

ACCENTURE RESEARCH

# InnovateGPT: LLMs to Measure Innovation

An Application to the Life Sciences Industry

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# Problem Statement

## Motivation:

Innovation is a vital determinant of productivity, competitive advantage and corporate success. However, companies and Accenture clients face challenges to measure and harness innovation.

1

### How to define innovation?

Innovation is an **intangible**, **subjective** and **complex** concept.

It is context-dependent, and it has no universal agreed-upon definition.

A work can be innovative because it is **novel** or because it is **influential** on future works.

2

### How to measure innovation?

**Patents** are the best-known proxy for innovation. But patents are **lengthy**, **technical** and **difficult** to understand.

What is the link between patents and innovation?

How to quantitatively measure innovation?

3

### How to harness innovation?

Innovation impacts not only financial outcomes, but also productivity and competitive advantage.

Establishing a direct link between innovation and **corporate performance** is **challenging** yet **crucial**.



# Objective

Develop a **comprehensive framework** using **Large Language Models (LLMs)** to quantify **innovation** through **patents** and help **Accenture clients** define **effective innovation** and **research investment strategies** and understand their **competitive landscape**.

# Scope and Data

**Scope:** Life and Science | 2015-2022 | Worldwide



## Patents Data

Claims, Status, Owner,...



## Corporate Financial Data

Sales, R&D Spends,...



## Clinical Trials Data

Drug, Company, Status,...

