AI in the power industry

The Good, The Bad, The Ugly

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- 30 years in technology
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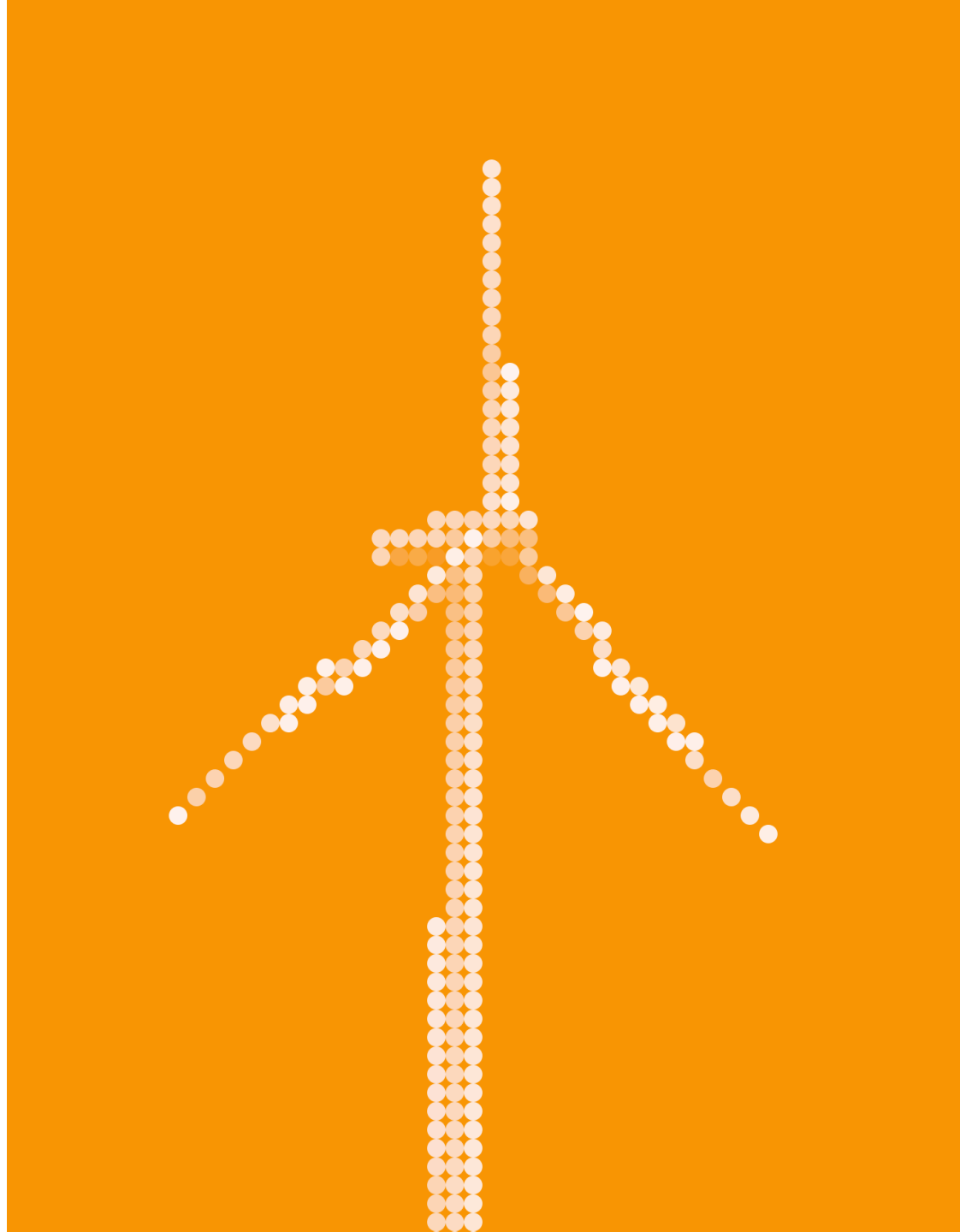
Topics of discussion

- Let’s be clear about AI
- Does it have a place in the power industry?
- So how and where could it be beneficial
- What pitfalls can we avoid?
- What challenges are present by AI now?
- What does the future hold?

Define AI without using the words Artificial Intelligence

What do we mean by AI?

