



Apple Twitter Sentiment Analysis

Group 5 Project

Why Sentiment Analysis Matters?

- Social media sentiment impacts brand perception, sales, and stock performance.
- Apple's customer feedback on Twitter reveals trends, concerns, and opportunities.
- Social media (Twitter) serves as a real-time pulse of public opinion.

Business Problem

- Understanding public sentiment toward Apple on Twitter is challenging due to short, informal text and varying contexts.
- Misclassifying sentiment can lead to inaccurate insights, affecting company's decisions.
- This project aims to determine the most effective sentiment analysis model by comparing traditional machine learning and deep learning approaches to achieve the highest accuracy.

Project Objectives

Main:

- To develop an accurate sentiment analysis model for Apple-related tweets by comparing traditional machine learning and deep learning approaches.

Specific:

- To preprocess Apple-related tweets by cleaning, tokenizing, and normalizing text data to ensure high-quality input for analysis.
- To handle data imbalance and enhance dataset quality using techniques such as SMOTE and other resampling methods to create a well-balanced training set.
- To develop and compare multiple sentiment classification models, including traditional machine learning such as Logistic Regression, and XGBoost and deep learning approaches such as LSTM and CNN, to identify the most effective model.
- To evaluate model performance using appropriate metrics such as accuracy ensuring the best-performing model provides reliable sentiment insights.

Data Overview



Dataset: 3,886 tweets

Sentiment Labels:

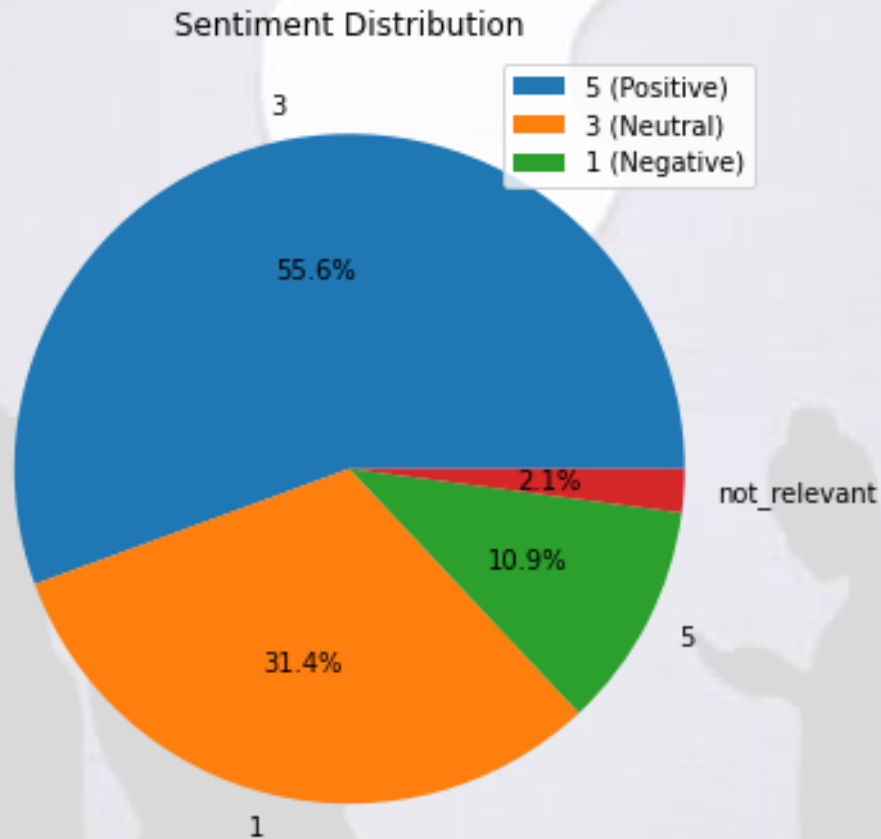
- 3 - Neutral – Majority class
- 1 - Negative – Significant portion
- 5 - Positive – Minority class

Challenges:

