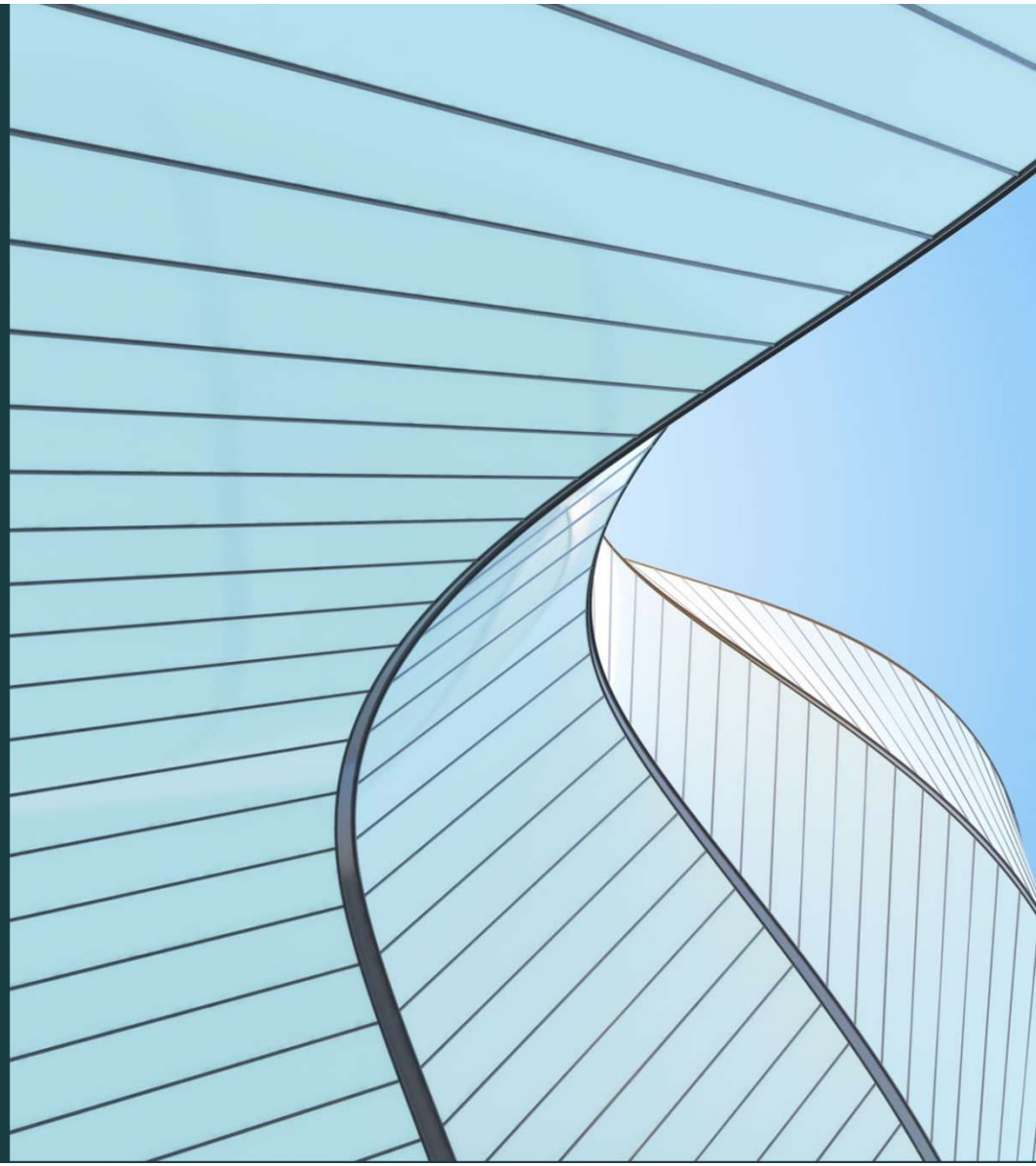
NLP

Group 1:

Happy

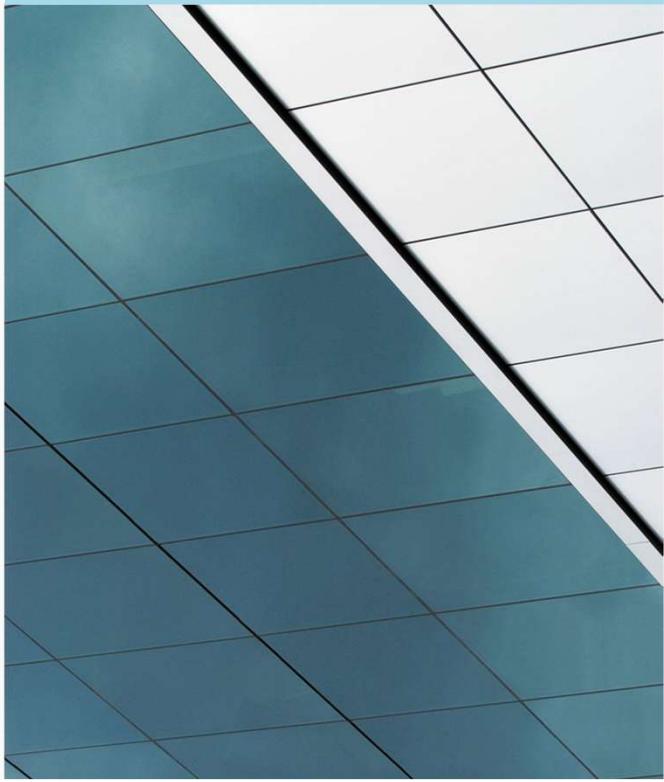
Nicholai

Goal: to build a classifier that is able to distinguish between ‘real’ and ‘fake’ news..



Approach & Methodology

- **Two main approaches**
  - Classic ML
  - Deep Learning
- Minimal to no preprocessing for BERT
- Use of a **pre-trained BERT model**: jy46604790/Fake-News-Bert-Detect
  - Loaded via Hugging Face's pipeline
  - Batched inference for efficiency



Approach and Methodology (Other models)

Cleaning Methods:

- Convert to lowercase
- Remove punctuation
- Remove numbers
- Strip whitespace

Combined Columns:

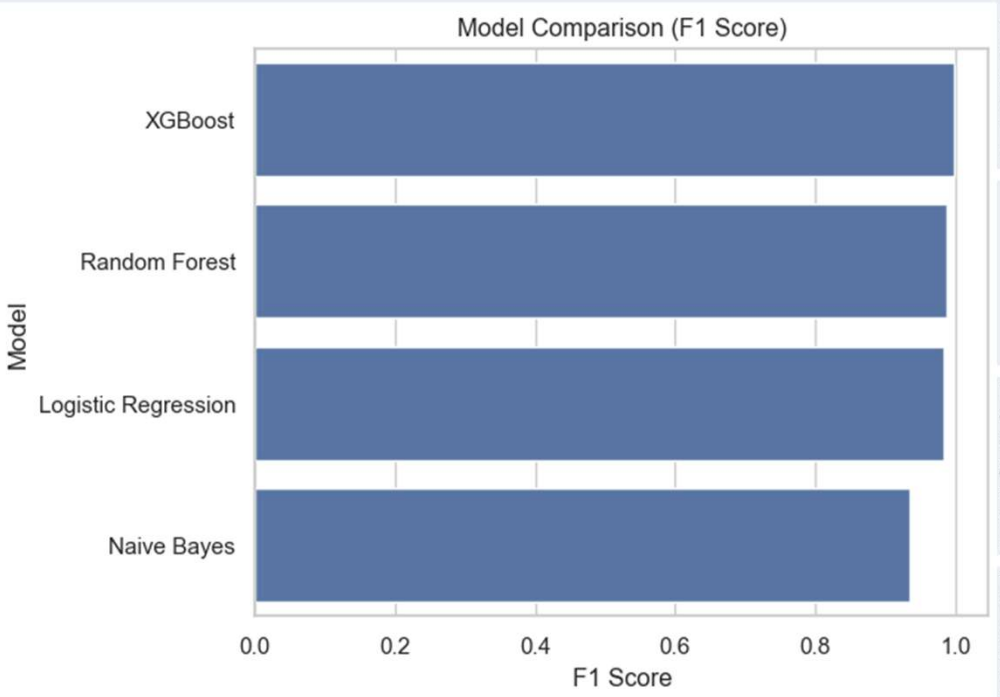
- `title` + `text` = `cleaned`

Tool Used:

