Analyzing Polticial Bias through A User-Friendly Interface

Colin Lightfoot

12/8/2017

Overview

Problem

1. Many news outlets report stories with biased undertones.
2. Some hide facts to present a specific argument.
3. The average person lacks the time to see multi-faceted stories.

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2. Recent studies have found neural networks to classify text accurately.
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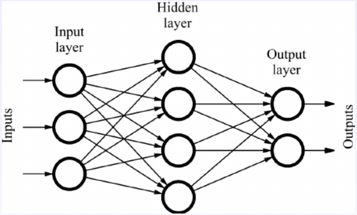
Related Work

- Iyyer et al. created political bias classifiers using Recursive Neural Network (RNN) models with Long Short Term Memory (LSTM) nodes with a high degree of accuracy.[1]
- Stanford researchers Arkajyoti Misra and Sanjib Basak showed that RNNs with LSTM nodes can also predict implicit political bias.[2]

Introduction to Neural Networks

- Algorithms modeled after the brain.
- Organized into layers with interconnected nodes.
- Weighted edges connect nodes.
- Layers are successively computed based off computations from the lower layers.
- Nodes transform input using an activation function and then outputs result.



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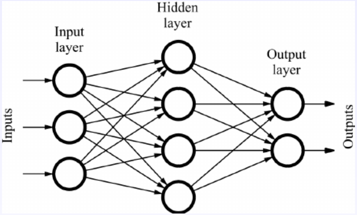

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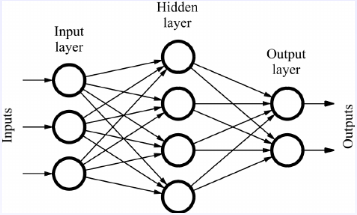

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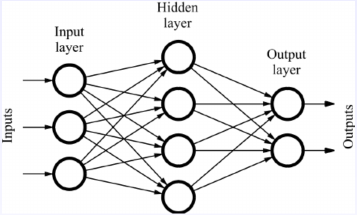

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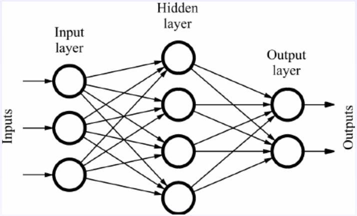
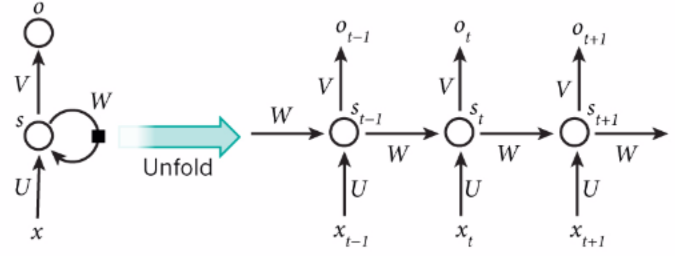


Recurrent Neural Networks

- Designed to make use of sequential information.
- Perform same computations for every element in a sequence.
- The output is dependent on the model's previous recurrences.
- RNNs can have dependent output since nodes hold previous calculations.



An unfolded recursive neural network

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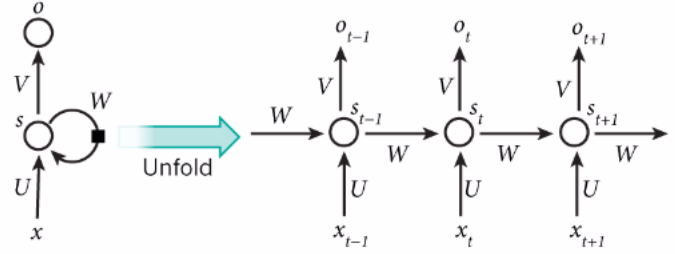

