DeepSentiment:

Tweet Sentiment Analysis using BERT-based models & LLMs

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Introduction

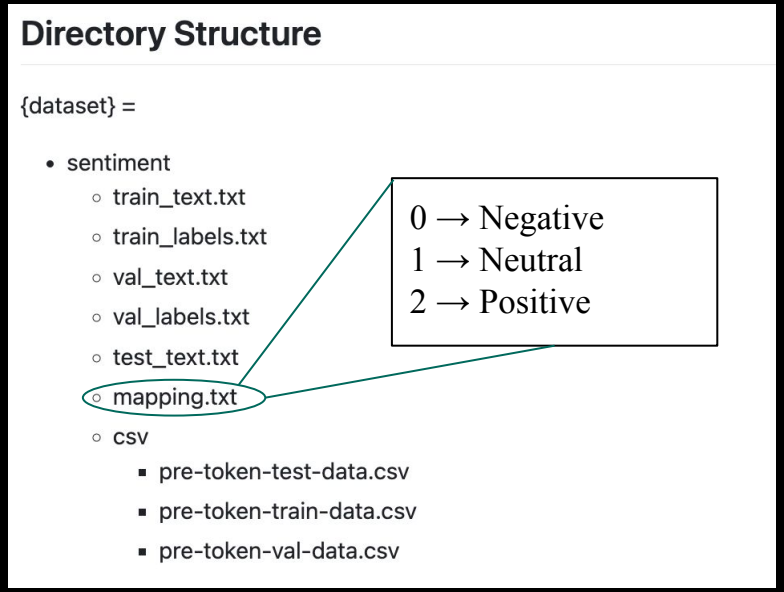
- Tweets are seems to have at least some predictive power and influence in the financial markets and our world!

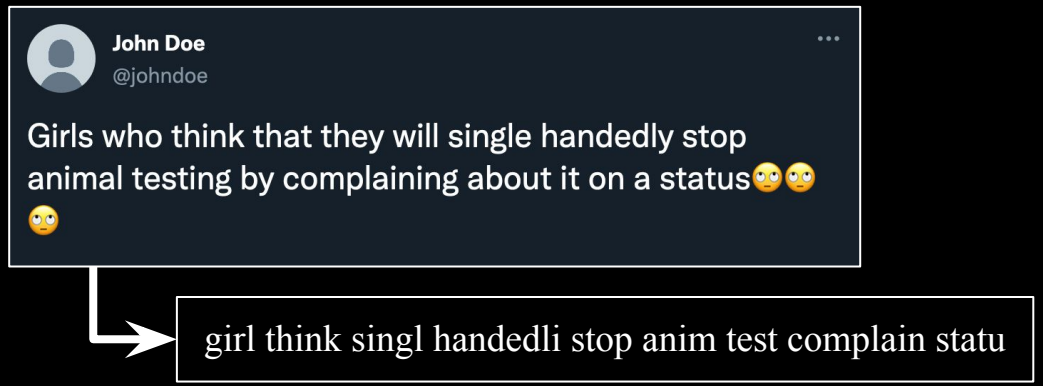
- **Goal:** Analyze predictive accuracy of BERT-based models, and LLM-based deep learning methods in the task of predicting sentiment of tweets.

Data & Preprocessing

- Our dataset comprises tweets extracted from the TweetEval benchmark, specifically focusing on the sentiment subset.
  - **Training data:** 45615 tweets
  - **Validation data:** 2000 tweets
  - **Testing data:** 12284 tweets

- **Preprocessing:**
  - Removing special characters & unnecessary words
  - Expanding contractions





Models

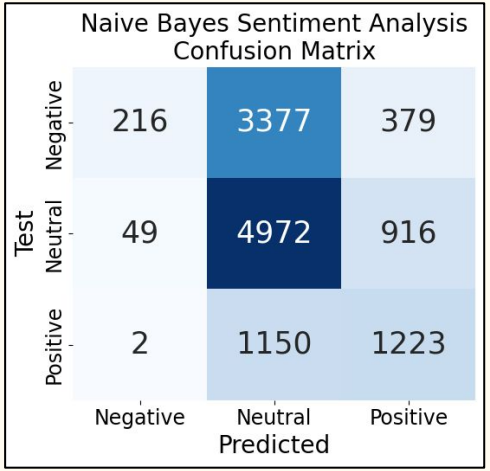
Transformers, Transformers everywhere!

