


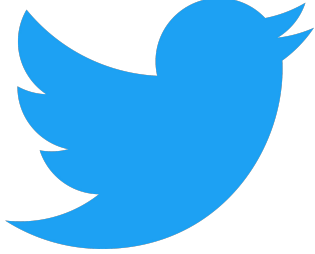
Fake news detection in combination with machine learning

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We propose to detect fake news using a combination of a transformer and classical machine learning algorithms with different features such as the text, the text sentiment, NER tags, POS tags, and so on. Finally, we thoroughly compare the results providing the accuracy, precision, recall, and F1-score metrics of all the systems.

Covid Fake News Dataset

Dataset



Split	Real	Fake	Total
Training	3360	3060	6420
Validation	1120	1020	2140
Test	1120	1020	2140
Total	5600	5100	10700



Distribution of data across classes and splits.
Note that the data is class-wise balanced and the class-wise distribution is similar across splits.

Code to reproduce results:

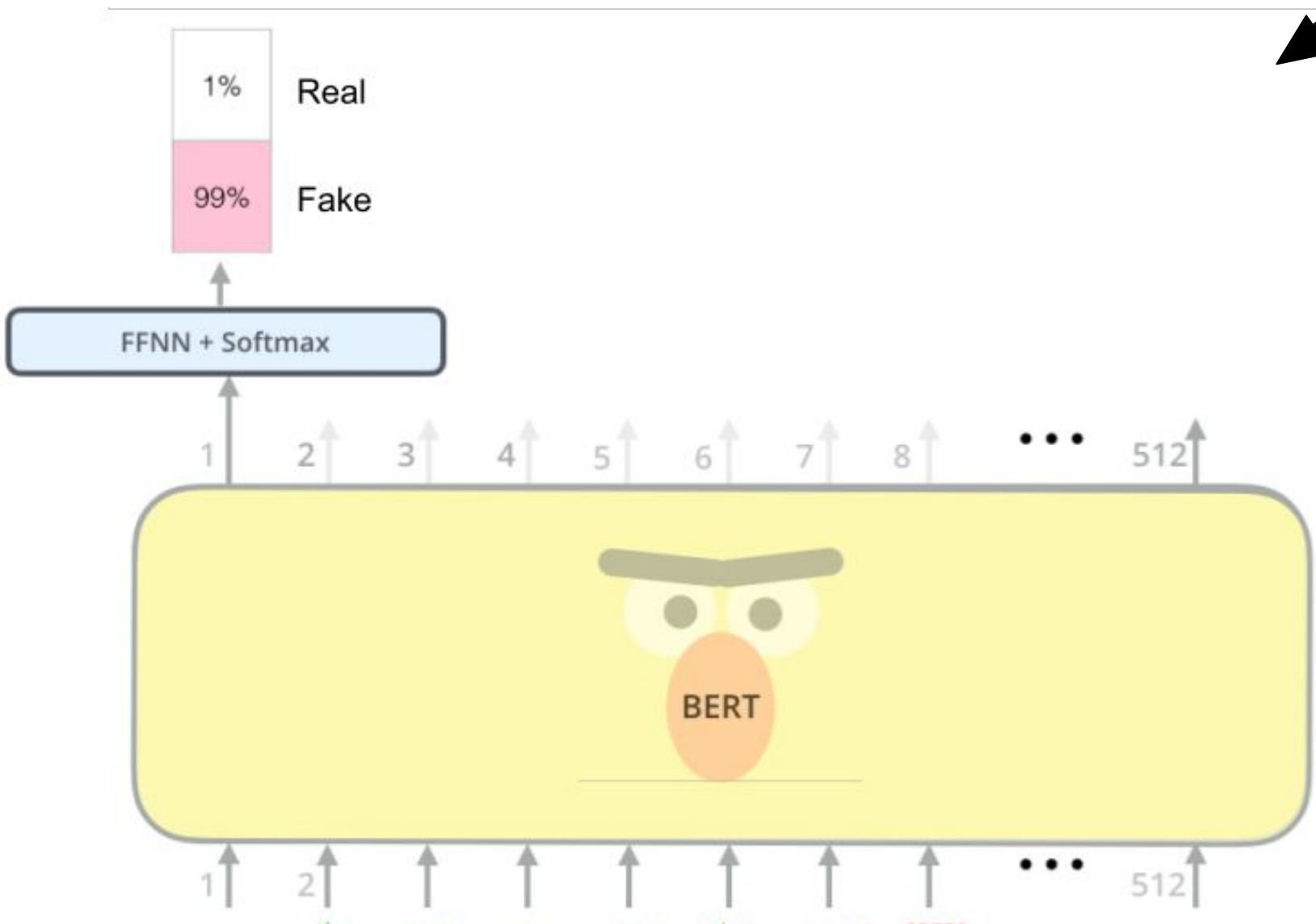
<https://colab.research.google.com/drive/10tbBn3AYZmwozdlv7eUU18n5cyHFN-If>