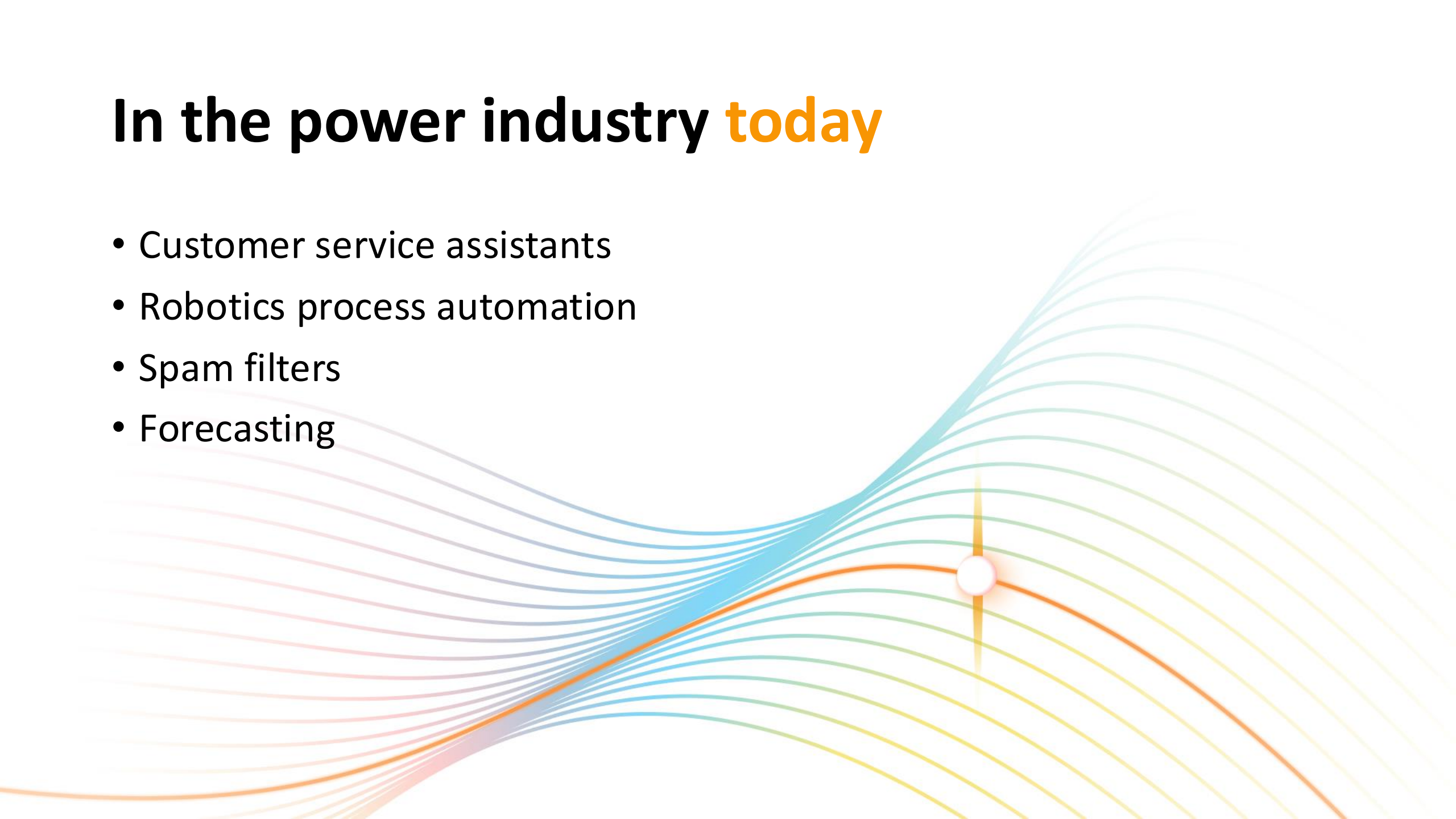
- Narrow AI trained for a specific task
  - Reactive Machines (RPA, first gen chatbots, spam filters)
  - Limited Memory (generative, assistants, self-driving)
  - Theory of Mind (Alexa, Siri, Autonomous vehicles, Sophia, LLMs)
  - Self-aware AI (AlphaZero, Project Debater)
- General AI
- Superintelligent AI



American University 2025[1]

In the power industry today

- Customer service assistants
- Robotics process automation
- Spam filters
- Forecasting



The Good

Suggest valid response/action

Digital twin scenario planning

Automate mundane processes freeing human intellectual space

Find solutions to complex problems faster

Help humans make decisions in complex situations

Examples of Good

Frequency and Phase Management

Utilize streaming data from PMUs and grid assets to determine and correct shifts in frequency due to outages, failures or demands.

Automate fast response frequency reserve assets to compensate based on this streaming data.

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Energy Market Forecasting

Enable better demand prediction based on historical market information, weather forecasting and asset performance.

Create a faster response to markets with flexible bidding and awarding .This could pave the way for energy trading at the microscale and create true ToD markets at the micro or macro level.

Operational Safety & Security

Utilize live streaming video with AI to recognize and alert of potential work hazards.

Correlate alarms across the communication network, physical alarms and electrical grid to detect and deter potential security threats.

Power Reliability and maintenance

Optimize network maintenance through holistic view of ALL assets, including people, communication and electrical.

