



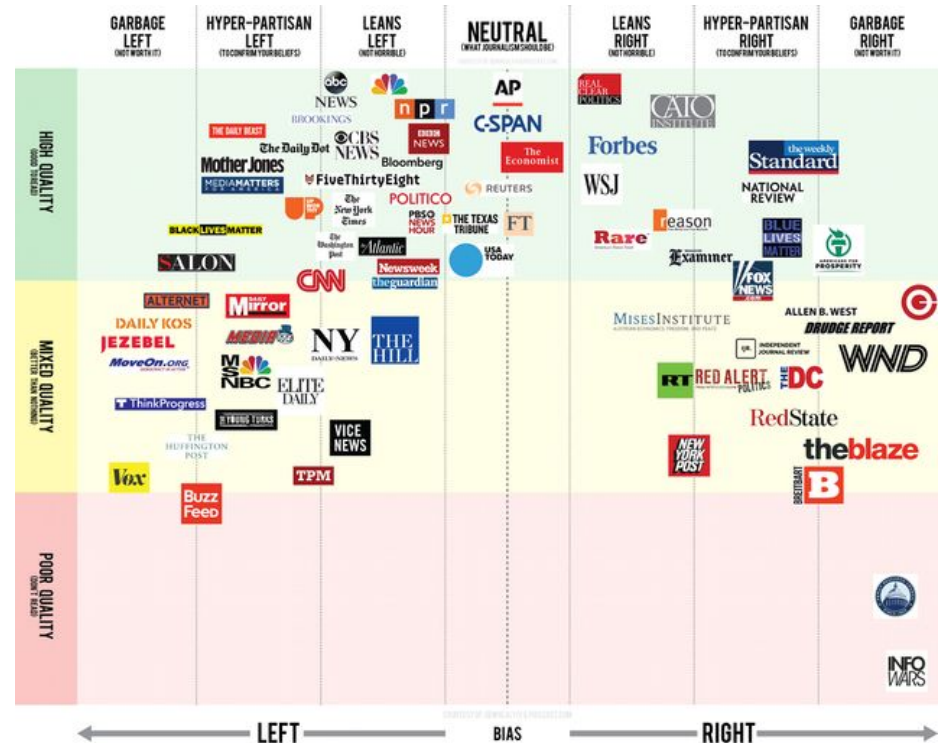
Sentence Level Detection of Ideological Bias

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Introduction

- Can we detect bias or political lean in news articles?
- Is this a problem?
 - Foreign party actors
 - “Fake News”
 - Political silos on social media
 - New news sources and consumption methods
- Create a more informed news consumer

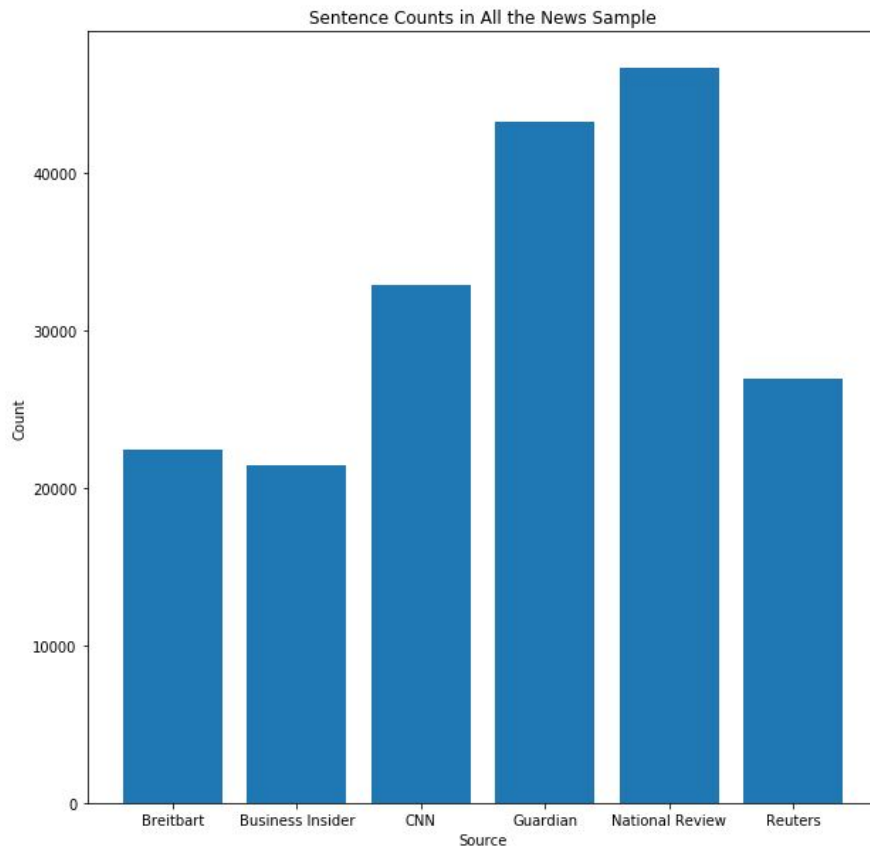


Previous Work

- Iyer et. al, 2014
 - Used keyword filtering/crowdsourcing to create dataset of polarity-labeled sentences (liberal, conservative, neutral)
 - Predicted polarity with 69% accuracy using recursive neural networks with word2vec embeddings.
- Dehghani et. al, 2017
 - Described technique called “weak supervision” to generate predictions for tasks with large amounts of unlabeled data and small amounts of labeled data
 - Achieved between 61% and 73% accuracy for various implementations of this technique when predicting the sentiments of tweets.

