

# KALEIDOSCOPE

**AI-Powered Innovation Intelligence Engine**

From Idea Generation to Decision-Ready Innovation

---

*Presented by*

*Eddie Li, Chaitanya Soma, Gitanjali Roy, Yijia Pan*



**Carnegie Mellon University**

Tepper School of Business  
MSBA Capstone



**Honda Research Institute**

Project Sponsor

## The Problem






# More Ideas ≠ More Innovation

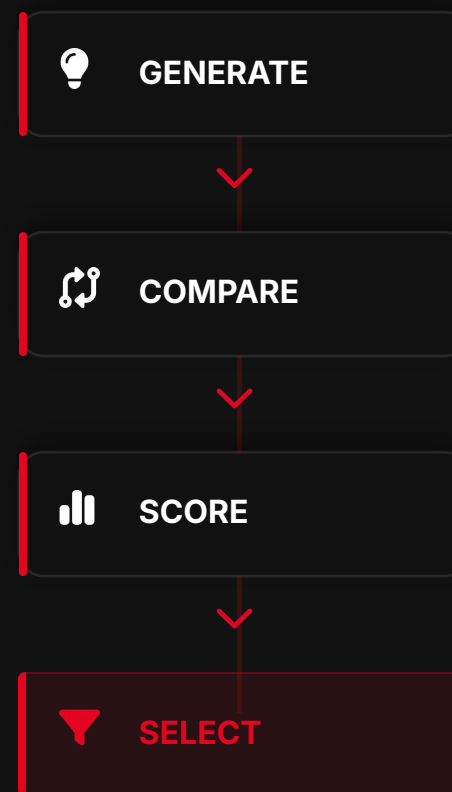
- 🤖 AI can generate hundreds of ideas instantly
- 📄 Most ideas are conceptually identical with different wording
- 📊 Creates a false sense of diversity in innovation pipelines
- ⌚ Teams waste time evaluating repeated concepts
- ✂️ Innovation portfolios cluster around safe, predictable ideas

⚠️ Real bottleneck is not Generation, it is **Evaluation**

## Novelty Engine

# Ideation Must be Measured, Not Just Generated

-  Ideas are broken into structured dimensions (problem, mechanism, outcome)
-  Similarity engine detects hidden conceptual overlap
-  Novelty score ranks ideas based on distance from existing ideas
-  Selection mechanism filters out redundant ideas in real time
-  Ensures final portfolio is diverse, distinct, and decision-ready



✓ Distinct by **design**, not by accident

# Six Semantic Dimensions

Every idea is decomposed into 6 weighted dimensions. Weights reflect how much each dimension distinguishes one idea from another.

DIMENSION	WEIGHT	GROUP	UNIQUE VALUES	WHY THIS WEIGHT
<b>Core Mechanism</b>	<b>30%</b>	Functional	200 / 200	Every idea has a unique mechanism. Most discriminating signal.
<b>Problem / Opportunity</b>	<b>25%</b>	Strategic	199 / 200	Nearly unique. Identifies distinct gaps being targeted.
<b>Intended Outcome</b>	<b>20%</b>	Strategic	197 / 200	Catches ideas aiming at the same goal despite different mechanisms.
<b>Stakeholder</b>	<b>12%</b>	Situational	71 / 200	Meaningful but less discriminating than mechanisms.
<b>Context</b>	<b>8%</b>	Situational	156 / 200	Mostly surface variation in setting. Weak differentiator.
<b>Value Type</b>	<b>5%</b>	Strategic	16 / 200	Only 16 categories. Too coarse to tell ideas apart.

$$\text{Weighted similarity} = 0.30 \cdot \text{sim}(\text{mechanism}) + 0.25 \cdot \text{sim}(\text{problem}) + 0.20 \cdot \text{sim}(\text{outcome}) + 0.12 \cdot \text{sim}(\text{stakeholder}) + 0.08 \cdot \text{sim}(\text{context}) + 0.05 \cdot \text{sim}(\text{value\_type})$$

# 14 Generation Rules






Rules in 3 layers force systematic exploration. Progressive relaxation prevents deadlock when the space saturates.