- `TfidfVectorizer` with English stop words removed

Model	Type	Strengths	Notes
Logistic Regression	Linear	Simple, interpretable	Good baseline
Naive Bayes	Probabilistic	Fast, works well on text	Assumes feature independence
Random Forest	Ensemble	Reduces overfitting, robust	Slower, more complex
XGBoost	Boosting	High performance, regularized	Requires tuning

Scores (Other models)

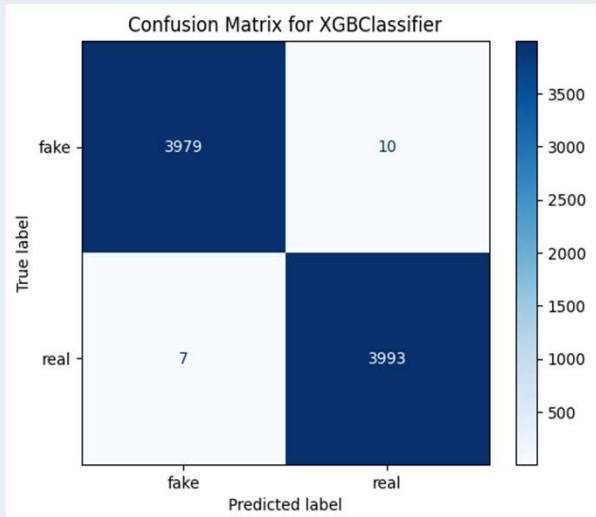



```
Training and evaluating: XGBoost
Cross-Validation Accuracy: 0.9078
Cross-Validation F1 Score: 0.9134
Accuracy: 0.9078 ± 0.0025
F1 Score: 0.9134 ± 0.0022
Test Accuracy: 0.9979
F1 Score: 0.9979
```

```
Training and evaluating: Random Forest
Cross-Validation Accuracy: 0.9352
Cross-Validation F1 Score: 0.9369
Accuracy: 0.9352 ± 0.0022
F1 Score: 0.9369 ± 0.0022
Test Accuracy: 0.9871
F1 Score: 0.9871
```

```
Training and evaluating: Logistic Regression
Cross-Validation Accuracy: 0.9407
Cross-Validation F1 Score: 0.9417
Accuracy: 0.9407 ± 0.0025
F1 Score: 0.9417 ± 0.0024
Test Accuracy: 0.9832
F1 Score: 0.9832
```

```
Training and evaluating: Naive Bayes
Cross-Validation Accuracy: 0.9369
Cross-Validation F1 Score: 0.9362
Accuracy: 0.9369 ± 0.0029
F1 Score: 0.9362 ± 0.0029
Test Accuracy: 0.9357
F1 Score: 0.9356
```



BERT

- Stands for Bidirectional Encoder Representations from **Transformers**
- Pretrained on massive datasets
- Little to no pre-processing
- Reads entire text in both directions—understands context, not just keywords
- Outperforms classic ML
- Limitations
  - Generalization to new types of fake news
  - Computational cost

