Optimizing Training Efficiency through Conversational LLM

deFacto Global Inc

Final Presentation

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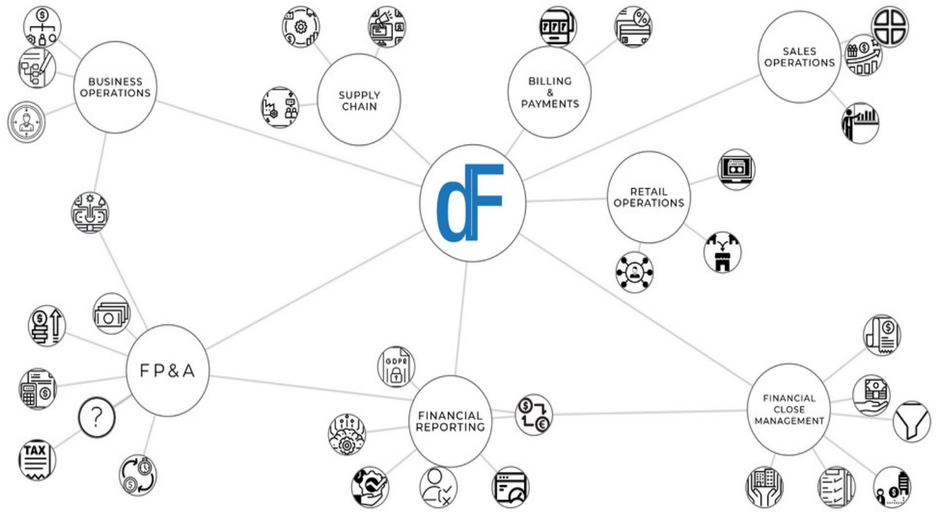
Overview of the Corporation

- **deFacto Global** Inc specializes in **business modeling and financial planning** capabilities integrated into Excel, Power BI, and web interfaces as part of their extended planning analysis (xP&A) platform.
  - *Offers a user-friendly platform that optimize planning, analysis, and decision-making processes for financial and operational data.*



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Project Objective

- Develop a **conversational large language model (LLM)** for its software training materials (user guide).
  - **Clients**
    - *Automated material delivery and comprehension process.*
    - *Faster and more straight-forward solution to answer questions regarding software.*
  - **Consultants**
    - *Reduced workload in repetitive explaining about technical difficulties from clients.*
    - *Empowered to focus on value-added job engagements.*
  - **Corporate**
    - *Transformed operational efficiency, strategically positioning in company operation.*
    - *Differentiating itself from competitors, enhance stakeholder value.*

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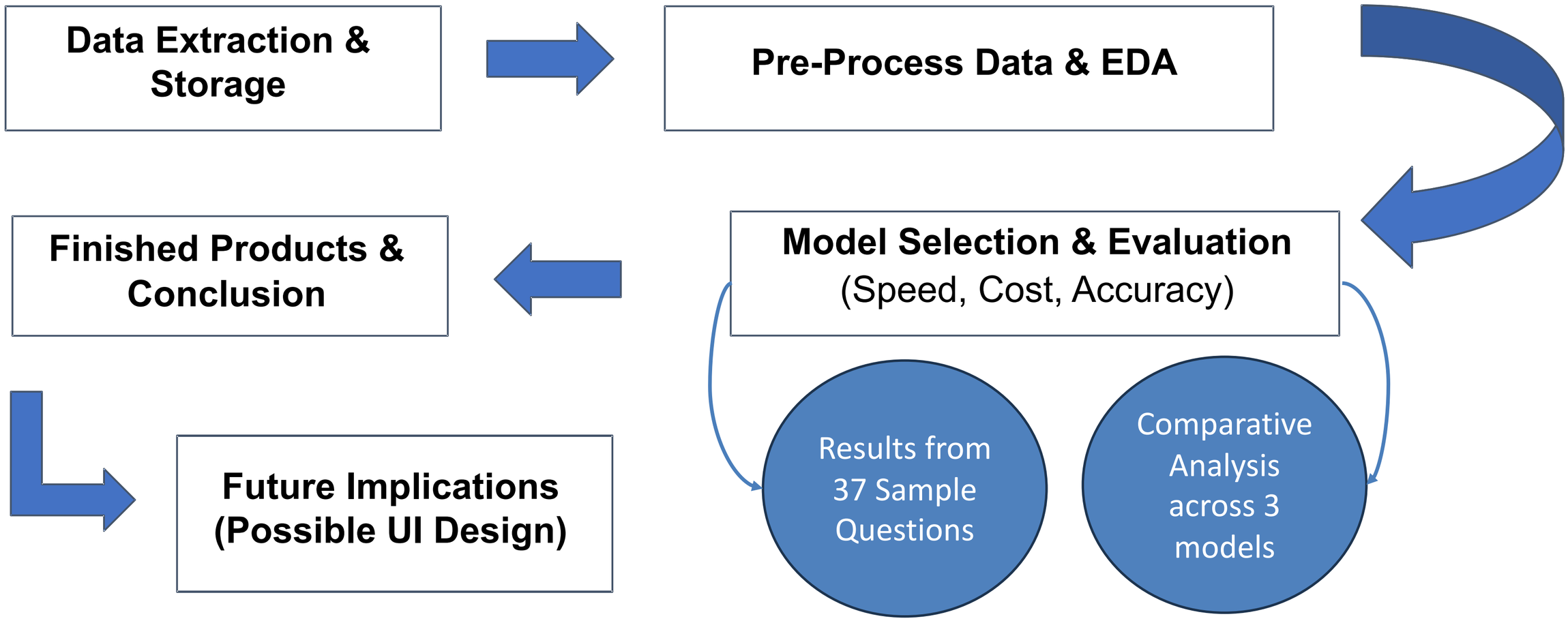
Methodology



