

# 112 學年度大學部專題競賽



國立清華大學資訊工程學系

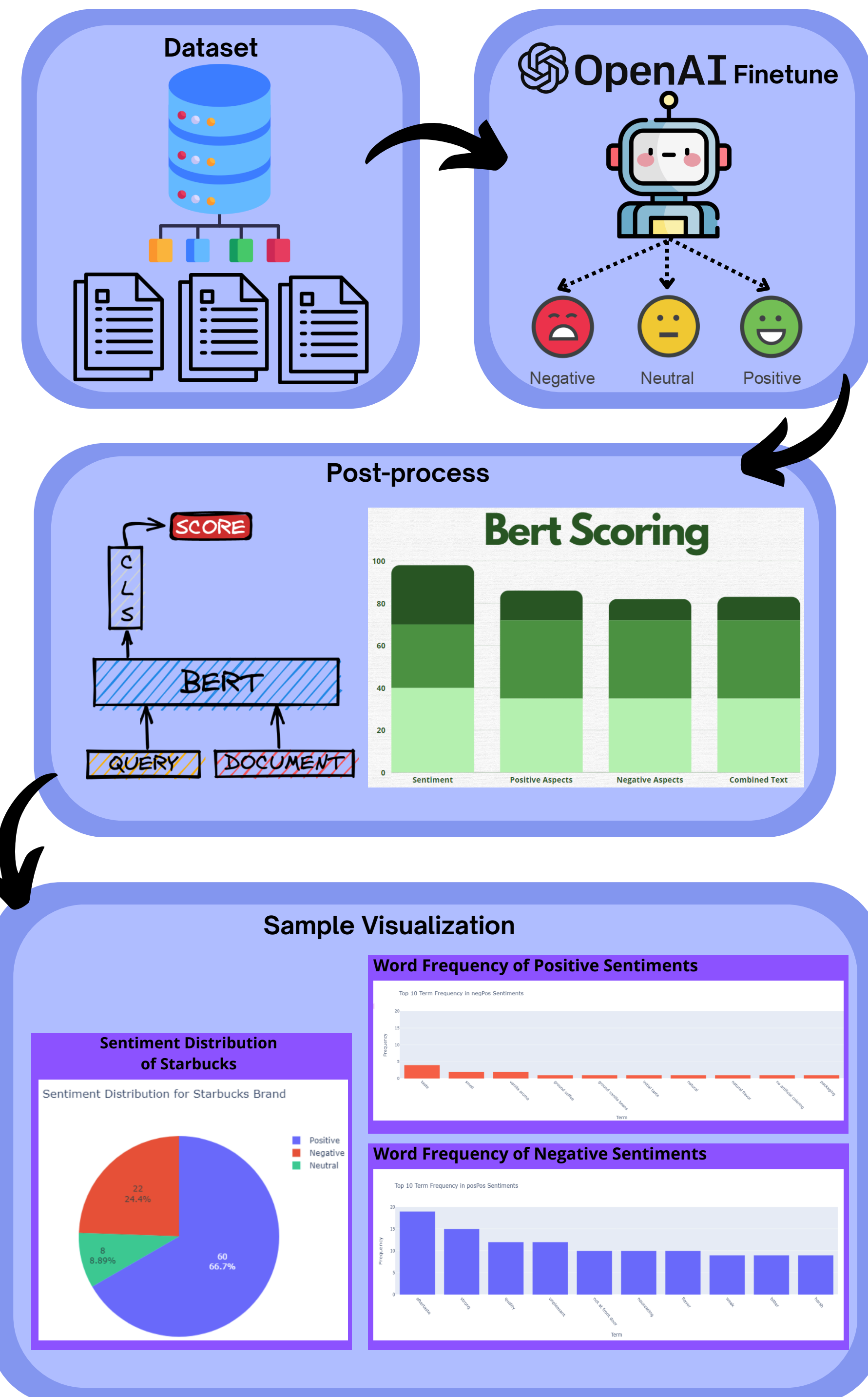
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## GPT Approach: Product Review Summarization, Sentiment Analysis, Key Point Extraction

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### Background

From the time when 'just Google it' was the go-to, to the current era of 'just ChatGPT it', the landscape of Natural Language Processing (NLP) has undergone transformative shifts. As AI becomes integral to our daily information interactions, understanding its strengths and weaknesses is crucial. Our work in product summarization explores the depths of NLP capabilities. By applying the latest techniques in text analysis, we not only decode complex information but also unveil new potentials for innovation and knowledge discovery.



### Objective

Utilize capabilities of the **OpenAI API** to fine-tune data and develop a model capable of extracting sentiment values from diverse product reviews. By utilizing this advanced technology, we aim to build a successful model that not only identifies but also quantifies the sentiment associated with various products, providing deeper insights into consumer perceptions and preferences.

### Main Discoveries

- LLM alone is not enough for end product.
- Small, high quality dataset is enough for fine tuning.
- Fine-tuning is a vital component to get a specific need.
- Pre & Post-Processing is required to ensure good result.

### Dataset

Developed a custom dataset of **10,000 Amazon reviews**, optimized for nuanced sentiment analysis. Each entry is meticulously preprocessed and manually annotated to ensure accurate, balanced sentiment labels. Our rigorous validation processes ensure the dataset's reliability, making it ideal for training effective AI models in realistic scenarios.

### OpenAI Fine-tuning Babbage API

We utilized **OpenAI's Fine Tuning API** to enhance our sentiment analysis model. Starting with the necessary setup and API integrations, we developed functions to process and analyze text, focusing on extracting sentiments and key aspects efficiently. Our refined approach with the **Babbage** model improved the model's precision in understanding complex sentiments from extensive text data, showcasing significant advancements in handling and analyzing customer feedback.

Prompt: "Provide me Sentiment, Positive Aspects, Negative Aspects. Sentiment should only be positive/negative/neutral. List more than 1 aspect, but each aspect should be 3 words max. If there are no Positive/Negative Aspects provide the string x."

### Post-process

Using the **bert\_score** library, we evaluated our model's textual accuracy. Results show an F1 score of **0.975** for sentiment analysis, confirming high precision. Scores for positive and negative aspects were **0.864** and **0.820** respectively, demonstrating robust performance in detailed sentiment extraction. These metrics validate our model's effectiveness in real-world applications.

### Sample Visualization

Analyzing 7,000 reviews, we found that 66.7% expressed positive sentiments about Starbucks, particularly praising the aftertaste and flavor quality. However, mixed feelings about the aftertaste and coffee sweetness suggest areas for improvement. Visualizations highlight the aftertaste as a key aspect in both positive and negative feedback, offering Starbucks actionable insights to refine their products and marketing strategies.