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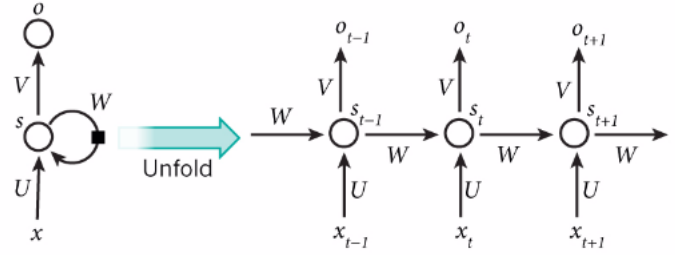

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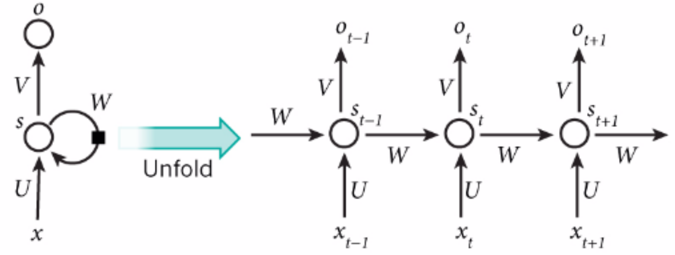

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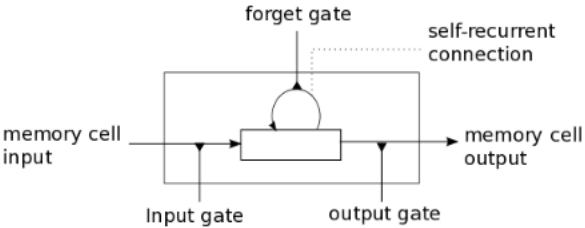
LSTM Nodes

- Retains standard node properties.
- Prevents exploding and vanishing gradient dilemmas during edges' weight training.
- Has a chance to "forget" its current state.
- Otherwise remembers state for next recurrence.



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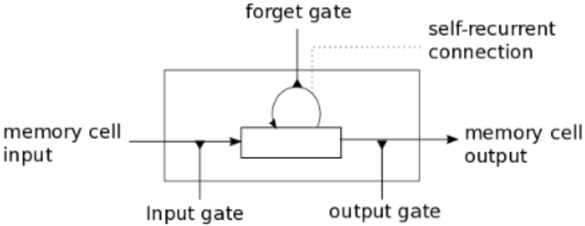

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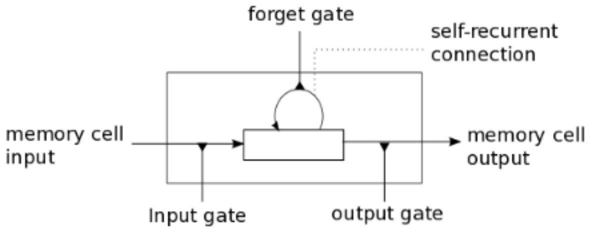

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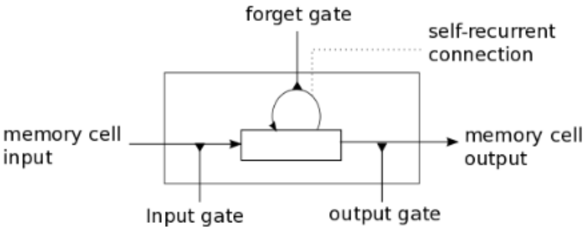
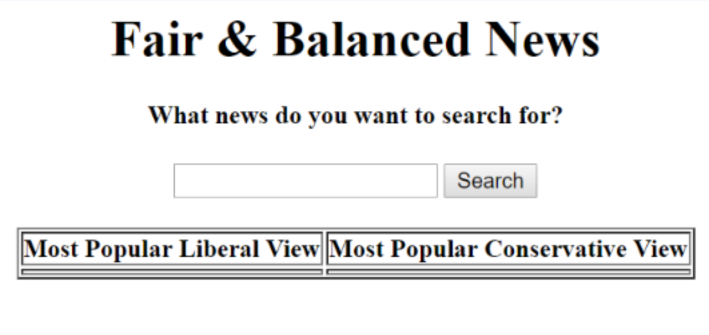


A simple LSTM node.