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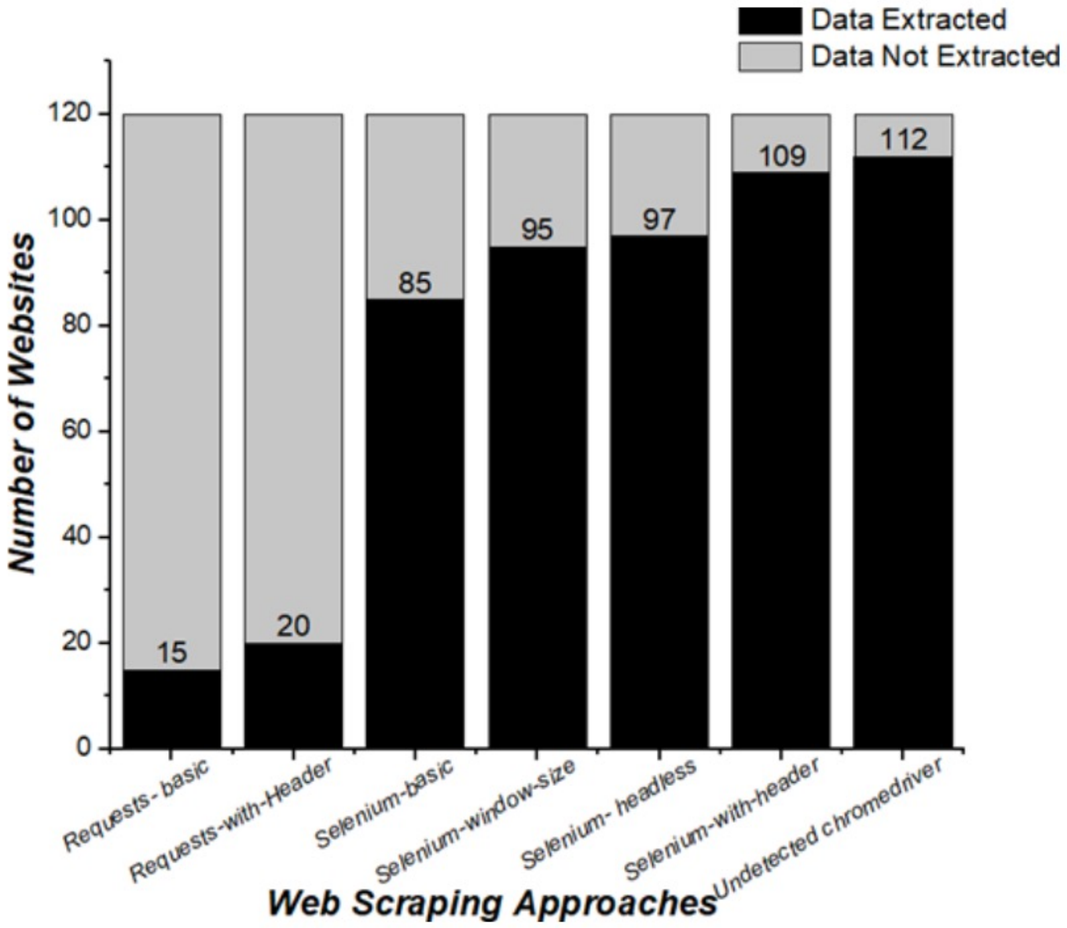
Data Extraction

