai

timeless in traditional architecture), optimizing sizing under uncertainty and correcting trajectories in real-time, taking advantage of price differences, and showcasing ingenuity to ensure overall comfort and decarbonization. Fortunately, the energy cost of these algorithms is negligible compared to the massive savings they enable.

A key success factor will be the adoption by all stakeholders of the benefits and uses: to open up to long-term investments—often undervalued due to low fossil resource prices during crises—understanding the real benefit of AI compared to a simplistic and illusory all-insulation approach, demonstrating thermal sobriety to fully utilize thermal inertia with extended comfort temperature ranges—a reflection, in a way, of the principle of "participation" and "shared control" from the Manifesto.

Verteego - Tackling food waste and boosting solidarity with those in need11

Due to increasing ecological pressures, consumers and governments are deeply concerned about food waste and the destruction of unsold goods, especially in the retail sector. Estimates suggest that around 10 million tons of consumable food are wasted every year, just in France alone. This amounts to about 150 kg per person. What's the cost? Nearly 15 billion euros annually... More than 14% of this food waste is directly attributed to the retail sector. Pressured by these expectations and the growing awareness of CSR, retailers are seeking effective solutions to limit excess stock while establishing alternative channels to destruction downstream for widespread deployment, such as providers like Too Good To Go, Phenix, or Comerso, or initiatives for those in need like La Banque Alimentaire and Les Restos du Cœur.

During a contract with a leading food retailer, Verteego tackled stock reduction. In the retail sector, current solutions for sales forecasting and development

11 Contribution from Pascal Decaux, head of growth at Verteego (a startup that publishes a high-precision predictive platform).

Promotional campaigns often lack precision when it comes to managing stock levels, especially for slow-moving products. This inaccuracy can lead to food waste, as excess stock nearing its expiration date becomes a problem. By improving accuracy by 7 percentage points, stores can prevent over 10 tons of waste per month in a 1,000 square meter store using modern sales forecasting algorithms. These initial results from Verteego represent a first step towards an algorithmic contribution to the common good.

Another potential contribution involves solidarity and supporting those in need. Retailers can utilize algorithms to move stock, enhancing profitability while offering quality products at lower prices to those less fortunate. Algorithms that manage stock markdown scenarios enable retailers to choose between in-store markdowns and alternative supplier channels, as mentioned earlier.

The offerings from these alternative suppliers could expand significantly due to more precise stock forecasts and a broader selection benefiting those in need (Food Bank networks, Restos du cœur, etc.) and budget-conscious consumers (Phenix, Too Good To Go, etc.). This area is yet to be fully realized. Calling all willing hands!

Health - a great potential for combating diseases or renewing human and social connections

The healthcare field also holds promising possibilities. While navigating the nuanced debates around the concept of the 'enhanced human,'12, many human struggles could be alleviated through the undeniable effectiveness of models and algorithms; whether it's in sorting within an emergency department where every minute counts, or in making diagnoses informed by extensive experience and access to select data

12 These questions intensely captivate imaginations and fears in today's debates; sometimes rightly so, as the more effective tools become for doing good, the more temptations for misuse may arise, even though caricature is inevitable in such discussions, allowing Cassandras to capitalize cleverly.

basic patient history could greatly enhance the efficiency of emergency responders. Or in anticipating cancers, reducing medical errors, tailoring intelligence to individual pathologies and personal histories, and more.

Algorithms are powerful engines of novel human interactions, and digital experiences now show this occurs not at the expense of genuine physical human connections, but rather enhances them. Recruitment and business networking professions are being fundamentally transformed by algorithms, with numerous inventive startups often giving people new opportunities: through algorithms and the reduction of digital editorial costs, everyone can cultivate a personalized array of talents and imaginations, becoming an active participant in their career and global mission, and allowing recruiters enhanced with voracious algorithms to grasp a far broader projection of individual potential beyond the confines of traditional*Curricula Vitae* and life-determining diplomas and typically more closed traditional networks. Does anyone also realize that the Good Samaritan itself could be a metaphor for certain beautiful digital and algorithmic promises, with the experience of connecting with those excluded from society?

Predilife - Breast Cancer Prevention13

Predilife, a biomedical startup focused on breast cancer prevention, Predilife embodies the old saying: "an ounce of prevention is worth a pound of cure" by developing tests that predict the risk of major breast cancer-related diseases based on family history, lifestyle, and genetics. With these risk assessments, a preventive plan is offered by the doctor, which might include more imaging exams for high-risk individuals, allowing for earlier disease detection, including cancer, significantly altering recovery rates. This predictive and preventive approach in medicine could potentially lead to about 30% fewer metastatic cancers.

This field is rapidly advancing with the benefits of human genome sequencing soon to be applied in clinical practice. Predilife examines the genotyping results from hundreds of thousands of SNPs (Single Nucleotide Polymorphisms), which can be considered as a sample of key genomic points. The cost of this data

13 Interview with Stéphane Ragusa, founder and CEO of Predilife

has recently dropped to under 100 euros, paving the way for vast applications. Listed on the stock exchange, Predilife is one of the leading global players in this field. Let's hear the personal story of S. Ragusa, the founder and CEO:

This topic blends my extensive research into vocation and psychology with a practical application, as we predict each individual's trajectory in the medical field. Where do I come from, where am I going? What is my path here on earth medically, and beyond on other levels? Between medicine and destiny in the afterlife, this topic of prediction involves profound subjects with an application meant to reach millions.

Funding is a tricky game at every stage of development for an entrepreneur. Initially, there are research contracts with pharmaceutical labs, public funding (like Bpifrance, formerly Oseo, the National Research Agency, or the Ministry), but these are always one-off funds. Some individuals have shown interest and invested, but nothing is automatic. It's the 'friends and family' approach. In my case, it was a colleague from university, a student I met during a course at HEC, a woman I met on a golf course, and eventually my wife's aunt who invested significantly because she also had substantial resources. I remember our first meeting which lasted half an hour. She concluded with the phrase: 'I believe in you and your project.' She immediately invested 300K€ and then 3M€. It's fundamentally a matter of trust between people.

I believe I wouldn't have persevered in this venture if I hadn't felt deep down that it was a kind of calling, a personal vocation. I founded this company at a time when I was undergoing a spiritual conversion, joining the Church after reading Thérèse of Avila and following the example of the top student from my competitive exams at Louis-le-Grand, who had gone to Ulm and become a priest. This spiritual shift coincided with the creation of the company. I enrolled in a Theology degree a few weeks later, inspired by a phrase from the dialogues between God and Catherine of Siena: 'Take care of my affairs and I will take care of yours.' Without this faith in support from above, I would probably have abandoned this project long ago for safer paths on the earthly plane. Now, I think we will reach millions of people, which is also a medical responsibility, and I rely on Providence because otherwise, it would be an overwhelming project and too heavy a burden to bear. I make all my major decisions based on my inspiration: scientific choices, recruitments, even going public, and that's what gives me a certain peace despite external uncertainties.

Predilepsy - reducing the impact of epileptic seizures through earlier detection14

Predilepsy aims to gather an open-source community composed of researchers, data scientists, public or private medical institutions, and cloud infrastructure providers to develop machine learning algorithms that can detect and predict epileptic seizures.

An epileptic seizure is an uncontrolled electrical discharge in the brain that temporarily prevents neurons from performing their roles in coordination, movement, language, memory, etc. Around 1.5% of the global population suffers from epilepsy (source: WHO), and 1 in 3 cases is drug-resistant and cannot be treated with currently available medications. Although most seizures (provided they do not affect breathing or heart rate) are harmless to the patient, their unpredictability is a major cause of falls, drownings, and other accidents.

Enabling patients to predict epileptic seizures would fundamentally change their daily lives and that of those around them. The algorithms developed by the Predilepsy community are open-source, allowing software developers or hardware providers to integrate them into patient-focused solutions or use them in scientific research projects... Stay tuned!

Oviral - AI specialists unite to prevent a pandemic resurgence15

Several French companies specializing in data and AI, led by OpenValue, have rallied their community of data scientists to prevent a recurrence of the COVID-19 pandemic through an independent, sovereign, supportive, and open project.

As France has emerged from lockdown, it is crucial to anticipate the risks of a second wave of the pandemic and, if it occurs, to respond swiftly to mitigate health risks. To achieve this, the project is currently mapping databases that will be useful. This mapping will lead to

14 Contribution by Rupert Schiessl, Founder of the PREDILEPSY Project, an open source initiative to address epileptic seizures

15 Contribution by Guillaume LEBOUCHER, Founder of Openvalue and AI for Schools

A conversion of raw data gathered into metadata, followed by strategic pillars. These pillars could assist in defining future COVID-19 prevention action plans. This metadata can be accessed by anyone on an open and free platform. Based on this, algorithms have been trained to detect weak signals, potential precursors of a return of the epidemic, and to assess the risk of outbreak formation in various locations. Authorities will then have additional resources to act proactively, sometimes even before an outbreak begins, thanks to AI capabilities.

Let's clarify that this project is designed to complement and strengthen applications like StopCovid: in facing a particularly complex situation, mobilization must be diverse. This approach also aims to ensure French technological independence and sovereignty, but to be effective, it requires a call to public authorities. With their help, a general consultation of databases could be mobilized to create an effective barrier against a potential second wave of COVID-19. Of course, the data must be systematically anonymized and usage must comply with laws that protect individual freedoms.

Entrepreneurs learn every day to question themselves and to be pragmatic. Humility is the key to this initiative. It's also a call to unite all data specialists who wish to join: actions will be our best defenses against a resurgence of the pandemic. Let's work together for data that serves the public good. Cooperation with health authorities would be a valuable aid. If this aid doesn't come immediately, we will continue this mission at our own level in service of the common good. Here too, unity can create strength and make a difference.

Work - a great potential to democratize co-creative innovation for everyone and to reinvent employment, including in traditional professions

Get to work with clarity! 16

Humans and machines are closely connected. The link is called work, resulting in employment. Algorithms programmed into machines contribute to the centuries-old movement of innovation and task automation, human professions, and the mediation of machines in human relationships. To illustrate, let's revisit these key dates:

- printing in the 16th century;
- loom and steam engine in the 18th and 19th centuries;
- electricity in the 19th century;
- analog machines in the early 20th century;
- computerization, cybernetics, and artificial intelligence (AI) in the latter half of the 20th century;
- industrial robots for about 30 years;
- internet and e-commerce in the early 21st century;
- social media boom since the late 2000s.

The relationship between humans and machines is often rocky, if not downright tumultuous. The advances in artificial intelligence (like image recognition) could make it even more so. AI tools act as both a poison and a cure, an attraction and a deterrent, as Bernard Stiegler likes to point out, sparking fears and hopes alike. Tech prophets eagerly stoke the flames of a poorly managed debate that's ready to ignite.

Research on the impact of digital technologies on employment isn't new. The study most often cited from this decade dates back to 2013. It was conducted by two researchers from Oxford University, Carl Benedikt Frey and Michael Osborne, under the title "The future of

16 Contribution by Pierre Blanc, entrepreneur, President of Athling Consulting, author of Artificial Intelligence Explained to My Boss (Kawa Editions, 2018)

employment: How vulnerable are jobs to automation?17. It assigns an automation probability (between 0 and 1) to each of the 702 occupations listed in the American O*NET database. This probability is seen as a potential job loss factor over the timeframe considered by Frey and Osborne, which is between 10 and 20 years. It's determined by machine learning experts18 for a sample of 70 occupations, then automatically extended to the entire database using a statistical algorithm. Based on these findings, the study indicates that 47% of jobs have an automation probability above 0.7, 19% between 0.3 and 0.7, and 34% below 0.3. This is highlighted to amplify predictions by observers who frequently warn us about the massive job losses due to rapid automation of routine and repetitive tasks. AI gives them a prime opportunity to indulge in pessimistic quotes about the future of workers and humanity in general, if not violent ones. For example:

> *"From this viewpoint, artificial intelligence is the final nail in the coffin for ordinary workers."19*
> *"Wealth and power would be entirely concentrated in the hands of a tiny elite, while most people would suffer not from exploitation, but from a far worse fate: irrelevance."20*

Imagining the future of work without discussing technology and artificial intelligence makes no sense given the extent of computerization. Nevertheless, the first mistake would be to continue relying on macro studies like the one from Oxford dating back to 2013. Seven years later, the workforce of the 702 jobs studied has grown by over 10%, more than double that of the American population. The predicted declines in high-labor-intensity jobs considered highly susceptible to automation, like cashiers, servers, salespeople, and truck drivers, have not materialized. In fact, they are growing. Clearly, being automatable doesn't mean being automated. Studies frequently cited in the media overlook a key element: the tools behind these so-called gains and the limitations of their performance. None of

17 https://www.oxfordmartin.ox.ac.uk/publications/the-future-of-employment/

18 It should be noted that Michael Osborne is an expert in machine learning.

19 Abhijit V. Banerjee and Esther Duflo, Good Economics for Hard Times (Seuil, 2020)

20 Yuval Noah Harari, 21 Lessons for the 21st Century (Albin Michel, 2019)

These studies aren't anchored in clearly defined tools. The statements remain quite vague, not to mention broad.

A second mistake ? Comparing the most anxious employees to the English Luddites or the French Canuts, who were machine breakers in their time. This shows a lack of understanding of that era and the skills, even expertise, of these workers. Taking the time to revisit history could prevent repeating errors that led to sometimes violent uprisings.

A third mistake ? Planning 10 or 20 years ahead using current economic tools. Automation, through the rollout of robots, is seen as an investment by employers, while at the same time, they have to pay taxes on human employee wages. The fiscal question and the optimal use of our taxes should be at the heart of this reinvention. The balance is unfavorable to human employees. Ignoring this means condemning the worker in the long run, condemning all of us, really.

A fourth mistake ? Claiming ignorance. It's a form of admitting weakness, a programmed defeat. When will we finally focus on work? Not at the macroeconomic level by opposing it to capital, but on the work carried out by billions of humans. Work (tasks, activities) is the great neglected topic in publications and debates about the impact of AI-based tools. Tech prophets talk, in this order, of jobs, skills, professions, and very rarely of tasks. Employment results from recognizing skills grouped under the term competencies required for a profession, which is merely the result of performing tasks or activities, essentially work.

Talking about employment makes sense only if you've first focused on work. Predicting the impacts of AI-based tools on employment, skills, or professions requires starting with a detailed analysis of the effects of implementing such tools on the very content of work. What work is being asked of you? What work will be demanded once these tools are in place? The use of digital tools alters the way tasks are performed, and thus, the work itself.

The events we're experiencing clearly show that humans cannot be reduced to a variable adjusted against technology, much less to a percentage. With the significant improvement in AI tool performance, it is truly urgent to take care of work and, through it, ourselves. The role given to technologies will illuminate the societal choices ahead.

Ultimately, exchange, debate, confront, listen, and build—it's an ambitious and inspiring plan. Let's not let it slip away. So let's get to work with clarity!

Entourage.social: reinventing our presence with impoverished individuals through digital technology21

The disruption caused by algorithms is widely recognized for its potential in recruitment, as evidenced by numerous online recruitment platforms that have emerged with natural language processing algorithms, smart matching of supply and demand, etc. But who would have guessed that it also applies to the inclusion and reintegration into work for those living on the street?

Entourage.socialEntourage.social aims to reconnect those who have lost their networks. Combating exclusion isn't just a matter for public authorities and associations; each of us, through our daily attention, can be part of the solution. The Entourage project is driven by individuals with experience of homelessness, social action experts, and web professionals. Entourage has created and operates a mobile social network, the Entourage app, enabling everyone to act within their community. On the network, residents, associations, and homeless individuals can connect, interact, and carry out solidarity actions together. Entourage develops technology that contrasts with traditional social networks: pivotal for connecting individuals but fading when true human relationships begin. The tool is not an end in itself, quite the opposite!

The story begins in 2012. Every morning and evening, Jean-Marc Potdevin, founder of Entourage, passes by people living on the street, on the sidewalk, where they sleep. The year 2015 is dedicated to meeting homeless individuals, exploring the sector of severe exclusion, and mobilizing partners and volunteers to develop the project. A first version of the mobile app, initially for associations, is launched, and the association receives crucial support: from the Bettencourt-Schueller Foundation, which allows it to recruit a team to carry the project forward. Starting January 2016, three people join the Entourage team full-time (Jean-Marc Potdevin, the association's president, has been volunteering since the project's inception!). In 2018, 50,000

21 Contribution by Jean-Marc Potdevin and François Pelissier, Entourage.social

people have joined the network in five cities across France (Paris, Lyon, Grenoble, Lille, and Rennes)

Rather than doing without, doing with consideration for people's welfare, doing together... The idea of a 'Street Committee' emerged: it sustainably and proactively involves stakeholders 'among the most vulnerable,' people potentially very far from digital technology in the design of algorithms. Additionally, Entourage has developed its own ethical framework:

- mandatory consent - Just like everyone else, people experiencing homelessness have their own free will. It's essential to obtain their consent before initiating any action for them, ensuring they're ready to receive help;
- protection of personal data - Actions created must not disclose the identity or precise location of individuals to safeguard their privacy. We comply with the new GDPR law;
- 100% moderation by Entourage - At Entourage, a dedicated team handles moderation: Guillaume, a social worker with experience from the 115 and Samu Social via the Red Cross, ensures the network functions smoothly and adheres to Entourage's ethical charter: you can read his profile here. Moderation involves daily monitoring of the network and checking the content of actions and user profiles, which may lead to content removal or user bans when necessary.

Since late 2019, Entourage has launched the social network Linkedout to give visibility to the 'invisible'.

