MICHIGAN ENGINEERING
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Left, Right, or Neutral? Run it Bias First!

Political Bias Article Classification using Supervised and Unsupervised Learning

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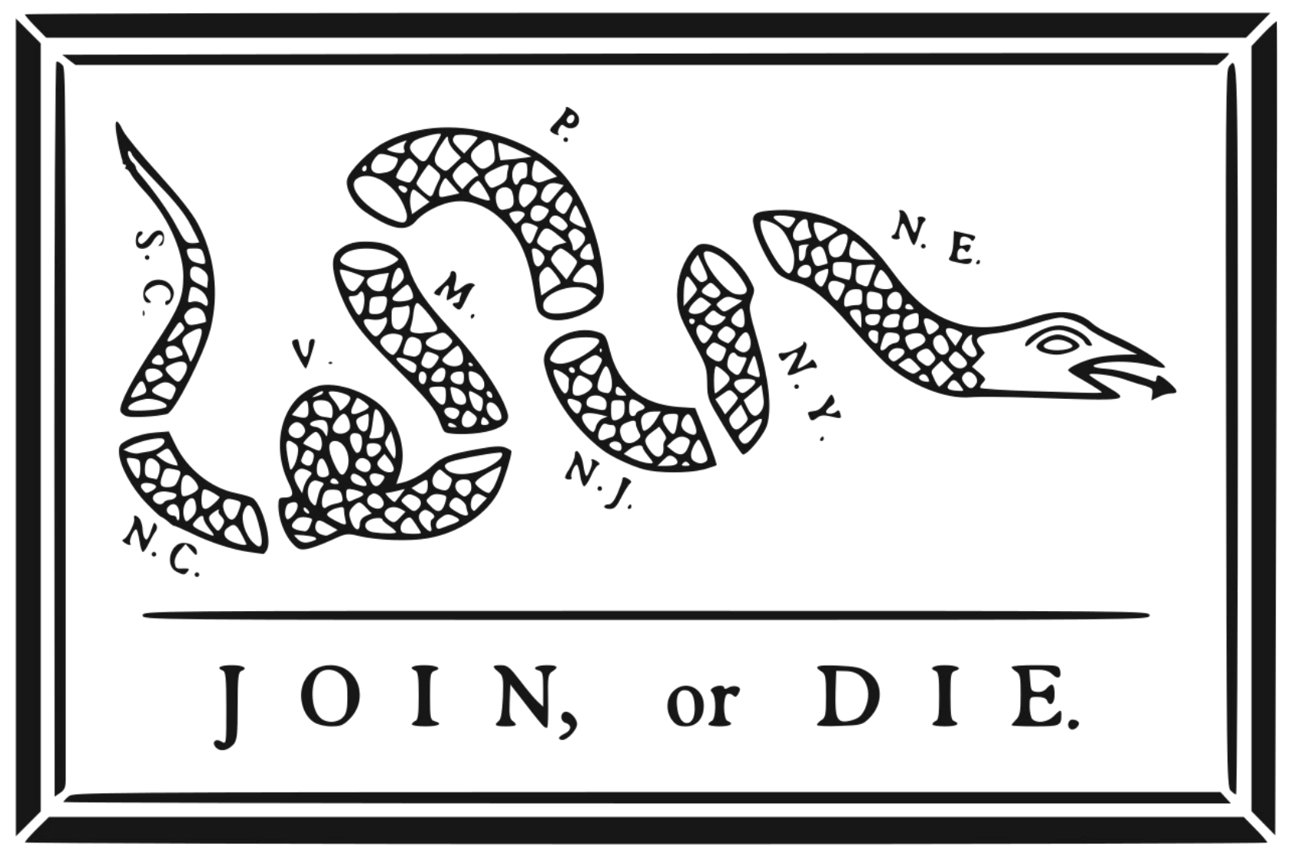
Introduction