Implementation

- User searches a news topic.
- Web scraper searches queried article results.
- Articles are run through RNN.
- Cycle repeats until RNN finds both a liberal and a conservative article.



The user interface for my project.

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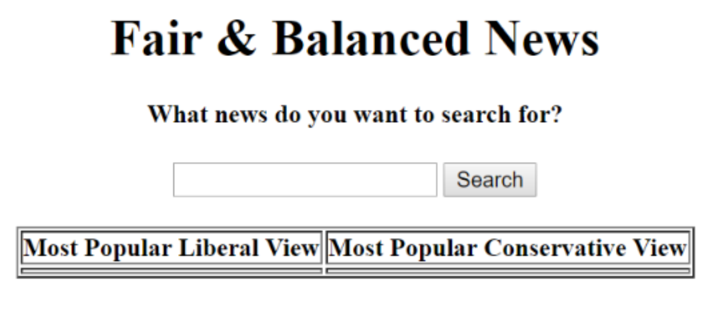

Figure 7: The user interface for my project.

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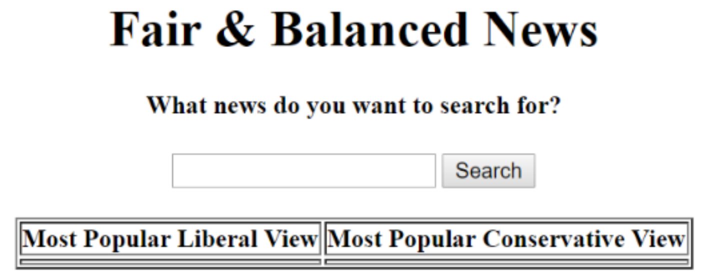

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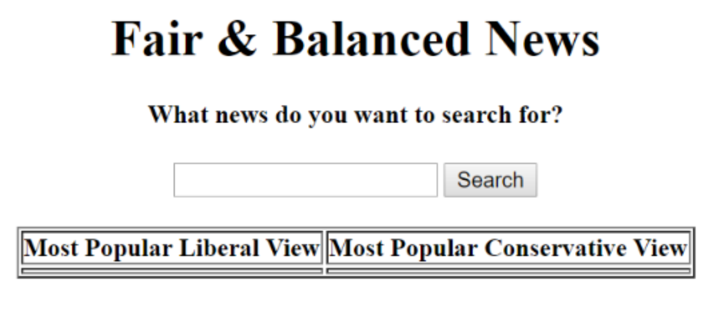

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F1 Score

Precision is measured as

$$\frac{true\ \ positives}{false\ \ positives + true\ \ positives},$$

while recall is measured as

$$\frac{true\ \ positives}{false\ \ negatives + true\ \ positives}.$$

Measuring the amount of false positives and false negatives shows model's ability to not predict Type I and II errors.
The formula for calculating the F1 Score is:

$$F1\ \ Score = 2 \times \frac{precision \times recall}{precision + recall}.$$

Evaluation

- F1 Score: 0.90
- Overall Accuracy: 57.49%
- Conservative Accuracy: 57.065%
- Liberal Accuracy: 65.625%

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Possible Noise

Possible Noise:

- Various-sized datasets
- Complexity of language
- Small sentence sizes

Future Work

- Continue tuning RNN
- Collect larger datasets
- Scrape more news outlets
- Run against other algorithms
- Better user interface

Conclusion

Thank you professors Deverick and Lewis, as well as my friends and family for helping me complete this project! I was able to apply knowledge learned throughout my time here to create a useful and easy-to-use webpage that helps people understand the political atmosphere surrounding a news event.

References

Mohit Iyyer, Peter Enns, Jordan Boyd-Graber, Philip Resnik. *Political Ideology Detection Using Recursive Neural Networks* http://www.aclweb.org/anthology/P/P14/P14-1105.pdf

Arkajyoti Misra and Sanjib Basak. *Political Bias Analysis* https://cs224d.stanford.edu/reports/MisraBasak.pdf