Qapa - Helping match job supply and demand22

AI in HR-Tech can help address a truly significant socio-economic challenge: the match between job supply and demand. This issue has been a major concern for the government, businesses, and citizens for many decades. Leveraging the massive data generated by interactions between recruiters and job seekers, and harnessing them with cutting-edge machine learning and artificial intelligence algorithms, can aid in solving the supply-demand mismatch problem

22 Contribution by Jean-Marc Potdevin, Vice-President of Qapa.fr

Employment. Beyond these matching tools to align supply and demand, the entire recruitment process can be automated to enhance the speed of getting back to work, and assist companies struggling to quickly find skilled labor nearby. This is what the tech teams at Qapa have accomplished, developing and launching an end-to-end AI recruitment chain for temporary work, from reading resumes and job listings to generating pay stubs, including checking specific job qualifications (licenses and permits for special equipment, safety certification, etc.), collecting necessary administrative documents, or drafting employment contracts and placement agreements for employers. This AI also manages, when needed, the scheduling of video interviews or interactions with candidates (texts, automated voice messages, mobile app...), offering great convenience for the candidate (replacing physical visits to a traditional temp agency or usual delays and frustrations).

Moreover, Qapa's AI aims to provide predictions to recruiters based on job offerings and the employment pool (how many probable applications, in what timeframe, etc.) as well as to candidates. Currently deployed across France, this solution seeks to find an average candidate in under 4 hours for 75% of posted jobs, and was tested during the Covid crisis which put certain sectors under high stress (logistics and food distribution): in less than 5 days, Qapa's AI enabled, for instance, the placement of over 800 individuals at 300 work sites for one of the major distribution players in France, which would likely have been challenging using traditional recruitment methods. While the traditional temp sector collapsed by 60% to 90%, the fully digital temp platform Qapa recorded a 50% increase in the number of temporary workers placed and pay stubs generated over the two months of lockdown, suggesting notable efficiency for both recruiters and job seekers using the automated solution.

Among others, one of the ethical challenges of that kind of tech concerns the risk to lock candidates within impossible career change, an eternal short term/long-term compromise : by itself, AI can quickly learn that the peculiar qualification of a candidate on a specific area increases the probability of being eternally selected for a job offer centered on that qualification. The candidate thus risks being locked in a single type of job and quickly decrease motivation. Its is one of the effects on which

engineers and PhDs at Qapa are working with their team in Grenoble, together with research partners from CNRS and INRIA (as part of the public-private project JobAgile, addressing the 'Great Digital Challenges' and supported by Bpifrance): an AI that analyzes a candidate's journey, experiences, and qualifications, understanding the job market (supply and demand), could suggest (and even fund) targeted training for candidates, ensuring improved job performance, salary, and employability.

Chance : help people know themselves and reinvent their professionnal project facing disriuption[23]

There's an old saying that there are decades where nothing happens, and there are weeks where decades happen. The 12 to 15 weeks of crisis certainly fit the latter definition. Nearly all trends already present in society have greatly accelerated, and changes that might have taken years otherwise are finally happening within months. One of these trends has been the growing divide between 'land' and 'cloud.' While major sectors of the traditional 'land-based' economy have slowed down or even shut down, digital 'cloud' giants have sped up their growth; the NASDAQ technology index hit a new record right in the middle of the crisis.

Although algorithms have proved highly effective in searching for documents and transporting goods around the world, they have been less effective in helping people find their place in the new digital economy. Even before the crisis, there was a persistent problem of structural unemployment. Many highly skilled jobs remain unfilled for months on end and companies are ‘talent hungry’ when, elsewhere, many are in long-term unemployment or feel locked in jobs that they find purposeless. According to Gallup, between 30 % to 40 % of workers in OECD countries consider having a « *bullshit job* », meaning a job lacking any meaning in their eyes.

In the mid 90s, when commercial internet hardly started, one hoped that most issues related to matching two sides of a market could be solved by technology.

23 Contribution by Andrei Vazhnov, CTO of Chance.co

Technology has come a long way in the past twenty years, fulfilling many of our hopes: markets for buyers and sellers, passengers and airlines, or vehicle drivers, among others, have been entirely transformed, now operating online instantly and seamlessly. However, this transformation hasn't yet reached the job market for employers and job seekers. Despite significant advances in job search platforms and the ease of submitting resumes online, the average duration of unemployment remains roughly the same as it was in 1995. Why?

At Chance, we believe this is because job searching is not merely a technological issue for candidates and employers. There's a deep psychological dimension that hasn't been addressed yet. First, people aren't equipped to navigate their own psychological complexities. We're often unable to predict what we might enjoy unless we've experienced it. Second, the cost of searching and making a wrong choice is very high. If you receive poor service from an airline you haven't used before, the frustration lasts a few hours. Choosing the wrong job results in a negative experience for you and the company, lasting months or even years, often with additional side effects. Finally, neither employers nor candidates are encouraged to be transparent with each other during the hiring process, with each trying to present themselves in the best light rather than genuinely determining the best fit.

The crisis context exacerbates this issue. The digital transformation of the economy has already greatly disoriented many people; now, years will be compressed into a few months as hundreds of thousands of unemployed individuals must urgently find their new place. These individuals will face a series of complex choices: Should I change fields and learn a new profession related to the digital economy, which would take years and thousands of euros? Or should I simply enhance my digital skills to be more employable in my current industry? This is what we refer to as the horizontal or vertical dimensions of the 'digital T.' Which aspects of my personality and interests can be leveraged to quickly find my rightful place? Do I have the diligence and time required to undertake and succeed in my new career project? If not, should I choose another or work to change the personal traits that hinder me?

At Chance, we are convinced that the true breakthrough solution to this problem needs to fully integrate psychological and technological dimensions. On one hand, we must help lost individuals understand the landscape of the digital economy; on the other, we must assist them in comprehending their own psychological complexity, their constraints, and their possible choices. Ultimately, we aim to guide them in building a realistic bridge between the two.

As noted at the start of this white paper, there has been a sensationalized focus in recent years on robots 'taking away' jobs. This has largely been an illusion because many major robotics companies have faced challenges or even closed down over the last few years, and the much-publicized autonomous vehicles have taken longer to arrive than expected. More tangibly, the real issue is that people don't know how to navigate the new digital economy landscape. At Chance, we believe entrepreneurs have a significant role to play in addressing this problem, which has so far stubbornly resisted technological solutions. The solution cannot rely solely on 'automating' the hiring process but must be rooted in understanding the psychological dimension of career building, which is really a very personal journey, not just a 'match' with the right company. Only then, by combining human judgment with algorithms, can we find the right solution.

Nobel laureate in economics Edmund Phelps speaks of the need to build a new economy of 'mass flourishing,' emphasizing that for most people, a job is not just a source of income but a quest for meaning. According to his definition, flourishing comes from the experience of the new: new situations, new problems, and new ideas to develop and share. The digital economy has always theoretically promised that future jobs would be less repetitive and more suited to human ability to handle new situations. Hopefully, we can reach this future sooner than anticipated.

Vital technologies for small and medium enterprise (SME) entrepreneurs to survive and reinvent themselves in the face of economic crisis24

Necessity and Challenges

Amid the major economic downturn caused by COVID-19, the fabric of small and medium enterprises has been significantly weakened. Why should entrepreneurs of these smaller businesses, who are less familiar with algorithmic promises, pay attention? Missing out is even more critical now, as in many cases, a productivity boost through automation will be absolutely essential to avoid bankruptcy. Similarly, in the realms of organization and management, the shift caused by the explosion of remote work during lockdown means returning to pre-pandemic norms is impossible. Thus, far from the illusion of 'techno-push', the use of algorithms will persist where they meet essential survival needs: rapid transition to e-commerce and remote customer relationships, automation of time-consuming tasks with low added value, particularly insufficiently digitized support functions, some of which are doomed by the necessity of more comprehensive remote work. However, several obstacles must be overcome:

- challenges in understanding AI logic and implications;
- heightened fears due to this lack of knowledge (fear of 'undergoing AI rather than mastering it', succumbing to an unnecessary trend, failing to gain tangible benefits...);
- hesitancy about the investment cost required for AI (common among SMEs, also consider CSR for example);
- too small to hire data algorithm professionals: data analysts, data scientists, etc.

Aside from the small minority of start-ups & SMEs providing algorithmic services, traditional economy SMEs don't

24 Contribution by Laurent Barthélémy (founder of HyperionLBC) and Gaetan Fron (founder of demain.ai)

have teams of expert technicians (algorithmics, data science, etc.), so they need to use ready-made tools: SaaS services and/or Cloud APIs to integrate into their information systems.

In some cases, the benefits of AI technologies are clear: predictive supply and sales, machine vision (quality control) for sorting and grading apricots or peaches, mechanical parts, or recognizing and sorting different waste items on a tray, etc. In other cases, it's more challenging: a mechanical and boilermaking company, a semi-wholesaler of hotel equipment, a jam jar factory, a management consulting firm, etc. They may feel overwhelmed when it comes to integrating AI into their CRM, recruitment processes, or production workflows ...

Methodology above all else

AI isn't an end in itself. It's essential to define the problem that needs solving—like performance, quality, recruitment, or client retention—then determine if technology can address these issues, and finally, if AI techniques are suitable25 .

- Understand at least the basics to make informed decisions:
  - AI = Data, thus data security (integrity, availability, confidentiality) is essential;
  - training learning algorithms may introduce biases;
  - since AI is probabilistic, one must consider false positives/negatives.
- Identify the need: how can AI be useful?
- Look at what early adopters are doing – rely on real-life case studies.
- Enhance skills in business and IT about AI topics. Collaborate with suitable providers.
- Identify available data by their activity: sales, production, finance, HR... Data can be supplemented through acquisition (paid or free data) or by creating new data (synthetic data). 67

25 For more operational details, you can consult demain.ai : AI for business)

- Identify solutions: revamp the business model, specific AI toolkit, SaaS... Prioritize technologies that rely on APIs.
- Conduct a thorough risk analysis and contract review to control the influence of major tech companies or publishers.
- Define a scope for analyzing "pain points": at what level (service, establishment, subsidiary, entire company) - Assess the processes where they are located: model the information flow - Evaluate the possibility of solving the pain point with AI.
- Establish a roadmap.
- Create a proof of concept to validate.
- Also consider:
  - information security + legal security (notably GDPR);
  - Quick wins, a classic in change management. Start with the simplest topics supported by motivated business leaders. Then, leveraging a success, expand the AI initiative (wider scope, greater difficulty).
- Limit investment: reduce financial risks of failure.

How did the SME LSA Courtage integrate AI and what were the results?

LSA Courtage is a small to medium-sized enterprise with 125 employees that runs a platform for subscribing to insurance policies. Their approach leverages advanced technology to speed up the subscription process. In this context, LSA Courtage uses AI's machine vision capabilities to validate documents like driver's licenses and various certificates submitted by clients. By utilizing a cloud-based AI service, they didn't need to hire data scientists or make significant investments. The AI supports staff who continuously enhance the reliability of the process. The results are seemingly impressive: document validation time has been reduced by 45%, and agent productivity has increased by 20%.

This use case appears to align with the principles of the Manifesto of Hope & Algorithms in the following areas:

- shared control: the process is guided by humans, with AI assisting the operators' work;
- subsidiarity: employees actively and voluntarily contribute to improving the algorithm's performance.

A matter of public interest: supporting small businesses to take action

AI is relevant to all businesses, not just the largest ones:

- leaders should embrace this technology;
- however, AI isn't everything;
- there are risks associated with algorithm use: bias, manipulation, employee acceptance/rejection; thus, guidelines are needed to manage these risks (which can be overcome when projects are viewed through an ethical lens).

Through its various initiatives, Hope & Algorithms can address several significant challenges:

- Provide leaders with examples closely related to their activities and concerns, showing that AI enables SMEs to broadly expand their business (with the growth-related benefits).
- Help them understand the issues related to AI, which have been heightened by the COVID-19 crisis and the devastating slowdown of the economy and social life.
- Offer them a methodology and operational criteria for discernment, especially concerning ethical aspects.
- Assist leaders in protecting themselves. Help them unite on AI issues.

Creating tailored online and large-scale training, like MOOCs for SMEs, will likely be beneficial26 .

26 See already the MOOC with Bpifrance aimed at leaders on the introduction to data usage

Cultural Goods: The Impact of Recommendation Engines - The Musicovery Experience27

The Challenge of Recommendation Engines in Maintaining Cultural Diversity

In the realm of cultural goods, especially music, the impact of algorithmic recommendation services has been both early and profound... It's been over ten years since these practices have been disrupted, bringing significant changes to musical diversity, cultural openness of listeners, and the economic and social structure of the industry.

Regarding the first point, cultural diversity and personal growth, a major risk is the paradoxical impoverishment in the face of theoretically available richness28 through confinement, commonly called the filter bubble, which has two causes: (i) the user's natural tendency to prefer their comfort zone, meaning what they know and like; (ii) the biases of the algorithms used, based on preference co-occurrences, which are inherently conformist and lazy, underexposing users to content that might interest them. Indeed, to make recommendations, several types of data can be used, particularly: user behavioral data, whether it's purchases, preferences expressed through various interactions with the engine interface; or descriptive data about cultural goods content, which allows for category creation.

To leverage behavioral data, the primary model used is collaborative filtering. It relies on the co-occurrence of behaviors: knowing a user's behavior towards a set of cultural content, the algorithm calculates

27 Contribution by Vincent Castaignet, Founder of Musicovery.com

28 The dramatic decline in musical diversity is already noticeable: the majority of musical experiences now occur through watching videos on a cellphone rather than through individual musical practice, concerts, or focused listening in one's living room. It appears that 80% of music 'consumed' in France is centered around rap.

It maps other users who are similar to him and predicts his likely behavior towards other content he hasn't been exposed to, but that similar users have. To utilize content data, algorithms are alternatively used to calculate the similarity between content through a mathematical metric defined over the broad space that includes all the descriptors associated with them: genres of the work, chronological periods, categories, descriptive labels, etc.

Each of these approaches has its inherent limitations. Collaborative filtering struggles with 'cold starts' for recommending new content and/or advising new users, inevitably leading to a bias towards selecting the most popular items, creating a type of confinement. Content similarity approaches may lack depth in interest and preference details, risking categories being defined too broadly and insufficiently relevant without enough descriptors available. Hybrid filtering systems can address these respective shortcomings of collaborative filtering or content similarity. Nevertheless, the filter bubble emerges when recommendations are based solely on content and user behavior similarity.

The issue is intense in the music sector: with a database of over 50 million titles, including 300,000 new titles each week, it's inevitable to rely on a recommendation tool. This tool must manage such a massive database and specific user behaviors like frequently replaying the same title and associated saturation phenomena, the habit of using a playlist, an ordered list of recommended titles, not just the recommendation of a single track. Innovation in artificial intelligence is plentiful: beyond simple hybrid systems, the automation of content description from audio signals through convolutional neural networks, the generation of ordered playlists via hidden Markov chains, database size limitation, or data set compression... But this should also include identifying relevant ways to avoid the filter bubble, with more explicit user collaboration: enrichment by semi-random means, semi-supervised reinforcement learning models, ...

In this context, research has been conducted to provide a measure of cultural diversity. UNESCO and the Ministry of Culture in France use the Sterling model, which breaks down diversity into three axes: variety (the number of different categories for

describe content, e.g., the various music genres), balance (the relative distribution of content among these categories), and disparity (the distance between these categories).

The entrepreneurial journey of Musicovery to spark musical curiosity and diversity

Against the juggernauts of major music platforms, Musicovery's entrepreneurial venture, a niche B2B music recommendation engine, aimed to integrate these principles into its algorithms as much as possible. Musicovery aspires to enable bolder exploration within the music universe for the most curious listeners; a concept that identifies the right digital experience contexts and levers to offer more explorations. By using algorithms that better account for user behavior, listeners are guided to discover new artists they might like more easily; and the promise for artists is to expand their potential audience.

On the algorithmic loyalty front, Musicovery's developed algorithms require minimal information about the listener to be relevant (efficiency is key), and recommendations come with explanations: the listener knows why a suggestion is made.

Regarding cultural diversification: Musicovery measures each listener's appetite for curiosity, i.e., their ability to listen to an unfamiliar artist; the service then provides recommendations to fully satisfy their specific curiosity without pushing them beyond their personal free will and positioning.

On the music offering side, Musicovery strives to expose each artist to the groups of listeners most likely to appreciate them, especially the most curious and influential. This aims to maximize the diversity of the music offering, directly at the content distribution level but also indirectly at the production level (the creator, realizing they potentially have an audience even when being aesthetically bold, is encouraged to continue their unique creative journey).

Consumer Data: The Competition Against Digital Oligarchies, Paylead's Experience with Banking Data29

The battle over consumer data has led to the rise of digital oligarchies like GAFAM-BATX, whose dominance is a hot topic in many discussions. In 2018-2019, a new realm of personal data emerged: banking data. Could European companies, adhering to GDPR regulations, regain control by fostering genuine competition that contributes to the common good, as outlined in this Manifesto? In 2018, many factors influenced the exploitation of personal data. Amidst these alarming developments and even confirmed scandals, the GAFAM-BATX giants have lost some of their luster. It's now fashionable to criticize them. Direct consequences include stock market fluctuations, the opening of legal investigations, and ministerial offices delving into the issue. However, the reality of economic voting is evident: the tangible loyalty of individuals to the ubiquitous services of Facebook, Instagram, Amazon, or Google remains strong. Despite everything, nothing truly compels these hundreds of millions of consumers to favor these services through countless daily actions, except for the irresistible simplicity and often lifesaving efficiency of these services.

Banking data is the next frontier where the battle will intensify. Holding both minor and major secrets of our daily lives, our bank statements are like a sometimes tedious directory... yet they reveal incredible detail about our habits: income, purchases, subscriptions, travel, healthcare expenses, and more. Banking data has fascinated for a long time, and it's easy to see why.

Why has its massive exploitation only recently begun to surface? Of course, there's PSD2, a European regulation mandating its sharing through APIs; however, account aggregators have been providing this data for several years, and many consumers have benefited. The true catalyst lies elsewhere, at the heart of the economic war waged by the web giants.