- **Most Efficient Method from Research:**
  - Selenium Chrome Driver
- **Automated Tasks:**
  - Login Procedures
  - Course Selection
  - Content Extraction from each Tab
- **Summary:**
  - 4 Courses
  - 96 Tabs
  - One Course: ~14,866 tokens



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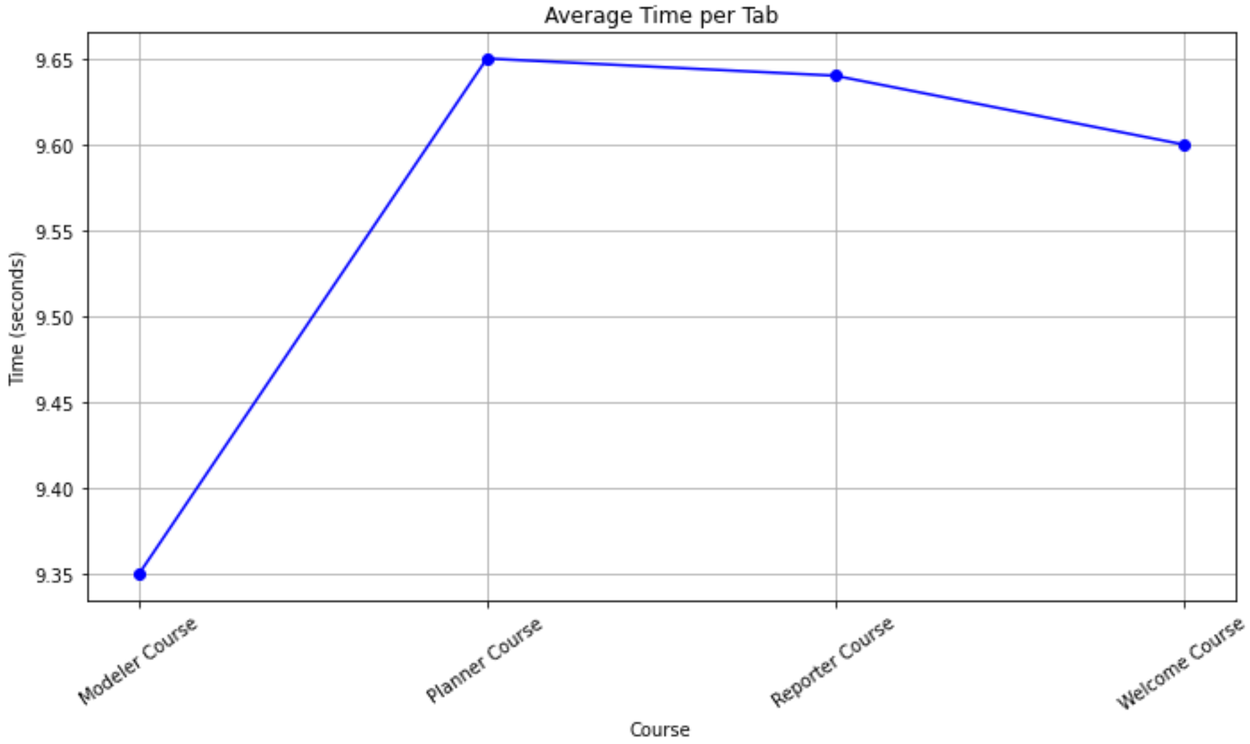
Data Extraction (Results)



Average Time per Tab: ~ 9.50 seconds

- **Relatively fast for websites with login procedures.**
- **Data stored in csv. Format.**

Total Time per Course : (Ranges)

