

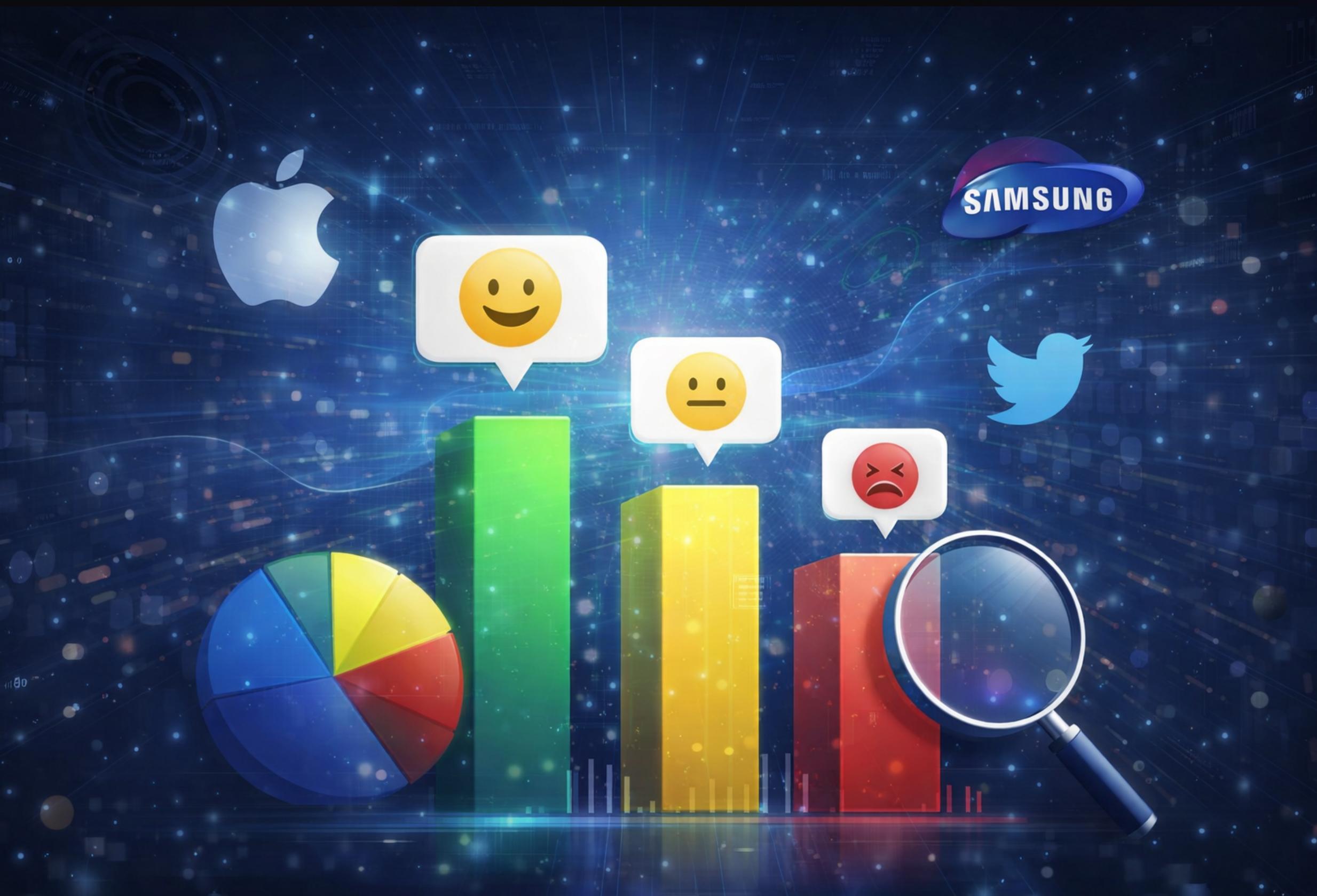
# Twitter Sentiment Analysis Group Project

Understanding Public Opinion Using Machine learning & NLP

Maryanne, Christine, Kiragu, Kuria, Collins - Phase 4 Data Science Project

# Project Overview

- This project aims to build NLP models that can predict the sentiment of tweets for Apple and Google products as either positive or negative or neutral.
- The NLP base model will be a binary classifier focusing on the positive and negative reviews and will expand into a multi class classifier capturing neutral sentiment reviews.
- This will aid the companies in collection of reviews for their products and build or improve said products from the reviews.



# Objectives

- Develop an automated sentiment classification system that accurately labels tweets about Apple and Google products as positive, Negative or neutral.
- Preprocess and transform raw Twitter text data into a structured format suitable for machine learning.
- Train and evaluate multiple NLP models to identify the most effective approach for sentiment classification based on performance metrics such as accuracy, precision, recall, and F1-score.