- Imbalanced dataset
- Varying confidence scores
- Presence of irrelevant tweets

Key Findings

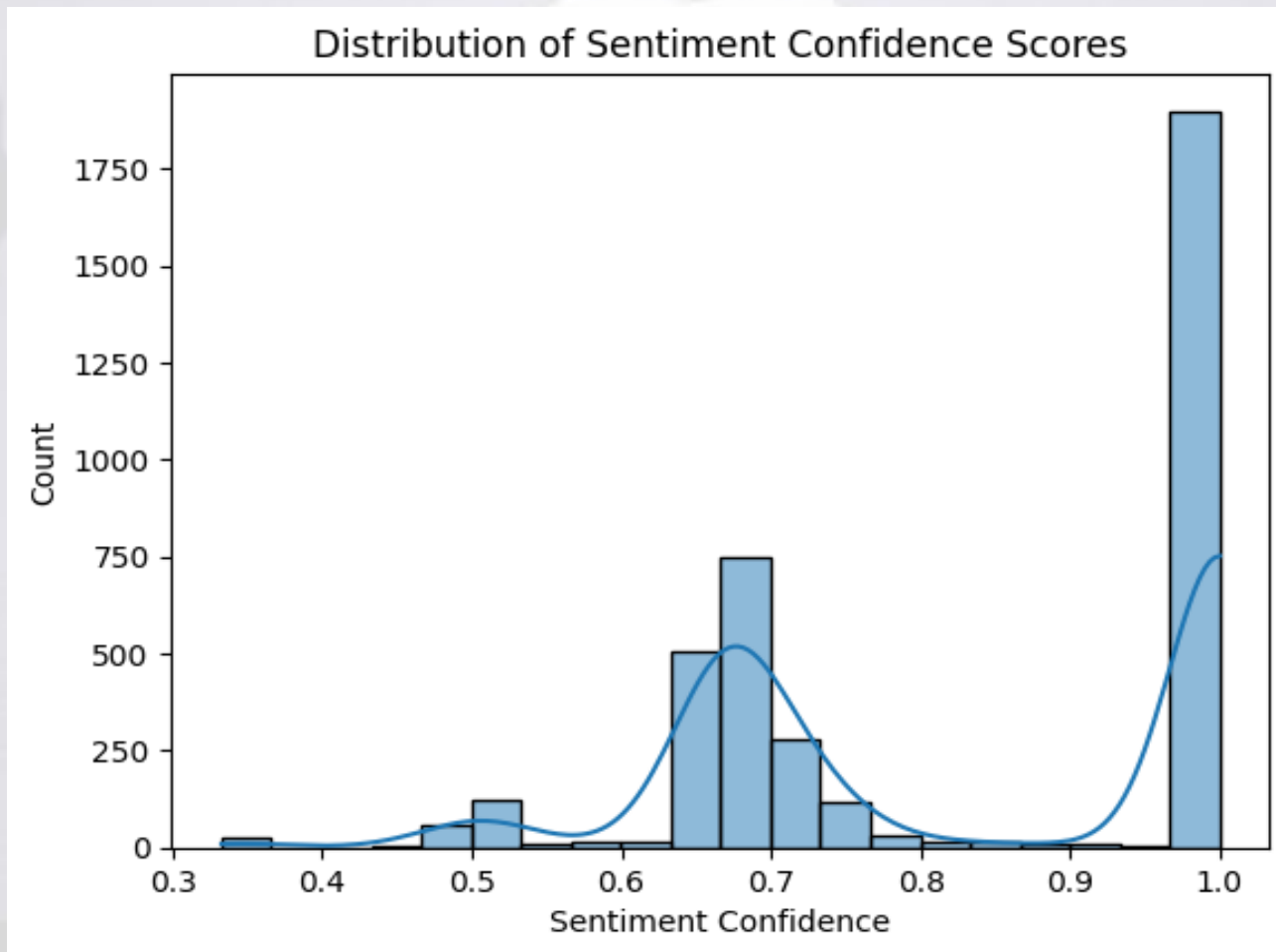
1. Sentiment Distribution



Observation:

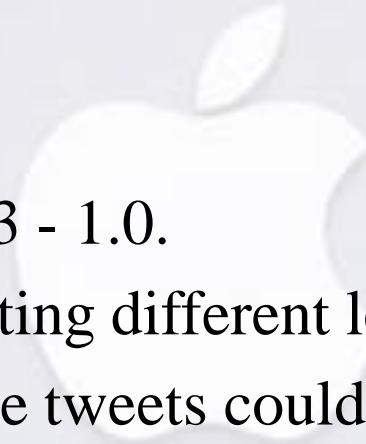
- Most tweets are Neutral (55%), followed by Negative (31%), and Positive (11%).
- Neutral sentiments dominate, indicating mixed public perception.
- There is Presence of Not relevant(2%) tweets

2. Sentiment Confidence Scores

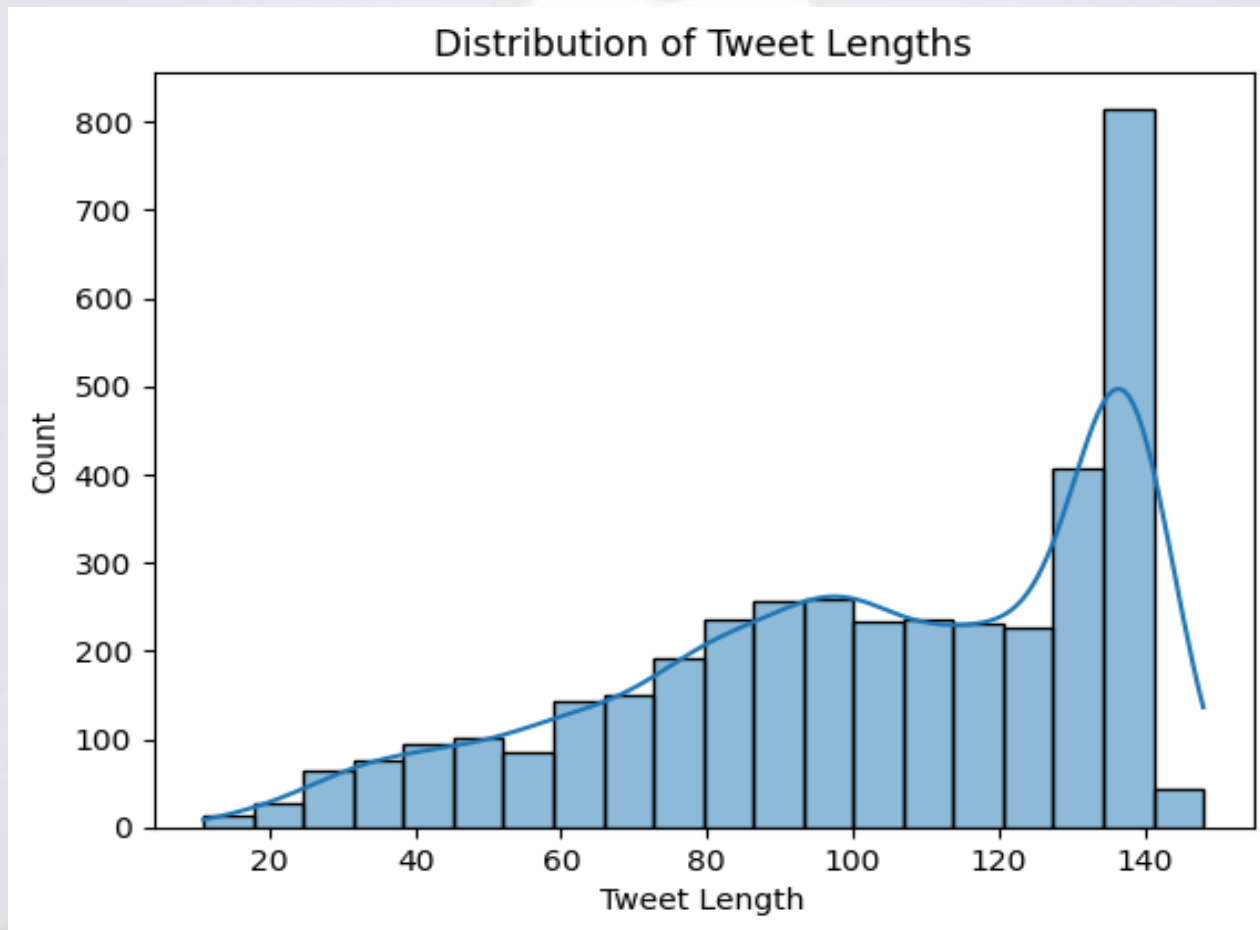


Observation:

- Confidence scores range 0.3 - 1.0.
- Peaks at 0.7 and 1.0, indicating different levels of reliability.
- Filtering out low-confidence tweets could improve model accuracy.