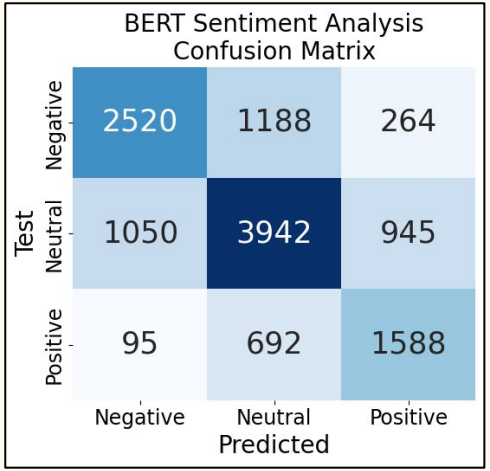
- `naive-bayes`
- `bert-base-uncased`
- `roberta-base`
- `phi-3 mini` (few shot)

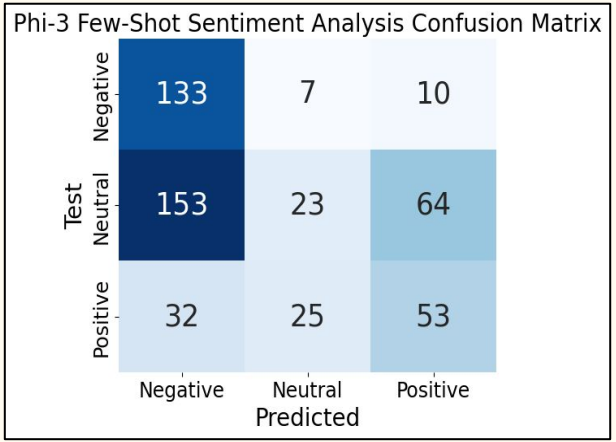
Results & Analysis

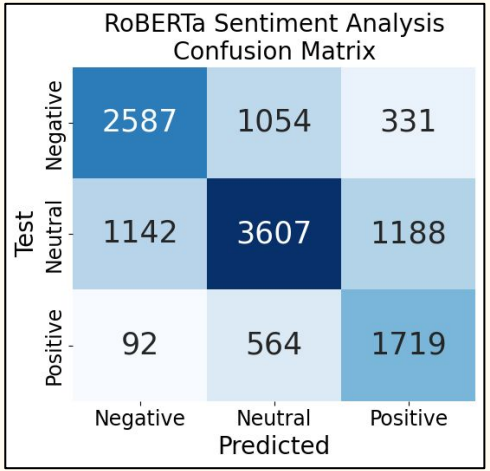
Comparative Metrics for Sentiment Classification on the Test Set: BERT / RoBERTa			
	Precision	Recall	F1
Negative	0.69 / 0.59	0.61 / 0.80	0.65 / 0.68
Neutral	0.65 / 0.71	0.73 / 0.55	0.69 / 0.62
Positive	0.64 / 0.63	0.57 / 0.60	0.61 / 0.61

Model	Sentiment Classification Accuracy on the Test set
BERT	0.655
RoBERTa	0.644
Naive Bayes	0.52
Phi-3*	0.418









Future Work

- Exploring the comparative efficacy of zero/one/few-shot learning and different LLMs
- Fine tuning some other hyperparameters using a more powerful & efficient compute resource
- Having a multi-agent LLM framework with an orchestrator and some specialised agents to better suit our task
- Using Generative Adversarial Networks (GANs) to predict tweet sentiments

References

[1] TweetEval Benchmark and Associated Papers: https://github.com/cardiffnlp/tweeteval

[2] BERTweet Paper: https://paperswithcode.com/paper/bertweet-a-pre-trained-language-model-for

[3] Hugging Face's FacebookAI/RoBERTa-base Model: https://huggingface.co/FacebookAI/roberta-base

[4] V. Mahalakshmi, P. Shenbagavalli, S. Raguvaran, V. Rajakumareswaran, E. Sivaraman, Twitter sentiment analysis using conditional generative adversarial network, International Journal of Cognitive Computing in Engineering, Volume 5, 2024, Pages 161-169, ISSN 2666-3074, https://doi.org/10.1016/j.ijcce.2024.03.002.

[5] Hugging Face's Microsoft/Phi-3-mini-128k-instruct : https://huggingface.co/microsoft/Phi-3-mini-128k-instruct