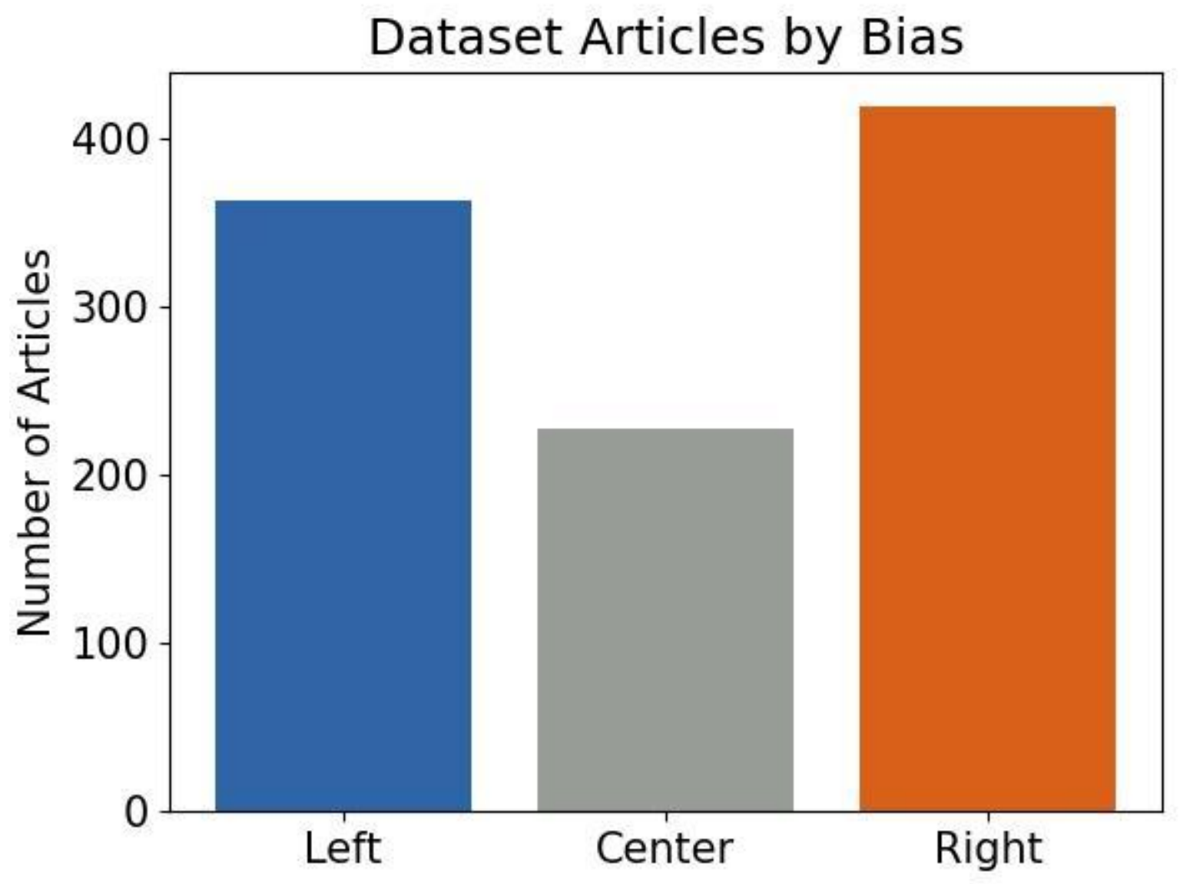
In today's increasingly polarized political environment, media contains subliminal messaging through word choice and phrasing that is inherently biased towards a specific narrative.

Goal: Political bias detection with minimal injection of human bias into training data.