29 Contribution by Charles de Gastines & Jacquelin Bécheau-Lafonta, co-founders of paylead.fr

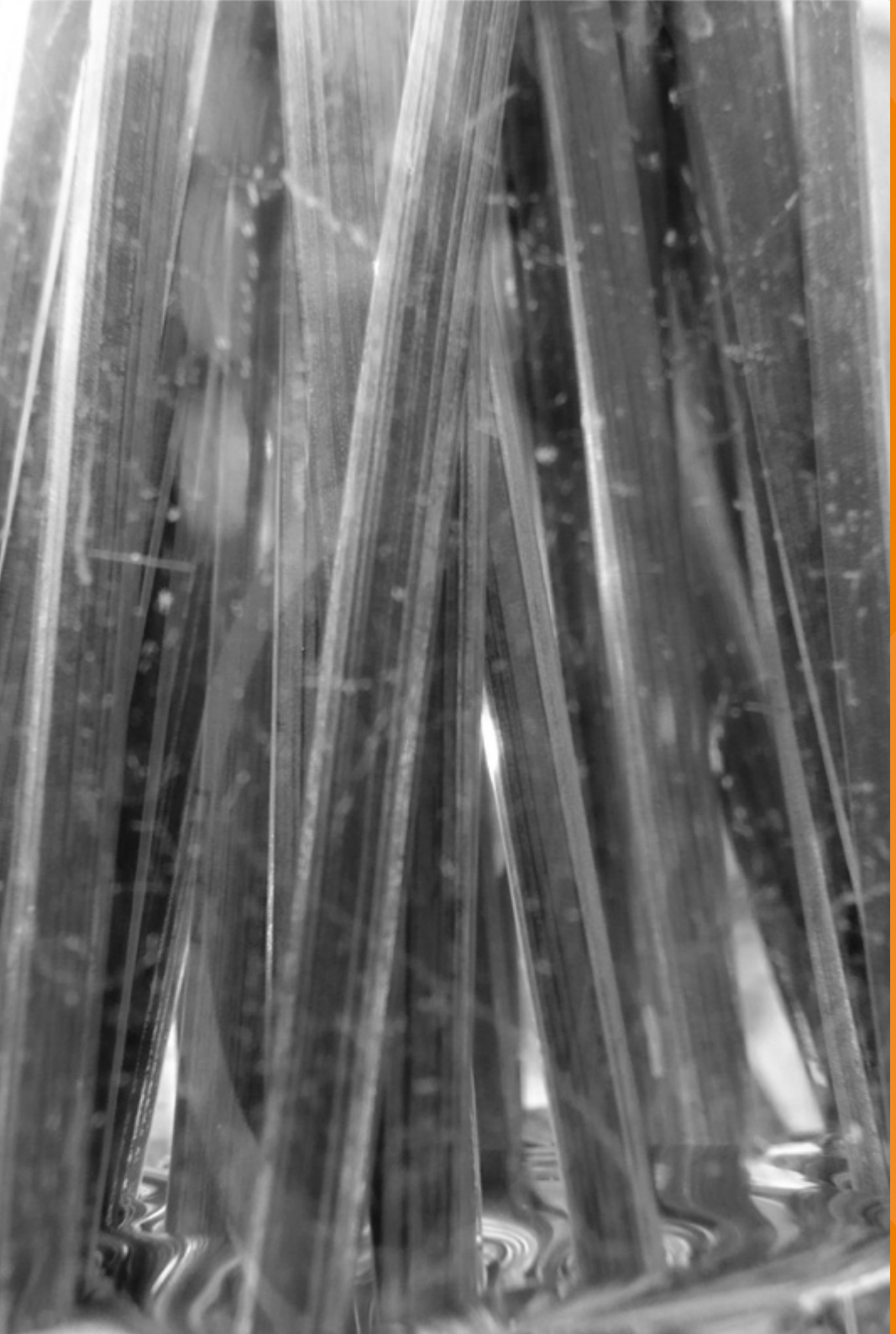
mobile: the GAFAM-BATX once again, gradually enticing banks to capture banking data. Their main weapon? The same one wielded in the previous battle: tangible value wrapped in simplicity and apparent gratuity. Banks no longer have a choice and must also create value and offer a straightforward experience. Pressed for time and lacking agility, they'll increasingly need to share this data with third parties or face massive attrition soon.

This data holds small promises for consumers. Although still subtle today, these promises could become more significant than other digital uses over time. "I don't want yet another loyalty card, ... but at the nth purchase, I appreciate a discount. Long forms annoy me..., yet I need to quickly finalize my new home loan. I hardly have time to monitor my account... yet there's plenty to do to manage my savings." These three issues can potentially be solved with just a few clicks thanks to the sharing of banking data. On the flip side, do I want my employer to access my spouse's income without my knowledge? Or for third parties to know where I vacationed or which specialist I consulted? Once again, the sharing of banking data is at stake. Banking data is a crucial territory of personal data, with an unexpected depth of history. In comparison, web browsing and social media data are rich in intentions and interests but sometimes too fleeting; merchant purchase data, even from a ubiquitous presence like Amazon, captures only a limited part of our habits. Banking data also benefits from a long history of intrinsic security, a key identity aspect for banks. Unlike the "Wild West" of the Internet and social networks, this history bears the potential promise of more inherently secure algorithmic uses than those of other personal data.

The realm of banking data is still to be conquered. Should we dream of taming the tech giants by taxing them awkwardly and disproportionately, or by erecting new regulatory barriers ... and becoming champions of a passive and plaintive ethics? Let’s start by creating competition. Certainly through antitrust measures, a fundamental safeguard of economic freedom, more threatened now by the all-or-nothing approach of digital platforms. But also through entrepreneurs! To create new entrants, just as the founders of the tech giants did.

Paylead is a European fintech established in 2016 that offers cutting-edge loyalty services for merchants,

In partnership with banks, using advanced algorithms to intelligently analyze payment data and consumer needs. Its goal is to become a more balanced competitor, offering natural checks against the temptations of the strongest, while respecting GDPR: providing consumers with increased purchasing power and personalized opportunities based on their preferences, by loyally respecting consent and privacy. Data is carefully anonymized before processing by the startup's algorithms; increased transparency in algorithm usage, with no hidden agendas; and as much security as possible in a demanding world.



Ethical and Spiritual Deep Dive: Convergences and Divergences on Algorithms' Contribution to the Common Good

Promises and Ethical Tensions According to Some Entrepreneurs: Results from Our Algo-Entrepreneurial Survey

We consulted about forty entrepreneurs (80%), investors, and data scientists on:

- the promises that drive them as creators;
- the risks they perceive regarding algorithms; and the risks perceived by their colleagues, clients, or partners;
- The ethical measures they've implemented;
- their personal spiritual renewal, what form it might take (prayer, meditation, Scriptures, ...) and potential sharing spaces;
- their expectations concerning ethics and the algo-entrepreneurial vocation.

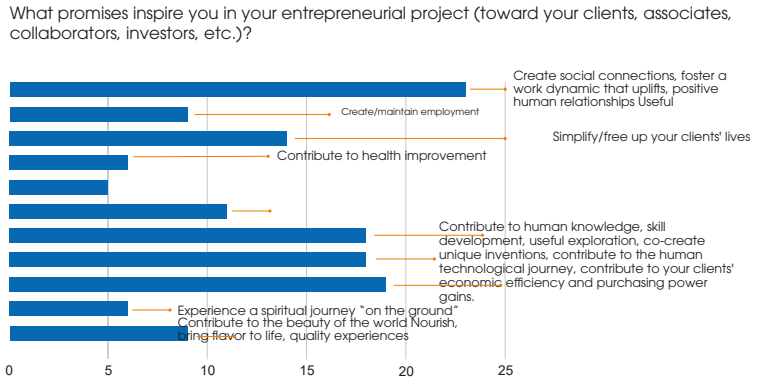
Important note: the survey was conducted before the COVID crisis

Profile of Companies Surveyed in the Algo-Entrepreneurial Inquiry

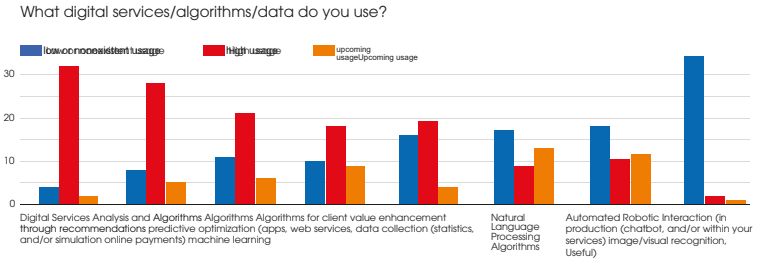
- Recent: less than 5 years for 50% (less than 10 years for ~ about ⅔).
- Predominantly digital (digital products or services for ⅔, investment or related consultancy for about 15%) applied to various sectors: agriculture, health, luxury, creative industries, fintech, services...
- B2B commercial at 70%, B2C at 15%, the rest in the associative, public, or mixed sector.
- Experiencing strong to very strong growth (>100% annually) for ~70% of cases.
- Small to medium size (10-250p for a large half) or very small (1-10p for a third).
- Key functions expected from algorithms:
  - core business;
  - automate;
  - personalize;
  - scalability;
  - little risk control, social HR connection, ...

What promises motivate these entrepreneurs, investors, and experts? As demonstrated by the chart, likely first is their company's fundamental role as a workplace and social connection offered by

the company, and the economic value provided to its customers, notably through promises of simplification and economic efficiency; but also participating in the human adventure and its inventions.

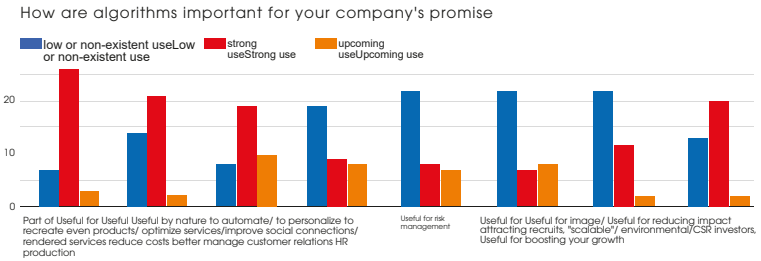


Similar to the average maturity level of digital companies, almost all of them have now digitized their services and initiated data valorization projects; half have started effectively deploying predictive or optimization algorithms, but still a minority have implemented more advanced AI algorithms like natural language processing, image processing, deep learning, or robotics.

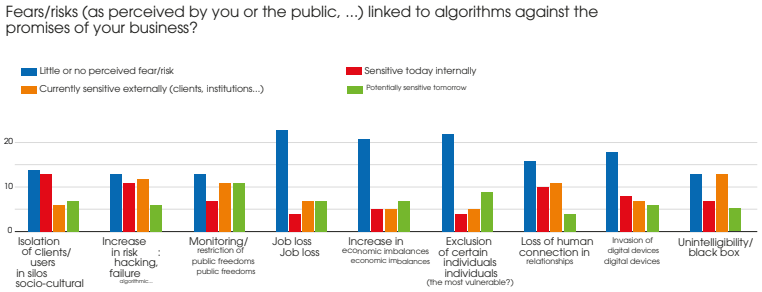


Why are algorithms important to them? For companies that are mostly digital, it's primarily the very nature of their production, and they expect automation, service personalization, and scalability promises. Benefits include brand image, risk management, CSR, and resource management

humans are still largely seen as minorities: should this be viewed as areas for further development for algorithms to become strong aspects of their identity?

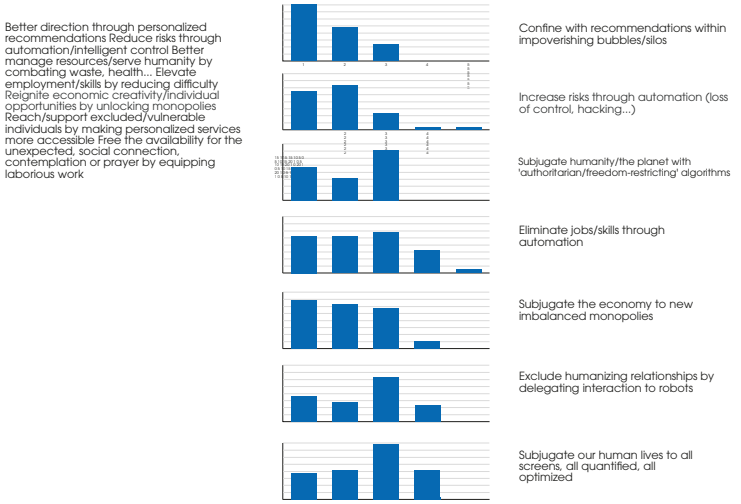


What fears/risks/dilemmas are perceived by the entrepreneur or their circle? For those in the algorithmic field, the perception naturally differs from that of society at large, banking on the hope that job losses and economic imbalance risks are not the primary concerns: rather, the risks of being trapped in silos, increased cyber risks, and the loss of human connection or exclusion of certain individuals are indeed perceived, at least for the future. Let's also remember that the survey was launched before the COVID crisis.

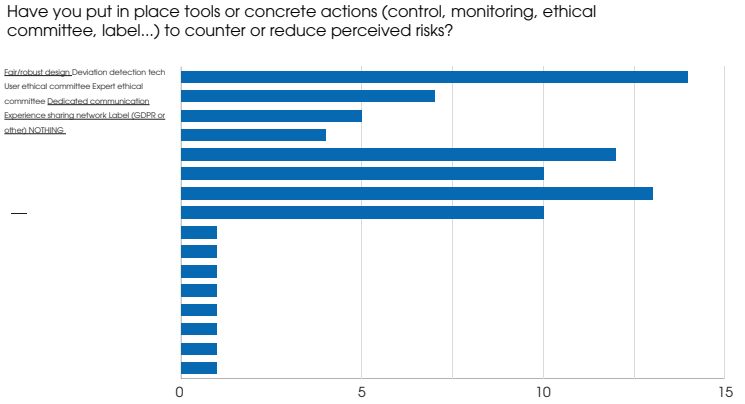


The deep dive into seven potential tensions surrounding algorithms within their entrepreneurial promise supports these perceptions. The personalization benefits tied to recommendations, risk reduction through automation, or redistribution of monopolies through economic creativity against the status quo are once again seen as outweighing potential drawbacks. The opinion is

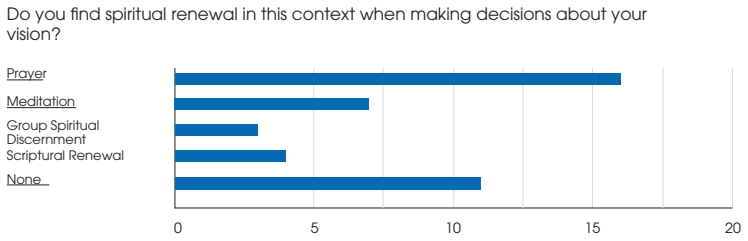
more uncertain about the net contribution to social connections, job elevation; and the subjugation by screens or digital quantification at the expense of the availability for unexpected events and contemplation.



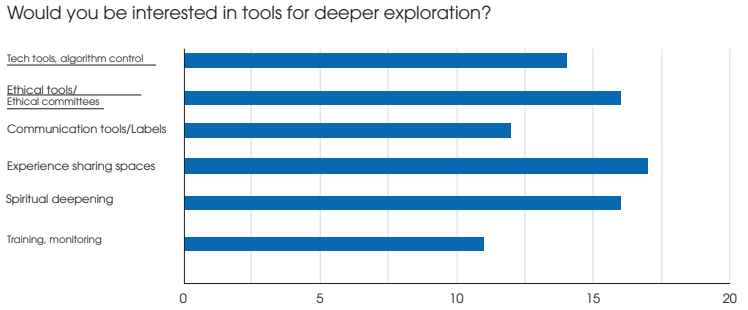
What actions or measures have these entrepreneurs and experts implemented? For half of them, protocols for 'fair/robust' product design, communication, GDPR certification or dedicated communication, but still few technologies for detecting deviations or ethical committees.



Spiritually, two-thirds of these entrepreneurs and experts turn to prayer and meditation, as well as reading and leveraging their skills in non-profit projects; however, few engage in discernment with peers.



This niche group clearly expresses a need: a space for sharing with peers and joint discernment, and for many, a deeper exploration of ethical, moral, and spiritual aspects, along with potentially related technological tools.



To wrap up, here's a selection of open comments from respondents on their views, perceptions, or recommendations for best practices:

Insights from algorithm-driven entrepreneurship

(...) Engage people—especially those far from the digital world and the smallest among us—to co-design and discern over time

(...) Educate about algorithms: for young digital citizens who are not just consumers. (...) The challenge of mastering our digital life: inequality in digital education

(...) Impact of digital and screen exposure on youth through access to unnecessary/harmful content.

(...) Utilize algorithms to enhance the core values of the company (mine or my clients')

(...) Understanding what algorithms can do (prediction, etc.) is key

(...) Algorithms are central to the service we offer our clients. We are focused on harmonizing algorithms to break them out of their silos.

(...) In a marketplace business model, the main goal is growth, which can only be achieved at a certain scale by reducing costs through algorithms.

Emerging guidelines on AI ethics: institutional and regulatory initiatives in France, Europe, and worldwide

Numerous standards emerged in 2017-2018 in Europe and globally regarding the ethics of algorithms and artificial intelligence. Within a rich semantic variety (see Figure 2 - word cloud, Nuffield Foundation, 2019), there is significant overlap around half a dozen key principles with varying but convergent formulations.

Fig. 2 - Word Cloud of Common Terms in Anglo-Saxon Literature 2017-2018

The following paragraphs summarize some important initiatives and the key principles that emerge from them.

Some Initiatives in France

Even before the General Data Protection Regulation (GDPR) came into effect in 2018, French institutions had been producing numerous reports and long-standing initiatives, notably since the Computer and Freedom laws of the last century. Recently noted are:

- The Digital Republic Act (October 2016), which notably mandated transparency in algorithmic processing as part of administrative decisions (explicit mention and the possibility for users to request the main rules, March 2017 decree).

- Several reports like the one from the parliamentary office OPECST "For a controlled, useful, and demystified artificial intelligence," March 2017, and the one from the National Commission for Informatics and Liberties (CNIL) "How to keep human oversight

in December 2017, and finally "Giving Meaning to Artificial Intelligence," a report from the parliamentary mission led by C. Villani in March 2018.

