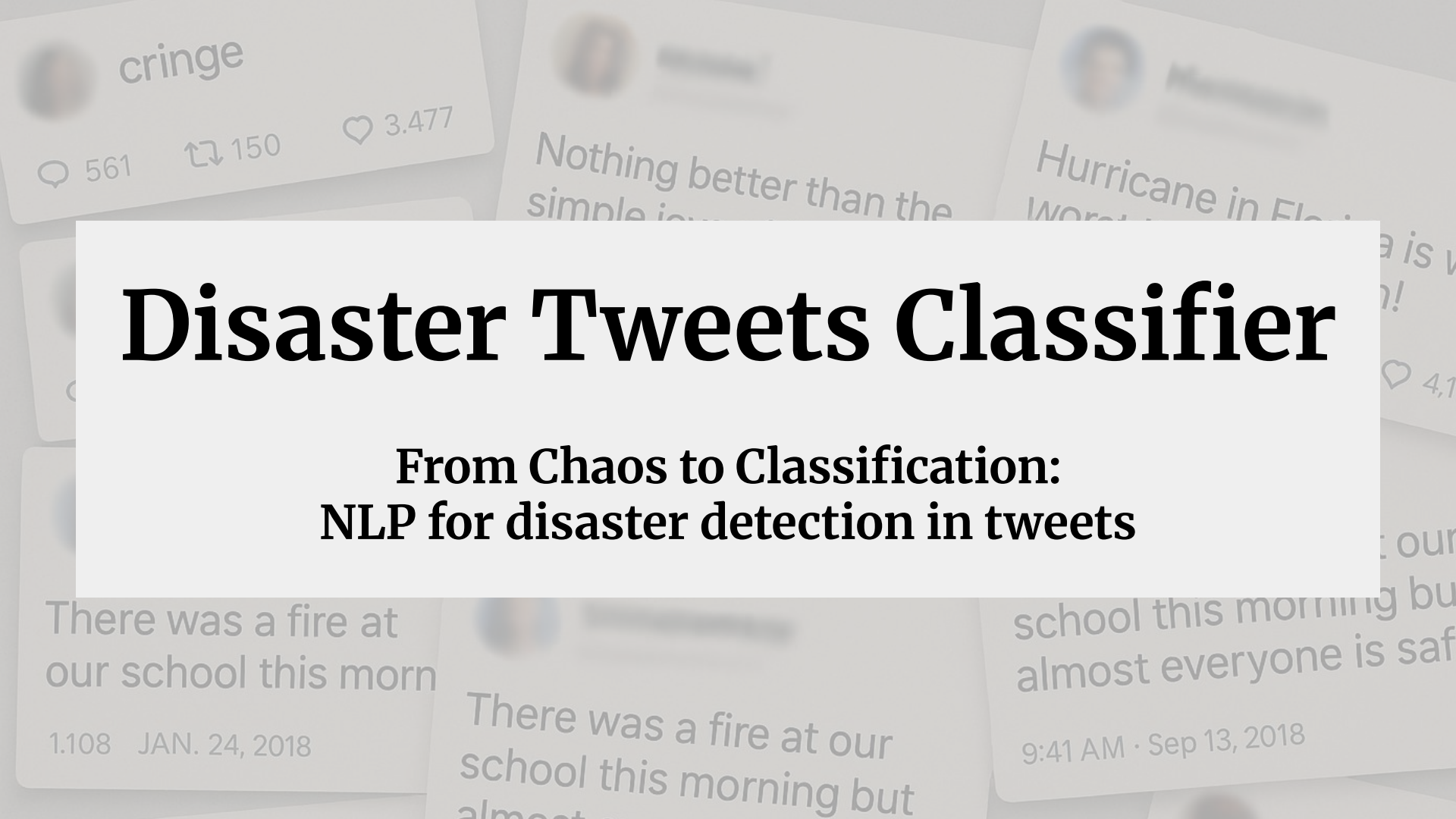


Disaster Tweets Classifier

From Chaos to Classification:
NLP for disaster detection in tweets

Project Introduction

Goal

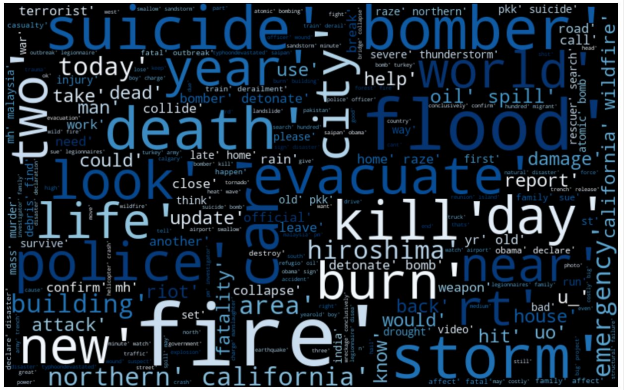
Predict whether a tweet refers to a real disaster (1) or not (0).

Impact

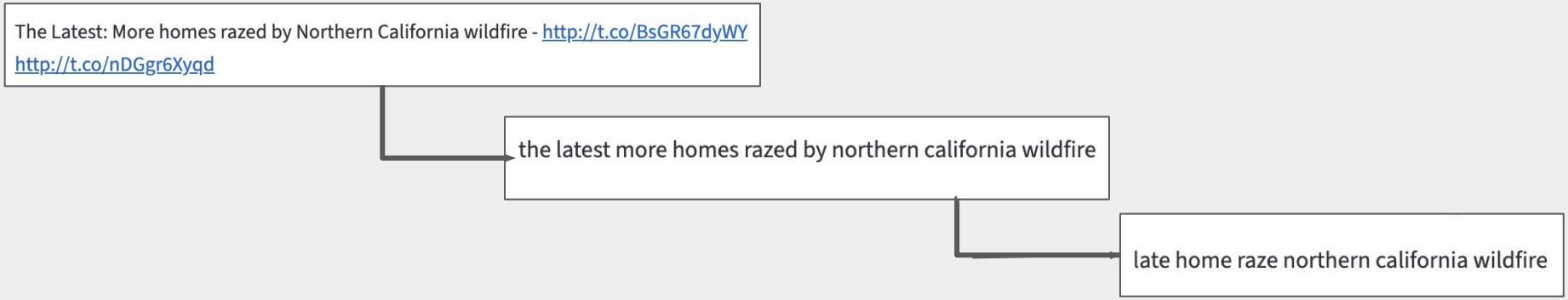
Rapid detection of disaster-related tweets can support emergency services & crisis management.

Data

7,613 labeled tweets (text + target).



Pipeline



Data Cleaning & Preprocessing

- Lowercasing, removing noise
- POS-tagged lemmatization
- Stopword removal

Feature Engineering

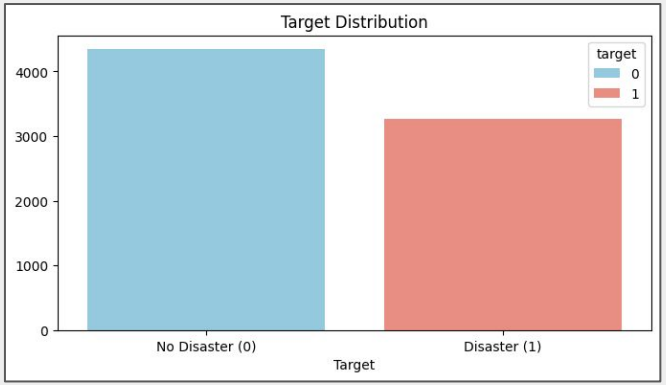
- CountVectorizer (n-grams)
- TF-IDF Vectorization
- Binary Count Vectorization for specific NB experiments