Hugging Face

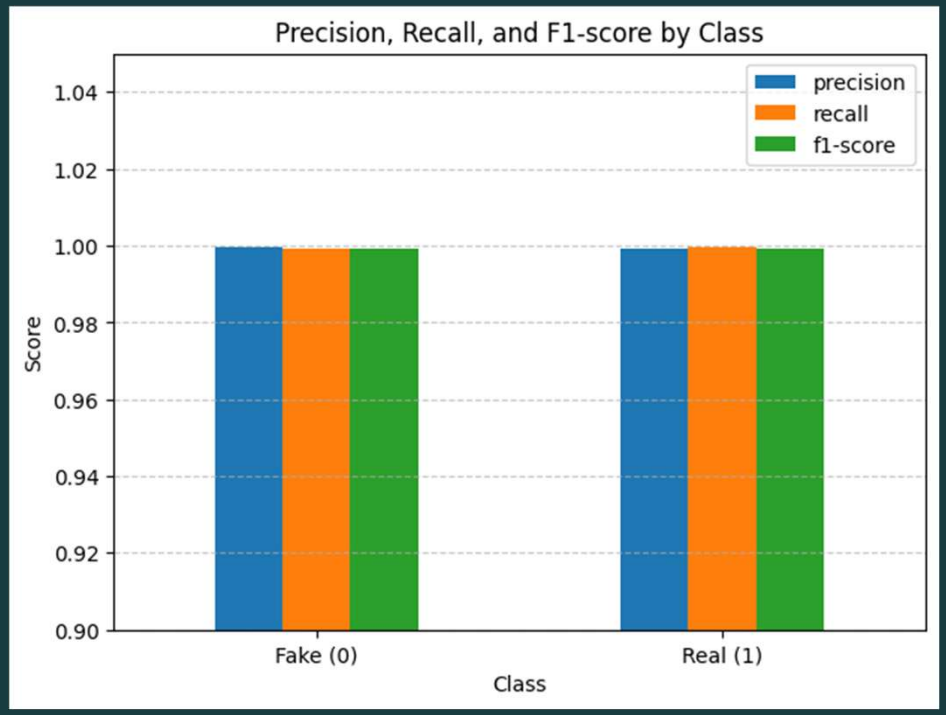
- Leading open-source platform for Natural Language Processing (NLP)
- A library that provides access to *thousands* of pretrained models

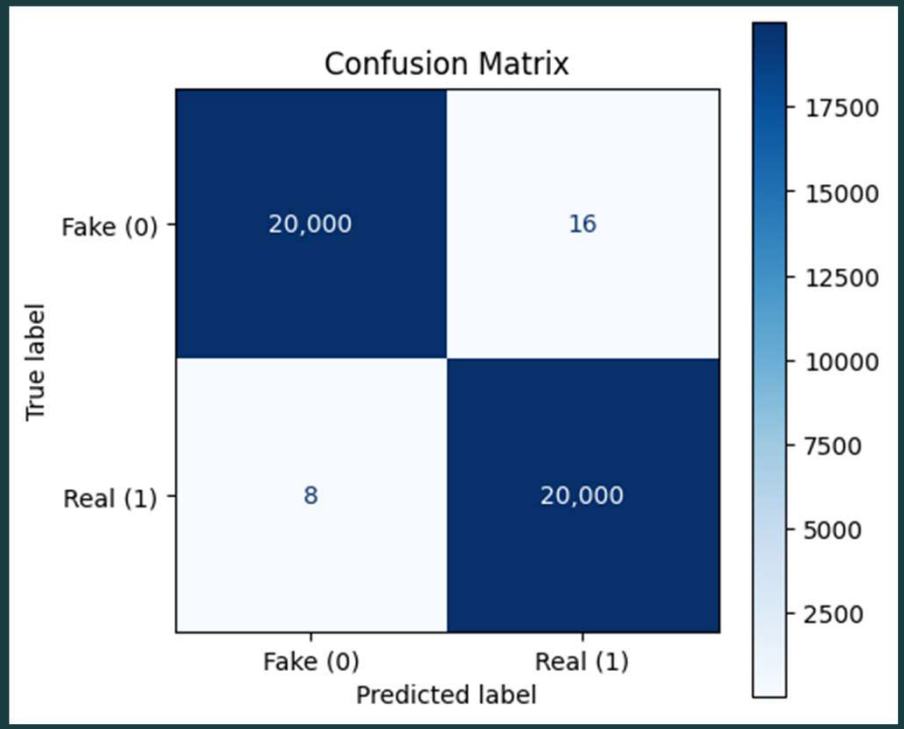
jy46604790/Fake-News-Bert-Detect (pre-trained model)

- This particular model is trained by over 40,000 news sources from different media based on the 'roberta-base'.

