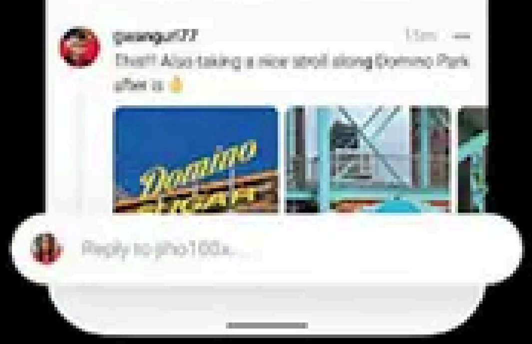
Threads



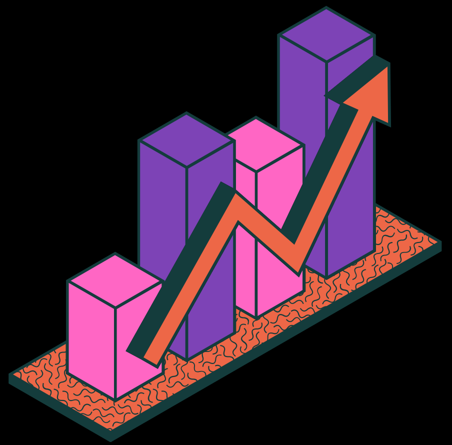
Connect over conversation

Sentiment Analysis with CNN

Business Problem

Threads, Customer Feedback

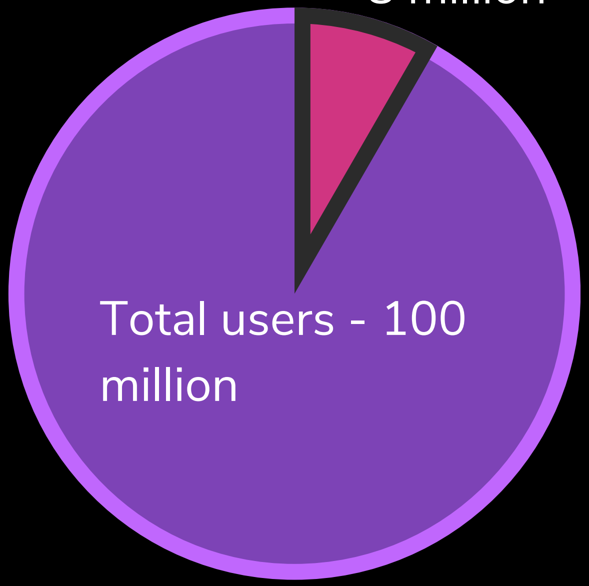
While being the fastest-growing social media app



100 million users

in the first 5 days

... Threads struggles to retain customers



8% sustained active daily users

long-term

The need to analyze customer feedback to innovate the Threads app:

- fix bugs and inconveniences when using the app
- add additional features to meet customers' demands and attract customers

Data Preparation

From the original dataset

No.	Variable name	Type of data	Value
1	source	label	Google Play or App Store
2	review_id	string	id generated after each review done by users
3	user_name	string	
4	review_title	string	title about review (2000 unique values, accounting for 5% only)
5	review_description	string	main review text
6	rating	index	corresponding ratings
7	thumbs_up	index	validation provided by other users
8	review_date	date	date each review was published
9	developer_response	string	100% no response
10	language_code	label	the corresponding language that the review was written in
11	appVersion	label	corresponding version for reviews
12	country_code	geographic role	1 value only: “us”

37,000 text-based reviews

Data Preparation

to a more selected dataset

Redundant features are removed

No.	Variable name
1	source
2	review_id
3	user_name
4	review_title
5	review_description
6	rating
7	thumbs_up
8	review_date
9	developer_response
10	language_code
11	appVersion
12	country_code

So that remaining features are below

- **review_text:** Analyze user experiences and identify improvement areas.
- **rating:** Gauge user satisfaction and train sentiment recognition models.
- **review_likes (thumbs_up):** Understand user sentiment resonance and potential widespread issues.
- **appVersion:** Track sentiment changes linked to specific app versions.
- **review_date:** Monitor sentiment trends over time.
- **language_code:** Filter for English reviews for the best training of BERT model.

Model Description

What is Convolutional Neural Network?

A CNN

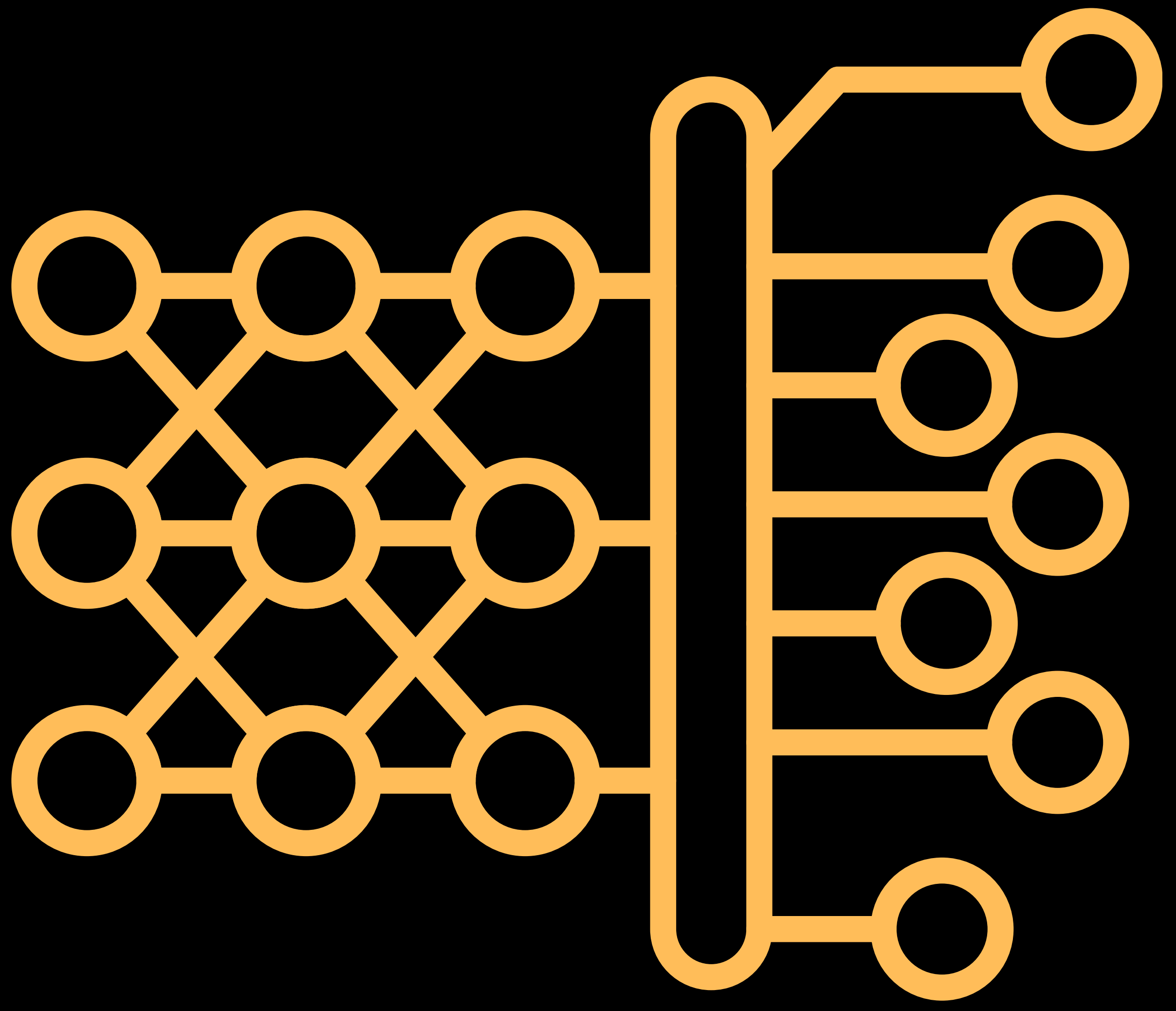
is a special type of computer program that can learn to find patterns in data, like images or text