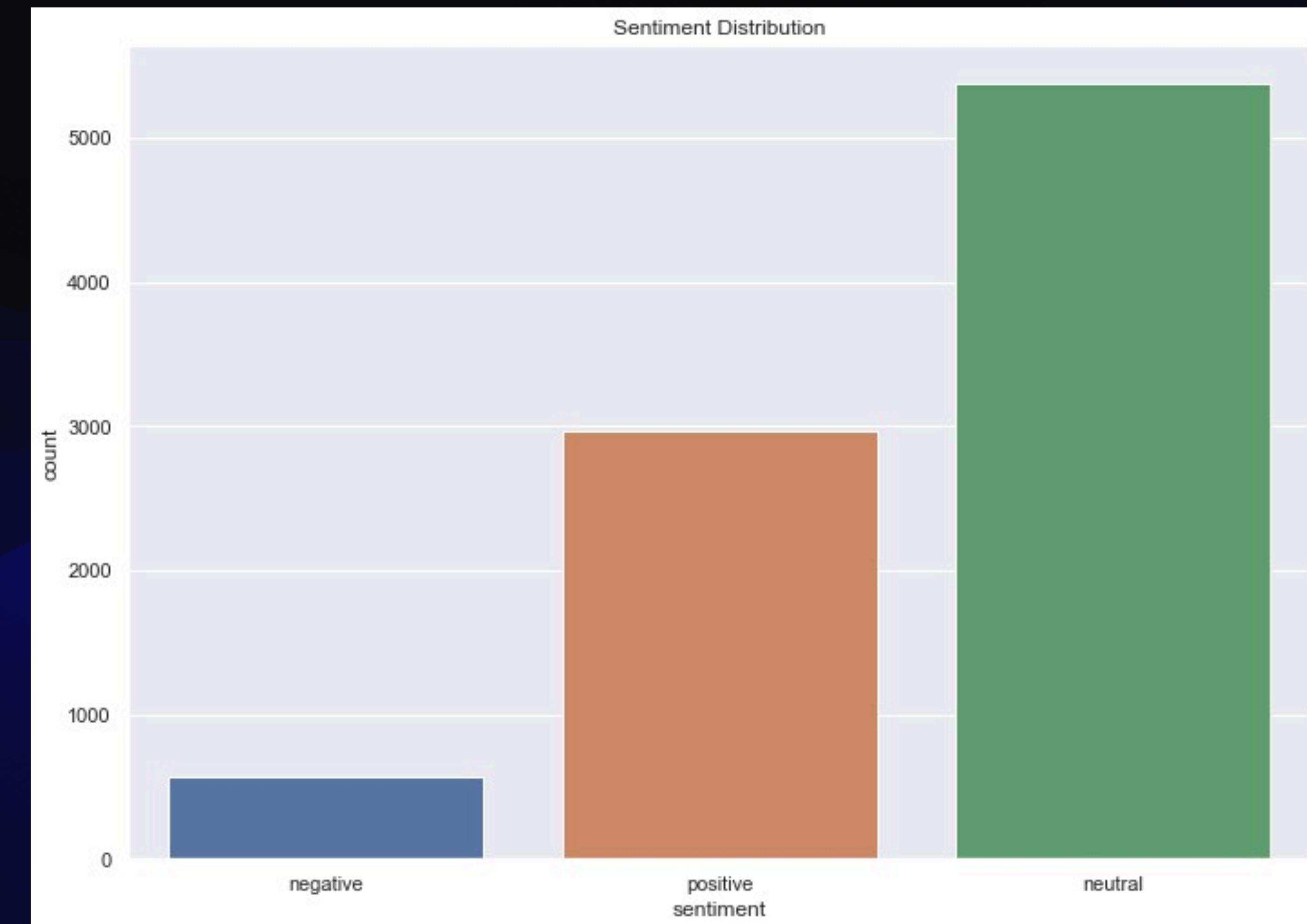
# Data Understanding

- Dataset consists of tweets about Apple and Google products
- The tweets were labeled by human contributors(crowdsourcing).
- Each Tweet was classified as Positive emotion, Negative emotion and No emotion towards a product.
- This Dataset contains 9093 data rows of tweets.

