Capstone Project
Leah Pope

Learning During COVID-19 Sentiment Classifier

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Hello!

I'm Leah Pope

https://github.com/lspope

leah@metisconsultingllc.com

https://leahspope7.medium.com

https://www.linkedin.com/in/leahspope

This project explores the question...

"What is the public sentiment in the United States on K-12 learning during the COVID-19 pandemic?"

Methodology

◎ 30,599 Tweets from Users across the US

- ○ Collected via Twitter Stream & Queries

- ○ Kaggle <u>Tweets about Distance Learning</u>

- ○ Filtered out non-US Tweets

◎ Label sentiment - Positive, Negative, Neutral

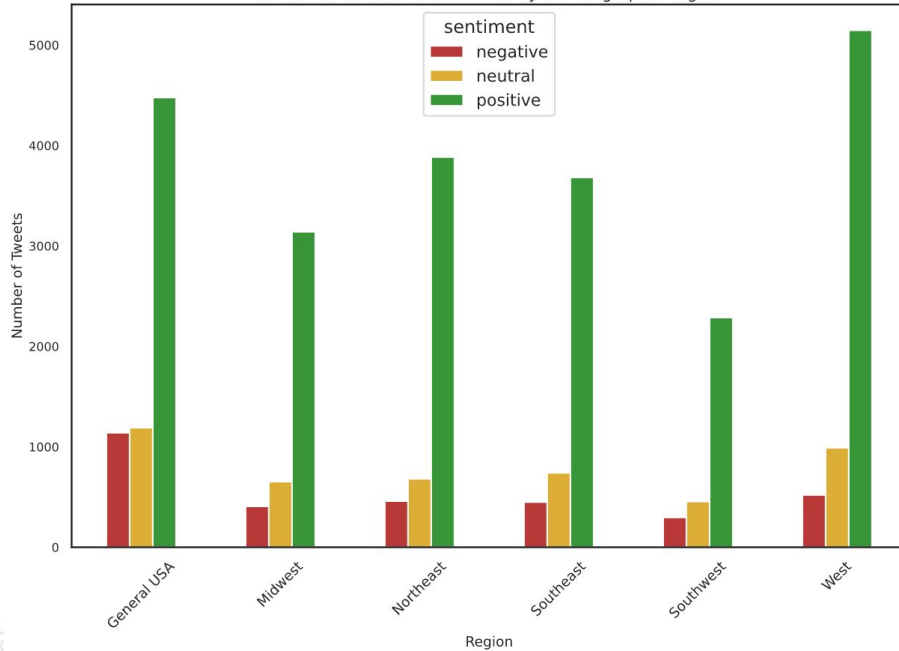- ○ Human & Sentiment Tools

- ○ Use sentiment where Tools agree

Methodology

◎ Discover trends using EDA

  ○ Topic Modeling using Unsupervised Machine Learning to organize Pos/Neg/Neutral Tweets into topics

◎ Create multiclass (Pos/Neg/Neutral) classifier

  ○ Natural Language Processing

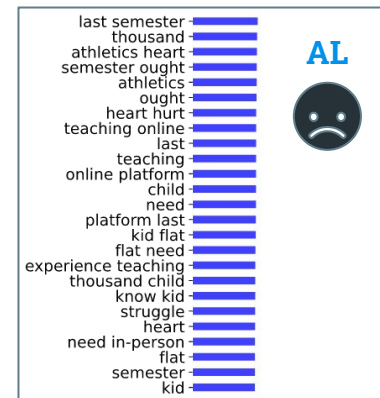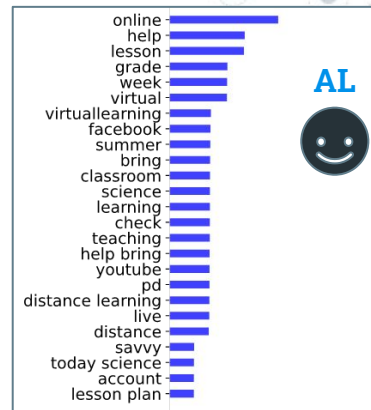 ○ Supervised Machine Learning
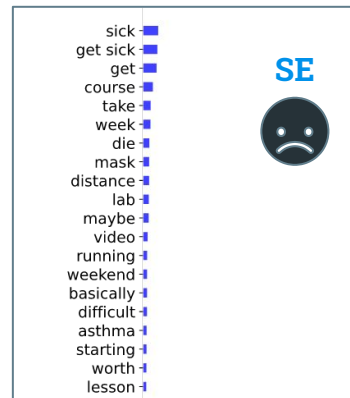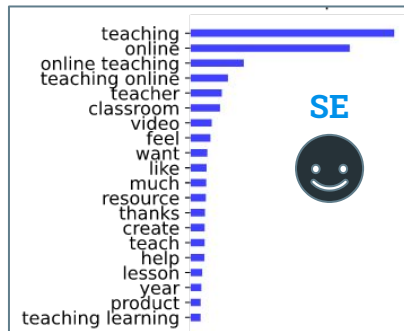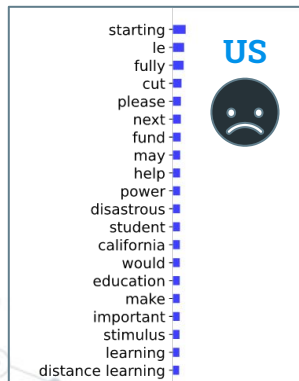
Exploratory Data Analysis