Convolution:
A process where a small tool (filter) moves over the data to look for specific patterns

Neural network:
Connected unit work together to make decisions

Automated learning

Efficiency



Model Description

CNN Input

Text data -> Number

(CNN can only understand numbers, not words)

Sentence: I love using Threads

	Feature 1	Feature 2	Feature 3
I	1.0	0.0	0.0
love	0.0	1.0	0.0
using	0.0	0.0	1.0
Threads	0.5	0.5	0.0

Model Description

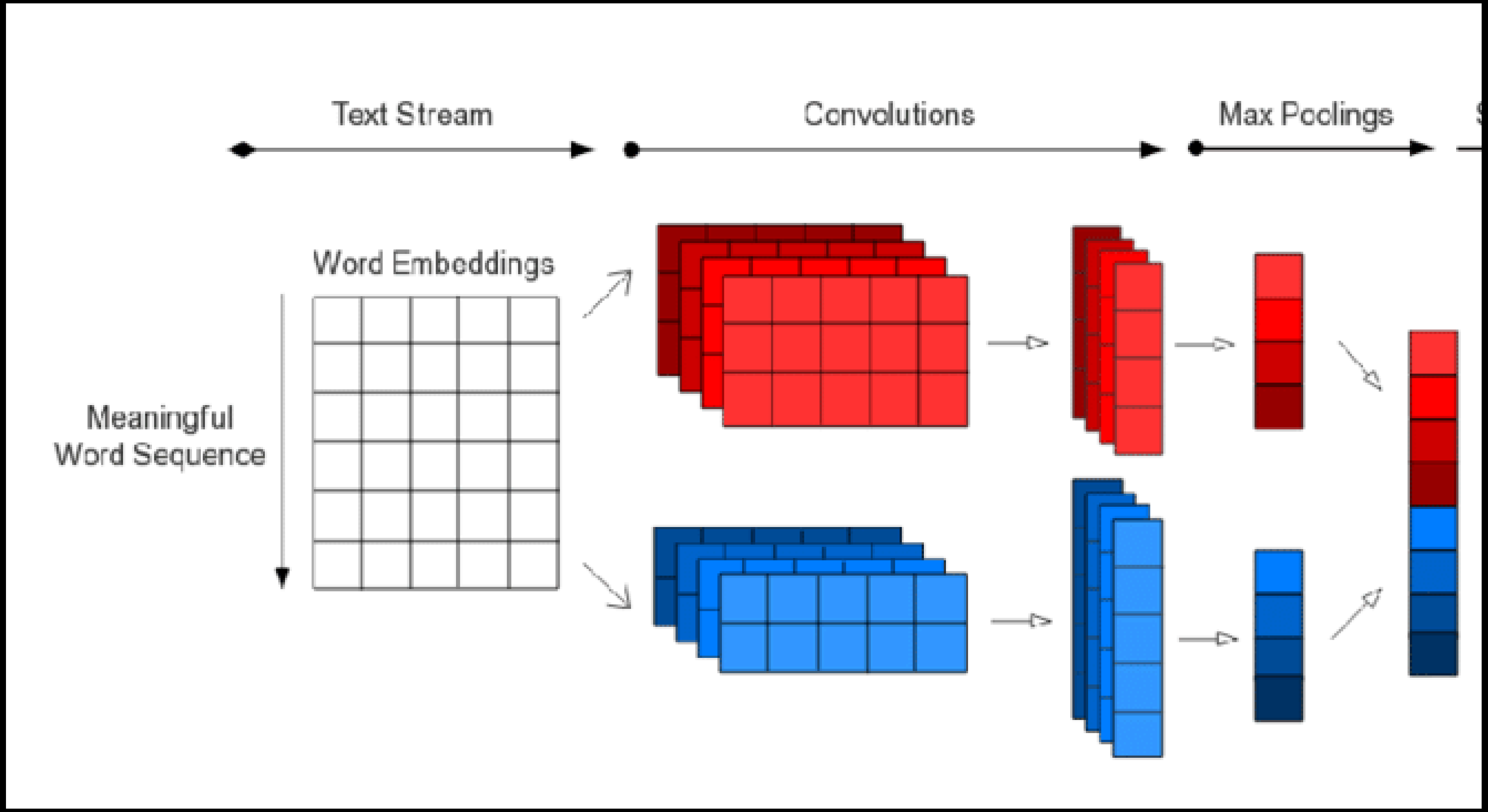
CNN Layer Types (Feature Extraction)

1. Convolutional Layer

Detects important words/phrases in text data

2. Max Pooling Layer

Reduces the size data, keeping only the most important information



Model Description

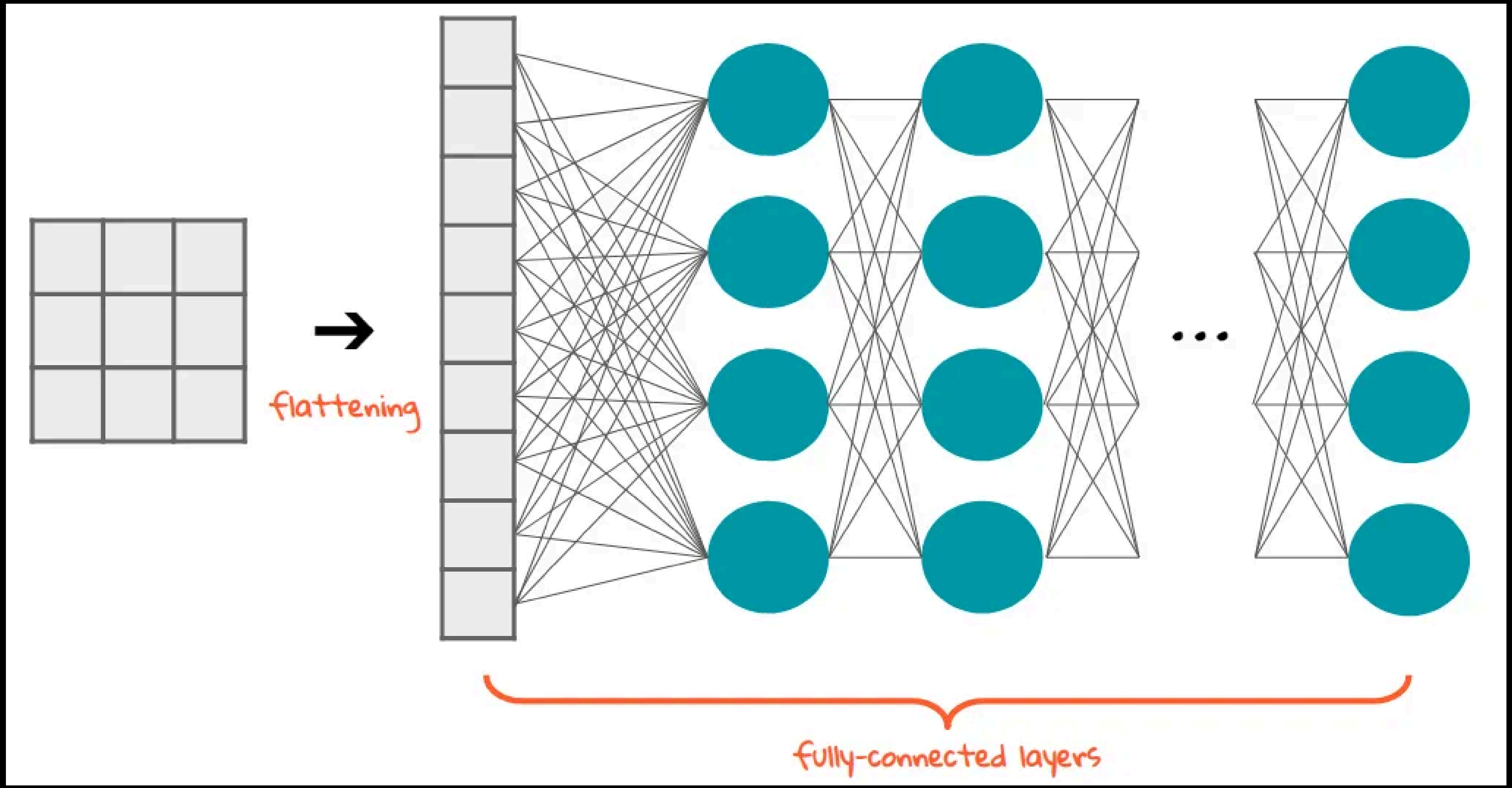
CNN Layer Types (Classification)

