Executive Summary: Course Review Analyzer

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In this project, we created a Natural Language Processing (NLP) pipeline for analyzing course reviews. The work culminates in a Streamlit web application that allows users to input and assess course reviews in real time.

Objectives + KPIs

- Extract and study classical NLP features from course/product reviews.
- Detect and filter meaningless or gibberish reviews where no actionable insights can be extracted
- Build models to predict the sentiment of reviews, studying both classical NLP and fine-tuning pre-trained deep learning frameworks.
- Build a proof-of-concept app that analyzes sentiment, culls meaningless reviews, summarizes reviews, and assess the instructor's performance.

Stakeholders

- Instructors seeking direct feedback
- Academic and industry administrators needing scalable quality metrics
- Students making informed decisions based on curated reviews, summaries, sentiment, etc.

Data Sources & Exploration

- A large dataset of Coursera course reviews (via Kaggle)
- Amazon product reviews and a set of labeled gibberish entries (also via Kaggle)

Modeling

We explored 3 main avenues in this project for understanding course reviews using NLP. We wanted to learn more about classical NLP features as well as do a deeper dive into classification methods:

1. **Entropy Analysis**
   - Investigated the entropy of reviews across different languages.
   - Found statistically significant differences using non-parametric tests (e.g., Kruskal-Wallis).
2. **Gibberish Detection**
   - Trained a classifier using Amazon data to detect meaningless reviews.
   - Applied statistical tests (f-statistics) and tree-based models to identify key features like entropy, word count, punctuation ratio, and language detectability.
   - Achieved substantial improvement over baseline methods in identifying low-quality text.
3. **Sentiment Analysis**
   - Leveraged both classical NLP features and fine-tuned deep learning models to assess sentiment.
   - Created features from token patterns, sentiment lexicons, and embeddings.
   - Demonstrated that sentiment could be predicted with better classification metrics over various relevant baseline models.

Deployment

- Created a basic Streamlit tool that allows users to track sentiment, summarize, calculate an overall score, and get constructive feedback based on the reviews analyzed.
- The app uses a simplified version of the models due to space/compute limitations on their free tier hosting but provides a proof-of-concept of the overarching idea of the project.