Dataset

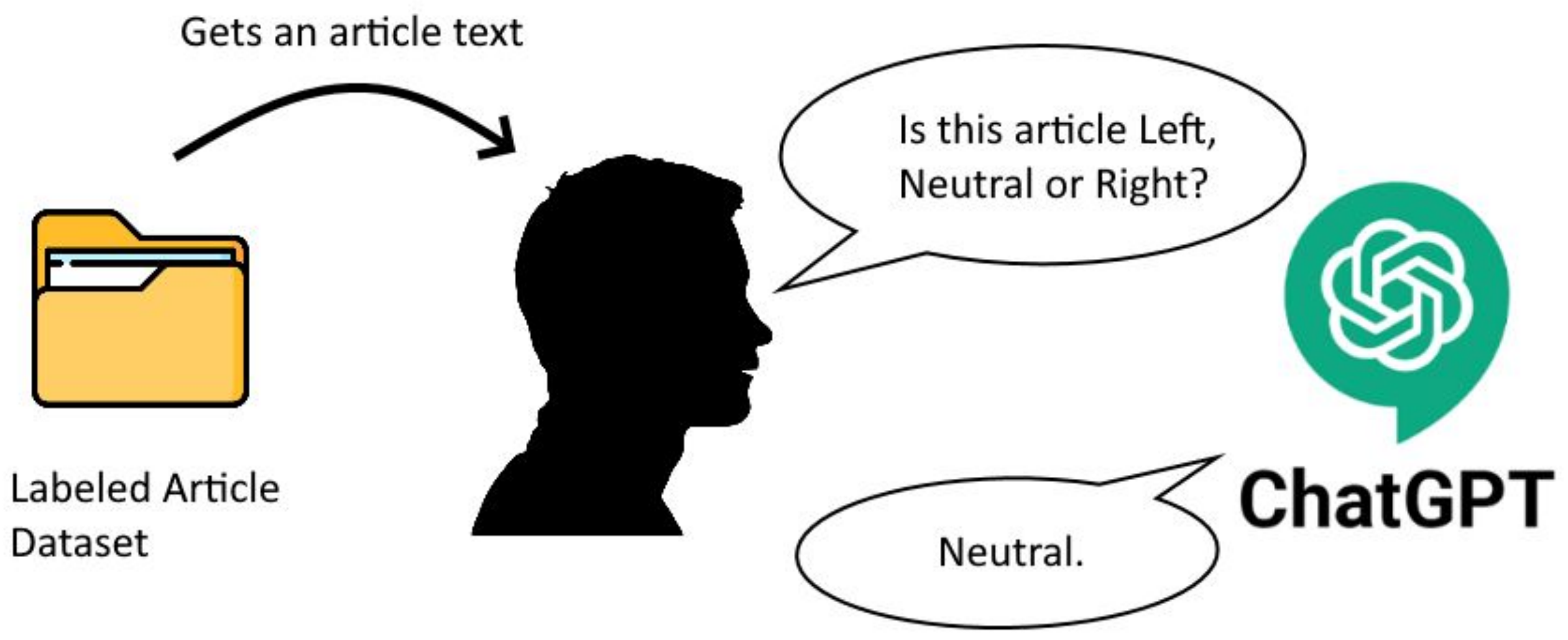
MBIC (Media Bias Including Characteristics) dataset from Kaggle was used.

Articles were parsed for text using **Newspaper3k** Python Package.