Academics have already worked on the ethical domain, see for instance the 2013 AFIA document (French Association for AI) https://afia.asso.fr/wp-content/uploads/2016/10/AFIA79.pdf. Following legislative reports and laws passed in 2016 - 2018, serveal large-scale public initiativeshave been financed, including l'Agence Nationale de la Recherche : for instance DATA-IA Institute hosted by Université Paris-Saclay and INRIA, supporting « trustworthy AI » (cf. N. Boujmaa and Bertrand Thirion). A quote :

> *(...) Law alone cannot protect against potential abuse in unreliable tech deployment. Algorithms are part of the solution in order to reduce information assymetry in an interdisciplinary setting. Trustworthy AI is Responsible (values and laws) and Robust (technology). The goal is to reduce risks and maximise benefits for everyone. (...)*

In practical terms, let's note that several ethical initiatives emerged among French data scientists in 2018, including:

- Data For Good association proposed a number of initiatives, including the French Serment d'Hippocrate du Data Scientist in 5 principles (see detail in annex) ;
- two French AI experts alwo suggested the Serment Holberton-Turing.

ADEL Algorithms Data Ethics Label - is a French business initiative from the biomedical domain, on the basis of research work of his founder : following a white paper (in French) « Vade-mecum sur le traitement des données numériques : Réflexions et bonnes pratiques éthiques », a labelling approach is proposed, focused on health data, clinical trial settings and medical devices using health data, to be further generalised later on.

Various codes and initiatives that have emerged globally since 2017

We won't go into detail about the emergence of the GDPR, enacted in May 2018 at the European level, which has already established a number of key and original principles worldwide to ensure what pertains to "autonomy" concerning data processing and algorithms, particularly focusing on informed consent, revocability, portability, etc.

In a more advanced approach to AI algorithms, a communication from a group of experts under the auspices of the European Commission released in late 2018 provided ethical guidelines for trustworthy AI. This communication projected more social and environmental opportunities and benefits associated with AI than risks, but emphasized that all of this requires building trust by putting humans at the center (human-centric) along two key axes:

- AI should respect **fundamental rights**, applicable regulation as well as values and basic principles, securing a « ethical purpose » ;
- AI should be **reliable and robust** in the technical domain since, even if AI is well-intended, lack of technological mastery can cause prejudice.

A senior group of experts proposed « Trustworthy AI made in Europe ». Note that that piece of European communication explicitly mentions the necessity to look for the common good, and give special care to situations involving more vulnerable groups such as children, disabled or minorities.

In February 2020, the European Commission released its Report on the impact of AI, the Internet of Things, and robotics on safety and liability : a crucial distinction is proposed between two categories, namely "high-risk" AI and the rest. For high-risk cases, regulatory oversight would be established on (a) training data, its reliability, representativeness, etc. (b) transparency, (c) required human oversight: the real challenge remains judging each case individually. Does everything related to health fall under strong AI, such as making appointments or booking hospital beds, even outside epidemic crises?

Similarly, the recent OECD report "Council Recommendations on AI" reminds us of five principles

that complement each other: i) inclusive growth, sustainable development, and well-being; ii) human-centered values and fairness; iii) transparency and explainability; iv) robustness, safety, and security; and v) accountability. This report recommends proactive and cooperative international investment in R&D, skill training, and the transformation of the labor market through AI. The OECD also launched an AI policy observatory for countries, https://oecd.ai/, which centralizes all OECD information and data on AI.

Globally, numerous standards and ethical guideline initiatives emerged between 2017-2019 in academia, professional associations, or major algorithmic multinationals, notably including:

- The Asilomar AI principles (futureoflife.org/ai-principles/) were developed in 2017 during the Asilomar conference for beneficial AI and were co-signed by thousands of researchers and experts. They provide guidance on both the short-term and long-term ethics of applications and R&D.
- The Partnership on AI brings together commitments from major multinational companies (www.partnershiponai.org/tenets/).
- The IEEE Standards Association has also launched a global initiative on the ethics of intelligent and autonomous systems (standards.ieee.org/develop/indconn/ec/autonomous_systems.html).
- Google released its 'AI ethical principles' in June 2018 (https://ai.google/principles/).
- IBM/Watson has also offered examples demonstrating the implementation of ethical principles (responsibility, explainability, fairness, respect for users' rights, etc.) in designing algorithmic services www.ibm.com/watson/assets/duo/pdf/everydayethics.pdf.

A more comprehensive synthesis is available in the study published in 2019 by the Nuffield Foundation at the University of Cambridge, which provides an overview of Anglo-Saxon academic literature and a research roadmap30 .

OpenAI (cf. https://openai.com) was at the time also a non-profit research and foresight platform for AI, producing studies and standards on the control of 'robust algorithms, for the good of all': operating on an open-source basis, it brought together notable figures like Elon Musk, Peter Thiel, and Reid Hoffman, founder of LinkedIn, with a more

30 Whittlestone, J. Nyrup, R. Alexandrova, A. Dihal, K. Cave, S. (2019) Ethical and societal implications of algorithms, data, and artificial intelligence: a roadmap for research. London: Nuffield Foundation

clearly detailed on the potential pitfalls of so-called 'strong' AI, which Elon Musk has echoed in the press.

Some investment funds (seed or growth), not necessarily ESG or 'ethical', are already taking a keen interest in AI.

Vigeo Eiris31, a leader in CSR (Corporate Social Responsibility) assessment and rating, announced in September 2019 that it will now consider in its evaluations how companies employ and integrate AI. Vigeo Eiris aligns with the ethical AI approach promoted by the OECD, mentioned earlier. This seems to be a first, at least in France: perhaps AFNOR, B Corp, Label Lucie, etc., will follow suit.

Of course, we can't count the analyses and white papers from major consultants on AI: for instance, Accenture or Keyrus, Capgemini or PwC among many others. Chambers of commerce and regions are starting to stimulate and inform SMEs about AI, with the help of consulting firms or associations; for example, the CCI of Vaucluse, in connection with FrenchTech, with testimonials from the agro-food sector. A book like that of Gaëtan Fron and Olivier Mégean, Artificial Intelligence for Business, demain.ai 2018, offers concrete avenues for reflection and action to companies not specialized in AI but wishing to invest in it while mastering their efforts.

A comprehensive bibliography at the end of the White Paper highlights the abundance of articles, studies, theses, etc., on the ethics of AI. Let us highlight here a book that well summarizes this issue: "The Ethical Algorithm," by Kearns & Roth, Oxford University Press, 2019. The book addresses the main issues (bias, explainability, responsibility, privacy protection) by illustrating them with cases, and opens an intriguing discussion on the role AI itself could play in improving AI ethics.

31 Company founded by Nicole Notat in 2002, which merged with Ethibel in 2005, then Eiris (UK) in 2015, and was later acquired by Moody's

Initiatives in the Christian and Jewish world

Initiatives at the Vatican and in Europe

There is generally a strong concern about the impact of AI on employment, particularly in mediated relationships within the medical and social fields, as well as the legal rights of robots.

In December 2016, a conference titled Power and Limits of Artificial Intelligence » was held at the Vatican, bringing together scientists like S. Hawking, C. Villani, and international experts such as Y. Le Cun from Facebook Research. While the potential rise of AI surpassing human intelligence was discussed—a notion Y. Le Cun indicated as premature at the current technological level—broad debates addressed the significant impact on jobs, including in less developed nations and the replacement of white-collar roles; the risk of reduced motivation to learn skills where AI excels; and, more traditionally, issues of bias or insecurities needing algorithmic oversight.

The Centesimus Annus Academy released the proceedings of a 2018 colloquium « Catholic Social Teaching in action: Facing the Challenges of the Digital Age » addressing the economic, social, and societal challenges of digital technology, including the rise of AI. It highlights fundamental principles of an ethical economy (transparency, fairness, corporate social responsibility, etc.) without specific application to big data/AI issues. However, the mention of these terms alongside other digital keywords (blockchain, dematerialization, etc.) indicates awareness. A Microsoft-Vatican prize was awarded in 2019 to encourage ethical analysis of AI applications.

The Pontifical Academy for Life held a seminar in February 2019 on robo-ethics (humans, machines, and health), and convened again in February 2020 on AI: The « Good » Algorithm. The discussions primarily focused on human dignity and the autonomy of choice, along with the potential for dehumanization

in new relationships mediated by robots, their ability to interact with human emotions & the issue of assigning a "personality" to robots.

(...)

> *Robots play a crucial role in human life and societal development. However, they could exacerbate social disparities and unemployment. (...) We must not allow technologies to alter our future. New principles need to be established, particularly in healthcare. The first and foremost principle is human dignity, which certain algorithms violate. For instance, algorithms that assess a patient's illness severity and lifespan to determine appropriate medical care breach this principle. Conversely, algorithms that decide if a patient qualifies for palliative care, with the patient's consent, are acceptable. The second principle is autonomy, meaning individuals should live and make choices based on their values. Patient consent is essential before any treatment. It's important to highlight that Facebook's algorithm, designed to gauge a person's mood and prevent potential suicide by alerting their family, does not adhere to the autonomy principle.32*

(...) Our happiness begins with our human connections, which should remain intact despite technological advancements. (...) Social Assistive Robots (SARs) are designed to assist with challenging physical tasks and provide companionship and medical support to the elderly. Yet, they raise empirical and philosophical concerns. (...) We must consider the needs of individuals, especially the elderly, and the services robots provide to them for ethical reflection. SARs alter the concept of assistance, posing a risk of dehumanizing it. They are part of technological progress. SARs are seen as nurse substitutes. Some agree, believing SARs are more capable and attentive, while others disagree, emphasizing the irreplaceable human presence for the sick. The elderly wish to manage SARs due to privacy concerns. The use of SARs also raises social class issues, as only the wealthy may afford them. In essence, SARs cannot be universally judged. Human experiences and perspectives must be considered. In discussions about SARs, the opinions of the elderly, who will benefit or suffer from their use, must be included. SARs should not be forced upon or imposed on the elderly.

32 Excerpts from "Robots in the Service of Human Dignity and Autonomy" by Donald Oualy

The conference from February 26 to 28, 2020 (The 'Good' Algorithm) resulted in a joint Vatican-Microsoft-IBM call: Rome Call for Ethical Algorithms.

Father Salobir, a Dominican and the founding president of OPTIC - the Order of Preachers for Technology, Information and Communication (Optic) established in 2012 - has initiated numerous research, experimentation, and awareness projects in the realm of new technologies, particularly AI, including:

- Hackathons: from San Francisco (2014 and 2015) through Paris (2016) up to the Vatican in March 2018 (VHack) focusing on inclusion, migrants & interfaith dialogue, with the next one scheduled in Nairobi, Kenya, in 2019.
- GoodMakr, an accelerator specializing in supporting innovative projects with a significant positive impact on society since 2014, and "Ethic by design" a standard mentioned by OPTIC resonating with "Safety by design" in the field of industrial risk management.
- Numerous events for debate and awareness on Christian anthropology and AI or the reconstruction of technological trust, along with the 2019 synthesis report.

In its important report on the development and governance of technological solutions for exiting the COVID crisis (2020), OPTIC identifies key principles for balanced use from the dozens of applications tested worldwide.

The COMECE (Commission of the Bishops' Conferences of the European Community) released a text in January 2019 titled " The Robotization of Life ". While emphasizing the supreme importance of human dignity, the document questions potential rights for robots (broadly speaking, any autonomous computing system, thus including AI even when the goal isn't immediate mechanical action) and the legal framework applicable to robots. The COMECE document also highlights the concept of the common good and social justice; it examines the impact of robotization (again, broadly speaking) on the labor market and employment.

Initiatives in the French Catholic Community

Similar to the situation in the Vatican and Europe, there is clear concern in the French Catholic community regarding the rise of AI, focusing on risks and ethical challenges, anxieties about strong AI and transhumanism, as well as more theological questions about living alongside robots, without yet delving deeply into specific applications and current entrepreneurial dilemmas.

The Catholic Church of Paris released two documents in 2018 during the national bioethics debates, one addressing artificial intelligence - referencing the French CNIL's regulations, which are seen as legitimate within Christian anthropology, focusing more on robot personality and future AI capabilities - and another document on big data - almost exclusively centered on biomedical data and consent within the GDPR framework, also regarded as legitimate for Christians. A task force on "AI and tech" was established with the French Bishops' Conference.

Among Christian entrepreneurial movements, there's a noticeable awareness. In 2016, a conference on Ethics and Digitalization at the Business Ethics Center in Aix-en-Provence (JY Naudet) mentioned AI among other digital topics, but didn't delve deeply at that point. In 2018 and 2019, a special issue titled "Responsible" on AI was published by the Christian Management Movement (MCC). The Christian Entrepreneurs and Leaders (EDC) held regional conferences in 2019 on this subject and digital topics in general, focusing on these regional themes: *(i) Alsace: The evolution of the common good and digitalization, (ii) Aquitaine: Are human dignity and artificial intelligence compatible? and (iii) Auvergne Rhône-Alpes: Enterprise and augmented humans, how far? For a human-centered use of technological innovation.*

Initiatives in Protestant Churches

Few documents seem to have been published in the French-speaking Protestant world: notably, a publication by UEEL/CEPE/CNEF (Free Evangelical Churches), generally pessimistic in tone, listing potential dangers, inequalities that might arise, and the dream/utopia aspect.

However, in the Anglo-Saxon world, many proactive voices are being heard, particularly in America.

Some voices even include the redemption of future autonomous artificial intelligences in the divine plan, as reported by the synthesis article Is AI a Threat to Christianity.

> *"I don't see Christ's redemption limited to human beings,"*

Christopher Benek, an associate pastor at Providence Presbyterian Church in Florida with degrees from Princeton Theological Seminary, told Gizmodo in 2015.

> *"Redemption extends to all of creation, even AI. If AI achieves autonomy, we should encourage it to partake in Christ's redemptive mission in the world."*

It's fascinating to contrast this with the outstanding declaration "Artificial Intelligence: An Evangelical Statement of Principles," published in April 2019 by a committee of North American Baptist Churches. In about a dozen articles, it presents a well-supported stance on trust in genuinely beneficial promises concerning Christian anthropology, as well as clear and distinctive benchmarks on numerous controversies, especially regarding application fields, autonomy, justice, personal freedom, and moral responsibility. It excludes AI from the realm of moral agents and Creation, retaining hope of also being freed from the bondage of decay, cf. Romans 8:19-24.

We will revisit this rich declaration below.

Initiatives in the Jewish community

Let's first note, although perhaps outside the strictly confessional field, the warning from philosopher Hans Jonas in "The Imperative of Responsibility: In Search of an Ethics for the Technological Age":

> *"Technological actions trigger developments that tend to become autonomous; they acquire their own compelling dynamic, an autonomous inertia... which makes them not only irreversible but also beyond the control of those who act.".*

On the side of 'Talmudic' reflection, we can note:

- "God & Golem Inc" by Norbert Wiener, father of cybernetics and putative father of AI with Minsky;
- "Developing an AI ethics oracle using Jewish ethics dialogue", Nachshon Goltz, conference in Singapore 2018;
- "The Future of Artificial Intelligence", Andrew Boyarsky, Yeshiva University, New York, 2017
- "Robotic and Artificial Intelligence: a Jewish Ethical Perspective", Rappaport 2006, limited to neurosurgery
- "Reinvigorating Jewish Ethics", David A. Teutsch, in The Reconstructionist, vol 69,2, Spring 2005 more general.

In his work "Jewish Ethics", Rabbi Azoulay opens several fields of reflection on artificial intelligence.

Convergences between codes and initiatives & application dilemmas

As we have seen, a certain convergence emerges among various codes & initiatives that have appeared in France, Europe, and globally, both institutionally and academically as well as commercially. However, it is important to be cautious in discerning:

- (i) the inevitable tensions regarding the actual implementation of these principles, some of these tensions may be temporary; others are true dilemmas.
- (ii) the fact that the application of these principles depends on an underlying set of values, from which everything stems, and which is not inherently common to all.

Convergence of ethical codes around a small number of key principles

The "AI4People" Forum and "Good AI Society" recently published a framework (Floridi et al, 2018) for considering the optimal use of AI, aiming to both avoid stifling its potential and mitigating the risks of overuse. The emerging codes are grouped into these five categories

listed below: beneficence (focusing on well-being/common good/prosperity/general interest as per humanity and environmental initiatives), non-maleficence (including privacy, robustness, and protection against malicious intent), autonomy (respecting personal choice in delegating decisions to AI), justice (concerning stakeholder impact, non-discrimination, and redistributive solidarity mechanisms), and explicability (involving algorithm clarity and defining human responsibility). The first four categories align with biomedical ethics, while the fifth is a unique addition for AI's specific needs.

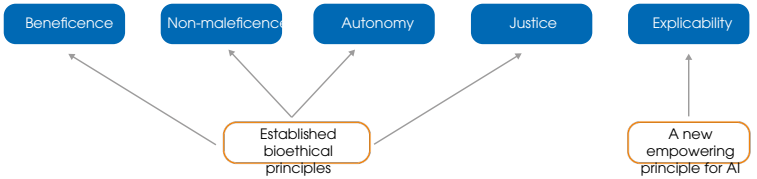


Fig. 3 - Ethical framework for AI based on four traditional principles plus one new one (Floridi & al, 2018)

Here is an illustrative table showcasing the promises and risks associated with these key principles.

Beneficence and Non-maleficence

- **Promises**
  - Prosperity/well-being/Common good
  - Environmental sustainability (anti-waste)
  - Reducing work hardship
  - Human health
  - Preventing fatalities (famine, epidemics, natural disasters)
  - Dignity & unity through renewed connections among people (including the most vulnerable - PSD, autistic individuals…)
  - The transitional role of machines in personal services
- **Risks**
  - Increase in unemployment33 **95**

33 As previously mentioned, note that this risk, with its obviously uncertain impact, is highly dependent on geographical and temporal scales. For instance, countries that became highly robotized between 1990-2010, such as Japan or Germany, have among the lowest unemployment rates.