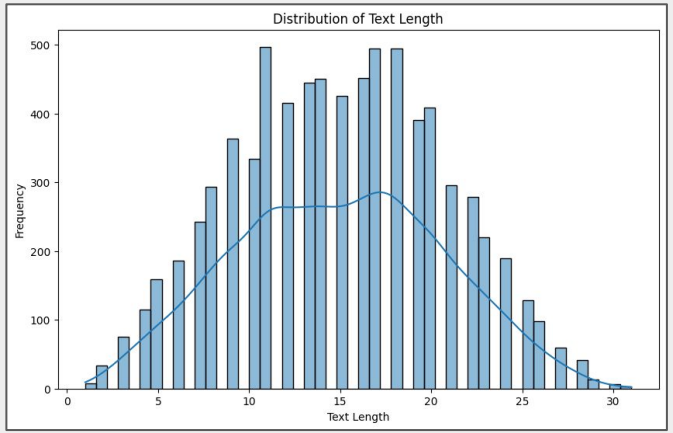
Model Training & Evaluation

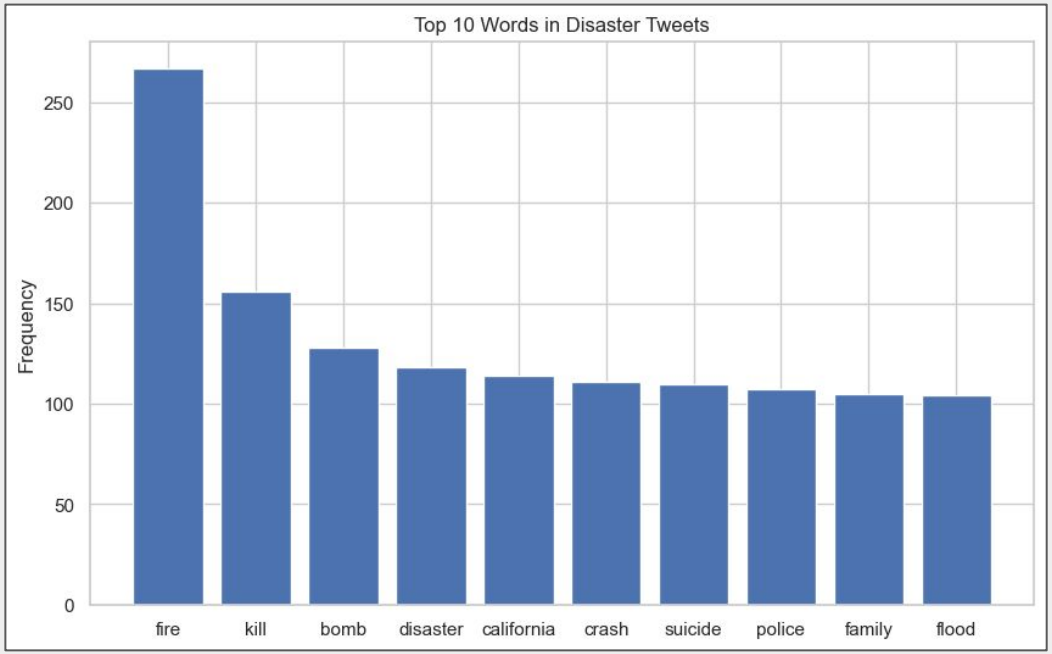
Models: Logistic Regression, Naive Bayes & CNN

Evaluation: Accuracy, Precision, Recall, F1-score, Confusion matrix & Classification report

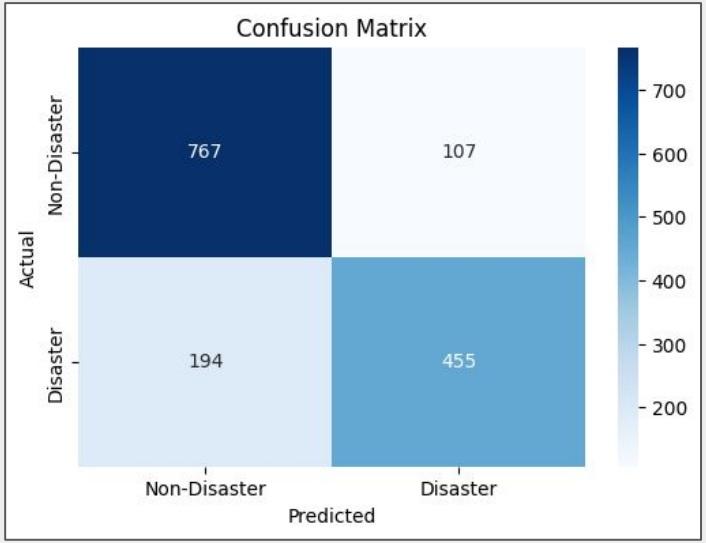
Data Analysis







Logistic Regression (Baseline)



