Sentiment Guessing Game:
Human vs. AI in Customer Experience Analytics

Sacred Heart University
Final Project Proposal

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1. Introduction

The digital era has brought a rapid growth in user-generated content across online marketplaces, e-commerce platforms, and social media. Reviews and feedback form the backbone of customer experience analytics, offering businesses critical insights into product quality, service levels, and customer satisfaction. However, the sheer volume of reviews makes manual inspection impractical. Natural Language Processing (NLP) and sentiment analysis techniques have emerged as scalable solutions to this challenge.

While sentiment analysis tools are widely deployed, a recurring question in business analytics is: *"How closely do AI interpretations align with human understanding?"* This project addresses that question by proposing an interactive application: the **Sentiment Guessing Game (Human vs AI)**. The game blends analytics, artificial intelligence, and gamification to demonstrate the capabilities and limitations of machine learning models in text interpretation.

The application will be designed using **Python** with a cloud-deployable **Streamlit interface**. Students and participants will act as players who attempt to classify product reviews into sentiment categories (positive, negative, neutral). Simultaneously, an AI model (such as BERT or TextBlob) will also predict the sentiment. The system then compares results against true labeled data, awarding points for correct guesses and matches. This creates an engaging environment where users learn about NLP while actively competing with AI.

2. Problem Statement

Businesses continuously seek to understand customer feedback at scale. Traditional approaches for teaching or demonstrating sentiment analysis rely on static demonstrations — charts, accuracy metrics, or dashboards. While academically valid, these approaches can lack engagement and do not provide students with hands-on experience in real-time comparison between human intuition and machine predictions.

The problem is twofold:

1. **Pedagogical Engagement:** Existing methods for teaching sentiment analysis often fail to capture student interest beyond the mechanics of model training and evaluation.
2. **Interpretability Gap:** Stakeholders rarely see side-by-side comparisons of human judgment versus AI predictions, leaving an incomplete understanding of how reliable and interpretable these models are.

Therefore, this project aims to create an innovative educational tool where sentiment analysis is not only demonstrated but also experienced through gamified interaction.

3. Objectives

The project's core objectives are:

1. **Design a Streamlit Web Application:** Build a user-friendly interface accessible through the cloud, supporting multiple players in a classroom setting.
2. **Integrate AI Models for Real-Time Sentiment Prediction:** Implement pre-trained models such as BERT-based transformers, TextBlob, or GPT for live sentiment classification.
3. **Create Interactive Gameplay Mechanics:** Allow users to guess sentiments, reveal AI predictions, and show actual labels from a dataset to calculate scores.
4. **Enable Multi-Round Play:** Support continuous rounds with scoreboards tracking human and AI performance.
5. **Highlight Business Analytics Value:** Demonstrate how organizations can leverage sentiment analysis to monitor customer satisfaction, identify product issues, and guide strategic decisions.
6. **Generate Comparative Insights:** Provide statistical summaries on how humans and AI differ in sentiment classification across multiple reviews.

4. Literature Review

4.1 Sentiment Analysis in Business

Sentiment analysis is one of the most practical applications of NLP in business analytics. Companies like Amazon, Netflix, and Yelp rely on sentiment tools to monitor consumer reactions at scale. Research indicates that sentiment polarity (positive, negative, neutral) strongly correlates with customer loyalty and churn prediction.

4.2 AI Models for Sentiment Classification

- **Lexicon-Based Models:** Tools like TextBlob and VADER use predefined dictionaries of positive and negative words to compute polarity scores. They are lightweight but limited in nuance.
- **Machine Learning Models:** Traditional classifiers (Naïve Bayes, SVM) have been applied on labeled datasets but require feature engineering.
- **Deep Learning Models:** BERT, RoBERTa, and GPT-based architectures significantly outperform traditional approaches, capturing context and subtleties in language.

4.3 Gamification in Analytics Education

Gamification increases learner engagement, knowledge retention, and interactivity. In analytics classrooms, games provide a hands-on approach to understand abstract concepts such as clustering, optimization, or classification. By framing sentiment analysis as a competition between human intuition and AI, this project leverages gamification to deepen conceptual understanding.