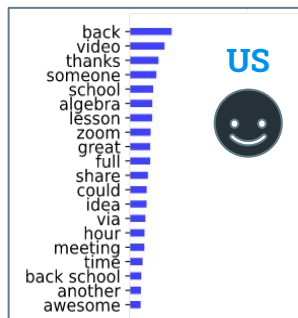Sentiment Breakdown of Tweets by US Geographic Region

◎ Vast majority of Tweets have Positive sentiment

◎ True for every Region and every State in every Region

◎ Suggests that Twitter being used to communicate positive statements on K-12 Ed during COVID

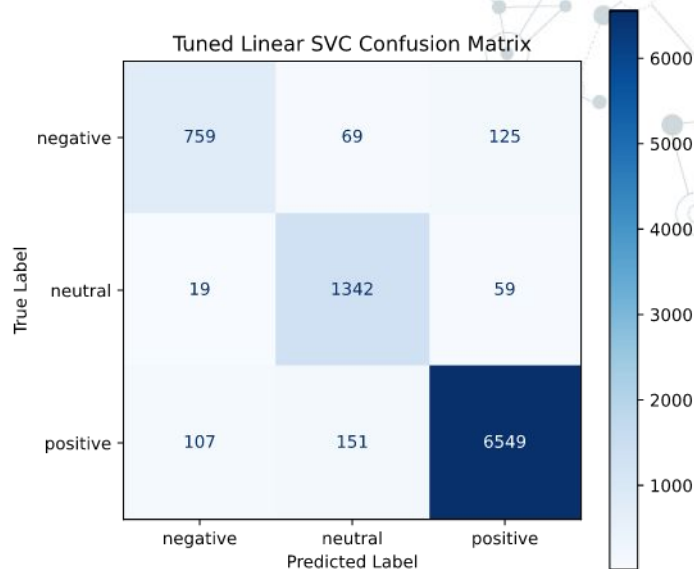◎ Explore the Topic Models for more context on Tweet content

Topic Modeling

◎ Use Topic Modeling vs Word Clouds to analyze Tweet content

Classifier

◎ Good performance achieved!
  ○ Weighted F1 Score **94%**
  ○ Balances Precision & Recall

◎ *Confusion Matrix* shows the # of times Classifier made **correct** predictions and # of times it made **wrong** predictions
  ○ Negative: 759 correct (out of 953)
  ○ Neutral: 1342 correct (out of 1420)
  ○ Positive: 6549 correct (out of 6807)

Tuned Linear SVC Confusion Matrix

	precision	recall	f1-score	support
negative	0.86	0.80	0.83	953
neutral	0.86	0.95	0.90	1420
positive	0.97	0.96	0.97	6807
accuracy			0.94	9180
macro avg	0.90	0.90	0.90	9180
weighted avg	0.94	0.94	0.94	9180