3. Flatten Layer

Converts the data from multiple dimensions into a single list of numbers

4. Fully Connected Layer

Combines all features to determine the overall sentiment (classifying a review as positive or negative)



Model Description

CNN Output

Probability distribution for Positive, Negative, and Neutral sentiments

=> Indicates the model's confidence in each sentiment

Example of Interpreting Results:

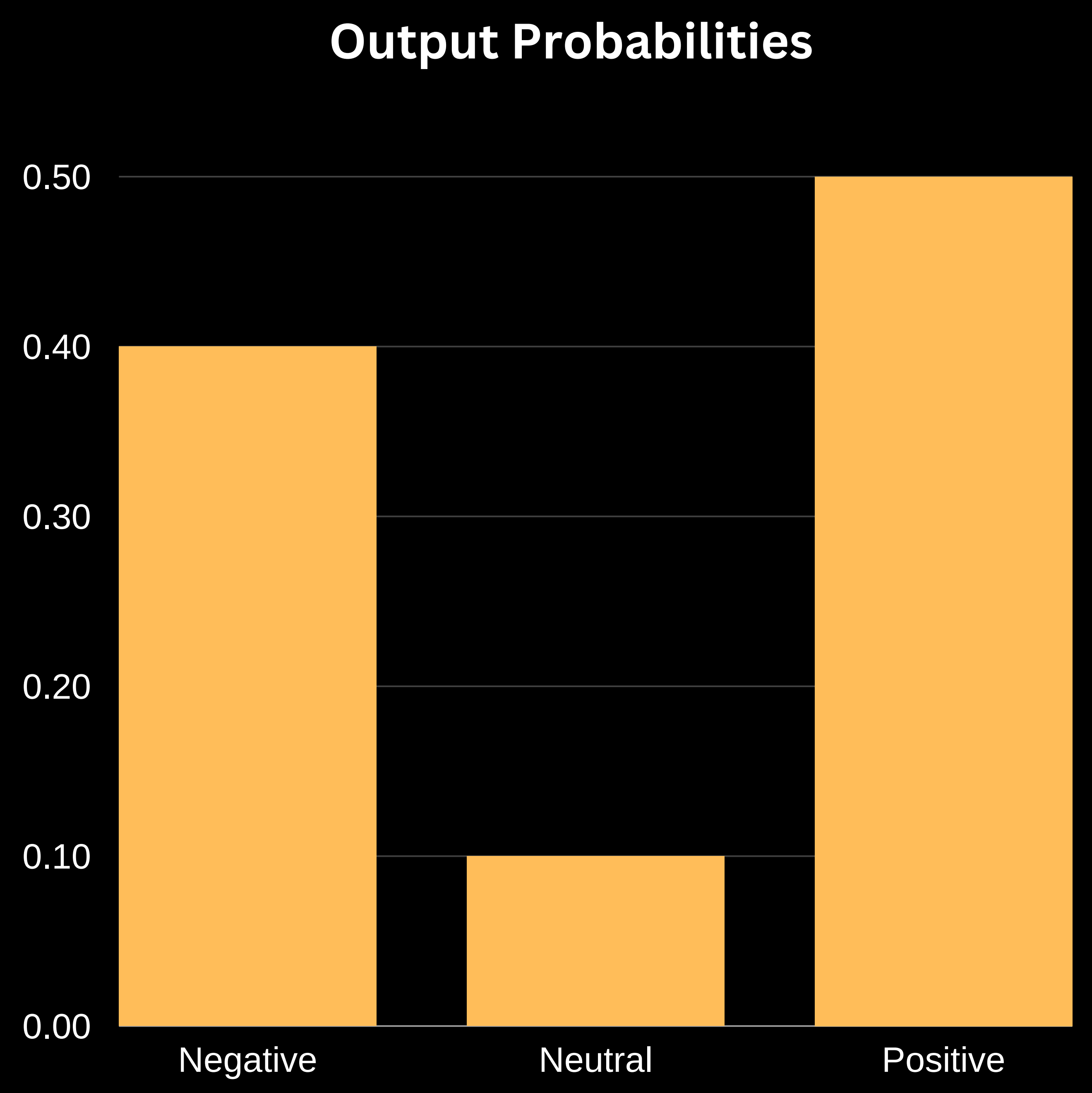
- Highest Probability: Positive (50%)

=> Most confident in **Positive sentiment.**

- Other Classes: Negative at 40%; Neutral at 10%

=> Some evidence for Negative and Neutral.