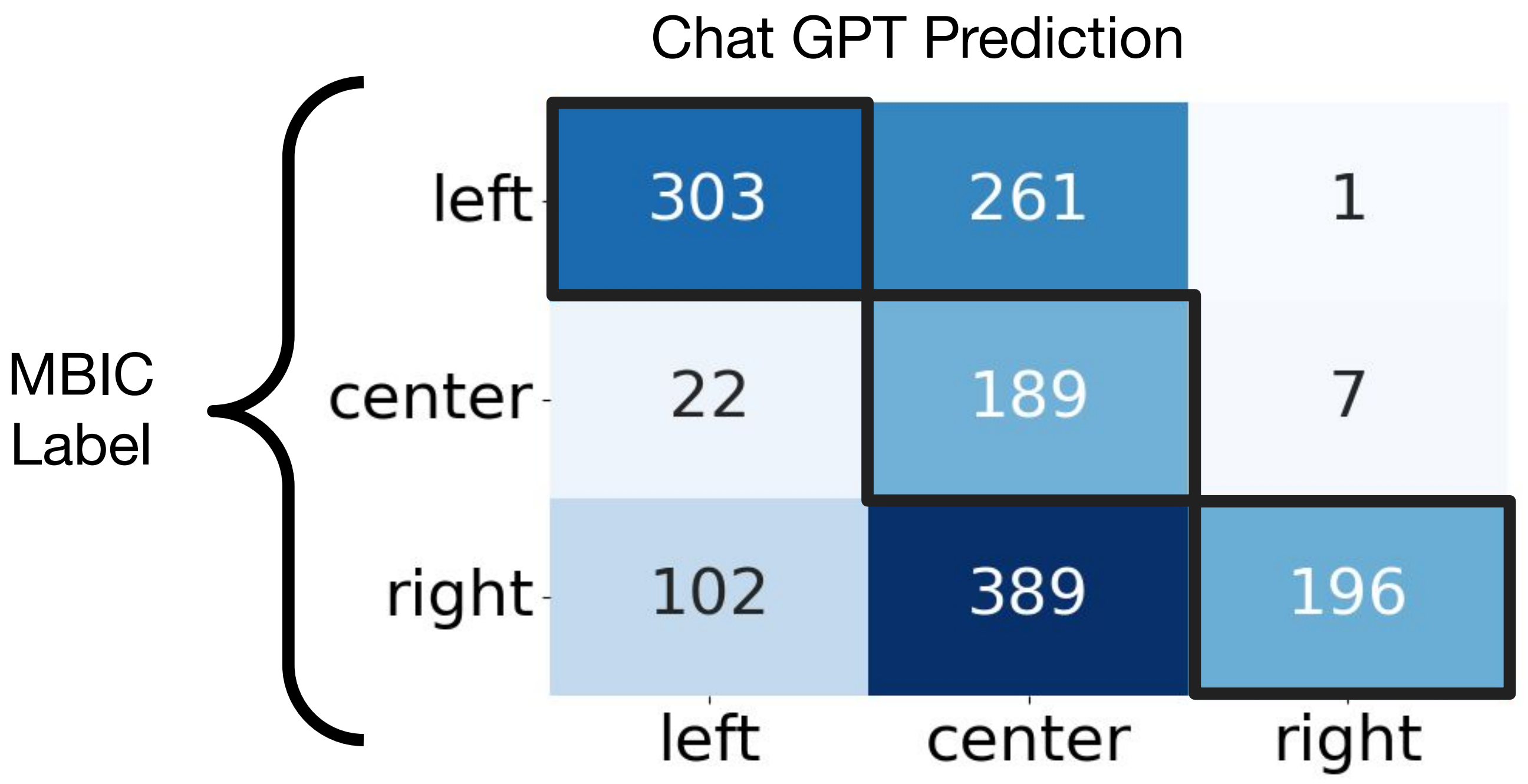


Unsupervised Methods

Ask ChatGPT: We explored ChatGPT's capabilities for classifying articles as politically left, neutral or right on a sentence level and an article level (first 4096 tokens)



Unsupervised Results



Chat GPT Prediction

MBIC Label	left	center	right
left	303	261	1
center	22	189	7
right	102	389	196

- ChatGPT achieved **46.8% accuracy** on political alignment
- Majority of articles were classified as Neutral by ChatGPT
- **83.1%** of misclassified articles were predicted as Neutral.
- ChatGPT performs worst in classifying Politically Right articles

Supervised Methods
BERT and GPT-2

Preprocessing Text: Removal of punctuation and non utf-8 characters. Stop words maintained for context around keywords.