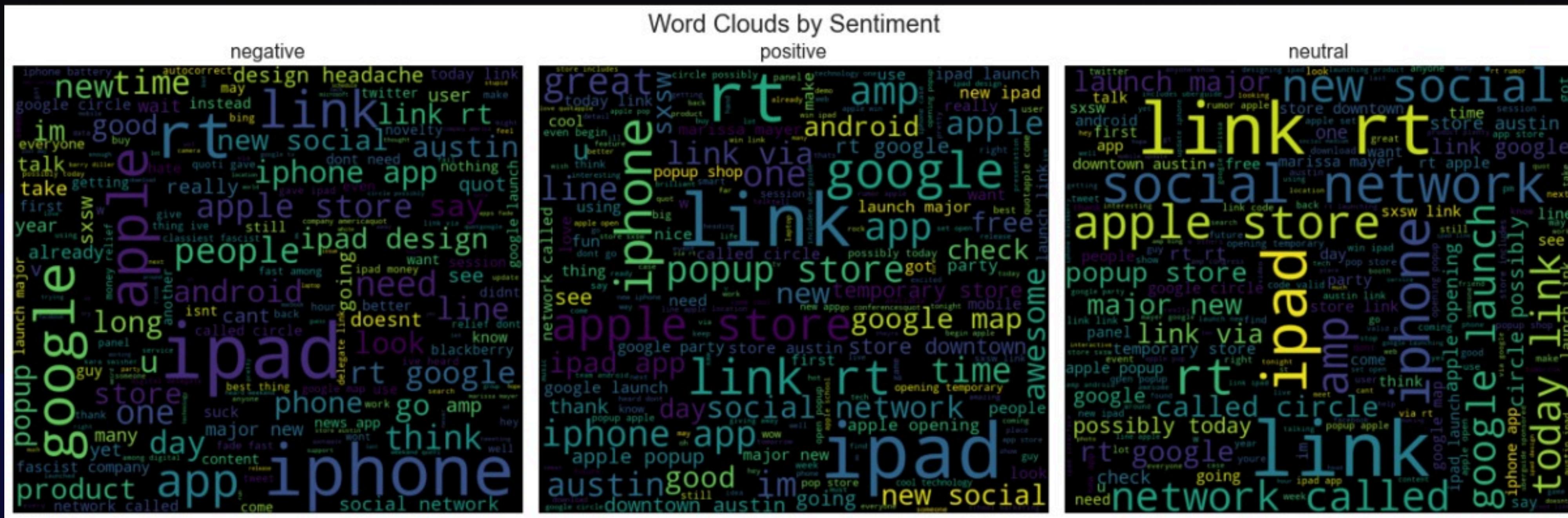


# EDA: Sentiment Distribution of Tweets

- Most Tweets express no emotion towards brands, followed by positive sentiment.
- Negative sentiment appears much less frequently.
- This imbalance explains why detecting negative emotion was challenging during modelling



# EDA: Word Clouds of Different Sentiments



- These word clouds show text data where words are displayed with different sizes based on how frequently they appear in a dataset.
  - More frequent words appear larger and bolder while less frequent words appear smaller.

# Modeling: Binary Models Performance

	Model	Accuracy	Recall	Precision	F1 Score
0	Binary Logistic Model	0.851224	0.901235	0.919817	0.910431
1	Binary Random Forest	0.869115	0.987654	0.873016	0.926804
2	Binary Multinomial Naive Bayes	0.823917	0.855219	0.929268	0.890707
3	Binary Linear SVC	0.862524	0.932660	0.906216	0.919248

- This Table compares different machine learning using accuracy, recall, precision and F1-score.
- Random Forest provided strong and balanced results making it the most reliable model for positive and negative sentiment classification.
- The comparison helped identify the best-performing approach for this project.

# Modeling: Multiclass classification

	Model	Accuracy	Recall	Precision	F1 Score
0	Logistic Regression	0.642991	0.642991	0.659670	0.649469
1	Random Forest	0.663178	0.663178	0.653575	0.648893
2	Naive Bayes	0.584299	0.584299	0.644802	0.599263
3	Linear SVC	0.651215	0.651215	0.659592	0.654749
4	XGBoost Classifier	0.657944	0.657944	0.640099	0.635602

- Random Forest provided better results making it the most reliable model for positive, negative and neutral sentiment classification.
- Neutral Sentiment dominates the dataset and semantically overlaps with both negative and positive.
- Therefore, the model struggles to draw clear decision boundaries, lowering multiclass accuracy to 67%.

# Recommendations

- We built a binary classifier for positive and negative sentiment. We recommend deploying this model in marketing and branding systems for twitter feedback analysis.
- The multi classifier has an accuracy of 67% which is a bit low due to unclear classification of the neutral sentiment. We recommend finding better strategies for training this model in the future.
- Classification was done using the tweet itself. Incorporating additional features such as emojis, hashtags and user engagement metrics (like, retweets) would improve sentiment classification performance.

# Conclusion

- This project successfully addressed the task of sentiment analysis by building and evaluating machine learning models for both binary and multi class sentiment classification.
- Through effective data preprocessing, feature extraction and model evaluation, the approach was able to accurately identify sentiment patterns within twitter texts.
- This analysis helps organisations understand public opinion and customer feedback, enabling data-driven decisions that improve brand engagement and strategic planning.

QA

**THANK YOU!**