**45**

**Companies**

**200K**

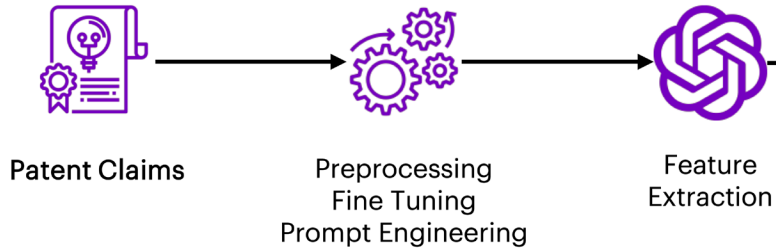
**Patents**

**4M**

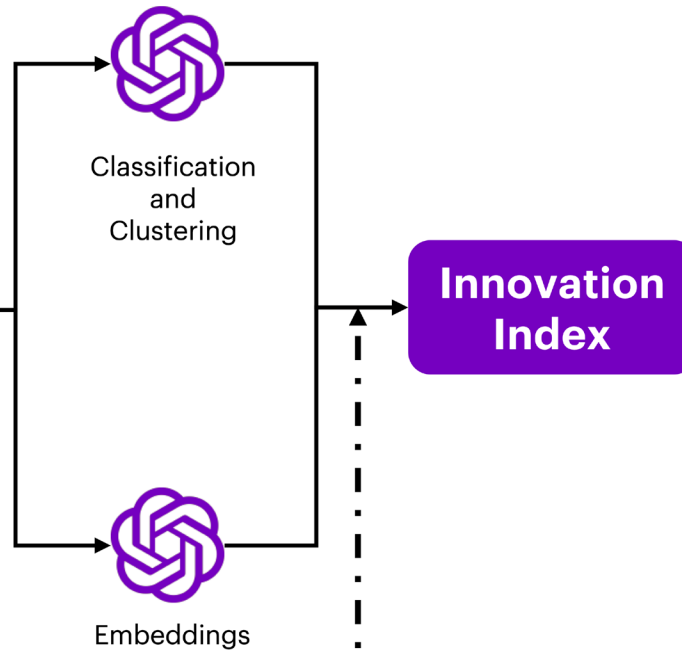
**Patent Claims**

# Framework

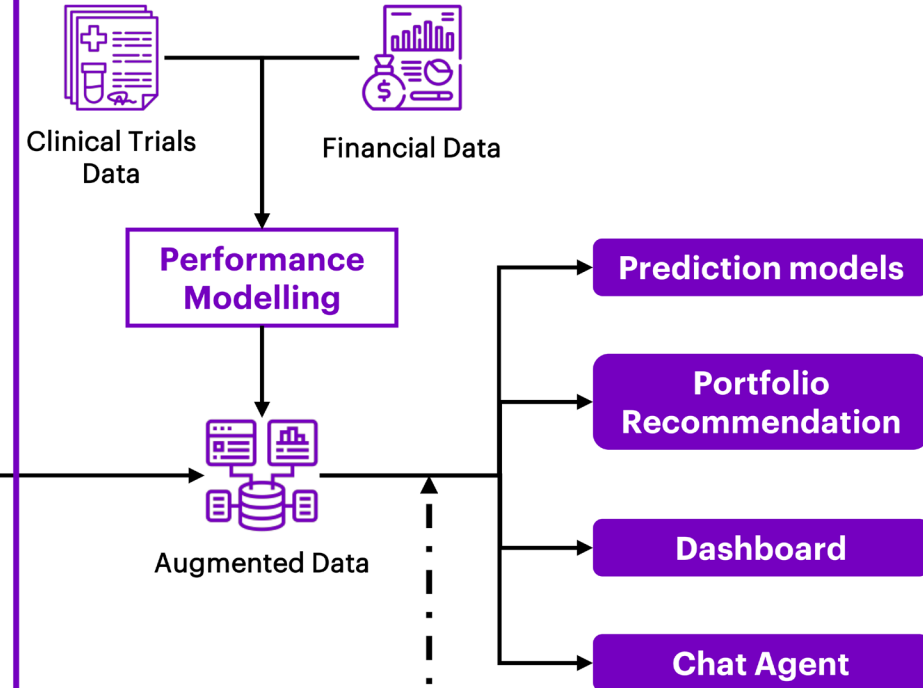
## Understanding Innovation How to define innovation?