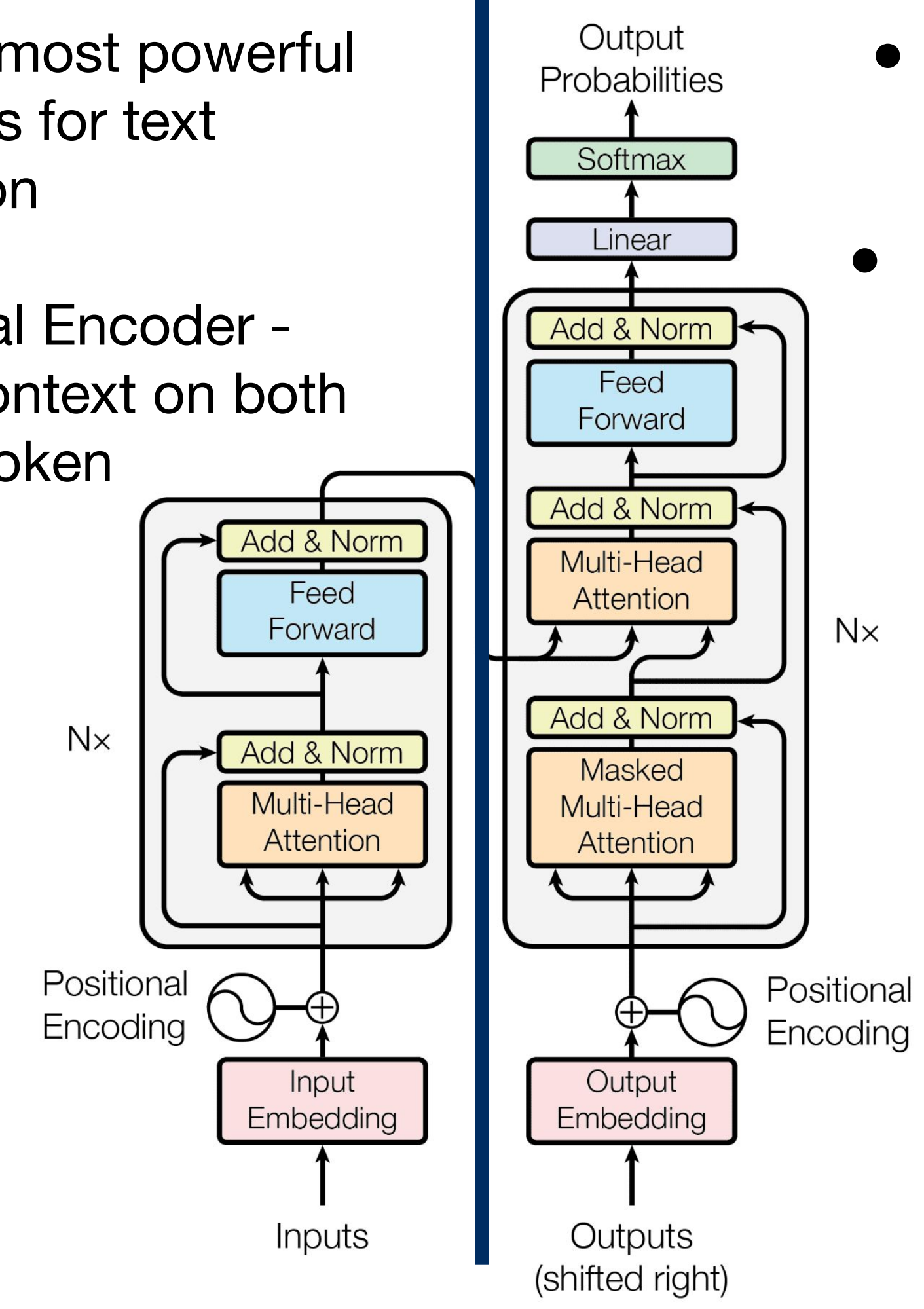
Transformer Models for Natural Language Processing (NLP)

BERT
Bidirectional Encoder Representations from Transformers

- Developed by Google
- One of the most powerful NLP models for text classification
- Bidirectional Encoder - captures context on both sides of a token