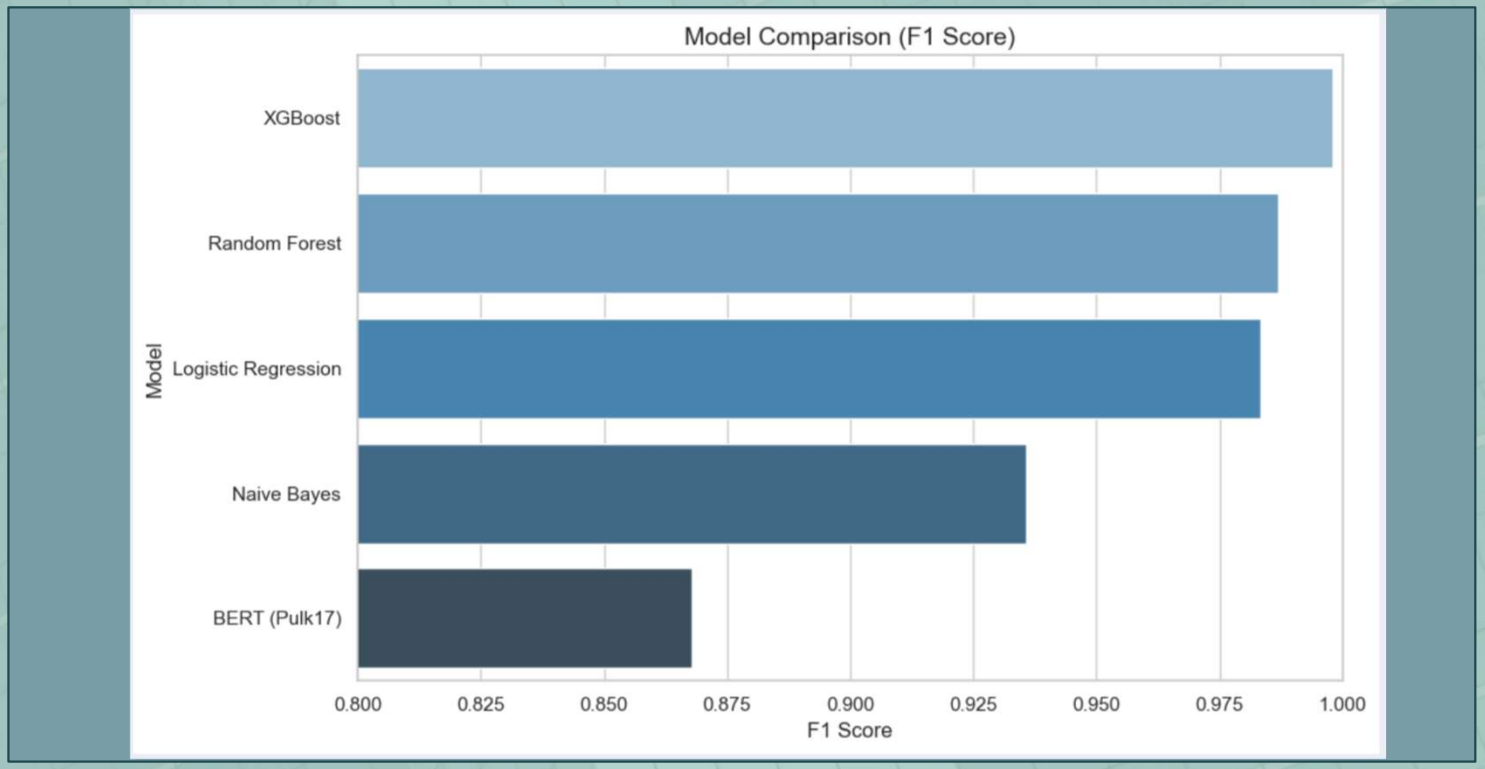
Results (BERT)

✅ `Accuracy: 0.9993991287366681`





Scores (Other models + BERT Pulk17)



Discussion

- The opportunity to explore deep learning and the Hugging Face ecosystem has been the most valuable outcome of this project for our team.

- The worst has yet to present itself.