5. Dataset Choice

Having a solid dataset is crucial. After evaluating options, I propose using the **Amazon Customer Reviews (also known as "Amazon Review Dataset")** from Kaggle. This dataset contains millions of reviews across many categories, including review text, star ratings, and metadata. Because star ratings can be mapped to sentiment categories, we can convert numeric ratings into Positive / Neutral / Negative labels.

Dataset Details & Link:

- **Name:** Amazon Review Dataset
- **Source:** Kaggle (publicly available)
- **Link:** https://www.kaggle.com/datasets/snap/amazon-fine-food-reviews
- **Description:** This dataset contains ~568,000 food-related product reviews, with fields such as `Text`, `Score`, and more. We can use `Text` as the review and map `Score` (1–5) into sentiment classes:
    - 1–2 stars → Negative
    - 3 stars → Neutral
    - 4–5 stars → Positive

This dataset is in CSV format and well-suited for our classroom demo. Because it is large, we will sample and balance classes (e.g. take 1,000–5,000 reviews total, with equal numbers of each sentiment class) for performance and clarity.

6. Methodology

6.1 Data Preparation

- Load CSV data using **pandas**.
- Clean review texts (remove HTML tags, punctuation, and excessive whitespace).
- Convert ratings to sentiment categories where applicable.
- Balance dataset to ensure roughly equal positive, negative, and neutral examples.

6.2 Model Integration

- **Option 1:** Hugging Face Transformers pipeline (`distilbert-base-uncased-finetuned-sst-2-english` or `twitter-roberta-base-sentiment`).
- **Option 2:** TextBlob for lightweight lexicon-based classification.
- **Option 3 (Optional):** GPT API for advanced predictions via prompts.

6.3 Game Logic

1. Display a random review.
2. Player selects sentiment (via Streamlit radio button).
3. AI model predicts sentiment.
4. Actual sentiment label revealed.
5. Points awarded based on matches.

6.4 User Interface

- Implemented with **Streamlit** for simplicity and cloud deployment.
- Scoreboard maintained via `st.session_state`.
- Multi-round capability with "Next Round" button.
- Sidebar displaying cumulative scores for both Human and AI.

6.5 Analytics Output

- Track agreement rate between human and AI.
- Show accuracy of each against true labels.
- Visualize results with bar charts or metrics at the end of multiple rounds.

7. Tools and Technologies

- **Programming:** Python
- **Frameworks/Libraries:**
    - Streamlit (UI and deployment)
    - pandas (data manipulation)
    - transformers (Hugging Face models)
    - TextBlob (lexicon-based model)
    - matplotlib/plotly (visualizations)
- **Dataset:** Amazon Reviews CSV

8. Expected Outcomes

1. A fully functional, cloud-hosted Streamlit application.
2. Demonstration of **real-time sentiment classification** and comparison between human players and AI.
3. A gamified learning experience that increases engagement and understanding of NLP.
4. Analytical insights into model performance vs. human intuition.
5. Educational contribution to business analytics pedagogy.

9. Timeline

Week	Task	Deliverable
1	Dataset collection, cleaning	Preprocessed CSV
2	AI model integration	Working model functions
3	Streamlit UI design	Draft web app
4	Implement game logic & scoring	Playable prototype
5	Testing & deployment	Cloud-hosted app
6	Documentation & Presentation	Final report + live demo

10. Innovation and Contribution

This project moves beyond static analysis by introducing **gamification** into sentiment analysis demonstrations. By enabling direct competition between human players and AI models, it highlights the interpretability challenges and strengths of NLP systems in real-world contexts. The innovation lies in reframing an academic topic into an **interactive, experiential learning tool**, enhancing both pedagogy and practical business understanding.

11. Conclusion

The **Sentiment Guessing Game (Human vs AI)** project proposes a unique fusion of business analytics, NLP, and interactive learning. It addresses the educational gap in engaging demonstrations of sentiment analysis and offers a scalable model for integrating AI into classroom experiences. By the end of the project, students will not only understand the mechanics of sentiment classification but also gain an appreciation of how AI and human intuition compare in analyzing customer feedback.