## Measuring Innovation How to measure innovation?



## Harnessing Innovation How to harness innovation?



Human in the Loop

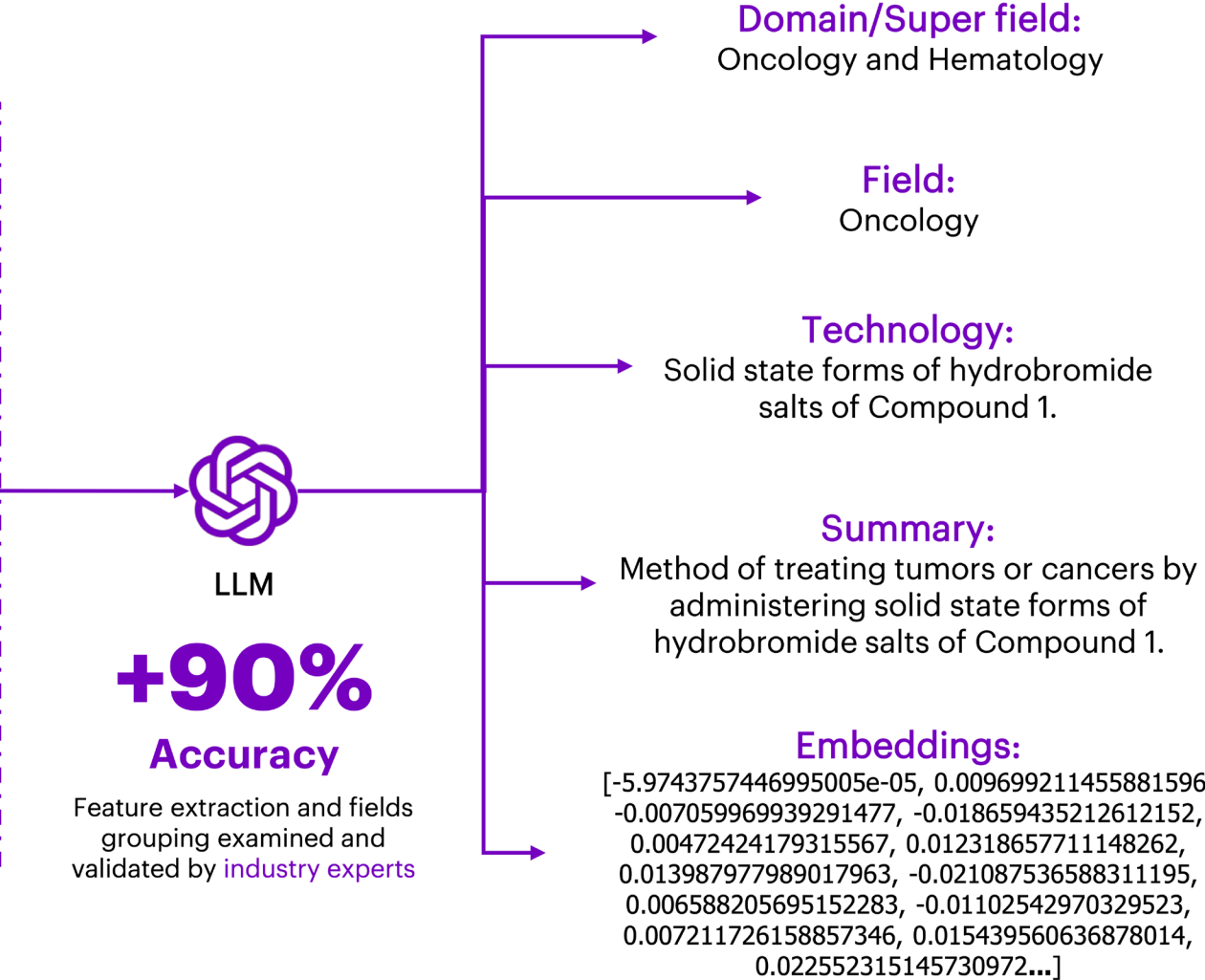


# LLM Facilitates Patent Understanding and Accurate Feature Extraction

**Patent: AR119614A1**

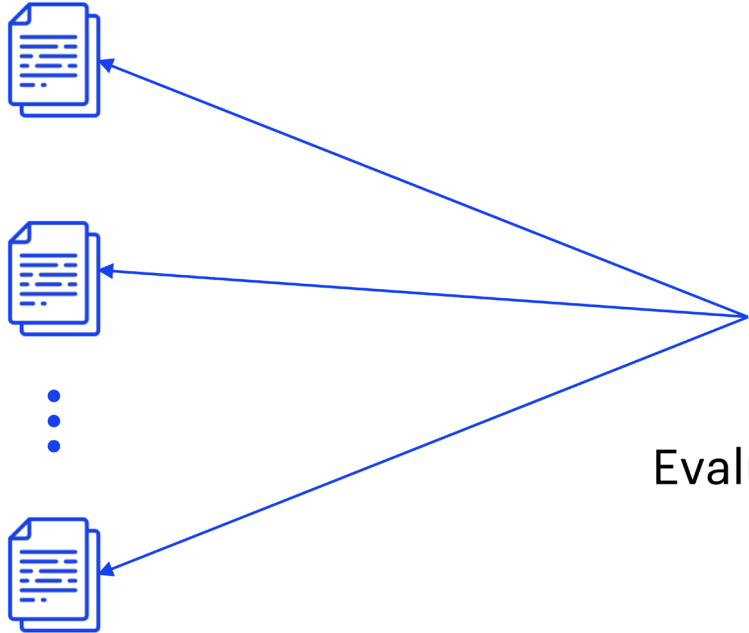
The present disclosure relates to:

- a) solid state forms of **hydrobromide salts** of Compound 1;
- b) **pharmaceutical compositions** comprising one or more solid state forms of hydrobromide salts of Compound 1, and, optionally, a pharmaceutically acceptable **carrier**;
- c) methods of treating **tumors** or **cancers** by administering one or more solid state forms of hydrobromide salts of Compound 1 to a subject in need thereof; and .
- d) methods for the preparation of solid-state forms of Compound 1.



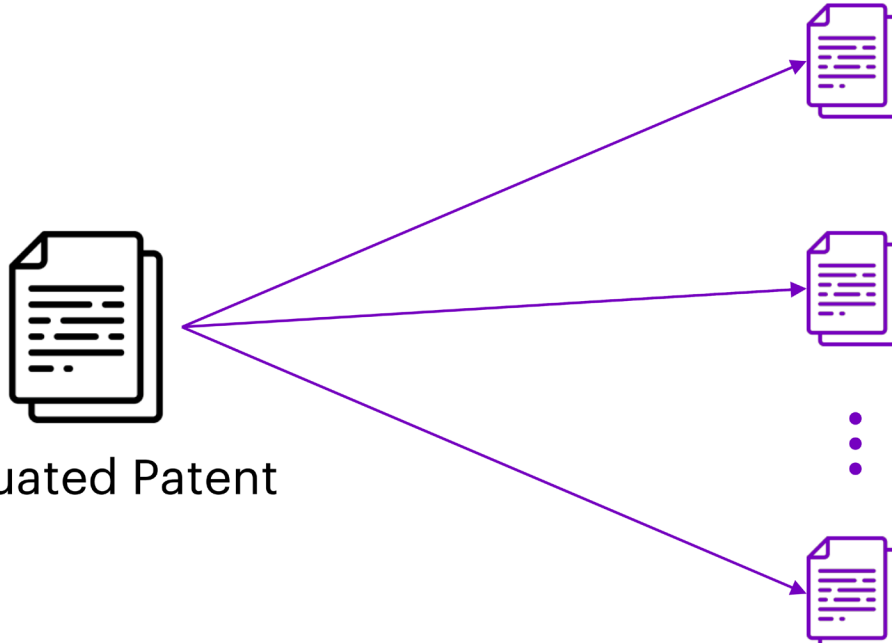
# The Innovation Index: A Comprehensive Measure of Influence and Novelty