Sentiment Determination: **Positive sentiment is most likely.**



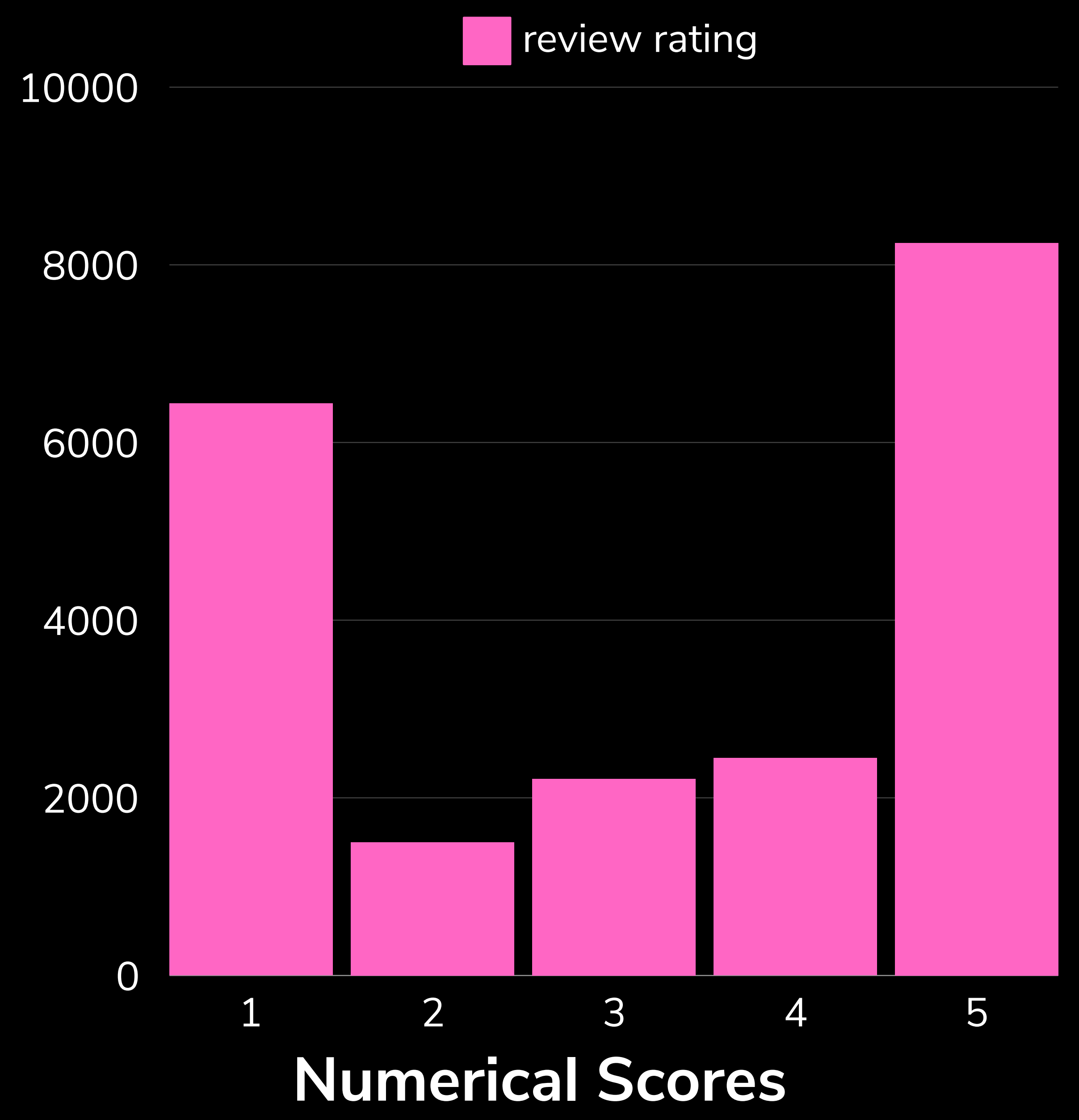
Final cleaning steps

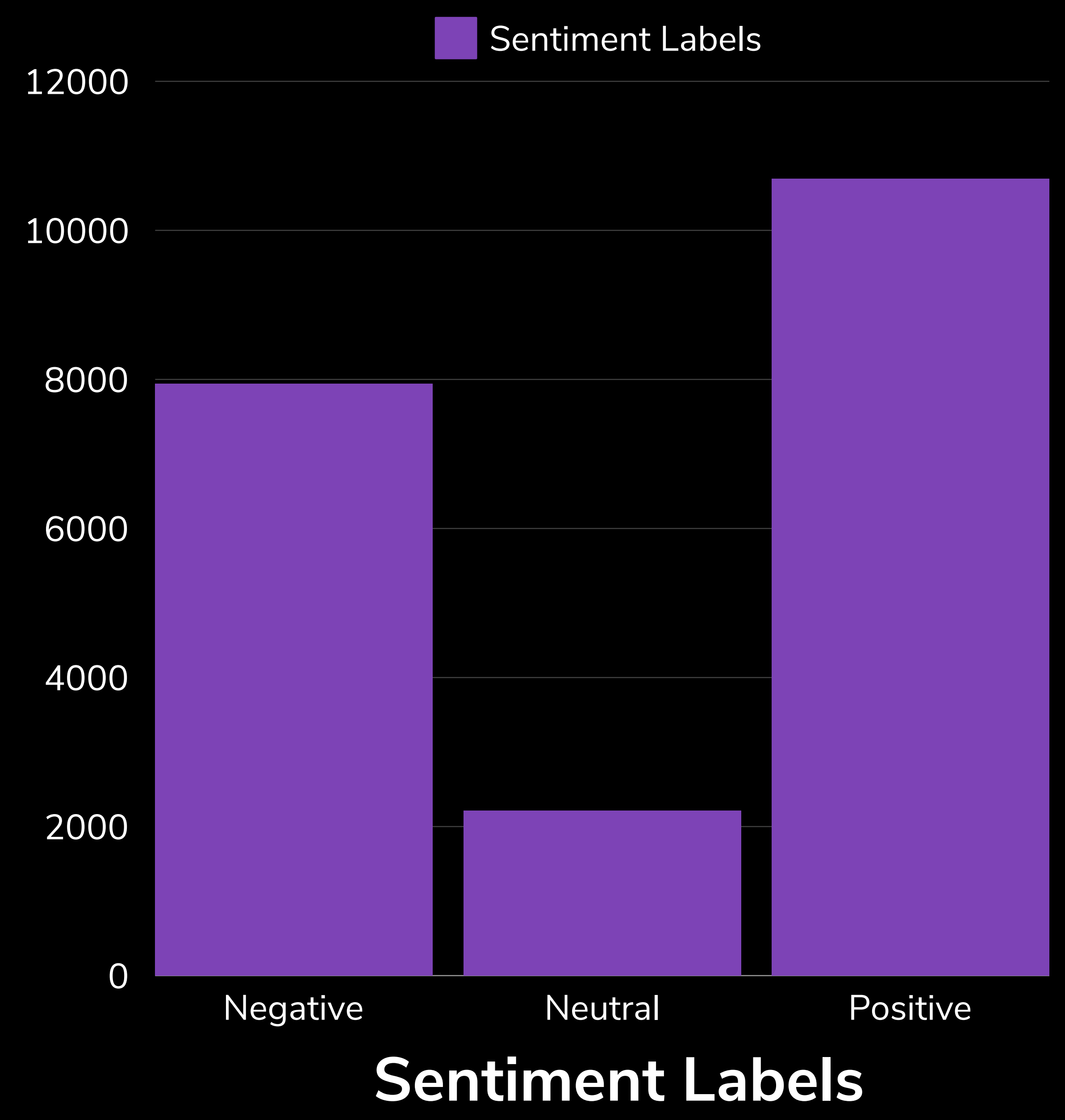
Ensure
consistency
focus
accuracy

- Tokenization
- Lowercasing
- Removing punctuation and stop words
- Word Indexing
- Word embeddings
- Sequence padding
- Remove non-English words

Exploratory Data Analysis (EDA)