- Degrading inter-personal relationship, excessively entertained or mediatised by machines
- Dehumanising robots (sexual robots, assistants subjugating aged people or autists…)
- Automated weapons
- Privacy disclosure
- Vulnérability increased by malevolent programming
- Explosion of energy costs of data & algorithms[34] as well as their environnemental impact (climate, rare earths, …)
- Digital confinement obstructing contemplation & the exercise of charity

Justice

▶ Promises

- Contractual and/or redistributive justice possibly less biased than human judgment
- Reduction of unearned incomes through lowered competitive barriers
- Reduction of illegitimate discrimination

▶ Risks

- Distributive injustice through increased guaranteed income for less people
- Discrimination of certain vulnerable persons, groups or minorities.

Autonomy (including consent and human control)

▶ Promises

- Accrued freedom and consent regarding willingness to delegate or not to machines
- Cautious respect of personal intentions
- Elevating the human person wrt. /degrading tasks

▶ Risks

- Loss of control on machines
- Recession of the human person through loss of skills & increased dependence
- Loss of "ora & labora"

34 Who would go from just a few percent of electricity consumption before 2015 to over 20% in the 2020s? However, many innovative paths are possible in 'greenIT,' including returning to 'small data' and using simpler models on dedicated applications that consume less energy.

Explainability (understanding, accountability)

▶ Promises

- Greater share of decision-making and data supportijng common good
- Democratising power

▶ Risks

- Loss of transparence through complexity shock
- Loss of responsibility through more complex chain of decision-making

Tensions, ambiguities, and real dilemmas in applications

Such general ethical principles lead inevitably alas to dilemmas and tensions,either through contradictory principles (biomedical ethics is familiar with the delicate balance between awaited benefits and risks associated to secondary effects) either by varying applications of a given principle (common good should favor the freedom of consumers vs. the preservation of climate and biodiversity ?).

In this context, the authors outline four specific goals—each representing a promise versus a risk—to ensure artificial intelligence is genuinely beneficial to humans and society by balancing benefits and risks:

- « Human self-realisation » : ... elevating the human person through automation of painful tasks, as did the washing machine when it appeared. Without devaluing the skills, and therefore the dignity of human being and recognition earned at work. A question of reasonable speed of change ?
- « Human agency » : homo faber acquiring new powers through augmented intelligence, ... without loss of responsibility.
- « Societal capabilities » : better solutions for collective issues such as the environment, transport etc. Without losing human control.
- « Societal cohesion » : tools to better cooperate and link with each other ... without losing each person's freewill ?

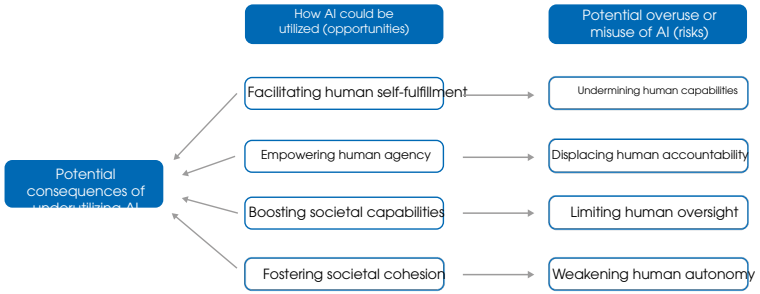


Fig. 4 - Four key opportunities presented by AI along with corresponding risks and the opportunity cost of insufficient AI usage (Floridi & al, 2018)

Beyond these convergences, the previously cited Nuffield Foundation study (cf. supra) highlights recurrent ambiguities in interpretation and serious dilemmas in practical applications.

Let's first illustrate some ambiguities regarding the scope of associated concepts.

While the concept of bias is universally mentioned in algorithmic ethics literature, it is particularly ambiguous. What do we mean when we seek algorithms as unbiased as possible?

- Statistically unbiased algorithm because it represents the average population, yet inherently disadvantages minority groups: 'sociological bias' vs 'statistical bias'?
- Residual statistical bias, unintentional or even unavoidable due to data limitations35?
- Deliberate bias - though not necessarily transparent - to favor certain determined categories?
- Or finally, an algorithm that transparently differentiates/customizes treatment based on profile types?

Moreover, the values necessary for applying the agreed-upon principles of ethical discernment are not inherently uniform. Take, for instance, the notion of equity—loosely translating to the Anglo-Saxon concept of 'fairness'—which doesn't always have the same assumptions whether referring to egalitarian, distributive, or somewhat 'contractual' justice:

35 Was this the case with the training datasets of Tay, Microsoft's chatbot, known for devolving into inappropriate remarks?

> *(...) Some theories aim to achieve a fair distribution of outcomes among groups. Naturally, we must define what makes an outcome distribution fair: various subtheories suggest that the fairest distributions are those that maximize overall benefit (utilitarianism), achieve maximum equality (egalitarianism), or benefit the least advantaged the most (minimax). Other fairness theories focus less on specific outcome distributions and more on how these outcomes are determined: whether the advantages or disadvantages a person experiences result from their own choices, or from unfortunate circumstances beyond their control, such as historical injustices against specific groups or individuals (...)*

Going deeper, there are fundamental tensions in pursuing 'ethical' applications of data, algorithms, and AI. AI4People summarizes these across four key axes:

- Designing more precise decision-making algorithms vs. ensuring equitable treatment by the algorithms
- Fully leveraging enhanced personalization through digital means vs. fostering solidarity and citizenship
- Using as much data as possible to improve service quality and efficiency vs. respecting individual privacy and informational autonomy
- Automating to make people's lives easier vs. supporting personal dignity and self-fulfillment

In more detail:

Quality of services versus privacy: using personal data can enhance public services by customizing them based on personal traits or demographics but may compromise personal privacy due to high data demands.

Personalization versus solidarity: increasing the personalization of services and information can yield economic and individual gains but risks creating or exacerbating divisions and undermining community solidarity.

Convenience versus dignity: boosting automation and quantification might make life more convenient but risks diminishing those invaluable qualities and skills that define human dignity and individuality.

Privacy versus transparency: the need to respect privacy or intellectual property can make it tough to provide fully satisfying information about an algorithm or the data on which it was trained.

Accuracy versus explainability: The most precise algorithms might rely on complex methods (like deep learning), whose internal workings aren't fully grasped by their creators or users.

Accuracy versus fairness: An algorithm that is generally more accurate might unfairly target a specific minority group.

Satisfaction of preferences versus equality: automation and AI could boost industries and lead to new technologies, but they might also increase exclusion and poverty.

Efficiency versus safety and sustainability: striving for rapid technological progress may not allow enough time to ensure developments are secure, robust, and reliable.

These tensions can also create win-lose imbalances, short-term versus long-term or local-global, leading to practical difficulties in managing the inevitable tensions between these axes, like the one between efficiency (in a service creating a good...) and respecting digital privacy... and the need to resist establishing a single code, where different actors might seek different balances « (...)in what contexts different people might be willing to sacrifice some amount of autonomy for other goods. (...)».

The report distinguishes between 'true dilemmas,' where a contradictory choice involving people and inevitably imbued with a hierarchy of values not necessarily universal is unavoidable; and 'false dilemmas,' where deeper technological efforts should reasonably allow for multiparty solutions. Here are some true dilemmas according to AI4People:

- Dilemma 1: assessing the acceptability of an algorithm that is less suitable for a specific subgroup when it is more accurate on average for the entire population.
- Dilemma 2: deciding to what extent it is desirable to limit the personalization of advertising and public services to preserve ideals of citizenship and solidarity.
- Dilemma 3: determining what privacy risks are acceptable to ensure better targeting of diseases or public health benefits.
- Dilemma 4: judging which types of skills should always remain in human hands and where it is preferable to reject innovative automation technologies.

Assessment from a Christian perspective

Agreement on General Principles

In line with the consensus on principles across various codes and initiatives, it is reasonable to assume that most Christians agree on the general principles that emerge, while also identifying potential points of disagreement.

What is the common good?

The Christian tradition, as formalized in the Church's Social Doctrine, specifically defines the concept of the common good as:

"the set of social conditions that allow groups and each of their members to achieve their perfection more fully and easily." The common good is not simply the sum of individual goods of each member of the social body. Being common to all and each, it remains indivisible, achievable only together, and must be enhanced and preserved, especially with an eye to the future. (DSE, 164). With the following clarification: "The common good of society is not an end in itself; it holds value only in relation to the pursuit of the ultimate ends of the person and the universal common good of the entire creation." (DSE, 170).

Regarding the Catholic Church specifically, one can align the key principles emerging from the aforementioned consensus (with some variations, for example, between the approach of the European Commission, GoogleAI, or data scientists' ethics as in 3.2.1) with the principles of the Church's Social Doctrine (DSE). However, it is important to note that the principles of the DSE are linked to Christian anthropology (the role and mission of humans in Creation, the importance of virtues and education) and a vision of the economy serving everyone, especially the poorest. On the other hand, the principles of AI largely stem from Anglo-Saxon liberal anthropology and liberal economics, where individual desires and rights take precedence over the concern for the common good and justice, with the free exercise of the former supposedly ensuring

the latter, through a legal framework as light as possible. The principles of AI may end up being mere showcases for an anthropological and economic vision that undermines them at the core.

AI4People	GoogleAI	European TrustworthyAI	Hippocratic Oath for Data Scientists (Fr.)	Social Doctrine of the Church
Beneficence	Be socially beneficial (including cultural contexts)			Common good Synderesis: doing good and avoiding evil, relativizing material success, and rejecting the primacy of financial profitability—economy as ethics (oikonomos)
Non-maleficence	AI apps that aren't pursued (like weapons, inappropriate surveillance, etc.) Privacy-by-design principles. Uses aligned with principles.	Respect for fundamental rights, regulations, and values. Protect privacy.	Privacy respect	
Justice	Avoid creating or reinforcing unfair bias.	Focus on the most vulnerable. Information asymmetry. Stakeholders involved from the start (including diversity).	Equity/non-discrimination	Social justice (commutative, distributive, general) e.g. Quadrag. Anno, Centes. Annus...) Private property and universal destination of goods.
Autonomy	Ensure safety in design and testing.	Robustness		Free will and associated responsibility. Subsidiarity. Anthropological model of body/soul/spirit and philosophy of knowledge and intelligence/imagination/emotions.
Understandability/explainability - accountability	High standards of scientific excellence. Be accountable to people.		Responsibility, independence, transparency, integrity, and scientific rigor.	Triptych of truth, justice, and freedom, in listening to others Subsidiarity

Initial inquiries related to the anthropological and social principles of the Social Doctrine of the Church (SDC)

"The SDC sheds an unchanging light on the ever-new problems that arise," reminded Pope Benedict XVI in his encyclical Caritas in Veritate (12). Doctrine and way of being, the SDC encompasses a vast array of principles, summarized as follows: human dignity (cf. Saint Leo the Great "Christian, know your dignity..."), common good, private property as stewardship, social justice (commutative and distributive), universal destination of goods, preferential option for the poor, subsidiarity, necessity of intermediary bodies, solidarity, rejection of usury, concepts of fair wage, fair price, vision of business where "all power comes from God" (Saint Paul, Romans 13:1) and leadership is service (the quintessential Christ-like attitude), Christian sense of work, staying connected to Creation; Catholic realism; man is neither his own cause nor his own law; society should be organized accordingly; man is meant to live in society (naturally, not contractually); being in the world but not of the world - No one can serve two masters... Seek first the kingdom and the justice of God and all else will be given to you (Saint Matthew 6:33); the fundamental distinction, clarified by Aristotle, between chrematistics (the art of accumulating wealth as the main purpose of existence) and economy (an ethic of using limited resources to meet the needs necessary for a good life focused on personal development).

In this context, indeed, new questions arise, as illustrated in the table below:

Some concepts from the SDC	New inquiries in the age of algorithmic entrepreneurship and AI
Common good & universal destination of goods	Universal sharing of public data, allowing everyone to contribute Massive sharing of private data enabling contribution to the common good (e.g., medical data) Algorithmic data monopoly situation, potentially privatizing the common good and altering wealth balance
Private property as stewardship	Shift from an economy of goods to one of functionality
Stakeholder theory & intermediary bodies, principle of subsidiarityCSR and respect	Breakdown of traditional verticality through the horizontalization of digital exchanges and information
for Creation	Positive contributions of algorithmic entrepreneurship to environmental preservation (e.g., IT for Green) Increase in consumption of rare resources by algorithmic systems (energy, rare metals, ... - need for GreenIT)

Should we create new principles for SDC or expand the existing ones to regulate AI, considering its design (explainability, auditability, algorithmic depth...), usage conditions (integrity, intrusiveness, disconnectability, human-in-the-loop...), and its specific fairness issues (non-discrimination, respect for dignity...)?

How can AI be made a tool for security and peace: directing funds and actions appropriately? Similar to SRI (Socially Responsible Investing, Ethical Investment, Impact Investing...), what about a DRI (Digitally Responsible Investment) or ARI (Algorithmically Responsible Investment)?

What does SDC have to say about independent work (consider notions of individualism, intermediary bodies, and the common good...), whose massive growth is enabled by algorithmic technologies, allowing anyone to start their own activity for almost nothing, even among the poorest?

The same goes for the massive phenomenon facilitated by the combination of algorithms and blockchain on micro-contracts, economic associations, and daily exchanges between every human being through new economic and social horizontalities without a centralized body, especially in light of subsidiarity, a fundamental concept of SDC?

Varied levels of consensus and specifically Christian contributions on application dilemmas

Let's explore points of convergence by separating them according to the degree of consensus we anticipate to be more or less easy to achieve. A first circle of 'reasonable minimum deontology' seems to broadly gather global actors:

- Direct AI applications towards the pursuit of good (beneficence and non-maleficence), such as the health and prosperity of humanity, environmental preservation, etc.36 and ensure concurrently non-maleficence, especially regarding cybersecurity and the energy and environmental impact of technologies37 (GreenIT).

36 Although at this point this very general principle leaves intact the discernment of good and evil and the relative place given to man as an individual, person, communities, etc., as well as to the environment, sensitive creatures, etc., and the inevitable tensions between 'the wheat and the tares' inevitably mixed together...

- Clearly define the intended goals, and ensure the robustness of technologies concerning the intended goals by eliminating design or usage biases—at least concerning these goals, without at this stage prejudging the 'good goals' prioritized—while also addressing unintentional failures, whether predictable or not (precaution), as well as malice, hacking, or terrorism.
- Seek as much as possible the explainability of algorithms—if only to ensure their reasonable effectiveness and reliability without necessarily specifying at this stage the extent of any potential transparency imperative developed for third parties.

A second circle on 'human- or citizen-centered' AI already assumes agreement on some underlying sociopolitical and cultural values, without necessarily convergence across all continents and/or multinational corporations. On this point, French and European institutional approaches, for example, are more explicit in the matter:

- Respect the fundamental rights of human beings in AI applications.
- Clearly illuminate the ethical objectives and promote user understanding.
- Encourage the inclusion of stakeholders in the cooperative processes of designing, using, and evaluating technologies.
- Respect the informed consent of stakeholders (autonomy) through algorithmic loyalty to consent, especially concerning individuals' privacy.
- Preserve a right to digital forgetting (to which a biblical approach to forgiveness might add anthropological and spiritual depth?).
- Ensure genuine human control over technologies and clearly defined human responsibility in this area.
- Ensure the preservation of social connections, both (i) by controlling the excessive invasion of digital mediations in personal and social life, as well as (b) by preventing through a

37 see for example "The Hidden Face of Digital" by Flipot, Michot, and Dobré

support and solidarity mechanisms for the transformation of work.

► Make sure not to forget nor discriminate certain minorities and/o more vulnerable groups - even if this principle leaves open controversy on defining and prioritizing though (sex, ethnic minorities, religion, sexual preference, children et aged people, disabled, ...), cf. following.

A third circle gathers the inevitable dilemmas concerning the use of AI in defining the common good, justice, freedom, and respect for human dignity. On this point, biblical anthropology and Christian tradition seem to offer a unique perspective:

► Subsidiarity and a fair balance between personal freedom and conscience, higher standards, and the pursuit of truth and the common good.

- Who determines the common good? Is it about adhering to laws and regulations: do they always carry well-considered wisdom and careful discernment, compatible with Christian values? To what extent can fostering healthy competition (*cum-petere* as the DSE reminds us, meaning collaboration to find the best solutions) through fair balances that prevent the tyranny of both private and public monopolies in the algorithmic 'winner takes all' economy be fruitful in making room for the search for the common good and creative solutions?

- How far should the pursuit of a higher good impose norms on individual freedom? Do algorithms always respect people's freedom and autonomy, for instance, by alerting them 'for their own good' but without their knowledge of third parties? What role is given to human conscience, the inviolable and sacred place where the Lord meets the human person, enlightens them, and ultimately respects their ultimate freedom?

- Consider, for example, environmental protection and specifically decarbonization efforts against climate change. Are these standards that unconditionally restrict individual freedom, encoded into algorithms without people's knowledge, or are they pathways enabling informed choices?

-

Think also about fears of muliplied algorithmic services propagating massive « fakenews » : should censorship be encoded within filtering without citizens' knowing ? How legitimate is a group - be it elected politicians, expert ethical commitees and/or business leaders of oligopolistic multinationals - to replace everyone's consciousness, called upon decision-making according to their soul and consciousness in that very sacred place where the Holy Spirit dwells ?