Automate operations based on historical data, coordinate outage, maintenance and skillsets.

Plan upgrades and capacity based on “what if?” scenarios.

The Bad

Unaided operational decisions

- ‘logic’ based decisions aren’t always the best

Unauthorized agents/actors

- Code generation
- Self-learning algorithms
- Reverse engineered models

Connected Data Sources

- How is it learning
- Location of the source data
- Validity of data

Examples of Bad

MEN'S JOURNAL

Google Issues a Warning to All 1.8 Billion Users

Kevin Harrish
Fri, August 15, 2025 at 11:48 PM EDT
3 min read

153

Google has 1.8 billion Gmail users worldwide, and the company recently issued a major warning to all of those users about a "new wave of threats" to cybersecurity, given the advancements in artificial intelligence.

Earlier this summer, Google issued an important warning to all of its users about a new form of cybersecurity attack called "indirect prompt injections."

The new threat puts individuals, businesses, and even governments at risk.

Harrish [2]

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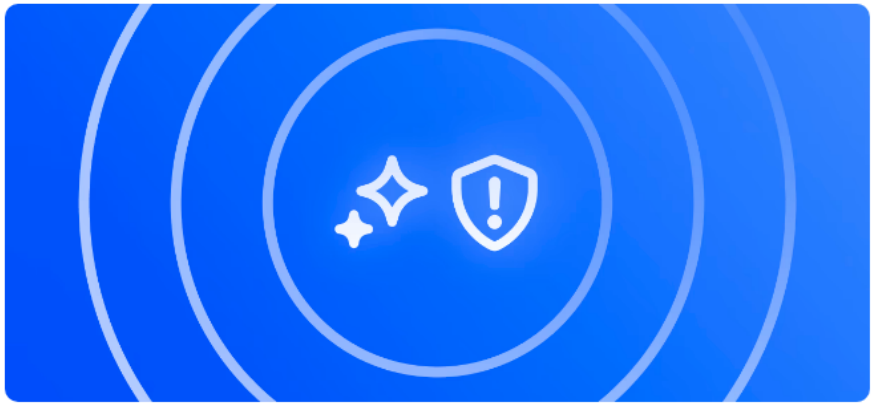
Toloka welcomes new investors Bezos Expeditions and Mikhail Parakhin in strategic funding round Learn more

Your biggest AI security risk isn't the model, it's the data

Toloka Team | June 10, 2025 | Essential ML Guide



The power of artificial intelligence feels boundless. From crafting flawless code and designing entire marketing campaigns to accelerating research, the race to integrate revolutionary AI tools is on. Organizations are deploying them at a staggering speed and scale, promising unprecedented efficiency and innovation.

But as we sprint to harness this power, we're venturing into uncharted territory. The rapid adoption of AI systems has created a parallel, and often invisible, landscape of security challenges. While the world is mesmerized by AI models' capabilities, a critical and foundational vulnerability lurks in the shadows: the data they are built on.

With generative AI, security concerns must be addressed early to protect systems from evolving threats and potential breaches.

Toloko [3]

The Ugly

Data storage

- Amount required to train models
- Cost of storage
- Impact of new data centre infrastructure

Energy Consumption

- Unforeseen increased demand
- Time to interconnect & capacity
- Cost of infrastructure to support
- More distributed generation

Regulation & Security

- Speed of technology vs regulation
- Source of models
- Validation procedures
- Intellectual Ownership
- Privacy

Examples of Ugly

Where we **WERE** in the US

In 2009 according to IEEE US power utilities already possessed 194 petabytes of data[4]

1 gigabyte of data-continuous use on the Internet uses 5kWh 50% in the DC.

1.24
TWh/yr

Where we **ARE** in the US

In the US in **2022** 135M smart meters generated about **54 petabytes** of new utility data[5]

Saving and storing 100 gigabytes of data in the cloud per year would result in a carbon footprint of about 0.2 tons of CO2, based on the usual U.S. electric mix.6

49M
tCO2e

OpenAI GPT-3 training computational processing energy consumption[8]

1.25
GWh

552
tCO2e

How we avoid the pitfalls?

- Thinking AI can do everything
- Replacing the wrong jobs with AI
- Underestimating the environmental impact
- Blindly trusting AI without verifying
- Becoming too dependent on AI

- Consider streaming analytics technologies
- Invest in Digital twin scenario testing
- Execute a good data retention solution
- Validate when and where it can be used
- Limit immediate action and keep human in the loop

The Future

Imagine a world where natural language-based conversations with an AI agent can provide minute by minute updates on

- power delivery priorities
- areas of congestion,
- probability of impact of storms
- unsafe conditions

with suggested mitigation measures and automated notifications upon biometrically secured levels of authorization.

Thank you

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