- **Proves that the extraction method is efficient and stable.**

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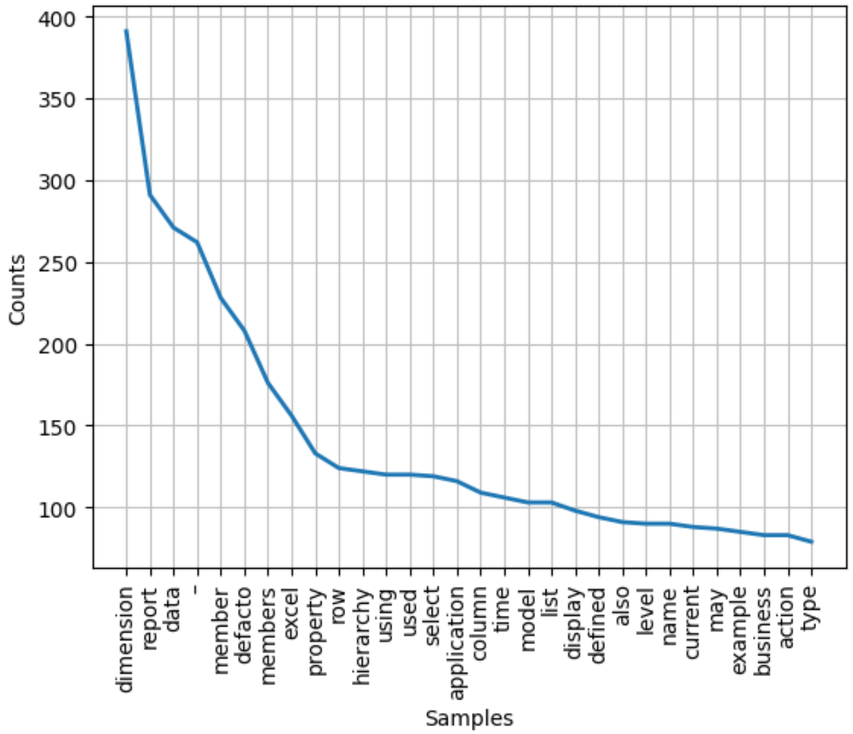
Exploratory Data Analysis



- ***Lemmatized words with the highest count.***
  - **Ex. “Dimension”:**

    - “organized categories that define the structure of clients’ business and the attributes of the tabular database.”

- ***Tokens with the highest frequency***

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Models NOT Selected

- **Dolly2 Model.**
  - *An open-source Large Language Model (LLM) developed by Databricks.*

Key Features:

- No need for external API & local execution.
- Comprehensive package: training code, datasets, model weights, inference pipeline.

Parameters and Variants:

- 3 billion, 7 billion, and 12 billion parameters.

Operational Challenges:

- Computational resource dependency for operation.

- **GPT4all + Langchain Model**
  - *A locally operated, privacy-conscious chatbot created by Nomic-AI.*

Key Features of GPT4all:

- Locally operated, free for use.
- No GPU or internet needed, ensuring data privacy.

Key Features of Langchain:

- Document parsing: Corpus segmented & embeddings stored in VectorStore.
- Vector representation matched via similarity search for retrieval.

Challenges Encountered:

- Response truncation and hallucination problems.
- Inclusion of pre-structured prompt during querying.

Model Selected: Pinecone

- **Pinecone Model**
- *Pinecone: a platform adept at storing and indexing millions of vector embeddings, offering rapid searches at ultra-low latencies.*
  - Utilization of the OpenAI Embedding API to generate vector embeddings.
  - Subsequent upload of the vector embeddings into Pinecone,.
  - Passage of query text or questions through the OpenAI API once more.
  - Extraction of the vector embedding, subsequently serving as the query dispatched to Pinecone.
  - Receiving of semantically akin answers.

Advantages:

- Effective even when shared keywords are absent.
- Enables fast and accurate retrieval of relevant information.

