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.

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<td>How to define innovation?</td>
<td>How to measure innovation?</td>
<td>How to harness innovation?</td>
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<td>Innovation is an intangible, subjective and complex concept.</td>
<td>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?</td>
<td>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.</td>
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A work can be innovative because it is novel or because it is influential on future works.
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
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

Evaluating a Patent:
- Patents Published Before
  - Reliance on existing knowledge
- Patents Published After
  - Influence on future knowledge

Non-Innovative
- Reliance ≥ 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...

Predicted Innovation Index

R² = 0.84
MAPE = 8%
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...

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*Harnessing Innovation*

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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
Thank you
The Innovation Index: A Comprehensive Measure of Influence and Novelty

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\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}}
\]

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 ≥ 75