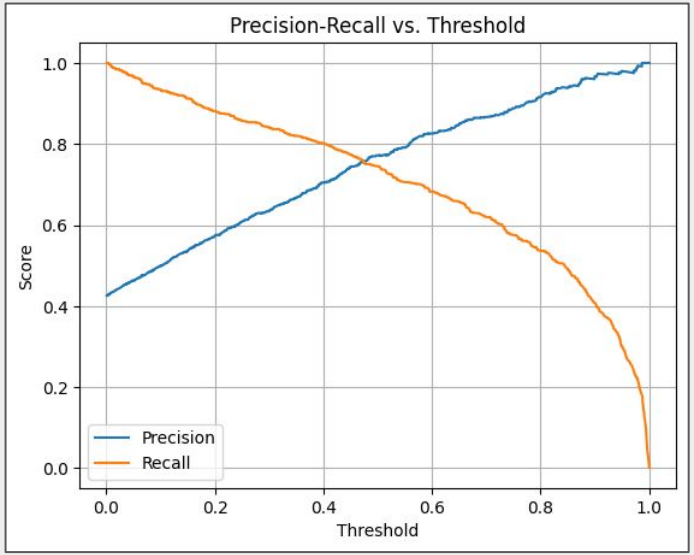
Accuracy	Precision	Recall	F1-Score
0.80	0.80	0.79	0.79

Why Logistic Regression?

Simple, fast, interpretable baseline for text classification.

- High precision, but recall lower → missed some disaster tweets.
- Useful as a performance benchmark for other models.

Logistic Regression (balanced model)



Goal: Improve recall to catch more disaster tweets.

- Balanced class weights.
- Cross-validation
- Adjusted threshold

Outcome:

- Recall improved slightly
- but precision dropped noticeably.

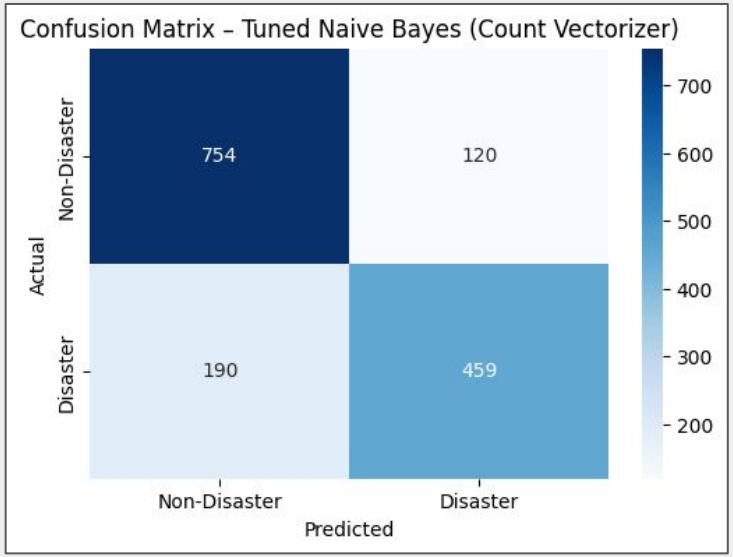
Threshold = 0.50

	precision	recall	f1-score	support
Not Disaster	0.80	0.88	0.84	874
Disaster	0.81	0.70	0.75	649
accuracy			0.80	1523
macro avg	0.80	0.79	0.79	1523
weighted avg	0.80	0.80	0.80	1523

Threshold = 0.45

	precision	recall	f1-score	support
Not Disaster	0.83	0.80	0.81	874
Disaster	0.74	0.77	0.76	649
accuracy			0.79	1523
macro avg	0.79	0.79	0.79	1523
weighted avg	0.79	0.79	0.79	1523

Naive Bayes



Accuracy	Precision	Recall	F1-Score
0.80	0.80	0.78	0.79

Why Naive Bayes?

Efficient for sparse, high-dimensional text data.

Experiments:

- CountVectorizer (baseline NB)
- Tuned alpha smoothing values
- TF-IDF (regular & tuned alpha)

Key Insight:

- More balanced precision/recall than LR, but slightly lower accuracy.

Convolutional Neural Network (CNN)

Why CNN?

- Captures local word patterns automatically.
- Learns embeddings instead of relying solely on vectorizers.