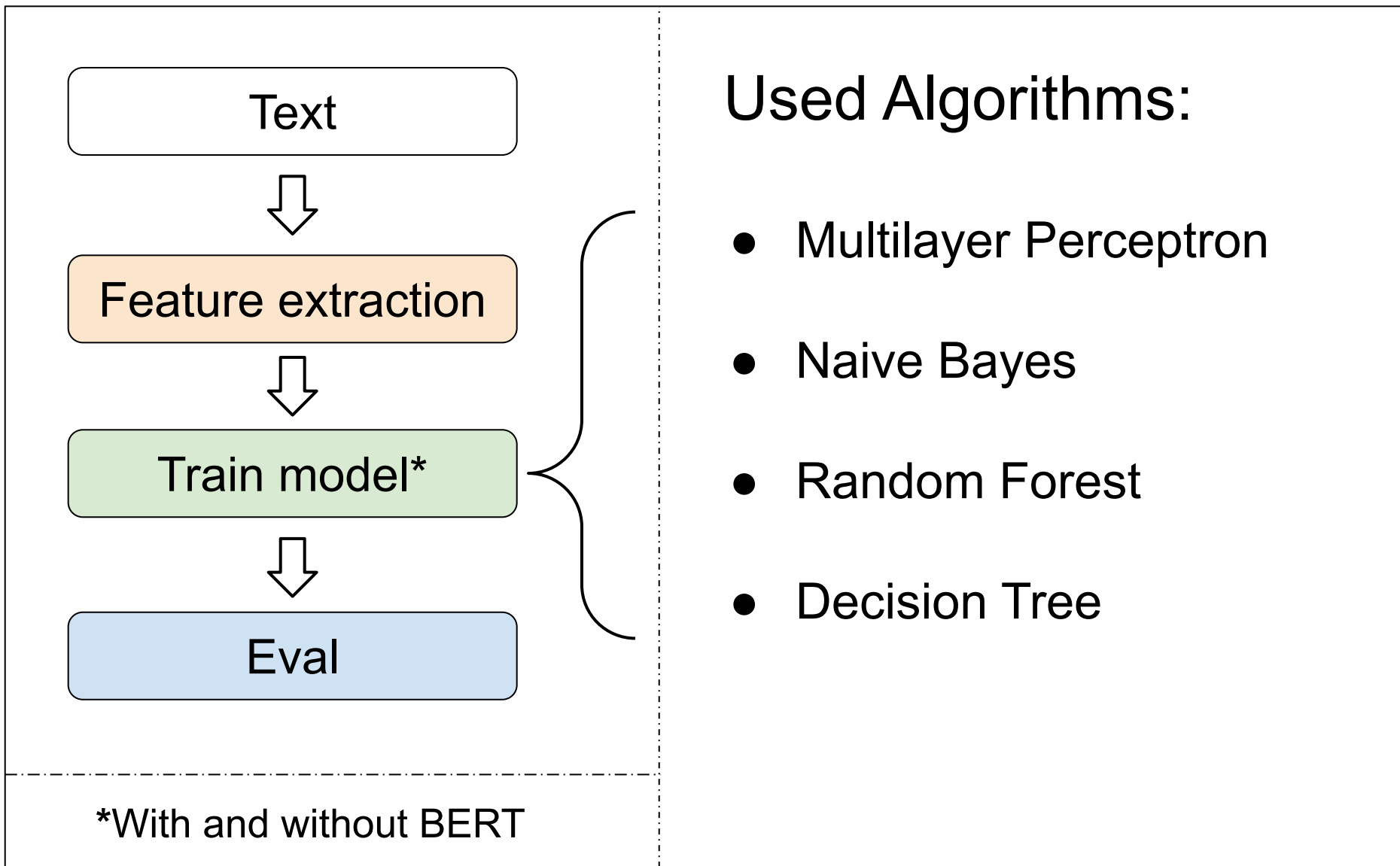
Feature extraction

- Sentiment analysis
- Word count
- Character count
- The number of sentences
- Text analysis (BERT)
- Sentences length
- Punctuation
- Number of URLs
- NER
- POS