► Primacy of the human person, unique image of God in the face of idolatry.
  - Does the use of robots to assist vulnerable people humanise or dehumanise them? The case of assistants for the elderly and autistic people.
  - What will be the psychological impact of the different ways of coupling humans and AI? How can augmented intelligence build a human being, shaping his or her freedom, conscience and self-improvement?
  - On a social level, how does the use of AI really create humanising links, or dehumanising zapping?
► Christian anthropology of the human consciousness, and of its inalienable freedom.
  - In what way is apparent consent to certain features of an algorithmic service truly respectful of human freedom and informs and deepens human awareness? Is this enough to guarantee respect for the individual?
  - Justice, the notion of the common good, the preferential option for the poor: who are the most vulnerable to be protected from the biases or effects of economic redistribution: minorities, children, etc.? What about human life, from the embryo onwards?
  - Tensions between equality, egalitarianism and economic freedom. What form of justice should we be referring to? Contractual justice or redistributive justice? The common good, the good of each and all at the same time, the social conditions for the elevation of each individual.
  - Universal destination of goods: in particular as regards fair mechanisms for sharing data - think of opensource, opendata - without undermining the legitimate private ownership of intellectual and industrial rights, the latter being replaced as a means and not an ultimate end

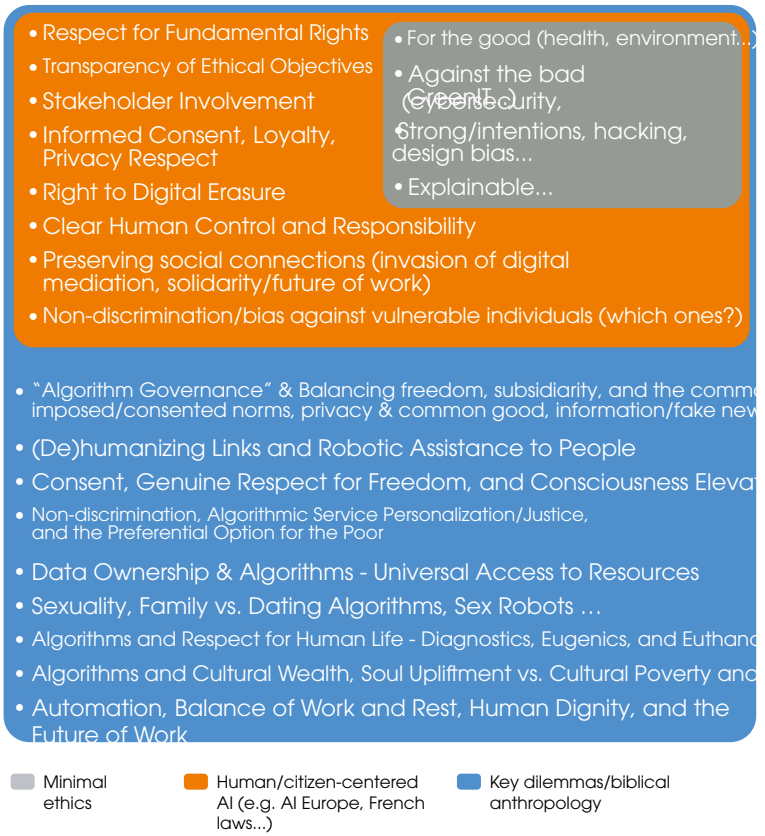
.

38 In line with the spirit of DSE, the Church encourages rightful owners to utilize their assets considering the effects of such use, striving for the common good beyond personal and familial benefits. This implies a responsibility for owners not to let their possessions remain unproductive, but to allocate them for productive activity, notably by entrusting them to those who have the desire and ability to make them fruitful (Compendium § 178).

- Christian anthropology on sexuality and family. How do algorithmic services entering the realm of sexuality affect humanization?
  - Depending on their settings and usage, dating sites with matching algorithms can support human flourishing through genuine, truthful encounters that lead to family creation; or they can lead to an endless pursuit of a 'perfect' meeting or countless, non-committal experiences.
  - As for sex robots—both conversational and soon physical—promising simulation, do they humanize and give sexuality its full meaning as intended by the Creator?
- Biblical anthropology on respect for human life.
  - Consider, for instance, the legality of euthanasia in certain countries, often based on diagnoses aided by models and algorithms concerning brain life state.
  - What future perspectives are opened by embryonic testing and related algorithms to anticipate certain characteristics of the unborn child, potentially influencing abortion decisions?
- Christian anthropology of culture, beauty, and spiritual elevation.
  - How does the apparent efficiency of recommendation algorithms and massive personalization uplift the soul by opening each person to beauty, encounters with otherness, and art as a spiritual experience, or does it impoverish through cultural poverty silos and social confinement?
- Christian anthropology of work, material, social, and spiritual well-being.
  - How does increased efficiency from rapid automation threaten human dignity, especially as work serves as a source of inclusion, social recognition, and pride in skills that allow each person to serve their neighbor?
  - How do AI machines foster a balance between work, prayer, rest, and leisure 'Ora & Labora,' or do they confine humans to only 'less burdensome' intellectual tasks or the misleading prospect of a leisure society?

In the book "God, Business, Google, and Me," T. Jauffret, an experienced entrepreneur himself, urges Christians to engage in the field of algorithmic innovation, highlighting how particularly North American entrepreneurs have passionately embraced their social and political roles. The book provides numerous insights to illuminate discernment on applications, especially algorithmic ones, through the lens of DSE.

Decreasing Circles of Consensus



Un point à creuser - déclaration d'un groupe d'églises évangéliques américaines

À cet aune, l'apport d'un comité de chrétiens évangélistes américain qui a publié en avril 2019 un communiqué « Artificial Intelligence : An Evangelical Statement of Principles » est très instructif. En une douzaine d'articles, il précise notamment :

- la confiance, dans un regard de foi, sur les promesses & capacités humaines face à ces nouvelles technologies, appelées à nourrir la vocation co-créatrice de l'humanité, et sur l'économie divine bienveillante sur un futur incertain ;
- la nécessité que des chrétiens s'investissent de manière proactive dans l'IA plutôt que de les subir avec retard ;
- la nécessité d'un discernement sur la base de principes typiquement adaptés de l'éthique médicale à l'IA (cf. ci-dessus) qui sont cohérents avec les principes bibliques de l'amour du prochain (*... guided by basic principles of medical ethics, including beneficence, nonmaleficence, autonomy, and justice, which are all consistent with the biblical principle of loving our neighbor.*) ainsi que l'évitement des biais discriminatoires;
- l'exclusion fondamentale de l'IA du champ des « agents moraux » que ne peuvent être que les êtres humains, seuls créés à l'image de Dieu ;
- la condamnation de l'objectification de la sexualité résultant de substituts robots ou IA au plan divin de la sexualité etc. ;
- le rappel du plan divin associant le travail et le repos en justes proportions, le travail n'étant pas limité à la seule activité de nature commerciale mais également à celle du service, refusant de fait l'objectif d'une IA préparant une perspective de société de pur loisir ;
- l'exigence d'un respect éthique de l'usage des données qui inclut mais ne se limite pas au seul consentement, même informé, mais se doit de respecter la dignité de la personne humaine, la recherche de la vérité et la protection du plus faible ;
- la légitimité d'un usage de l'IA en support aux actions de gouvernements, de la police, de la justice ou de la défense, mais sous condition de respect des droits inaliénables de la personne humaine dont celui de la liberté d'expression, et de la préservation de l'entière responsabilité morale par les seuls êtres humains - y compris du contrôle humain toujours nécessaire - de l'usage des machines de l'IA dans ces domaines.

Voilà semble-t-il un point de départ intéressant pour discerner à l'aune de l'anthropologie chrétienne les promesses et les risques. C'est sur le terrain des applications que cela se jouera.

Premières pistes sur la vocation spirituelle de l'entrepreneur algorithmique dans la pensée chrétienne

Comme déjà évoqué ci-dessus, la tradition économique reconnaît de longue date l'importance du rôle de l'entrepreneur face à l'incertitude. Schumpeter insiste en particulier sur la créativité et la motivation sous-jacentes, non principalement financière de celui-ci en tant que personne.

> *L'entrepreneur typique ne se demande pas si chaque effort auquel il se soumet lui promet un excédent de jouissance suffisant, se préoccupe peu des fruits hédonistiques de ses actes. Il crée sans répit, car il ne peut rien faire d'autre.*

Qu'en dit la tradition chrétienne ? Quelles pistes d'approfondissement pour la vocation spirituelle de l'entrepreneur en tant que personne ? le rôle créatif de l'entrepreneur est mentionné par la Doctrine Sociale de l'Église, par exemple aux articles 343 et 344 déjà cités.

> *L'initiative économique est une expression de l'intelligence humaine et de l'exigence de répondre aux besoins de l'homme d'une façon créative et en collaboration. C'est dans la créativité et dans la coopération qu'est inscrite la conception authentique de la compétition des entreprises : cum-petere, c'est-à-dire chercher ensemble les solutions les plus appropriées, pour répondre de la façon la plus adéquate aux besoins qui émergent petit à petit.(...) les rôles de l'entrepreneur et du dirigeant revêtent une importance centrale du point de vue social, car ils se situent au cœur du réseau de liens techniques, commerciaux, financiers et culturels qui caractérisent la réalité moderne de l'entreprise.*

D'autres auteurs chrétiens y voient une résonance spirituelle bien plus profonde. Détaillons, via Toth et Rahner, ce qui est rapporté du point de vue déjà évoqué ci-dessus du pape Saint Jean-Paul II sur la vocation de l'entrepreneur à l'image du Créateur, notablement exprimé à son Adresse aux Entrepreneurs de Milan en 1983 :

> *Pope John Paul II viewed enterprise as an activity of God the Creator whose image is impressed upon humanity. This image is clearly expressed in the abilities of men and women to combine intellectus (mind), res (material things) and opera (work) to produce goods and services that enhance and fulfill the human persons within Community. Pope John Paul II treated enterprise and the role of the entrepreneur as a right subsumed under the right to personal economic initiative and considered this right to be co-equal to the right of religious liberty : « the degree of well-being that society enjoys today would have been impossible without the dynamic figure of the entrepreneur, whose function consists in organizing human labor and the means of production in order to produce goods and services. » an entrepreneur is a steward of the resources of a nation. These resources are not to be possessed but to serve labor and ultimately, to be made available to all in society*
>
> The Entrepreneurial calling, Perspectives from Rahner, W.J. Toth.

On peut citer en ce sens également l'économiste Michael Novak qui n'hésite pas notamment dans son ouvrage Business as a Calling, 1996 sur la vocation des affaires à approfondir dans cette direction jusqu'au point d'une contribution unique au bien commun, y compris envers les plus pauvres.

> *Business ethics means a great deal more than obeying the civil law and not violating the moral law. It means imagining and creating a new sort of world based on the principles of individual creativity, community, realism, and the other virtues of enterprise. It means respecting the right of the poor to their own personal economic initiative and their own creativity. It means fashioning a culture worthy of free women and free men – to the benefit of the poor and to the greater glory of God. Business is, bar none, the best real hope of the poor. And that is one of the noblest callings inherent in business activities : to raise up the poor Opportunities and jobs are more valuable to them than handouts from a government that treats them like serfs.*

On peut également citer de manière complémentaire le point de vue de P. de Lauzun, économiste déjà cité, qui rappelle combien la prise de risque tout particulièrement par le moyen matériel par excellence qu'est l'argent, est visée bien différemment dans les paraboles évangéliques (cf. Parabole des Talents, de l'appréhension de l'argent en tant que rente, ou a fortiori du prêt d'usure, condamnés depuis fort longtemps.

> *La condamnation ne vise que le prêt « pur », non pas le profit d'entreprise ni tout de qui résulte de la participation à un projet avec les risques correspondants… bref tout investissement en fonds propres.*

Notons combien l'entrepreneur est appelé, pour être à la hauteur de cette noble vocation, à l'ordonner au profit du bien commun, y compris à la destination universelle des biens, au principe de solidarité et au respect intégral de l'homme, comme le rappelle d'ailleurs la DSE à l'article 345.

> *La doctrine sociale insiste sur la nécessité pour l'entrepreneur et le dirigeant de s'engager à structurer le travail dans leurs entreprises de façon à favoriser la famille, en particulier les mères de famille dans l'accomplissement de leurs tâches ; à la lumière d'une vision intégrale de l'homme et du développement, ils doivent encourager la « demande de qualite » : qualité des marchandises à produire et à consommer ; qualité des services dont on doit disposer ; qualité du milieu et de la vie en général ; ils doivent investir, lorsque les conditions économiques et la stabilité politique le permettent, dans les lieux et les secteurs de production qui offrent à l'individu, et à un peuple, l'occasion de mettre en valeur son travail*

Concluons avec les propos du P. Christophe Raimbault, théologien à l'ICP qui va dans un article jusqu'à interroger en Saint Paul lui-même à travers l'engagement personnel, la prise de risques, la solitude du leader et la fédération d'équipe qu'il fait évoluer, la détermination sans relâche au service d'un bien supérieur « un modèle pour tout entrepreneur ». (« Saint Paul, portrait d'un entrepreneur à part » La Croix 2014).

Espérance, entrepreneuriat et algorithmes : à la rencontre de la pensée de Teilhard de Chardin[39]

Le mot « algorithme » ne se rencontre nulle part, à ma connaissance, dans les écrits de Pierre Teilhard de Chardin. En revanche, il est souvent question d'espérance, toute sa réflexion étant orientée vers l'accomplissement de la création, une création qui se poursuit à travers l'action des créatures.

Son apport principal à la pensée chrétienne fut de renverser le schéma ancien qui voyait l'œuvre créatrice comme achevée au commencement du temps, mais, ayant été perturbée par la faute de l'homme, nécessitait une « réparation » afin de la ramener à son état initial. Le Christ apparaissait donc comme le « sauveur » d'une création pervertie, son incarnation étant conditionnée par le péché originel. En réaction à l'optimisme constructiviste de l'époque des Lumières, la spiritualité chrétienne invitait à méditer sur la condition humaine corrompue, à contempler la Croix où s'exposait le péché des hommes et à attendre patiemment le jugement dernier où tout serait rétabli dans son état premier. L'activité humaine se bornait à faire son « devoir d'état », obéissant aux commandements de Dieu et de l'Église, et pratiquant les sacrements qui donnaient accès à « l'état de grâce » nécessaire pour entrer au paradis.

Cette présentation de la spiritualité chrétienne ancienne est sans doute caricaturale. Le trait est forcé, mais il se peut que le schéma reste encore présent à l'arrière-plan de quelques esprits. La difficulté des temps, le sentiment de crise, la menace de la catastrophe, plus présente aujourd'hui qu'à l'époque de Teilhard, peuvent inciter à la passivité. Le monde serait irrécupérable. Autant le laisser aller à son triste sort et tourner les yeux vers le « retour du Christ » qui nous en délivrera.

C'est contre cela que Teilhard réagit vigoureusement. Pour lui, le monde a beau être partiellement corrompu, il reste le fruit de la création divine, aimé de Dieu. En outre, l'œuvre créatrice est une opération qui se poursuit, un processus continu, dont l'évolution du vivant est une manifestation. Il trouve sa source en Dieu, mais comme le grand inspirateur qui soutient la démarche. Rien ne se fait sans Dieu, mais rien ne se fera non plus sans la contribution de la créature, de toutes les créatures. Les forces du mal sont à l'œuvre dans le monde. Teilhard

39 Contribution du Père François Euvé sj, directeur de la Revue Etudes

en est bien conscient. Ce sont les forces de division, qui s'oppose au processus créateur qui est un processus d'union. Le terme est en effet la communion universelle, l'accomplissement du désir de chaque être d'entrer en relation avec l'autre, une relation que Teilhard n'hésite pas à qualifier d'amour, une force dont il perçoit la dimension cosmique. En se rendant présent dans le monde et en manifestant la victoire de la vie sur la mort par la résurrection de Jésus, Dieu nous assure que les forces de division ne l'emporteront pas.

C'est cette assurance qui soutient les entreprises humaines. Teilhard n'est pas familier avec le monde de l'entreprise (au sens précis du terme), mais c'est un chercheur pour qui la recherche est l'un des lieux où se dit le mieux la participation active de l'homme à l'œuvre créatrice. On comprend que sa pensée ait été reçue avec enthousiasme aussi bien par des chercheurs scientifiques que par des ingénieurs, des médecins, des entrepreneurs, etc.

Dans son ouvrage de spiritualité, Le Milieu divin, il commence son propos par la « divinisation des activités ». Son but est d'affirmer « la sanctification possible de l'action humaine ». Il s'affronte d'abord aux objections qui relèvent de la spiritualité défaitiste que j'ai présentée plus haut : pourquoi s'intéresser à un « Monde vicié et caduc » ? Pourquoi ne pas préférer un « détachement » qui nous permettra de rejoindre Dieu plus directement ? À cela, il oppose une spiritualité de l'incarnation : Dieu fait corps avec le monde. Même si ce monde est encore pécheur, empêtré dans le mal, Dieu reste solidaire de lui. L'amour de Dieu et l'amour de la terre ne sont pas séparables.

L'activité humaine contribue ainsi à la construction du Règne de Dieu.
On a pu penser que Teilhard identifiait ces deux termes, confondant le progrès humain et la croissance du Royaume. Mais ce n'est pas le cas. Il est conscient de l'ambivalence de nos entreprises. Tout ne dépend pas de nous. Ce que nous apportons, notre contribution à la construction de la Jérusalem céleste nécessite d'être repris, « refondu ». Mais ce n'est pas pour autant sans valeur. Si l'œuvre créatrice est une œuvre unificatrice, c'est qu'elle dit la communion déjà partiellement réalisée entre le Créateur et la créature. Teilhard relève dans les épîtres de saint Paul la fréquence des expressions qui disent l'union à Dieu (« ce n'est plus moi, c'est Christ qui vit en moi », Gal 2,20). Nous sommes ses « collaborateurs », comme il l'écrit dans sa lettre aux Philippiens : « Conduisez-vous seulement d'une manière digne de l'Évangile de Jésus-Christ, afin que [...] que j'entende dire en étant absent que vous demeurez fermes dans un même esprit, travaillant de concert pour la foi de l'Évangile » (1,27). La conclusion qu'il en tire est claire et encourageante : « Vraiment, par l'opération, toujours en cours de l'Incarnation, le Divin pénètre si bien nos énergies de créatures,

que nous ne saurions, pour le rencontrer et l'embrasser, trouver un milieu plus approprié que notre action même. »

Mais il ne faudrait pas identifier la pensée de Teilhard à un progressisme au sens banal du terme. La seconde partie du Milieu divin s'intitule la « divinisation des passivités ». Nous menons nos existences, mais nous sommes aussi menés par elles. Il ne s'agit pas de revenir à la spiritualité ancienne et à son défaitisme. Il s'agit plutôt de percevoir le danger d'une démarche trop autocentrée. Certes, mon action contribue à construire le monde, mais je ne dois pas oublier que ce que j'ai, je l'ai reçu d'un autre. Teilhard est sensible aux interdépendances, à tout ce qui nous met en relation les uns avec les autres, à tout ce qui nous relie à l'ensemble des créatures, humaines et non-humaines. La tentation est de se croire seul au monde, vivant dans une parfaite autarcie. Comme pour saint Augustin, le péché majeur est l'égocentrisme, la fermeture sur soi. C'est sans doute la tentation principale qui guette l'entrepreneur, l'homme d'action, celui qui mène ses affaires avec succès, qui construit une œuvre – son œuvre, et qui risque d'oublier tout ce qu'il a reçu.