GPT-2
Generative Pre-trained Transformer 2

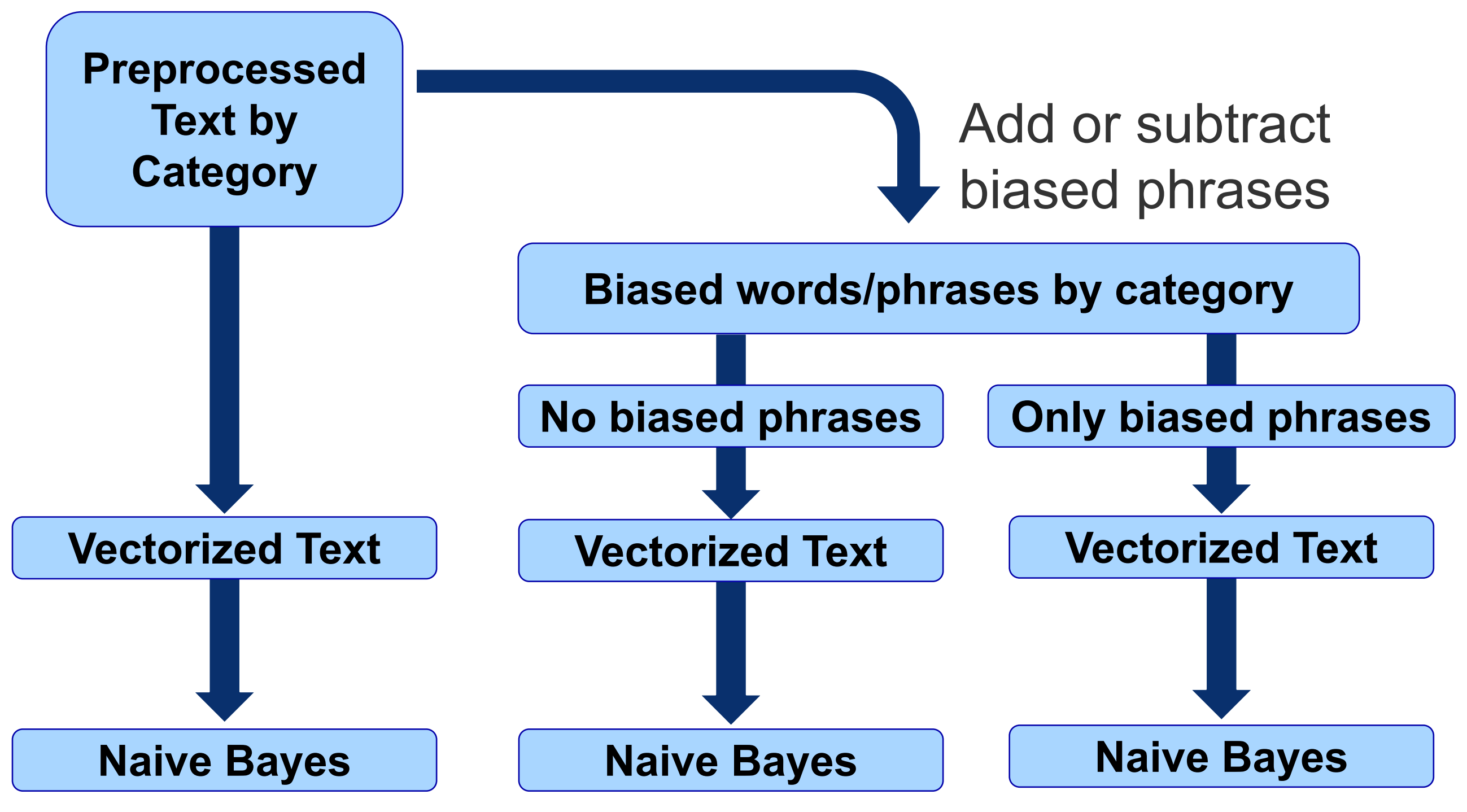
- Developed by OpenAI
- Traditionally used for text generation
- Can handle longer text sequences than BERT
- Unidirectional model