Distribution of Review Ratings

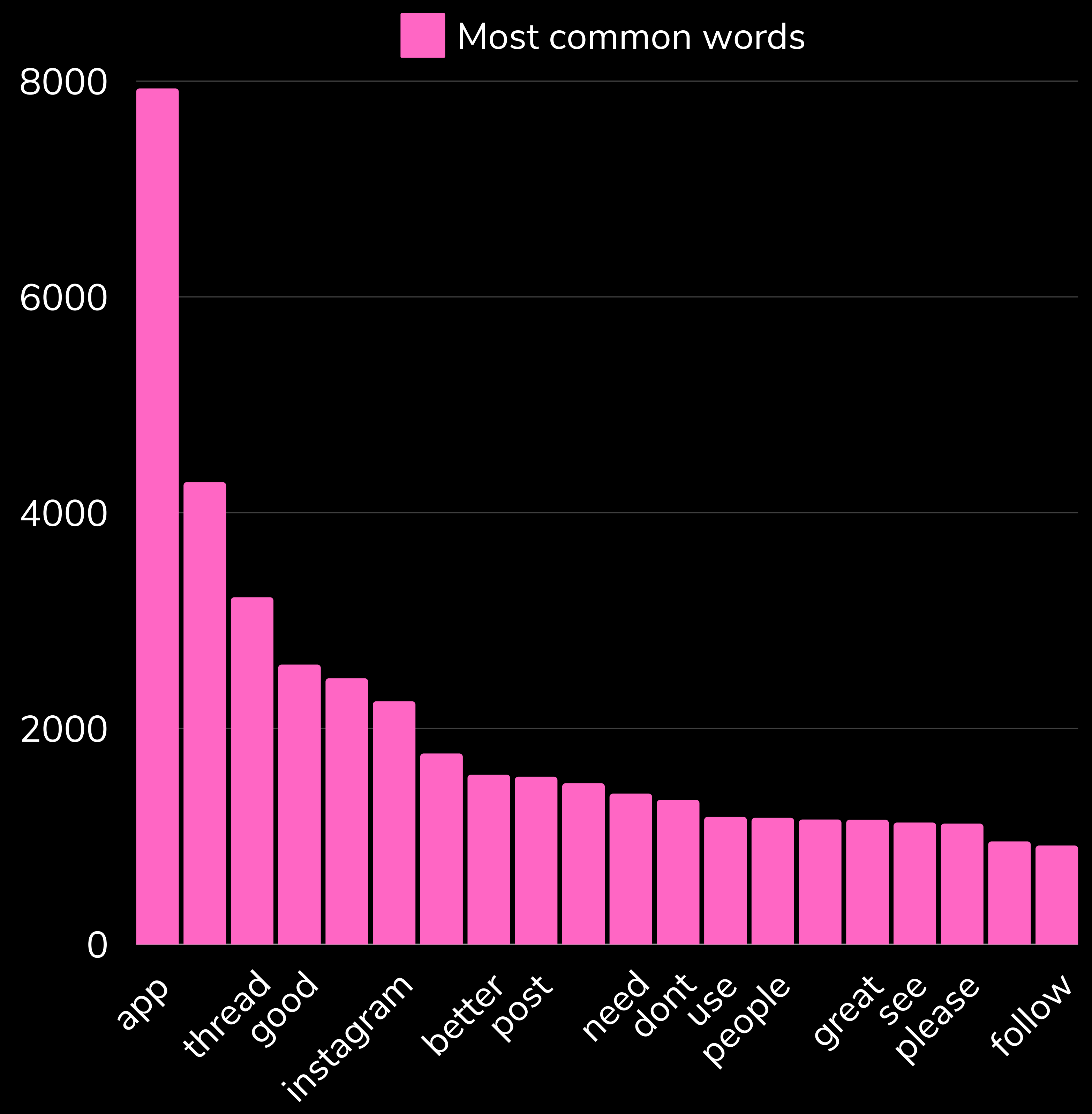




- Higher number of positive reviews (scores 4 and 5) than negative reviews (scores 1 and 2)
- The number of extreme scores (lowest - 1 and highest - 5) is 2-3 times the number of review scores of 2, 3, and 4
- Few 3 “neutral” scores = challenges in training the model to identify “moderate” feedback

Exploratory Data Analysis (EDA)

Identification of Most Common Words



- Top most common words in the dataset are **mostly positive** words ("good", "like", "great", and "nice").
- However, there are still areas for improvement
  - "better" (the app can be updated to become better next time)
  - "can't" (users are unable to use certain app functions)
  - "don't" (suggest a negative experience)

CNN Model's Architecture

Model: "sequential"

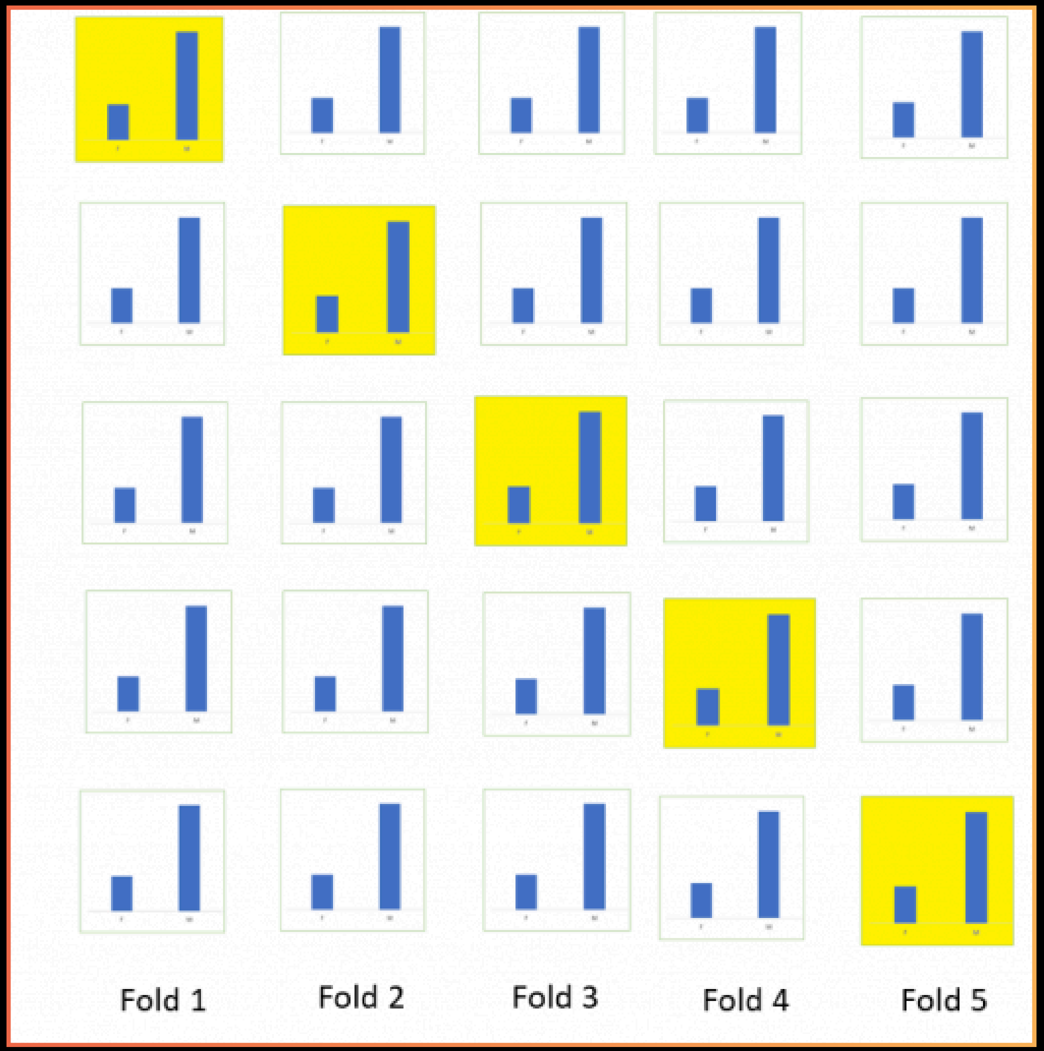
Layer (type)	Output Shape	Param #
embedding (Embedding)	(None, 490, 128)	640000
conv1d (Conv1D)	(None, 488, 32)	12320
max_pooling1d (MaxPooling1D)	(None, 244, 32)	0
flatten (Flatten)	(None, 7808)	0
dense (Dense)	(None, 3)	23427

Total params: 675747 (2.58 MB)
Trainable params: 675747 (2.58 MB)
Non-trainable params: 0 (0.00 Byte)

- 5-layers neural networks
- Over 600,000 trainable parameters
- Relu & Softmax activation function for non-linear patterns and multi-class classification