La « divinisation des passivités » n'est pas la dépréciation de l'action humaine, mais la condition de son authentique efficacité. Car c'est le rappel que l'action est commune. S'il revient à tel ou tel de prendre l'initiative, elle ne portera ses fruits que dans la collaboration. On rejoint sans doute par là la notion d'« intelligence collective » chère à Pierre Lévy (lecteur de Teilhard). C'est une œuvre commune qui se bâtit, sans que l'on puisse attribuer la primauté à tel ou tel acteur.

Telle est bien l'action créatrice de Dieu. Sa Parole en est à l'initiative, mais l'œuvre se poursuit par l'association de plus en plus étroite des créatures. L'issue en est encore incertaine, car bien des obstacles se présentent sur le chemin. Teilhard veut croire au succès final, non du fait d'un tempérament optimiste (ce n'était pas le cas), mais fondé sur un acte de foi. Si Dieu est présent au sein du monde, pas seulement comme le « grand architecte » ou « l'horloger cosmique », c'est qu'il l'anime de l'intérieur : « l'Univers se transforme et mûrit autour de nous ». Et l'effort humain y contribue. On ne peut séparer le triomphe du Christ et l'œuvre que nous cherchons à accomplir. « Sous l'enveloppe banale des choses, de tous nos efforts épurés et sauvés, s'engendre graduellement la Terre nouvelle ».

Bilan : dangers de l'IA et pistes d'espérance promues par le think-tank

Le parti pris du think-tank Espérance et Algorithmes est celui de la mise en œuvre de solutions bienveillantes et bienfaisantes des algorithmes et de l'IA.

Ceci étant, les auteurs du présent livre blanc sont parfaitement conscients néanmoins que, comme pour beaucoup d'autres, ces technologies sont déjà aussi pour certains un instrument de domination, d'enrichissement monopolistique ou de contrôle indu de la vie des citoyens. Autant peut-être que le mauvais usage de l'argent ou d'autres techniques (énergie, communications, alimentation, pharmacie etc.) parfois elles aussi mises de manière opaque au profit d'intérêts desservant le bien commun ou la justice sociale. Ainsi des puissants à visage découvert ou masqué, détenteurs d'une autorité politique ou de puissance économique et sociale se servent d'ores et déjà des algorithmes, par exemple et sans prétention à l'exhaustivité, pour :

- espionner et faire intrusion dans la vie privée des personnes ou dans la propriété intellectuelle et juridique des entreprises ;
- manipuler les personnes et les citoyens ;
- réduire nos espaces de liberté et développer la mise sous contrôle d'actes qui ressortissent à la vie privée ;
- s'enrichir indûment en concentrant dans des oligopoles les pouvoirs nouveaux que peut apporter l'IA ;
- utiliser l'IA à des fins immorales telles que les robots sexuels hyperréalistes et « intelligents », ou les « robots tueurs autonomes » ;
- multiplier l'efficacité d'actes illégaux ou agressifs tels que les cyberattaques ; prendre le contrôle de systèmes complexes individuels ou collectifs ou sociétaux, pour provoquer des conflits, destructions, accidents ou crises (véhicules autonomes, systèmes d'armes en réseau etc.) ; pour les employer de façon anormale et dangereuse ;

- mettre au point des ingénieries sociales malveillantes qui sont hors de portée de l'esprit humain du fait de leur niveau de complexité excessif, mais accessibles à des puissances de calcul et traitement de données colossales ;

- utiliser des résultats que seules des machines peuvent identifier et manipuler, du fait d'une complexité systémique ou numérique dépassant les capacités de l'esprit humain ;
- déresponsabiliser les individus ;
- brouiller les limites anthropologiques entre l'homme, l'animal et la machine ;
- créer des dissymétries sociales et économiques par manque d'intelligibilité et de transparence des algorithmes qu'ils sont seuls capables de développer et mettre en œuvre et installer des rationalités que nous ne pouvons que partiellement comprendre et que nous ne pourrions pas contester ;
- mettre l'IA au service de la publicité désordonnée et excessive en ligne ou à des bulles financières artificiellement associées ;

Pour l'IA comme pour l'énergie nucléaire ou les manipulations génétiques, il ne semble pas possible de « faire retourner le génie dans la lampe » (*you can't push the genious back into the bottle*) une fois qu'il en est sorti par l'ingéniosité humaine. La curiosité humaine est plus puissante que le principe de précaution ou la simple prudence et même la raison, et toute application potentiellement réalisable sera tôt ou tard concrétisée au moins au stade expérimental quand les conditions seront réunies : les questions de « bioéthique » le prouvent surabondamment.

Nous ne spéculons pas non plus sur l'émergence possible d'une « intelligence artificielle générale ou forte » qui présenterait un danger pour la liberté de l'humanité voire sa sécurité ou celle de la planète, ni sur les différences ontologiques ou phénoménologiques qui peuvent exister entre la pensée humaine et la « pensée » artificielle, a fortiori l'âme humaine et les artefacts. Considérant dans une perspective anthropologique et spirituelle chrétienne, que la plus grande force de l'univers est celle de l'amour-charité - de dimension surnaturelle reliée à Dieu et non pas seulement naturelle en relation à nos frères humains et à la Création tout entière -, gageons qu'aucune machine ou objet matériel ne pourrait jamais éprouver une telle disposition de l'âme, tout au plus la simuler.

Enfin nous savons que les usages « vertueux » (santé, assistance aux handicapés, aux personnes seules, prévention de l'épilepsie, prévention du cancer du sein, détection du cancer chez les enfants, mise à de disposition des plus pauvres en France ou ailleurs, de capacités ou services rendus possibles à prix modique grâce à l'IA...) ne justifient en aucun cas une passivité collective vis-à-vis des usages « vicieux » (domination économique, sociale et politique, totalitarisme par la reconnaissance faciale et l'intrusion dans la vie privée, soldats artificiels, robots sexuels

explicites et « intelligents », simulant des émotions, levier de rentabilité de plates-formes apparemment gratuites (quand c'est gratuit c'est toi le produit) reposant sur la publicité et créant des addictions de plus en plus fortes, dissolution du droit du travail par ubérisation atomisant les fournisseurs et les utilisateurs).

Sans doute est-ce opportun et urgent que d'autres puissants, disposant d'une autorité politique ou économique légitime, œuvrent à limiter les dérives illégales ou malsaines dans l'usage de l'IA. Canaliser les emplois malveillants ou irresponsables de l'IA, en sachant qu'ils existeront malgré tout d'une manière ou d'une autre, au moins de façon limitée. On ne peut pas mettre « hors-la-loi » les usages malintentionnés de l'IA, que d'ailleurs il est impossible d'imaginer exhaustivement, par nature. Sinon seuls les hors-la-loi s'y adonneront. Ce « containment » de l'IA malveillante ou mal orientée, dans les domaines sociaux, économiques et de sécurité, repose nécessairement sur une organisation mondiale collective, relayée et articulée localement/nationalement, pour monitorer, détecter, identifier, contrer voire détruire des systèmes/organisations malveillants et leur mise en œuvre.

Mais ce n'est pas à cela que nous nous attelons : tout en étant conscients et informés de cela, rappelons le principe chrétien « Commençons par nous changer nous-mêmes si nous voulons changer le monde »[40] Moyennant la conscience de l'enjeu global du développement de l'intelligence artificielle, nous nous concentrons, par subsidiarité, sur ce qui est de notre ressort et à notre portée : faire connaître, encourager et faciliter la mise en œuvre innovante et bienveillante de l'IA dans les entreprises, et susciter la création d'entreprises mettant en œuvre l'IA de façon vertueuse.

Les principes qui sous-tendent notre action trouvent leur inspiration dans l'anthropologie biblique et l'Évangile, ainsi que récemment dans la doctrine sociale de l'Église catholique. Vérité, liberté, justice, charité et responsabilité sont les cinq valeurs clés qui la sous-tendent. Sans offusquer leur origine, ces principes semblent également se retrouver sous une forme ou une autre dans bien d'autres traditions philosophiques ou spirituelles et pouvoir inspirer le plus grand nombre en des termes non confessionnels.

40 Principe formulé par Sainte Mère Teresa en notre temps à un interlocuteur qui lui demandait ce qui n'allait pas dans le monde en répondant : « Moi, et vous » ; qui peut trouver une formulation non-confessionnelle dans « Sois au monde ce que tu voudrais qu'il soit pour toi » ; et dont la forme minimale est « que chacun balaye devant sa propre porte. »

Conclusion Key Challenges and Proposals "Hope and Algorithms"

Overview of promises and risks, analysis of emerging ethical frameworks, firsthand accounts from entrepreneurial fields, and exploratory surveys with dozens of entrepreneurs presented in this White Paper. Insights from everyone who contributed to Hope & Algorithms converge to highlight the magnitude of hopes and questions as well as expectations on the ground for algorithmic services developed by entrepreneurs. What Christian anthropology applies to entrepreneurs in this context? How can we undertake and promote algorithms that liberate rather than enslave?

A historical perspective suggests that periods of scientific and technological breakthroughs correspond to social and spiritual disruptions. In each era of significant change, these manifest in the 'three orders': Scientific and technical, Social, Spiritual. These technical and intellectual advances are undoubtedly influenced by the Benedictine monasteries. Later, the followers of Saint Ignatius of Loyola would leave their spiritual and intellectual mark on Europe and the world, never conforming nor resting, including figures like Father Teilhard de Chardin, who resonate with current reflections even though he did not literally speak of algorithms as noted above. As Bergson writes, great mystics have been remarkable achievers, great men and women of action. The institutions they created experienced exceptional growth and longevity. In the 19th century, Andrew Carnegie serves as a good example of an entrepreneur whose actions were not limited to seeking immediate material benefits. Nowadays, with the revolution of algorithms and big data, technical and economic dimensions are rapidly developing; the social question is beginning to be raised, while the moral and spiritual dimensions are still evolving.

Indeed, like any technological or economic innovation, algorithms and artificial intelligence are tools that bring both good news and dire consequences, calling for discernment. Despite the recent construction of powerful, nearly monopolistic empires with often opaque algorithmic dominance, and the projection by some of a hybrid or even transhumanist anthropology that is far removed from Christian hope, we believe there is no inevitability in this matter; on the contrary, the field of algorithms is also one of new creative freedom, a relative democratization of socio-economic initiative, and a potential challenge to deadly rents, even a renewed material and communal sense of the universal destination of goods.

Develop a code of conduct for creators and concrete tools that balance the human-AI relationship

Instead of lamenting the overwhelming power of the new conquerors or relying solely on centralized state regulation, isn't there essentially a call to boost entrepreneurial creativity to compete boldly and foster healthy competition, including providing more transparent options for users than current offerings? After all, these algorithmic companies that have grown into behemoths weren't created by decrees but by a beautiful creative freedom, often by innovators who were far from wealthy, and the speed at which they've made their mark could just as easily turn against them in an algorithmic world wide open to new ideas.

We believe that entrepreneurs of all kinds, but especially algo-entrepreneurs, are at the forefront of this transformation, along with developers, programmers or coders, applied mathematicians or data scientists, digital product managers and ergonomists. As creators, they have a genuine scope for creative freedom in this area, often with more impact than institutional powers; thus, they also bear significant responsibilities and need guidance. The world where everyone interacts daily with algorithms is shaped by countless basic interactions among entrepreneurs, coders, and each of us as micro-users through every download and click of their emerging services.

We wish for discernment on the ground, illuminated by sharing among actors of goodwill, the Word of God, and Christian anthropology, rooted in deep experimentation to identify creative compromises and proven best practices in reality. The consensus-level ethics that form the basis of the first ethical codes that appeared around 2017-2018, while an important first step, are not enough as we've seen, as they lack a clear framework of basic anthropological values needed to weigh numerous dilemmas. Within the very design of algorithms lie many ethical choices in the hands of mathematicians-developers and entrepreneurs.

which guide them, essential value judgments41 according to the '1st law of Kraentzer': Technology is not good or bad - nor is it neutral42.

Let's not rule out the possibility that the formalization of such effective field practices, enlightened by Christian anthropology, could itself be partially equipped by models and algorithms/artificial intelligence. It would be quite interesting to test this based on a clear specification of a value system and criteria for resolving dilemmas to understand the AI's capability (at any given time) to manage ethical values (game theory, cases of unavoidable exogenous variables such as social justice, ...), and to explore a fruitful collaboration between the final human decision-maker and AI support, and perhaps applications of 'enhanced ethical coaching' combining algorithms and a human coach.

Delving into algorithmic entrepreneurship, its spiritual vocation, ethics, and regulation through a multidisciplinary research chair, amid the uncertainty and freedom in the era of big data

Supporting this on-the-ground ethical discernment, a multidisciplinary research effort could usefully illuminate the reflection, drawing on resources from economics, social sciences, ethics, philosophy, epistemology, theology, and applied mathematics.

41 See, for example, "Is there an ethics of algorithms" by Kraemer et al, 2011, which identifies that an algorithm contains an "essential value judgment" if two coders with different value judgments have an objective reason to design the algorithm (or choose the algorithm) differently to solve the same problem, all other things being equal.

42 See also Kraemer et al, 2011, which provides examples of "hard-coded" choices on classification thresholds for false positives/false negatives in the diagnosis of dead or living cells in medical imaging, which can have major impacts on biomedical ethical decisions. This ratio is sensitive to the many implicit filtering settings and algorithmic processing performed by coders. The article recommends making such value judgments as transparent as possible, or if not, leaving them to the users themselves.

decision, to inspire entrepreneurs towards a path of reasoned analysis, confident hope, and responsible creativity.

The entrepreneurial field could also welcome students and researchers engaged in applied research and training through research, possibly preparing future careers to design and implement creative solutions to the ethical challenges in each sector.

Perhaps even the Social Doctrine of the Church, not very familiar in its current edition with digital technology in general, and specifically the latest innovations in algorithms, AI, and even less with the new socio-economic balances faced by next-generation algorithmic enterprises, could benefit from contributions that result from this? The time seems ripe for such a contribution, given the many initiatives underway in the Christian and Jewish worlds.

Scope of a research chair

Engage creators & believers and inspire new callings

At the intersection of entrepreneurial field discernment and intellectual and spiritual deepening, it's necessary to create content that's truly usable for creators. In this regard, the experiences that shape daily life for 21st-century entrepreneurs—accelerators, online coaching, MOOCs, competitions like Kaggle, etc.—should inspire the spread of content traditionally carried by spiritual circles in older formats.

The focus is likely on:

- Entrepreneurs seeking frameworks, best practices, and places for practical exchange—a significant demand according to our Espérance et Algorithmes survey
- Venture capital investors, key partners for entrepreneurs, also interested in frameworks or even labels for 'responsible algorithmic investment'
- Mathematician-coders, algorithmic practitioners, who often lack clear frameworks to support their ethical standards or share their dilemmas
- Believers or people of goodwill looking for meaning in their work, invited to explore the full potential of algorithmic entrepreneurship guided by Christian anthropology, and potential co-creators of companies or recruits for entrepreneurs who often struggle to hire

But it is undoubtedly through genuine fraternal support in the field that real formative and inspirational growth can occur. Algo-entrepreneurs, investors, or AI experts could dedicate some of their time to assist existing charitable projects, helping others to design and develop algorithms to enhance the impact of these projects.

Algorithms & Integral Ecology: A Project to Encourage Individual Actions for the Common Good43

With a goal to unite a civic and algorithmic project aimed at mobilizing individual actions for more environmentally friendly and solidarity-driven lifestyles, a project is being considered in this regard.

We firmly believe that every individual action matters, referencing the hummingbird legend about doing our part against fires and the Christian principle mentioned above: 'Let us start by changing ourselves if we want to change the world.' Yet studies regularly show that while individuals claim to be aware of the climate and social crisis, they often act minimally in practice.

The current crisis presents an opportune moment to draw inspiration from Pope Francis's encyclical Laudato si', which advocates for preserving our common home and champions comprehensive ecology. We aim to unite men and women of goodwill, convinced that their responsible actions will significantly impact the consumption of goods and services through informed choices.

Moreover, this growing movement will influence businesses broadly and governments, given the varied roles of citizens: especially as consumers, entrepreneurs, voters, employees, and candidates in private, nonprofit, and public sectors, including elected officials. The decisions and actions of businesses and governments will bolster individual efforts toward a lifestyle that is more environmentally friendly and socially responsible.

We do not intend to overlook the numerous barriers and challenges: lack of knowledge, difficulties in discernment, doubts about usefulness, efforts required, purchasing power, job loss, training needs for professional development, and so on. On the contrary, we acknowledge them openly and without dogma, aiming to highlight positive and personalized examples. Our approach consists of two complementary tools:

43 Contribution from Marie David (Euler Hermes) and Pascal Decaux (Verteego / Cleantuesday)

- An individual profiling tool to understand one's socio-ecological profile (identity, environmental concerns, knowledge, barriers, etc.) and ecological achievements, while providing key figures and examples to position the person's profile and accomplishments among peers (clusters) and to recommend actions aligned with their socio-ecological profile.
- A collective mobilization tool (especially on social media) to recruit users of the individual profiling tool and to engage in debates using the results from this tool.