3. Tweet Length Analysis

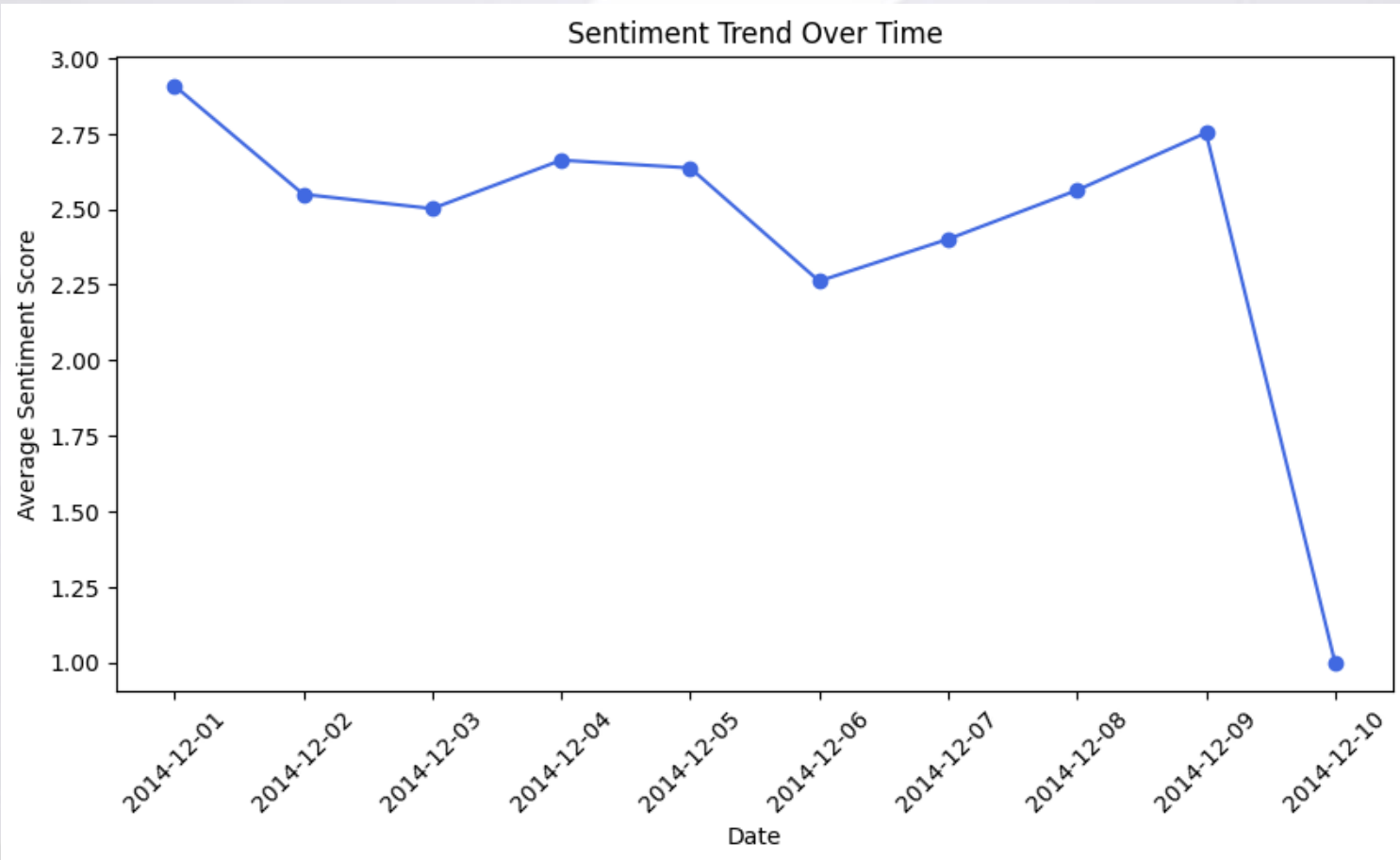


Observation:

- Most tweets are 100-140 characters.
- Longer tweets contain detailed opinions, which may indicate subjectivity in sentiment
- Most of the longer tweets also convey negative sentiments



4. Sentiment Over Time