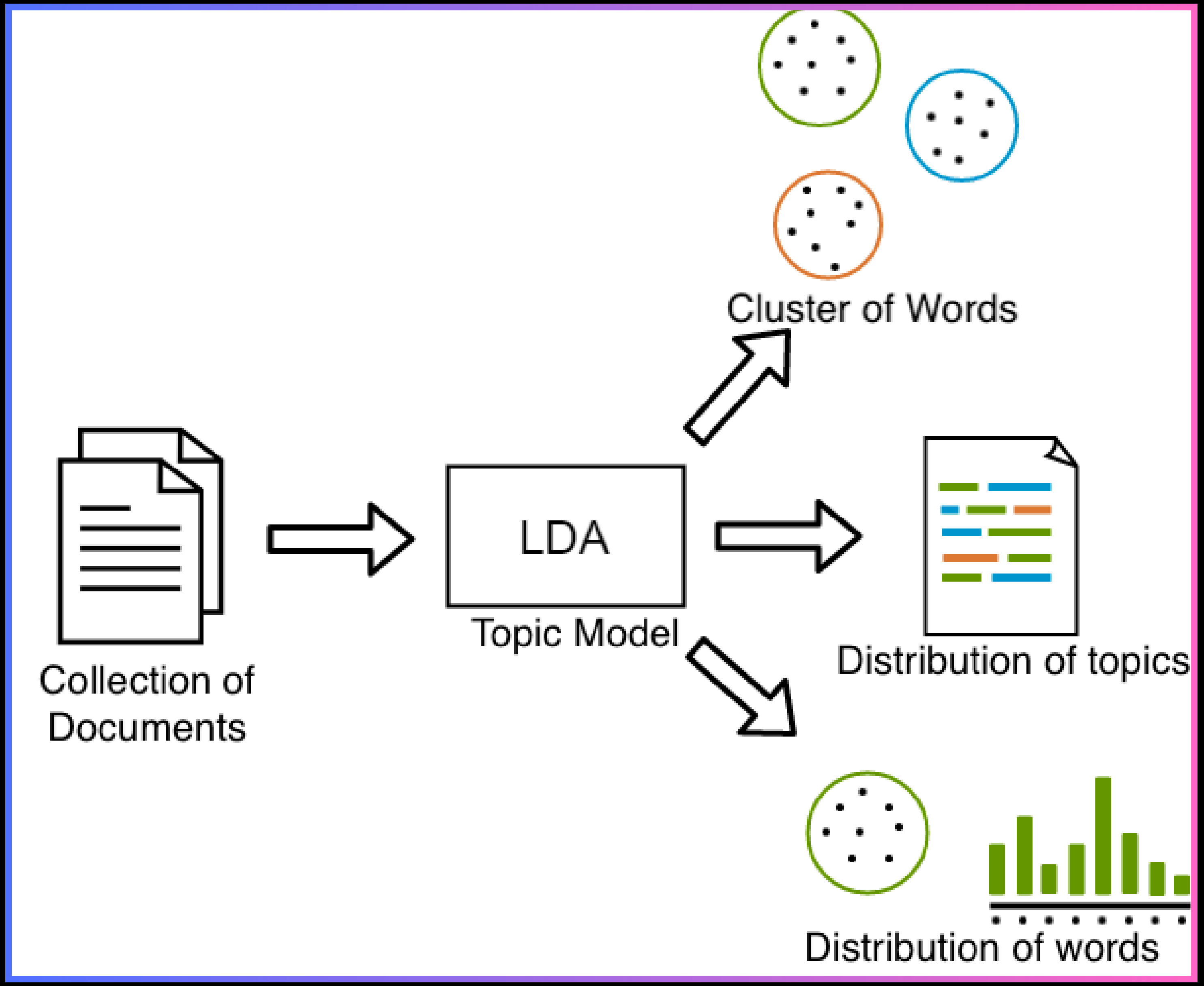
Cross-validation

Stratified k-fold



- Preserve same ratio between negative, neutral, positive classes for each fold (3.6 : 1 : 4.8).
- Cross-validate on 5 folds (k = 5)