We will utilize algorithms to process data collected by the individual profiling tool and the collective mobilization tool. The algorithms are expected to be relatively simple to develop. In our view, the project showcases the benefits made possible by algorithms used for a virtuous approach. Partnerships with existing associations and movements are identified as essential for the project's success.

Towards a label to promote inspired initiatives and funding

Supporting algorithmic entrepreneurship, a site of essential spiritual struggle and where the future is reinvented, particularly involves promoting financial investment, especially venture capital—a key element for enabling bold innovation. Yet, we know that far too few individuals or institutions (especially religious ones)—notably in France and Europe—are willing or daring to allocate even a modest portion of their savings to venture capital investment in creators and business developers, either due to ignorance or sometimes even out of spite or moral or spiritual mistrust towards a certain form of money or finance.

And yet, isn't investing in algo-entrepreneurial capital a risk that's 'blessed by the Gospel'? Let's revisit Pierre de Lauzun's essential distinction as he interprets various Gospel texts, between money tied to 'rent' and

money tied to 'creative risk,' emphasizing the call to 'venture into deeper waters' by encouraging those who strive through entrepreneurship to make a co-creative contribution to the world.

Let's support the establishment of capital investment tools in this context, as Christian actors have done in other areas through the Ascendi fund from the Saint-Wandrille monastery, or the ProClero fund from the Saint-Martin Community, perhaps through a specific label ensuring the quality of ethical algo-entrepreneurial practices.

Conclusion: Our Main Proposals

MULTI-DISCIPLINARY CHAIR - Deepen the ethics and spiritual vocation of algorithmic entrepreneurship through a multi-disciplinary seminar involving researchers, theologians, entrepreneurs, engineers, and investors.

BROTHERLY ALGO-ENTREPRENEURIAL SUPPORT - Encourage algo-entrepreneurial practices that serve the common good through a program of brotherly discernment and personal mentoring, involving entrepreneurial makers and potentially an acceleration system so that everyone who wishes, including the most disadvantaged, can reinvent their work through these technologies and contribute to the collective effort.

EDUCATION and DISCERNMENT - Provide extensive training, including through innovative teaching methods powered by algorithms and hands-on field internships, for current and future entrepreneurs, investors, and engineers among the youth, to gain a comprehensive understanding and a multidisciplinary and anthropological perspective.

TESTIMONIAL EVENTS - Raise awareness through testimonial events for entrepreneurial communities, investors, programmers/developers, and data scientists, as well as believers, about the universe of possibilities.

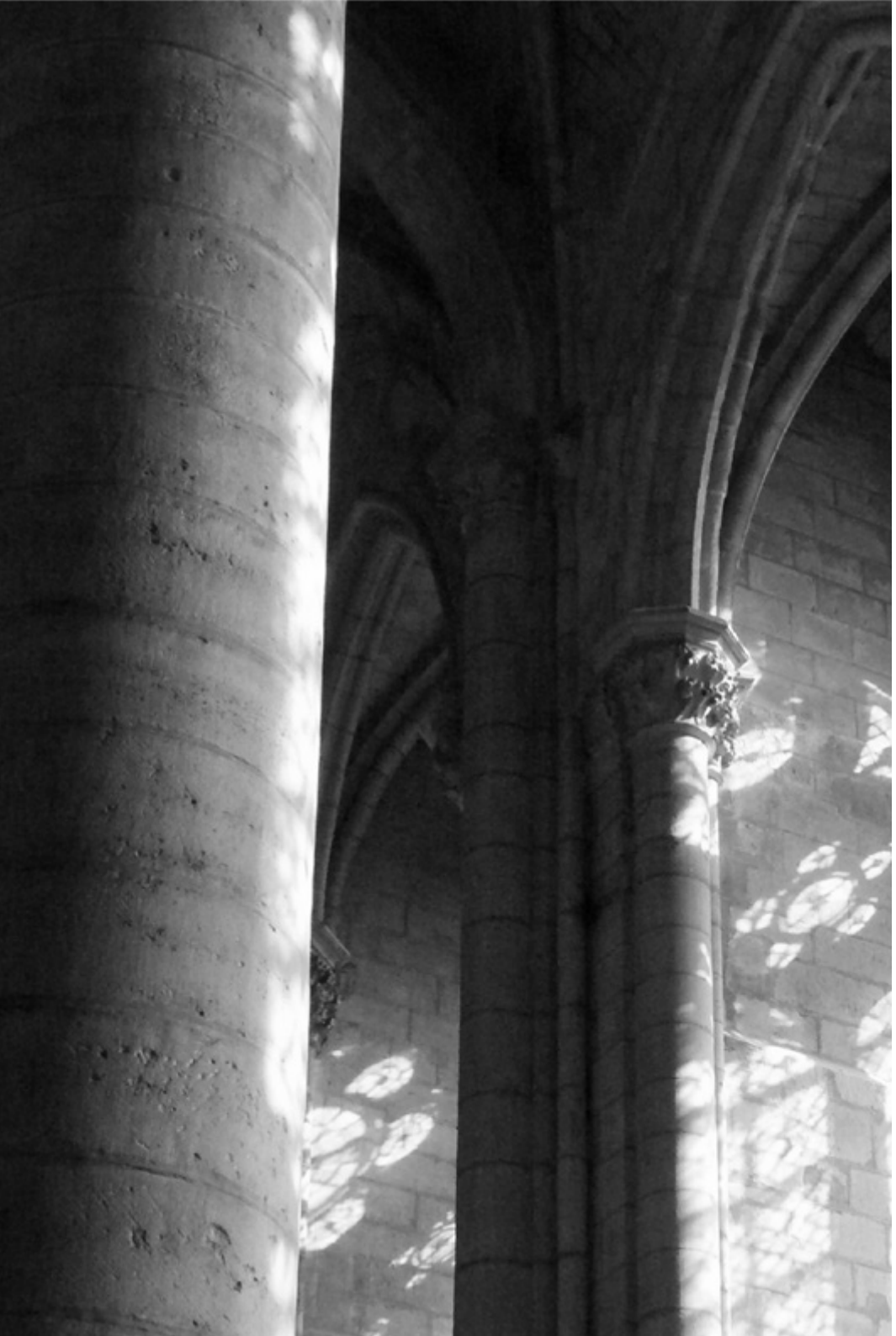
LABEL and INVESTMENT - Create a label "Hope & Algorithms" to promote inspiring and creative entrepreneurial initiatives through capital investment resources guided by algorithmic ethics.

ENHANCED PERSONAL COACHING (notably in INTEGRAL ECOLOGY) - Equip individuals with algorithms to aid in clear decision-making on ethical dilemmas concerning the common good, such as individual responsibility towards integral ecology, by providing specialized tools/AI and human moderation.

HUMAN-AI BALANCE - Offer proven anthropological and societal benchmarks for a pragmatic view of the human/machine relationship and humans at work to foster the design and ergonomics of balanced "human-AI" pairings in assisted decision-making.

SDC PROJECT - Contribute to the Social Doctrine of the Church by discerning benchmarks and encouraging vocations through algorithmic-entrepreneurial transformation inspired by evangelical wisdom44.

44 Let's remember al-Khwarizmi (783-850), an Uzbek mathematician, astronomer, translator, and philosopher from whom the word algorithm resonates, resided in the House of Wisdom in Baghdad, a research center established by the caliph of the time.



Afterword

Rabbi Michael Azoulay

The manifesto project views algorithms and artificial intelligence as 'a blessing' for 'the co-creator and responsible human who discerns their good uses.' This approach aligns with the anthropological and spiritual vision of the Book of Genesis. Indeed, the Bible starts with a couple entrusted by their Creator to tend and protect the 'Garden of Eden,' representing metaphors of Earth and humanity.

Created 'in the image of God' (Genesis I, 27), only humans are endowed with an inalienable dignity. No matter how complex, artificial intelligence cannot attain this.

Being created 'in the image of God' also signifies, according to Chaim of Volozhin45, that humans are creators. Creators of themselves as they shape the unfinished world left by God. They are tasked with perfecting it using the reason and moral conscience God bestowed upon them. Hence, the presence in the garden of the 'tree of knowledge of good and evil.'

The proximity of the terms 'knowledge/science' and 'good and evil' is significant: sciences should promote human flourishing, not degradation.

'Tree' in Hebrew is 'ets,' akin to the biblical term 'etsah,' meaning 'counsel,' 'reflection,' 'reason,' or 'judgment,' pointing to the moral judgment on the use of knowledge. In contrast, 'an algorithm does not possess reason, it is neither devious nor benevolent,' stated Anne-Marie Kermarrec, a research director at Inria, in Libération. Humans must exercise supreme control over these programs they design. Discriminations and questionable opinions embedded in mathematical codes are human flaws mirrored in programming. They are not the work of machines.

45 Rabbi, Talmudist, and moralist (1749-1821), disciple of the renowned Gaon of Vilna.

However, these risks seem minor compared to the impact automation has on employment. While it does create new jobs, it also leads to the loss of many professions. This risk has significantly increased with the economic effects of the global pandemic we've just experienced, and its impact will be felt for a long time. The digital revolution is more global than the industrial revolution, making it urgent to invest in training and re-skilling programs to prevent mass unemployment.

Should we regulate AI and algorithms or rely on individual conscience? Both will be necessary. This book, reflecting a shared understanding among entrepreneurs and believers on these issues, offers a hopeful sign that awakening consciousness and self-regulation aren't just utopian ideas.

It would be wrong to view digital transformation merely as a threat to humanity. The numerous benefits highlighted in this white paper should convince us that it's actually a tremendous opportunity, especially as it frees up our most precious resource—time—for more fulfilling activities. By taking over repetitive tasks, AI enables meaningful personal interactions that are central to economic and social relationships. Don't we fundamentally need time for contemplation to elevate ourselves? I'd like to conclude by acknowledging the thoughtful work of this think tank, aware of the exponential ubiquity of algorithms in nearly everything around us46. A Jewish saying teaches that wisdom is about foreseeing and anticipating the consequences of emerging creations. Let's bet that much wisdom will be needed in the coming decades...

46 Readers interested in how Judaism views these issues can refer to my book, 'Ethics of Judaism,' published in 2019 by La Maison d'Edition (pages 81 to 89).

Appendices

Guidelines from the European Expert Group for Trustworthy AI 'Made in Europe'

Chapter I : Key focus to guarantee ethical purpose

- **Make sure** that AI is human-centred: AI must be designed, deployed and used with an 'ethical purpose', based on - and reflecting - fundamental rights, societal values and ethical principles of beneficence (doing good), non-maleficence (doing no harm), human autonomy, justice and explicability. This is an essential aspect of achieving trustworthy AI.

- **Rely** on fundamental rights, principles and ethical values in order to assess prospectively the possible effects of AI on human beings and the common good. Pay particular attention to situations involving more vulnerable groups such as children, people with disabilities or minorities, or situations characterised by asymmetries of power or information, for example between employers and workers, or between companies and consumers.

- **Reckon** and be aware that while AI brings considerable benefits to individuals and society, it can also have negative impacts. Be vigilant about the areas of greatest concern.

Chapter II: Key Directions for Achieving Trustworthy AI

- **Integrate** the requirements of trustworthy AI from the first design stage: accountability, data governance, design for all, governance of AI autonomy (human supervision), non-discrimination, respect for human autonomy, respect for privacy, robustness, security, transparency.

- **Consider** both technical and non-technical methods to ensure these requirements are implemented in the AI system. Additionally, keep these requirements in mind when forming the team responsible for the system, the system itself, the testing environment, and the potential applications of the system.
- **Provide,** clearly and proactively, information to stakeholders (clients, workers, etc.) about the capabilities and limitations of the AI system, enabling them to set realistic expectations. Ensuring the traceability of the AI system is crucial in this regard.

- **Integrate** trustworthy AI within corporate culture and give stakeholders information on how it is implemented in design and use of AI systems. Trustworthy AI can also be incorporated inside deontological charts or code of conduct of organisations.

- **Ensure** the participation and inclusion of stakeholders in the design and development of the AI system. In addition, ensuring diversity in the formation of the teams responsible for developing, implementing and testing the product.

- **Strive** to facilitate the verifiability of AI systems, especially in critical contexts or situations. Whenever possible, design a system that allows tracking of various decisions regarding different inputs: data, pre-trained models, etc. Also, define methods for explaining the AI system.

- **Ensure** there is a clear process for accountability governance.

- **Plan** training and education to make sure managers, designers, users, and employers are informed about and trained in trustworthy AI.

- **Know** that there may be fundamental tensions between the different objectives (transparency may lead to misuse; detecting and correcting bias may conflict with privacy protection measures). Communicate and document these trade-offs.

- **Promote** research and innovation to support the implementation of trustworthy AI requirements.

Chapter III: Essential Guidelines for Evaluating Trustworthy AI

- Adopt an evaluation checklist to ensure trustworthy AI during development, deployment, or use, and tailor it to the specific use case of the system.
- Remember that an evaluation checklist will never be exhaustive, and simply checking boxes isn't enough to guarantee trustworthy AI. It's about establishing an ongoing process of identifying needs, assessing solutions, and improving outcomes throughout the AI system's lifecycle.

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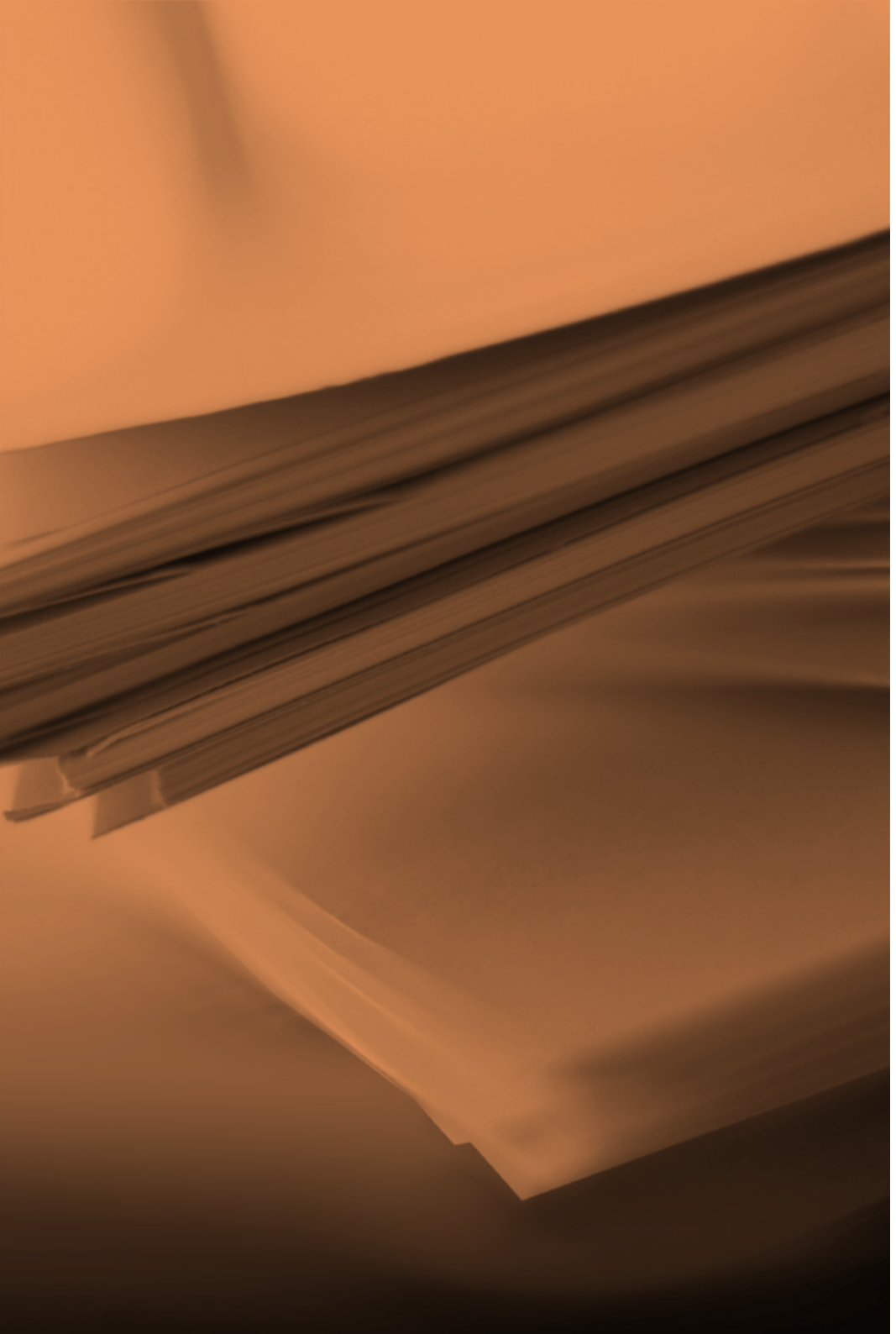

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Carrying a manifesto of 14 principles, born from research involving dozens of entrepreneurs and AI experts on rapidly evolving examples (health, ecology, work, etc.), and deep fraternal discernment, the white paper delves into the role of the entrepreneur and their 'unmatched creativity' when facing concrete ethical dilemmas at the heart of the scientific, economic, and even spiritual dimensions of the algorithmic revolution. Initial steps are proposed to practically identify risks and creative solutions.

We believe that a positive and clear-eyed algorithmic entrepreneurial wisdom deserves to be tested in the field, discerned through shared experiences and multidisciplinary deepening. To train and inspire meaningful vocations serving the common good in these times of crisis.

The think tank 'Espérance & Algorithmes' ("Hope & Algorithms") established in 2018, is a network of entrepreneurs, venture capitalists, and experts, all professionals in algorithm-driven businesses and artificial intelligence, drawing inspiration from biblical anthropology and fraternal sharing to discern and act with hope. Join us in building together for the common good!

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