Patents Published Before



Reliance on existing knowledge

Patents Published After



Influence on future knowledge

**Non-Innovative**  
Reliance  $\geq$  Influence

**Innovative**  
Reliance  $<$  Influence

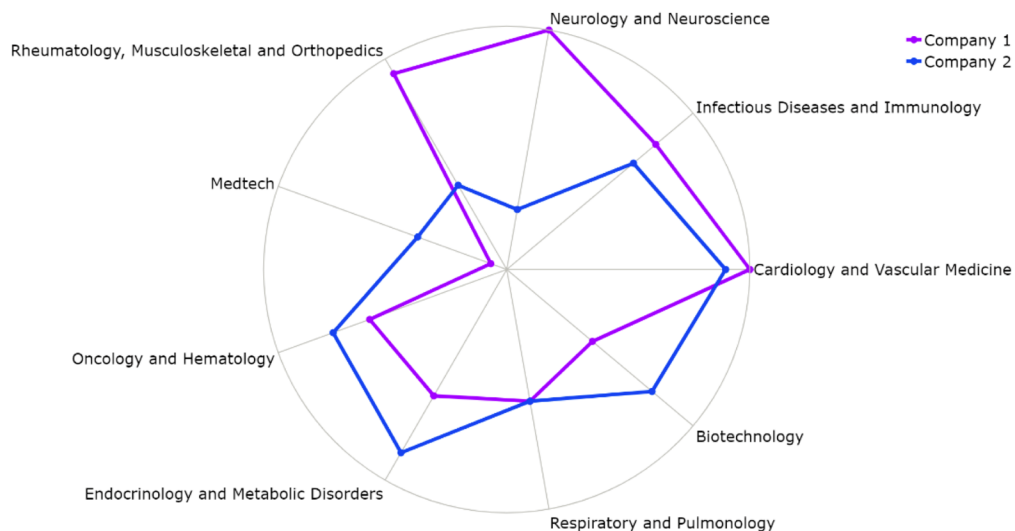
- Similarity between patents is computed based on **claims**, **summary** and **technology**.
- Each patent is compared to all patents with applications in the **same medical field**.



Measuring Innovation

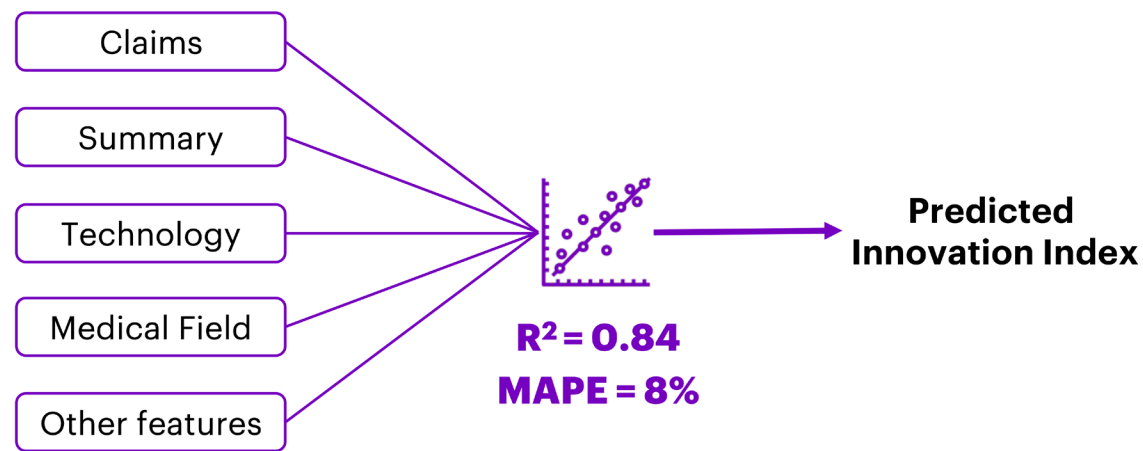
# The Innovation Index: A Powerful Competitive Analysis and Asset Valuation Tool