Architecture Highlights:

- Tokenization → Padding → Embedding Layer
- Convolution + MaxPooling layers
- Dense + Dropout for regularization
- Sigmoid activation for binary classification

Tokenized Sequence (word tokens)

```
[
  0 : "new"
  1 : "summer"
  2 : "long"
  3 : "thin"
  4 : "body"
  5 : "bag"
  6 : "hip"
  7 : "word"
  8 : "skirt"
  9 : "blue"
]
```

Token-Index Mapping

```
{
  "new" : 50
  "summer" : 484
  "long" : 524
  "thin" : 5276
  "body" : 80
  "bag" : 322
  "hip" : 3632
  "word" : 1390
  "skirt" : 5238
  "blue" : 922
}
```

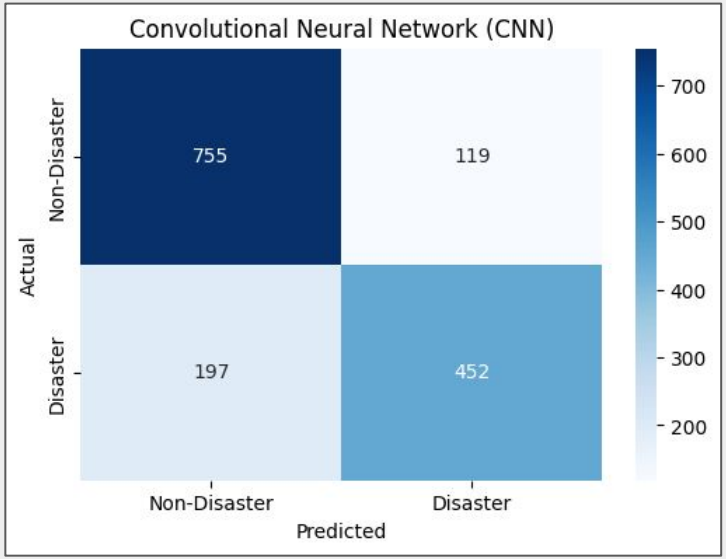
Vectorized Sequence (token IDs)

```
[
  0 : 50
  1 : 484
  2 : 524
  3 : 5276
  4 : 80
  5 : 322
  6 : 3632
  7 : 1390
  8 : 5238
  9 : 922
]
```

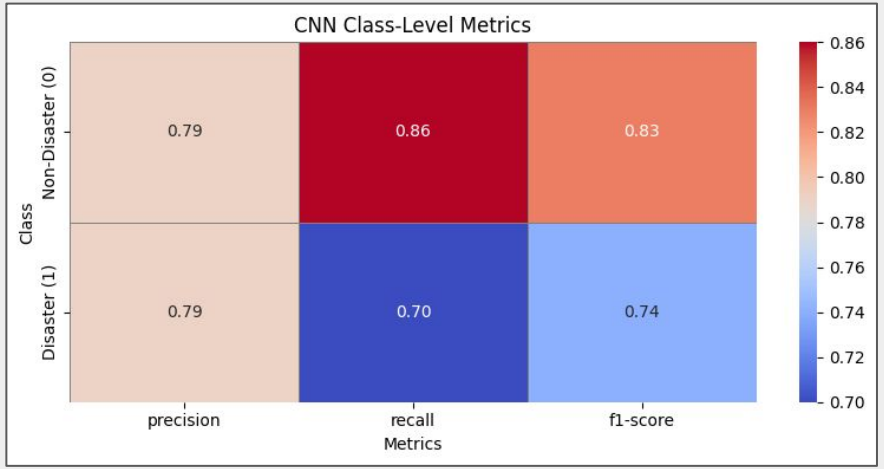
Padded Sequence (length = 100)

```
[
  0 : 50
  1 : 484
  2 : 524
  3 : 5276
  4 : 80
  5 : 322
  6 : 3632
  7 : 1390
  8 : 5238
  9 : 922
  10 : 0
```

Convolutional Neural Network (CNN)



Accuracy	Precision	Recall	F1-Score
0.79	0.79	0.78	0.78



🥇 **Best overall balance between precision and recall.**

Outperformed LR and NB in recall while keeping precision high.