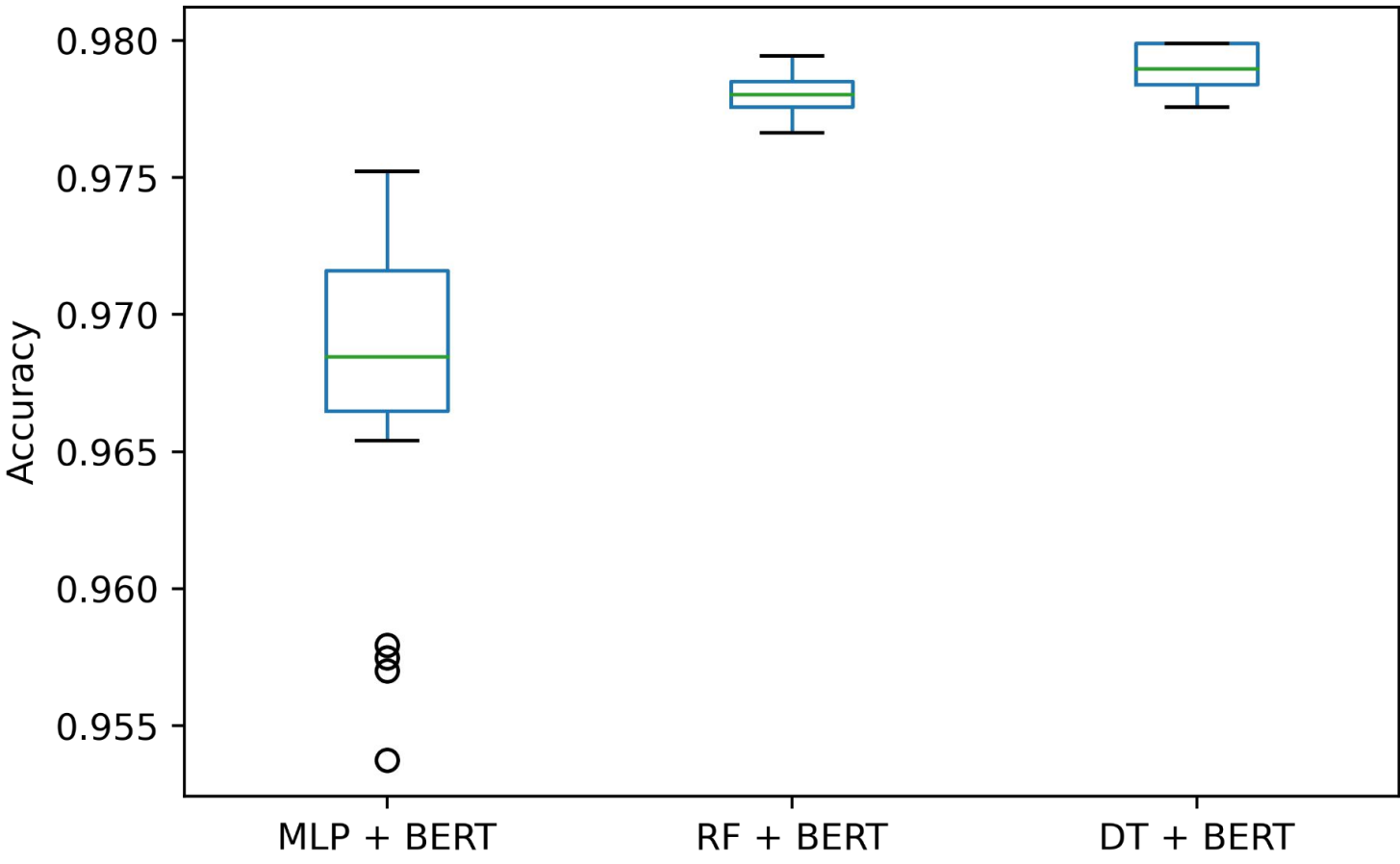
BERT transformer



Classic Machine Learning Algorithms



Model's accuracies using BERT as a feature



Abbreviations:

- **RF:** Random Forest.
- **MLP:** Multilayer Perceptron.
- **NB:** Naive Bayes.
- **DT:** Decision Tree.
- **LR:** Logistic Regression.
- **SVM:** Support Vector Machine.
- **GDBT:** Gradient Boost.
- **TC:** Transformer Combination with soft voting. RoBERTa+XLM-RoBERTa+XLNet+DeBERT.
- **BERT:** BERT transformer.

Results

Model	Accuracy ↑	Precision ↑	Recall ↑	F1-score ↑
BERT	97.52	96.51	98.83	97.66
NB	80.23	82.18	79.46	80.80
MLP	87.26±0.0092	85.96±0.0138	90.46±0.0082	88.14±0.0076
RF	92.75±0.0017	91.22±0.0023	95.31±0.0029	93.22±0.0016
DT	86.68±0.0029	86.75±0.0027	88.00±0.0054	87.37±0.0030
NB + BERT	97.24	96.74	98.04	97.38
MLP + BERT	96.75±0.0060	95.52±0.0079	98.40±0.0035	96.94±0.0056
RF + BERT	97.80±0.0007	97.02±0.0013	98.82±0.0004	97.91±0.0007
DT + BERT	97.93±0.0007	98.04±0.0009	98.00±0.0020	98.02 ±0.0007

Baseline

Model	Accuracy ↑	Precision ↑	Recall ↑	F1-score ↑
DT(Patwa et al., 2021)	85.37	85.47	85.37	85.39
LR(Patwa et al., 2021)	91.96	92.01	91.96	91.96
SVM(Patwa et al., 2021)	93.32	93.33	93.32	93.32
GDBT(Patwa et al., 2021)	86.96	87.24	86.96	86.96
TC(Das et al., 2021)	98.31	98.31	98.31	98.31