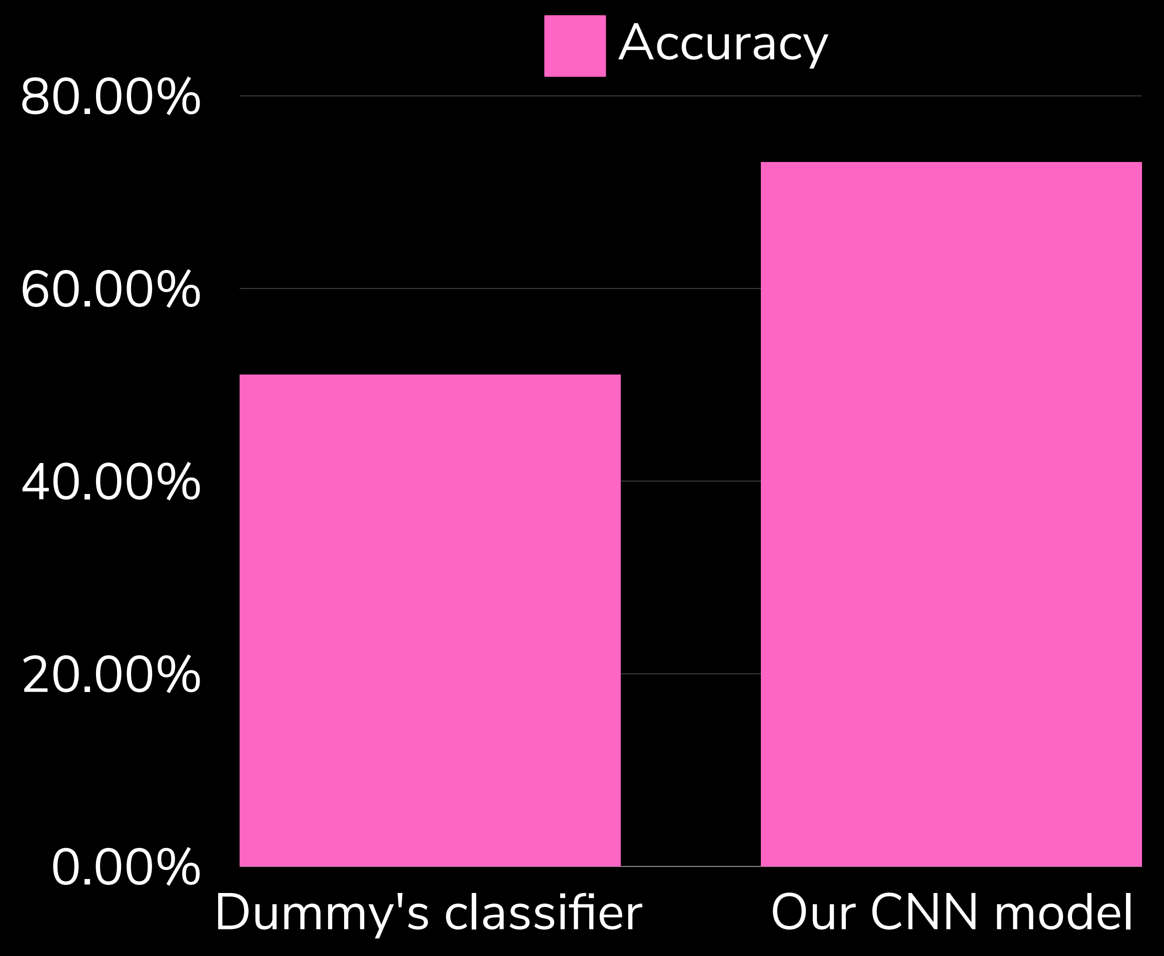
Latent Dirichlet Allocation

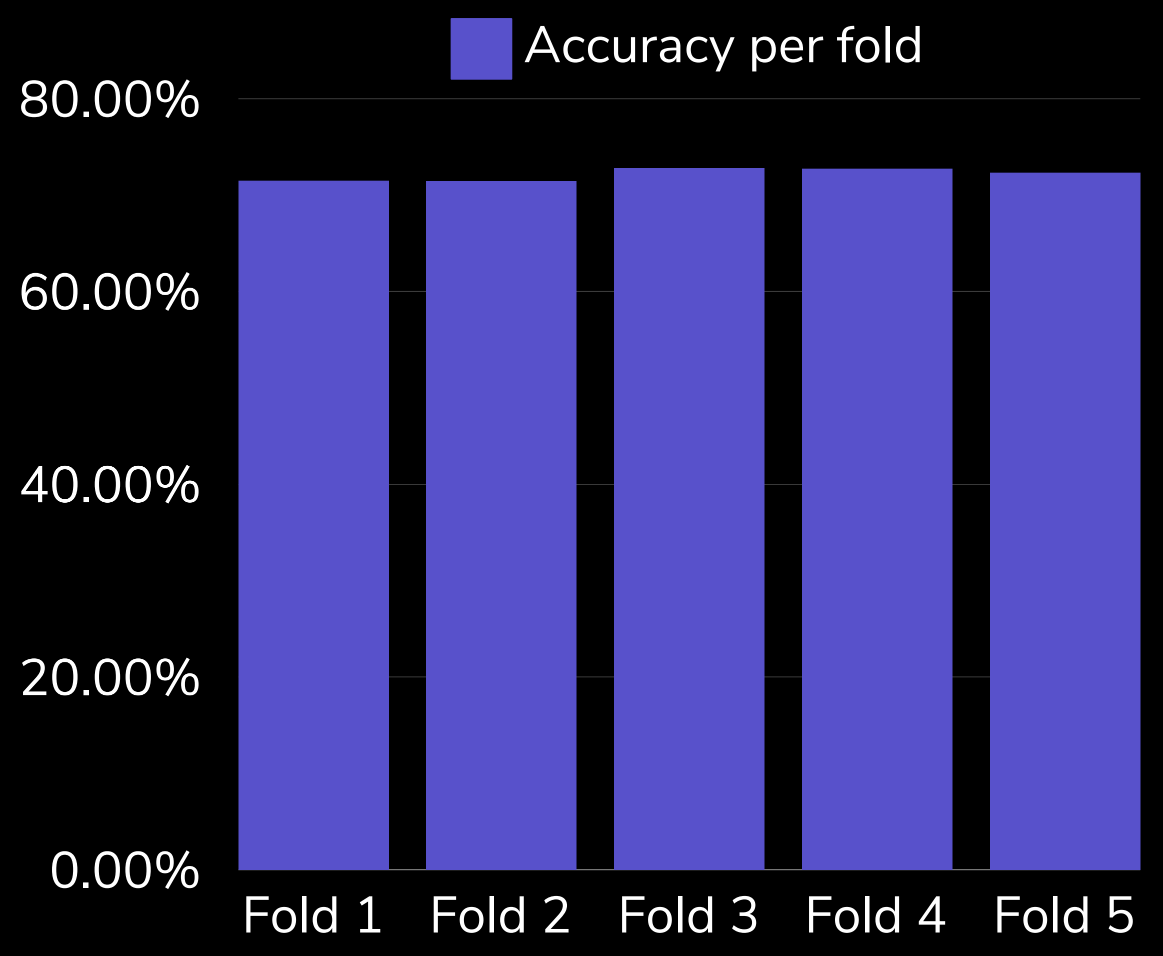


- A method for unsupervised classification of documents.
- Extract the top 5 most common topics mentioned in the positive and negative reviews.

Result Analysis

CNN’s overall performance



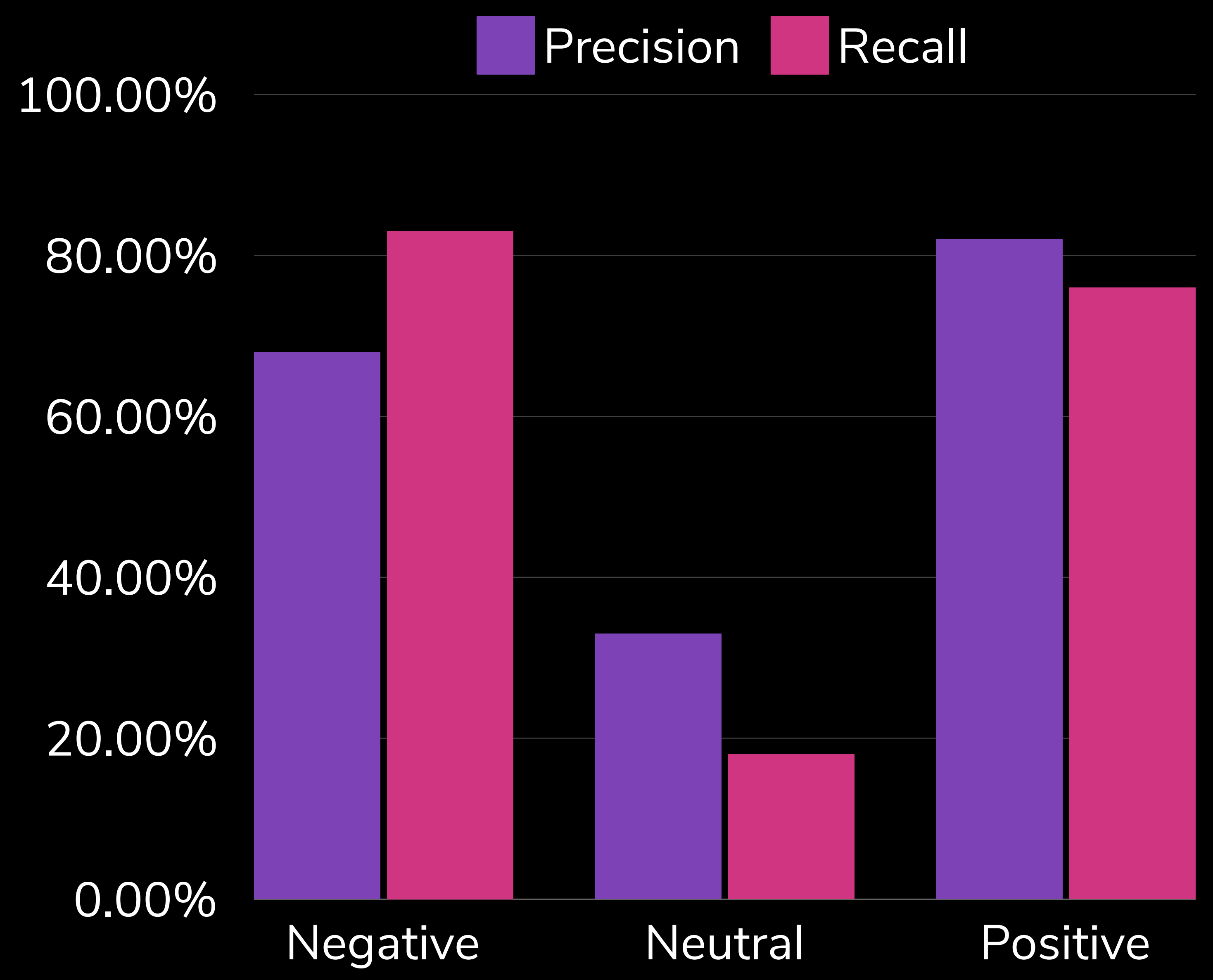


Our model outperforms the dummy classifier in accuracy (>20%), which can capture meaningful patterns in the data.

Model shows consistent performance across 5 data subsets, indicating reliability and generalization

Result Analysis

CNN’s performance by class



Class-Wise Performance Metrics

- Most positive reviews are correctly identified with few false positives.
- Many negative reviews are correctly identified, but there are some false positives.
- The model struggles to distinguish neutral reviews from positive and negative ones

Keyword Analysis:

- Positive and Negative Reviews contain extreme keywords such as “poor”, “horrible”, “irrelevant”, “copycat”, “pointless”, and “excellent”.
- Neutral Reviews: Lack of clear, distinct keywords makes them harder to classify.

Topic Modelling using LDA

Topic	Content
1	**lovely** **interface** fun beat **twitter** good wonderful app one amazing
2	think app way alternative thread much review first better **twitter**
3	follow like option please feature easy use add need thread
4	im friendly like instagram good thread user wow app top
5	instagram smooth like thread really experience best nice app good

Topic	Content
1	**racist opinion** time truth waste support free boring speech freedom
2	better new clone work app doesnt twitter nothing properly working
3	app search poor following dont see feed post people follow
4	want without login app dont thread cant delete instagram account
5	worse don't suck version best good paste app twitter copy

Positive Feedback:
Users appreciate the interface, community, and perceive Threads as a better alternative to Twitter.

Negative Feedback:
Users are frustrated with content moderation, customer service, and account management issues.