<b>LAYER 1 — SURFACE</b> <span style="float: right;">6 rules</span> <i>Label-level constraints</i>	<b>LAYER 2 — CONCEPTUAL</b> <span style="float: right;">4 rules</span> <i>Strategic depth</i>	<b>LAYER 3 — STRUCTURAL</b> <span style="float: right;">3 rules</span> <i>Portfolio shape</i>	<b>SEMANTIC SAFETY NET</b> <span style="float: right;">1 rule</span> <i>Catches what labels miss</i>
<ul style="list-style-type: none"> <li><b>01</b> Unique core mechanism across all ideas</li> <li><b>02</b> Unique problem / opportunity</li> <li><b>03</b> No stakeholder above 10% of ideas</li> <li><b>04</b> Each value type capped at 15%</li> <li><b>05</b> Dense topic clusters capped at 15</li> <li><b>06</b> Unique combo: mechanism + stakeholder + value type</li> </ul>	<ul style="list-style-type: none"> <li><b>07</b> <math>\geq 40\%</math> of ideas must be radical, not incremental</li> <li><b>08</b> Every 10th idea borrows from another industry</li> <li><b>09</b> Spread across near / mid / long-term horizons</li> <li><b>10</b> Each idea satisfies <math>\geq 2</math> of Honda's 4 strategic criteria</li> </ul>	<ul style="list-style-type: none"> <li><b>11</b> Every 20th idea challenges a core assumption</li> <li><b>12</b> No business model above 20%; covers licensing / franchise / B2B</li> <li><b>13</b> Specifies geography; covers multiple regions</li> </ul>	<ul style="list-style-type: none"> <li><b>14</b> Embed idea, reject if cosine similarity <math>&gt; 0.70</math> to any accepted idea</li> </ul>

Progressive relaxation: Attempts 1–5 enforce all rules → Attempt 6 drops Layer 3 → Attempt 7 keeps only Layer 1 + Rule 14 → Failure means no slot opens


## Patent Validation

# True Innovation Requires External Validation

-  Internally unique ideas may already exist in real-world patents
-  System retrieves patents in real time using APIs
-  Ideas and patents are compared using semantic embeddings
-  Similarity scoring identifies prior-art overlap
-  GPT assigns patent risk (High / Medium / Low) with justification

## Business Impact

- ✓ Eliminates redundant innovation early
- ✓ Reduces manual evaluation effort
- ✓ Enables faster go/no-go decisions
- ✓ Scales across multiple business domains
- ✓ Generalizes ideas across industries & models

 Enables fast, evidence-based novelty screening before deep review



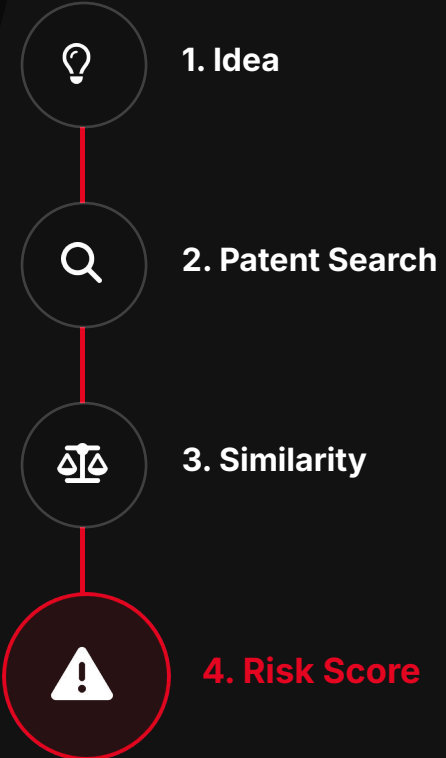
**Weeks → Minutes**

Evaluation cycle



**Reduced**

Manual Effort



# From Idea Generation to Decision Intelligence



**~99%**

duplicate reduction (pilot)



**Improved**

Portfolio Diversity

## Business Impact

- ✓ **90%+ reduction** in evaluation cycle
- ✓ **Reduction** in redundant analysis
- ✓ **Faster** decision-making



Cost per Evaluated Idea

**\$0.05 – \$0.10**

Scalable, low-cost innovation evaluation at scale



**Explorer**

Generates ~200 concepts



**Refiner**

Filters & structures ideas



**Similarity Engine**

Ensures true distinctiveness



**Patent Agent**

Validates against prior-art



**Decision-Ready Output**

UI + Excel (Diversity & Risk)

**BETTER IDEAS. FASTER DECISIONS.  
SMARTER INNOVATION.**

**ENGINEERING INNOVATION THAT'S  
NOVEL, DISTINCT, & PATENT-READY**

**FASTER DECISIONS. STRONGER IP. REAL BUSINESS IMPACT.**



Overview Briefs Method

TOPIC

e.g. Honda robotaxi and eVTOL strategy

Results will appear here after generation.

PORTFOLIO SIZE

10

Generate Portfolio

PROGRESS

Waiting for input...

EXPORT

Excel download will appear after generation