Fine-tuning and Hyperparameter Search

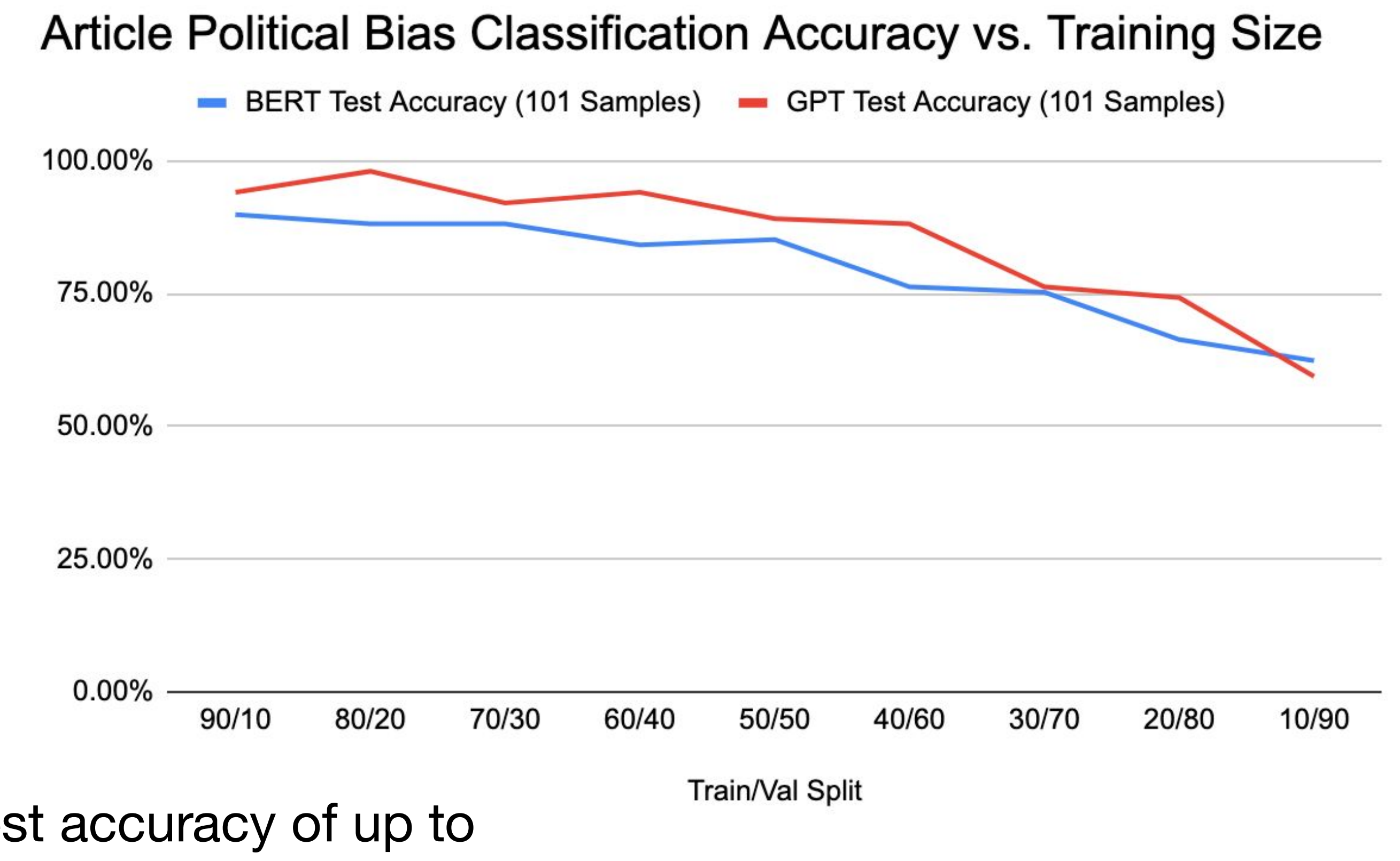
- BERT and GPT-2 pre-trained models fine-tuned for article political bias classification with appended fully connected layers
- Used a variety of train/test splits to evaluate accuracy vs. training data size
- Sigopt used for hyperparameter tuning to optimize performance
- Weight decay and dropout on the final classification layer were used to prevent overfitting