## Competitive Analysis



- **Comparative tool** for a better competitive landscape understanding.
- Guidance on strategic decision-making: focus on specific domains, resource allocation, strategic pivoting...

## Asset Valuation



- **Faster** and **accurate** approach for innovation valuation.
- Internal tool for patent, project and asset valuation.
- **Applications:** project selection, licensing, verbiage and legal protection drafting...



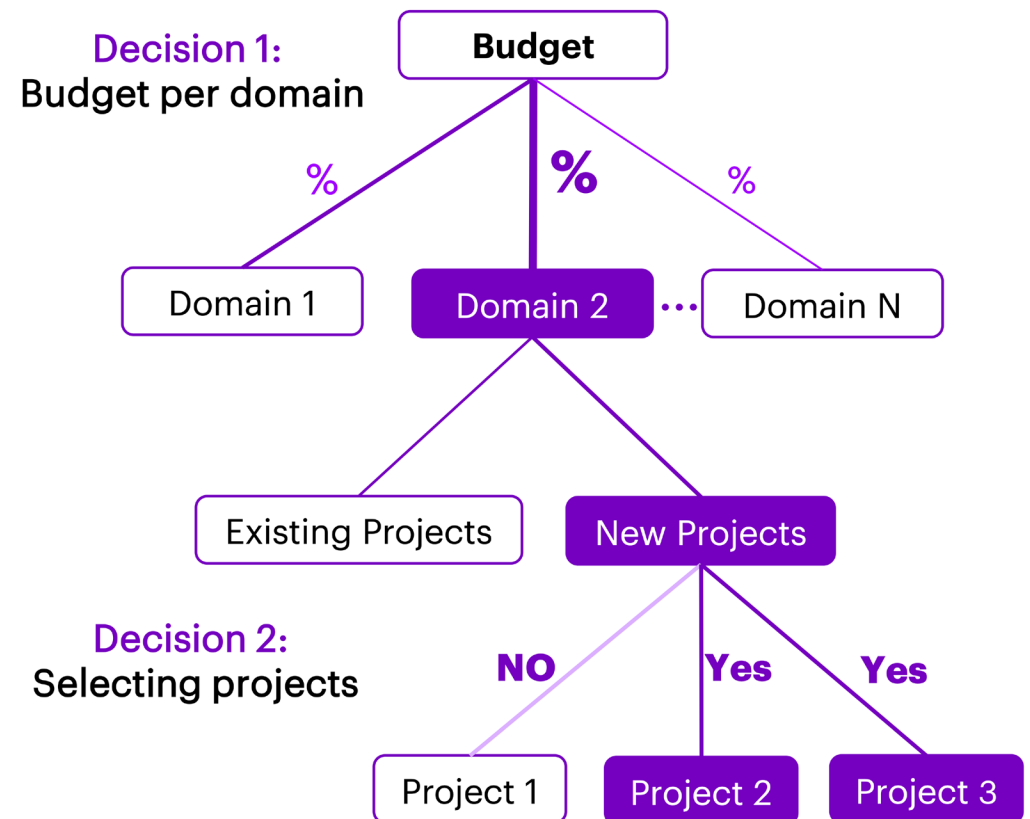
**Harnessing Innovation**



# The Innovation Index: A Guide for Effective Innovation Strategies and Optimal Resources Allocation

## Innovation Portfolio Optimization

- **Step 1:** How to allocate budget among the different medical domains?
- **Step 2:** Which projects should the company invest in per medical domain?
- **Business Decisions:** How much to invest per domain and on which projects?
- **Objective:** Maximize project success rate or financial profitability
- **Constraints:** Budgeting | Resources | Innovation Index | Portfolio diversification...