Observation:

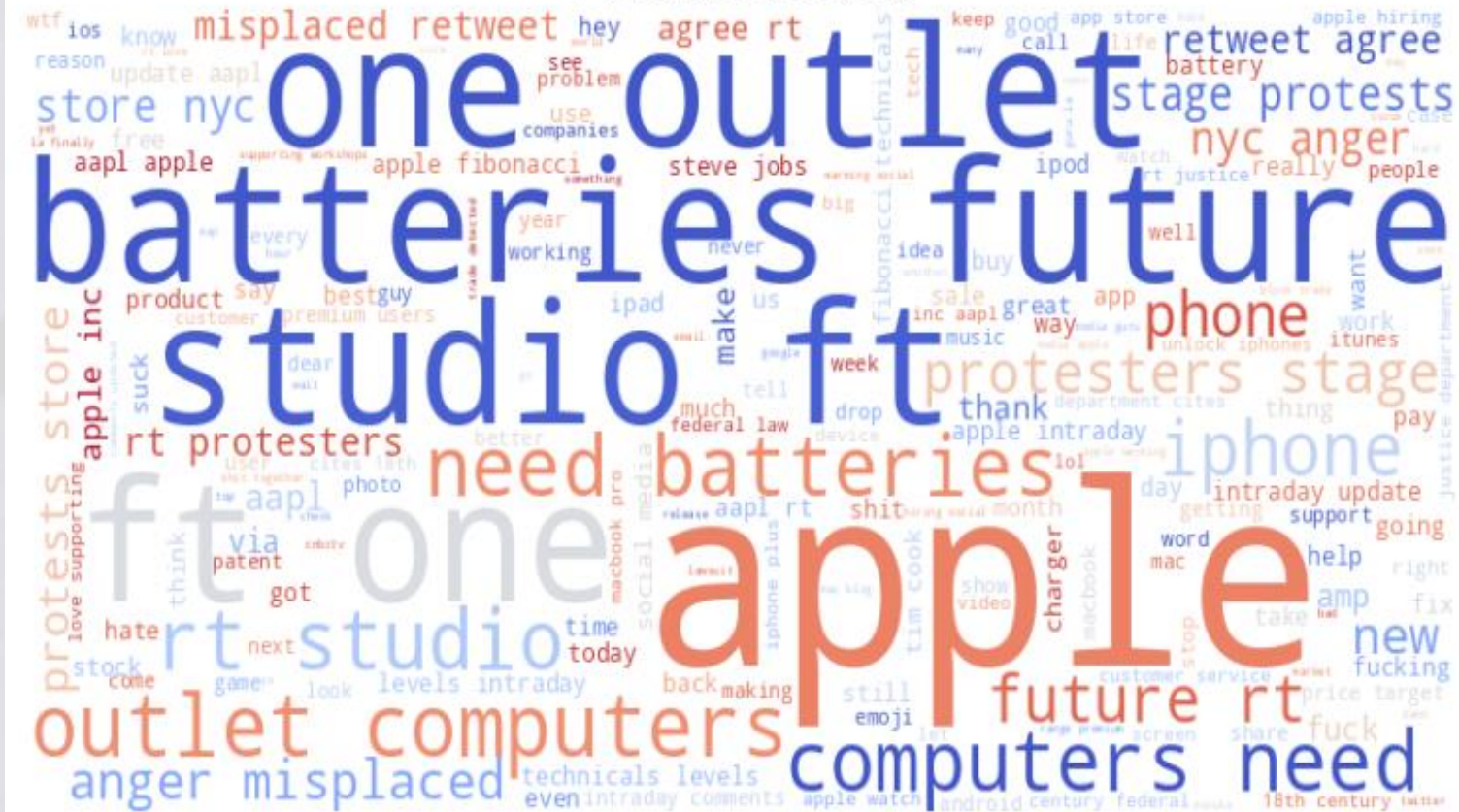
- Sentiment fluctuates based on product launches, stock market trends, and major news.
- Negative sentiment spikes during controversies or product issues.
- Positive sentiment increases after successful events or announcements.