Classifier Predictions

@jac___13 Sorry Jackie! I've kept our kids fully remote, even opting out of the hybrid model. I just can't trust other outside of my bubble right now. At least you guys in K-12 are in the earlier phases to get vaccinated. My wife in higher-Ed is not. I truly feel for educators right now.	☹
Parents! 🗣 @DaytonLive365 is offering a free "virtual field trip" for local K-12 students from Feb. 1 to March 14. Register here for access to stream Grammy-nominated duo, Black Violin: https://t.co/XR29EKm2TT https://t.co/mCb6W2vUZp	☺
Screw the open schools COVID movement for damaging the term open schools. An Open School is a K-12 self-directed democratic school. JCOS in Denver Colorado is the last Open School in USA. Here's an EP we released w/ a former student & teacher. https://t.co/3hJ2sGwMLD https://t.co/jbIfpO80UP	☹
There are two parts to the bill; the second would require districts to offer a 5 day per week, in-person option for all students, but only *after* the completion of vaccination phase 1b. K-12 teachers and staff are included in SDMAC\s 1b plan.	😐

Recommendations

For Education-focused Stakeholders:

EDA shows that Twitter is being used in the US to communicate primarily **Positive** statements on K-12 Ed during COVID

◎ Recommend Stakeholders explore the <u>Topic Modeling analysis</u> of these Positive Tweets for additional insight into content

EDA shows that West and Southwest Regions have a 'vocal' state, far exceeding others in # of Tweets. 'Vocal' states *are* the most populous in their Region **but** is it reasonable to have such a large lead?

◎ Recommend further Region/State population analysis to check for over-representation

Recommendations

For Data Scientists building upon this work:

The collected data has a class imbalance issue with 73.9% of the data labeled as Positive, 10.7% Negative, and 15.4% Neutral

- ◎ Recommend hyperparameter tuning uses the 'balanced' class_weight for LinearSVC or any other classification algorithm you may choose
- ◎ If class_weight is not an option, consider using Random Over Sampling to address the imbalance

Future Work

Dashboard Apps

◎ Customizable Topic Modeling
  ○ User selects specific Regions and/or States and desired # of topics and top words
◎ Classify streaming Tweets off Live Twitter
  ○ User selects Location & refines query

Improve Classifier Performance

◎ Collect more data & improve query terms

Thanks!

Questions?

leah@metisconsultingllc.com

Credits:
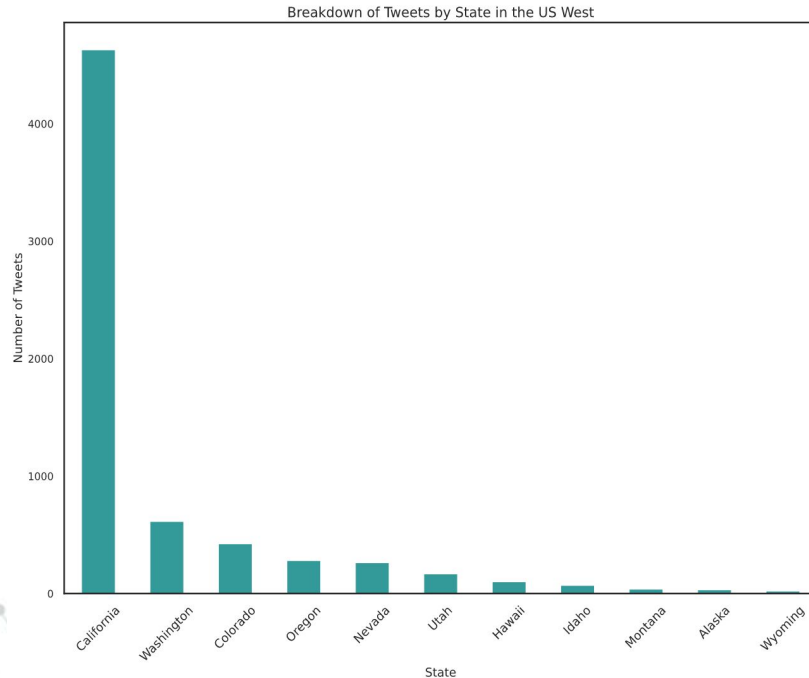
Additional Data: Kaggle Tweets about Distance Learning

Presentation template: SlidesCarnival

Photographs: Unsplash

APPENDIX

Exploratory Data Analysis

Breakdown of Tweets by State in the US West

◎ 2 Regions have a 'vocal' State (Tweet count far exceeds others)

◎ **West**: 69.6% of Tweets are from California, 9.3% from Washington

◎ **Southwest**: *(not shown)* - 71.50% of Tweets are from Texas, 18.40% from Arizona