Scaling Feasibility

Business Insights

Social Media Companies

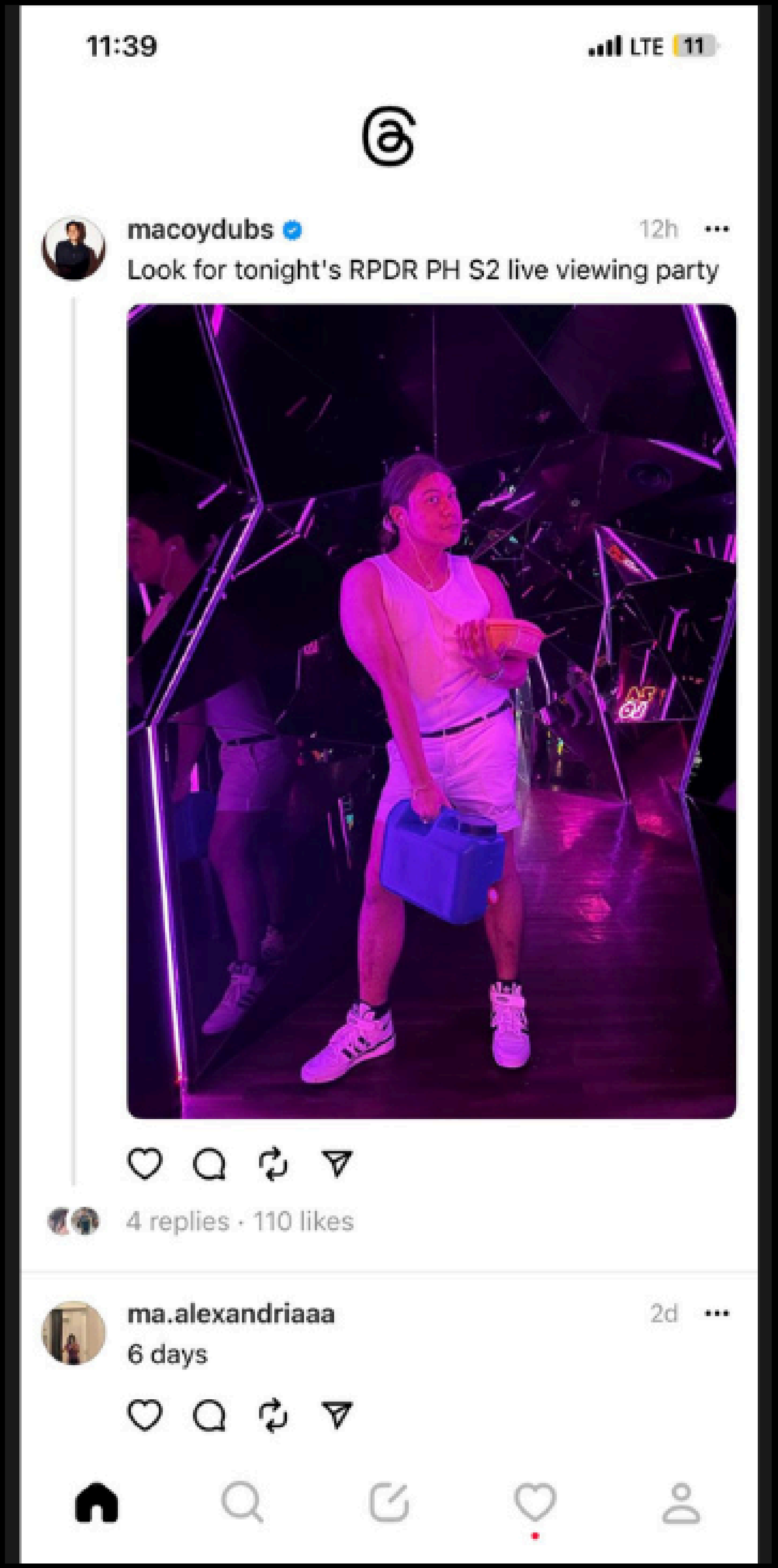
CRM Providers

Client Benefits

Monitor brand and product perception

Improve customer experience & touchpoints

Update product and feature offering



Scaling Feasibility

Integrate automated surveys

From specific feedback in reviews

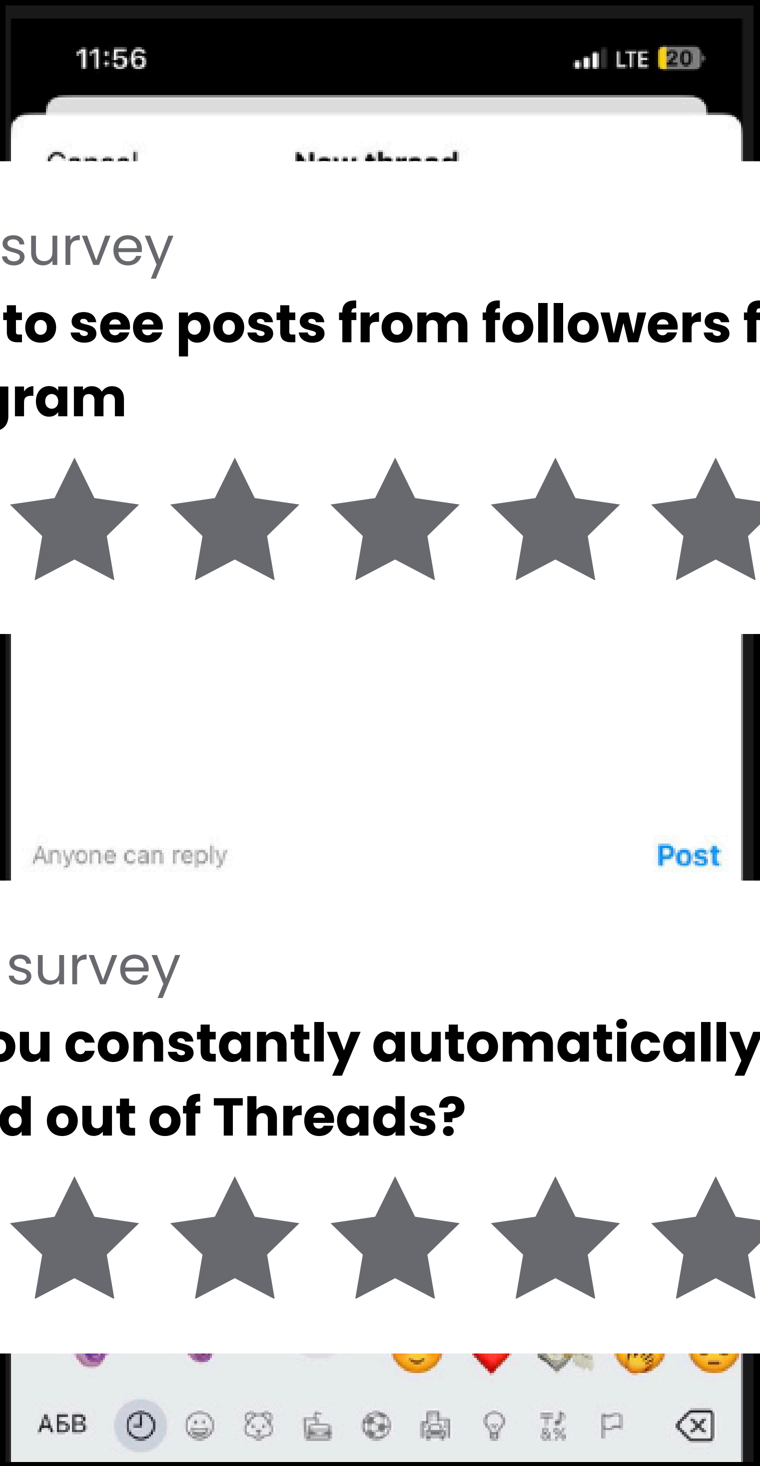
SheltieOwner100, 07/11/2023

A Better Version Of Twitter But Also Needs...
I expect the posts on my feed to be from only the pages that I follow but what I get in addition to those posts is posts from pages that I don't even follow at all & have zero more

Pure Hater, 07/08/2023

Poorly made app
If i could give it 0 stars I would. There are so many issues with this app. First of all, I couldn't be logged into instagram and threads at the same time without getting automa more

to feature-specific surveys for improving



Quick survey
I wish to see posts from followers from Instagram

Quick survey
Are you constantly automatically logged out of Threads?

Scaling Feasibility

Technical & Operational Concerns

Generally, resources are not an issue for large tech companies

Concern level

Integration Cost

- ✓ Cloud computing, CPU generators, system adaptation processes
- ✓ Integration into legacy systems

Latency Issues

- ✓ Batch Processing: general sentiments - monthly
- ✓ Real-time Processing: feature launch + event shock

Scaling Feasibility

Constraints and Potential for Expansion

1. Genuinity of reviews input

Double-sentiment reviews
Sarcasm

+

2. Language Accuracy Gap

Languages with high-context
Low resources

Irony Detection & Subjectivitiy Classification

Filter out un-genuine content as part of preprocessing

Multi-lingual models
Multi-label Scenarios

Normalize noise sources
Assign weights to emotional states