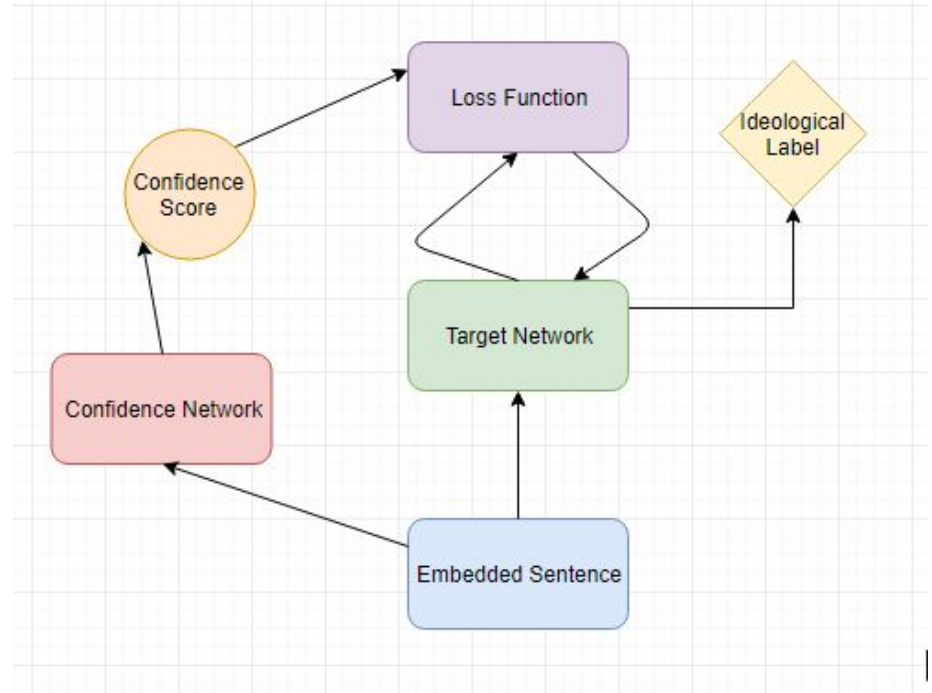
Data

- Ideological Books Corpus
 - Iyer et al., 2014
 - 4,326 sentences from magazine/book articles with definite polarity labels
 - 1,701 conservative
 - 2,025 liberal
 - 600 neutral
- All The News Dataset
 - Kaggle
 - Up to 5 million sentences from various news sources
 - We generated “weak” labels for these sentences



Architecture - Weak Supervision

- Approach outlined by Dehghani et al., 2017
- Train a “confidence” network to predict the difference between the “weak” label and the “true” label.
- Use that difference to weight the loss function when updating the parameters of the “target” network that predicts the true label.
- Finally, use the trained “target” network to assess the accuracy of the predictions for the data with true labels.









Weak Annotator

Logistic regression bag of words model trained on sentences from articles posted to ideologically focused Reddit pages

- Conservative: /r/conservative
- Liberal: /r/liberal, /r/progressive
- Neutral: /r/neutralnews

Training set balanced to include around 39k sentences for each label

Model-predicted class probabilities used to generate confidence scores for confidence network

	Boomerang: Since Left's Boycott Began, Ingraham Viewership Up 20% (newsbusters.org) submitted 5 hours ago by Tawana_Brawleys_Dad  4 comments share save hide report [I+c]
	Here's what the GOP tax bill won't do for middle class families. Republicans made a lot of promises they can't keep. (thinkprogress.org) submitted 3 hours ago by easyone  comment share save hide report [I+c]
	Supreme Court tosses out DOJ case against Microsoft thehill.com Submitted 5 hours ago by CarolinianRevolution  8 comments share save hide report [I+c]

Example article submission from /r/conservative (top), /r/liberal (middle), and /r/neutralnews (bottom).

Results

Model	Test Accuracy
Logistic regression	51.90%
CNN	54.01%
CNN with weak supervision	54.23%

- Cost Function: Cross-Entropy Loss
- Train time is a concern
- Further epochs could lead to better results
- Hyperparameter Tuning
- Confusion matrix analysis:
 - Neutral examples underweighted
 - Liberal examples most accurate