# Results and Impact

## Potential revenue generation: 10+ client meetings to share methodology and identify pharma client-specific actions in the following areas:

- Augment the **strategic decisions on innovation strategy** including which patents are pursued, their potential future value and how they are positioned in the competitive landscape
- Guide **R&D budget allocation decisions**
- Support **asset valuation for external innovation** (e.g., licensing and M&A) by integrating the Innovation Index in asset evaluation
- Improve **productivity of patent reviews** by **+95%** (Assumed 2 hours per patent to read, understand and classify for 200K patents. Processing time reduced from 400K hours to less than 1000 hours), translated into **199 FTE reduction**

## Internal Accenture asset for continuous insights

- **2-4 global thought leadership reports** to strengthen Accenture's value proposition in Life Sciences and beyond
- Expand to other industries to **sense future innovation** areas and proactively plan offerings and advise clients



# Results and Impact

*“This is excellent! I already have a half dozen clients’ Senior Executives who will be interested in using this.”*

Senior Managing Director, Accenture

*“We can now quantitatively connect early stages of patents to clinical success in Life Sciences. This is going to make some noise, some good noise.”*

Senior Principal, Accenture

*“You do not realize what you have done! You have just made the impossible, possible!”*

Life Sciences Manager, Accenture

# Demo

**Thank you**



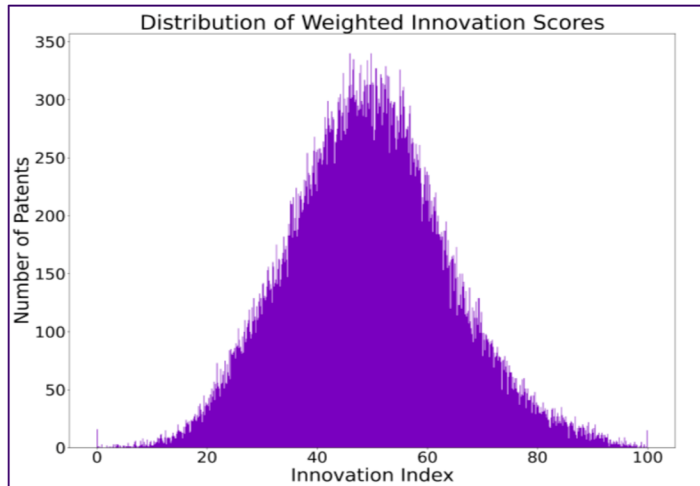
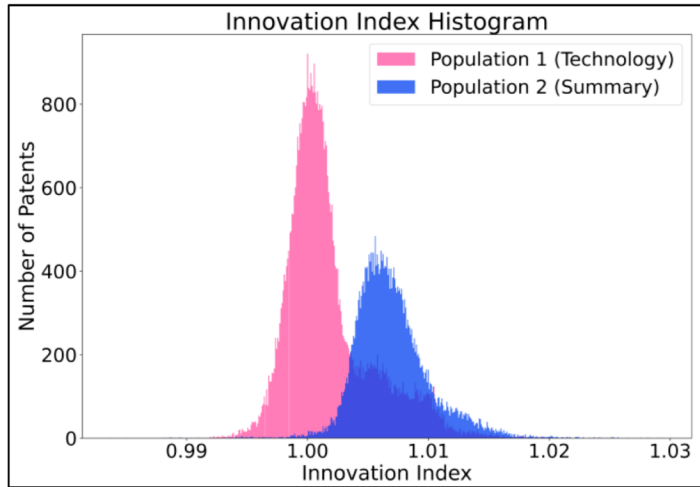
# The Innovation Index: A Comprehensive Measure of Influence and Novelty

$$\begin{aligned} \text{Innovation Index} &= \frac{\text{How *influential* is the patent on *future* works}}{\text{How *reliant* is the patent on *past* works}} \\ &= \frac{\text{Average Similarity to all *future* works}}{\text{Average Similarity to all *past* works}} \end{aligned}$$

Similarity: measured using Cosine Similarity Distance.



# The Innovation Index: A Representation of Two Key Features of Patents



- Innovation Index distribution is bimodal
- Use Gaussian Mixture Models to identify the two latent distributions.
- The distributions are related to the two main features in patents:
  - The technology
  - The purpose and legal protection (verbiage and summary)
- We create a composed Index that captures both features in one unified score.
- A unified Index facilitates patent comparison and provide a universal measure for innovation.
- 5% of the patents have Innovation Index  $\geq 75$



Measuring Innovation