Business Impact:

- Apple can anticipate sentiment shifts and proactively address concerns.
- Correlation with stock movements and brand perception can be leveraged for strategic planning.

5. Frequent Words

Overall Word Cloud



Observation:

- **Positive** sentiments include words like "**thank**," "**new**," "**great**," and "**love**" -suggests that users are expressing appreciation for Apple products or services.
- **Negative** sentiments include words like "**fuck**," "**suck**," and "**fix**"-possibly related to product issues or customer service complaints.
- **Neutral** words like "**studio**," "**outlet**," "**computers**," and "**batteries**" -indicates general discussions about Apple products without a strong emotional tone

Model Performance

Models Tested:

- Logistic Regression
- Random Forest
- XGBoost
- **Stacked Model (Best Performer)**
- Deep Learning Models (LSTM, CNN)

Deep Learning Model Performance

- LSTM & CNN were tested for sentiment classification.

Challenges:

- Required high computational power.
- Needed more training data to outperform traditional ML models.

Stacked Model outperformed deep learning models due to data limitations

Best Performing Model

Best Model: Stacked Model with Class Weights

- Achieved the highest accuracy of 75%.
- Strong recall for class '3' (largest class), ensuring effective classification.
- Balanced performance across precision , recall , and F1-score

Why the Stacked Model?

- Combines multiple classifiers for better accuracy.
- Handles class imbalance effectively using class weighting.
- Outperforms others in accuracy metric.

Business Insights



1. Market Sentiment Monitoring

- Negative sentiment highlights pain points.
- Neutral sentiments suggest indecision—opportunity to influence perception.

2. Product Feedback & Customer Service

- Negative tweets highlight issues with updates, pricing, and customer support.
- Proactive engagement can reduce dissatisfaction.

3. Sentiment-Driven Marketing

- Use sentiment insights to refine messaging and product launches.

Recommendations

- Analyze recurring negative themes and implement targeted improvements to enhance brand perception.
- Use positive feedback in marketing campaigns to strengthen brand loyalty and engage satisfied customers.
- Align promotional efforts with peak discussion times to maximize engagement and impact.
- Improve accuracy by integrating external metadata, refining preprocessing techniques, and fine-tuning model parameters.
- Conduct competitive benchmarking with competitors to identify areas for differentiation and strategic advantage.

Conclusion

- Sentiment analysis of Apple-related tweets provides real-time insights to enhance decision-making.
- The Stacked Model with Class Weights offers a reliable and scalable solution for sentiment classification, helping Apple track customer sentiment effectively.
- By leveraging these insights, Apple can improve brand perception, refine marketing strategies, and enhance customer experience.
- Addressing negative sentiment, amplifying positive engagement, and optimizing responses to neutral sentiment will strengthen customer loyalty.
- Further improvements, such as expanding the dataset and integrating external sentiment trends, can enhance accuracy and business impact.

Questions?

Feel free to ask anything.

Let's connect!

Github: <https://github.com/BetsyGitije/Sentiment-Classification-System>



THANK YOU!