Model Comparison & Final Selection

Model	Accuracy	Precision	Recall	F1-score
🥇 **CNN**	0.79	0.79	0.78	0.78
🥈 **Logistic Regression**	0.80	0.80	0.79	0.79
🥉 **Naive Bayes (TF-IDF)**	0.80	0.80	0.78	0.79

Final Model: CNN

- Balanced performance across precision and recall.
- Slightly lower accuracy than LR and NB, but strong in disaster detection without over-flagging.
- LR and NB, remain strong, efficient alternatives for production

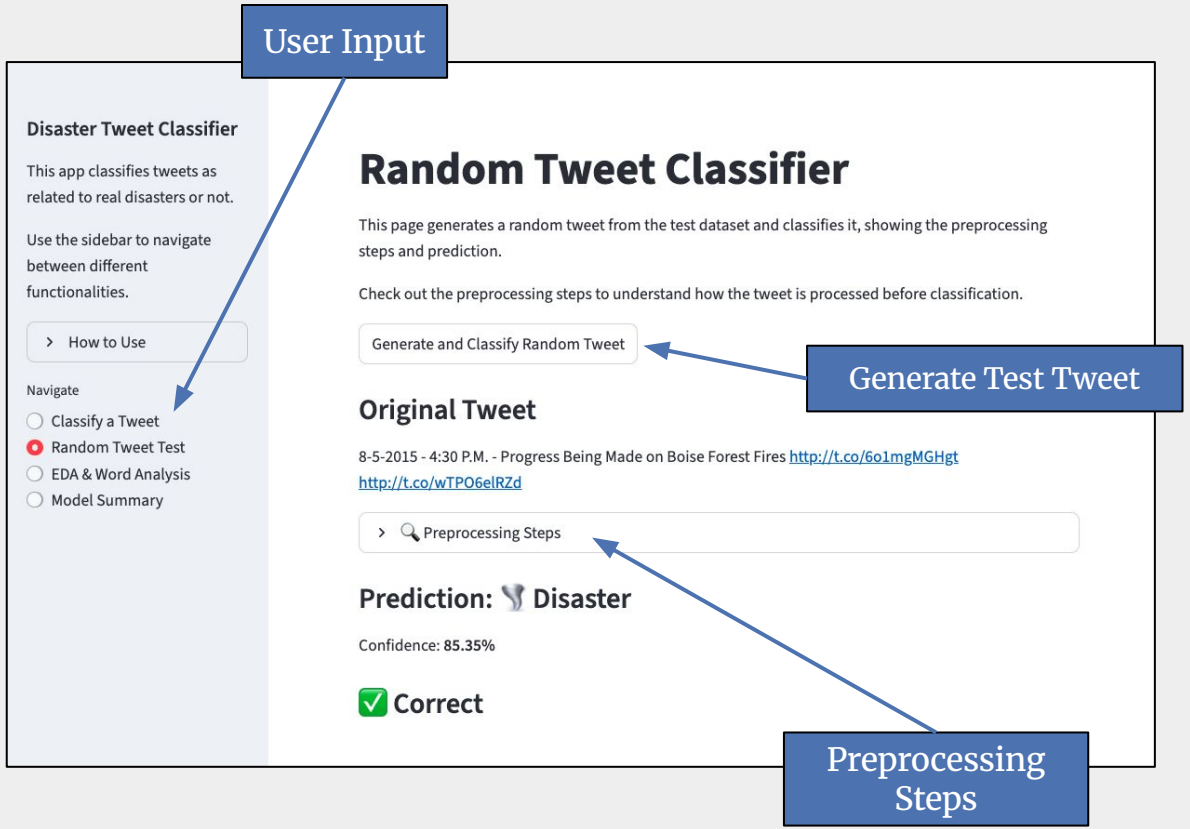
Model Demo

Features:

- User Tweet input or random Tweet from test set
- Preprocessing steps
- Info page

Technical Setup:

- Saved CNN model + Tokenizer
- Same preprocessing pipeline as training



Conclusion

✅ Created NLP pipeline

✅ CNN achieved the best balanced performance.

✅ Streamlit app provides an interactive, transparent model demo.

Key Learnings:

🎯 Preprocessing decisions improved generalization.

🎯 Boosting recall often lowers precision — finding balance is key.

🎯A well-documented, reproducible pipeline is essential for deployment readiness.