Naive Bayes Methods



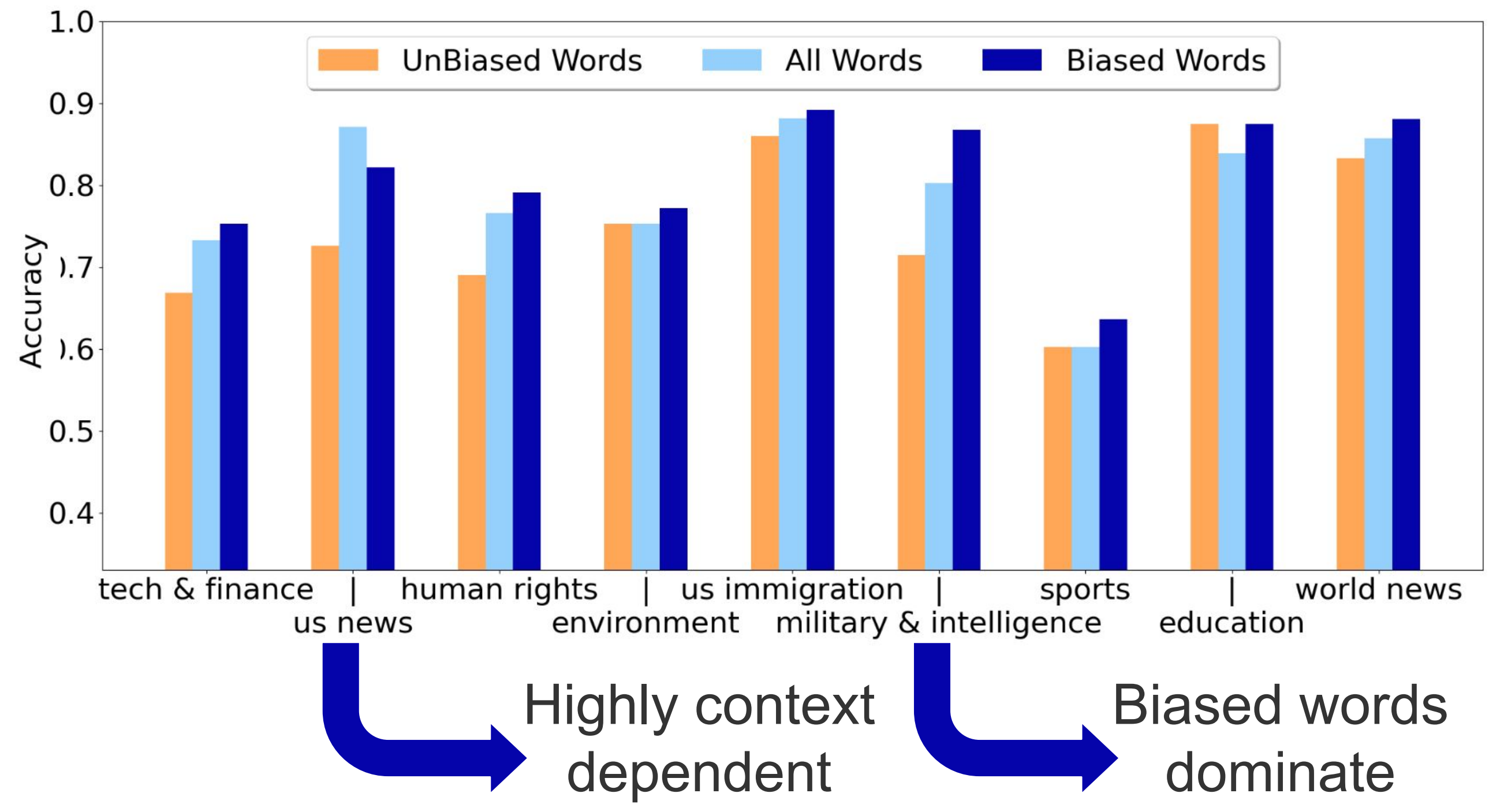
- Biased words were parsed by eliminating stopwords
- Categories were generalized to nine overarching news segments

Supervised Results
BERT and GPT-2



- Test accuracy of up to
  - 89.87% (BERT model)
  - 98.02% (GPT-2 model)
- The GPT-2 model performed better than BERT for most train/val splits
- This very high accuracy likely was reached due to the very polarized MBIC dataset

Naive Bayes Results



- Lowest accuracy: Sports are generally not highly biased
- Most stable: Education
- Most volatile: U.S. News and Military & Intelligence

Future Work

- Further evaluate supervised results for method inconsistencies and BERT/GPT-2 model feature selection
- Re-training and evaluating supervised classification when training data is injected with further human bias
- Further Naive Bayes Optimization with hyperparameter tuning
- Fine-tune ChatGPT (GPT-3.5 or GPT-4) model for improved classification accuracy

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