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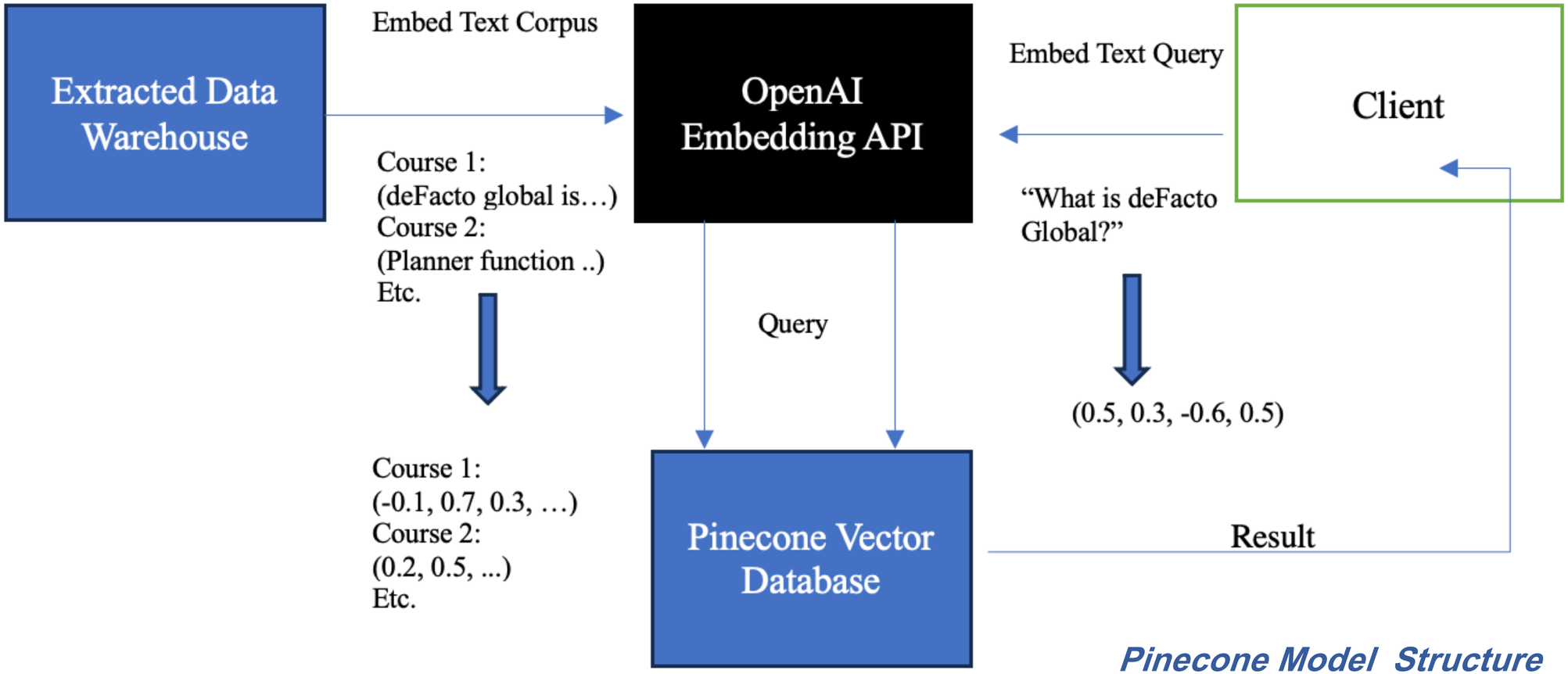
Model Selected: Pinecone (Continued)



Pinecone Model Structure

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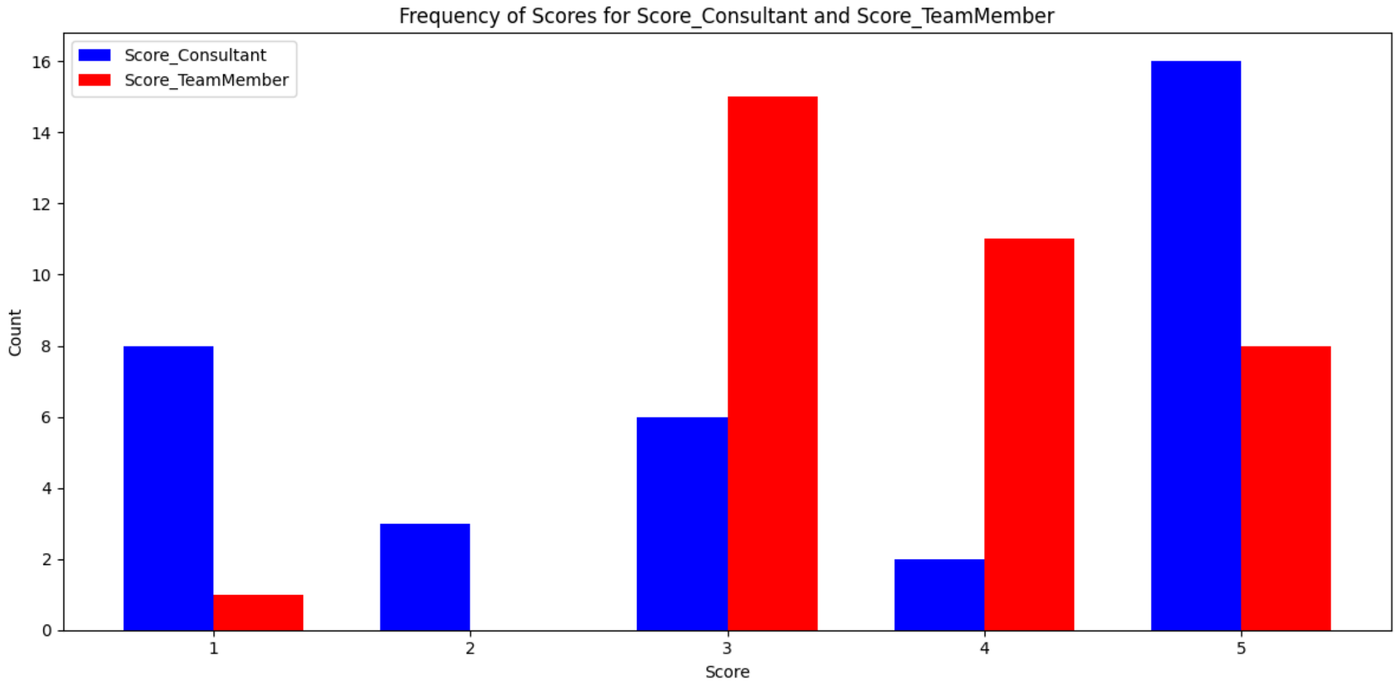
Model Evaluation

- **First Approach:**
  Sample Questions
  - 37 frequently posed software usage questions gathered.
  - Each question subjected to thorough Pinecone model testing.
  - Expert consultants and team members provided feedback.
  - Designed metric for rating answers on a 1 to 5 scale. (Guideline Provided)



Pinecone Model Evaluation

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Model Evaluation

- **Second Approach: Comparative Analysis**

Model	GPT4all +Langchain	Dolly2	Pinecone
Parameters	7 billion	3 billion	1.76 trillion (Pre-trained)
Speed	Crushed	10-15 minutes / query	Avg. 15 seconds/query
Cost	$2000+ per month	$1800+ per month	$0.004 per 1,000 tokens
Accuracy	High accurate if successful	High accurate if successful	Accurate
Limitations	Hallucination, Structured prompt	Significant computational resources	Relatively less accurate than others

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Demo Display

- **Double-click the below for a demo display of the Pinecone Model:**

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Conclusion

- **Development of a tailored LLM designed specifically for deFacto Global Inc's training materials**

1. Heightened operational efficiency, 2. Precise decision-making, 3. Overall business performance enhancement.

  - Document provided to the company regrading the model's access and deployment process.
  - Demo model for querying sample questions and showcasing the retrieval of results.
  - Achievements directly addresses the need to relieve the workload of consultants by providing a **comprehensive knowledge base, streamlining client interactions, and facilitating efficient problem-solving**.
  - Meaningful: incorporation of a cost-based approach in our evaluation process.

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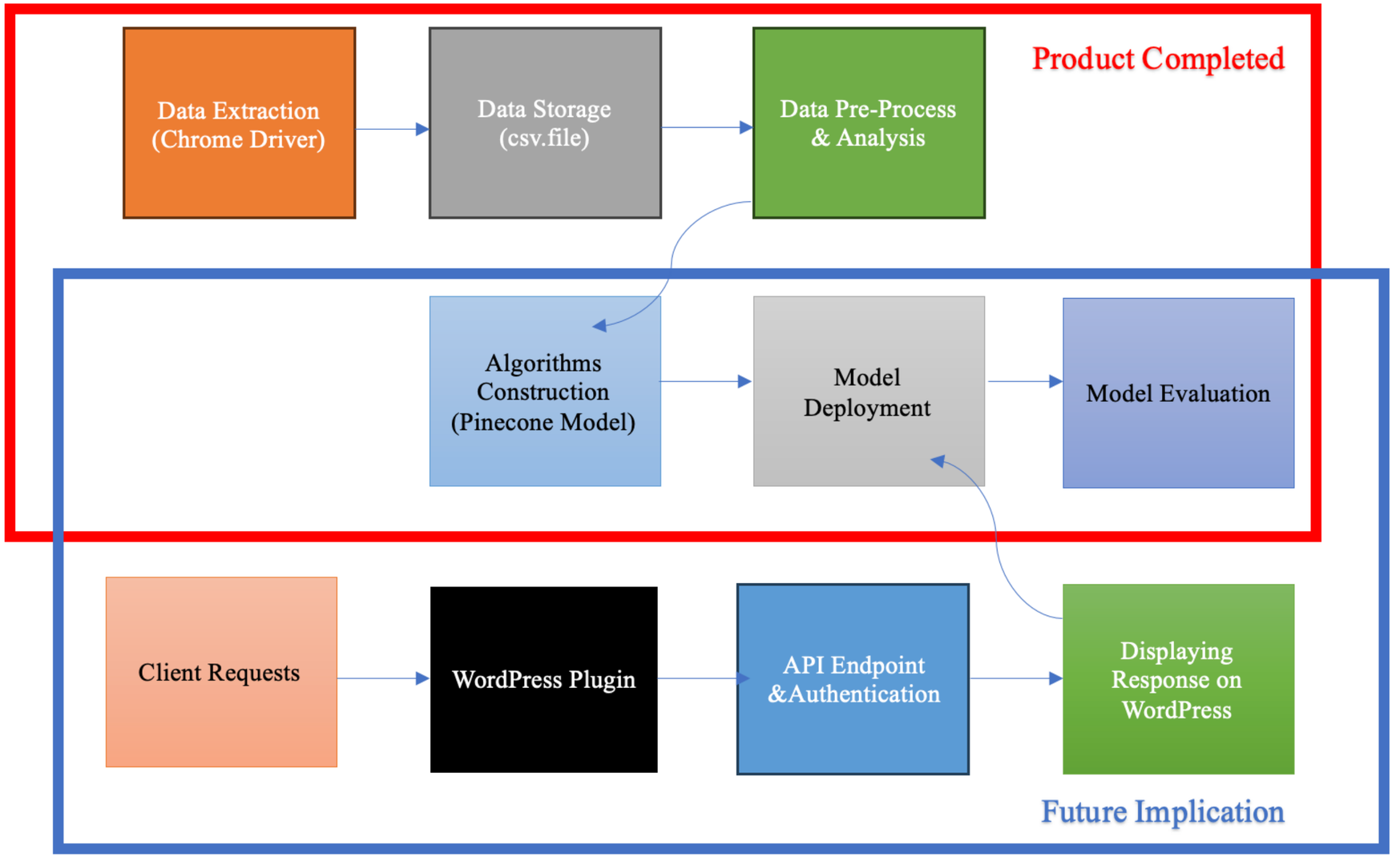
Future Implications

- **User Interface (UI)**

1. Create an API Endpoint
2. API Authentication
3. Deploy the Pinecone Model
4. Create a WordPress Plugin
5. Displaying Responses
6. Usage Limitations
7. Testing and Optimization



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2. deFacto Global. (n.d.). "deFacto Global: deFacto Power Planning (xP&A)." Retrieved from https://defactoglobal.com/defacto-power-planning/

3. Ceylan, B. (2023, July 4). Large language model evaluation in 2023: 5 methods. AIMultiple. https://research.aimultiple.com/large-language-model-evaluation/

4. Defacto Global. (n.d.). "Defacto Planning User Guide - Planner." Retrieved from https://training.defactoglobal.com/course/defacto-planning-user-guide-planner/

5. Ceylan, B. (2023, July 4). Large language model evaluation in 2023: 5 methods. AIMultiple. https://research.aimultiple.com/large-language-model-evaluation/

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Selected GitHub Links :

GitHub Repository
https://github.com/K-3-LT/defacto_global_bu/tree/main

1. Data Extraction
https://github.com/K-3-LT/defacto_global_bu/blob/main/Data_Extraction.ipynb

2. Scraped Data
(This is sensitive information of the company, please contact us if you want to download)

3. Data Pre-process & EDA
https://github.com/K-3-LT/defacto_global_bu/blob/main/Training_material_visualization.ipynb

6. Pinecone Model with Model Evaluation
https://github.com/K-3-LT/defacto_global_bu/blob/main/Pinecone_Model.ipynb

7. Pinecone Model Demo Notebook
https://github.com/K-3-LT/defacto_global_bu/blob/main/Query.ipynb