Influenza Forecasting in Canada

Presented by: Jessica Moloney

About Me

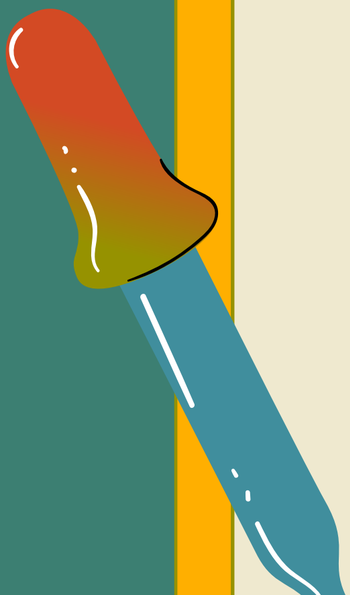
Psychology, Business Analytics and Quality Management

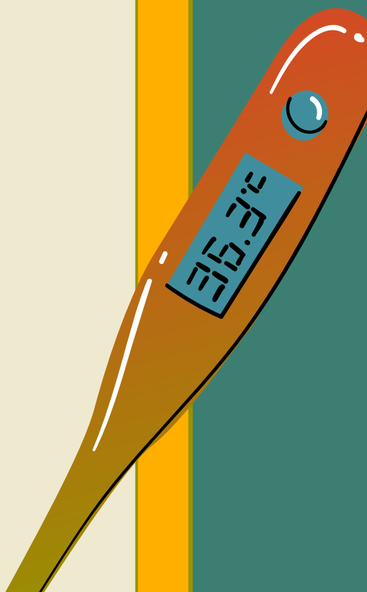
Passion for Public Health

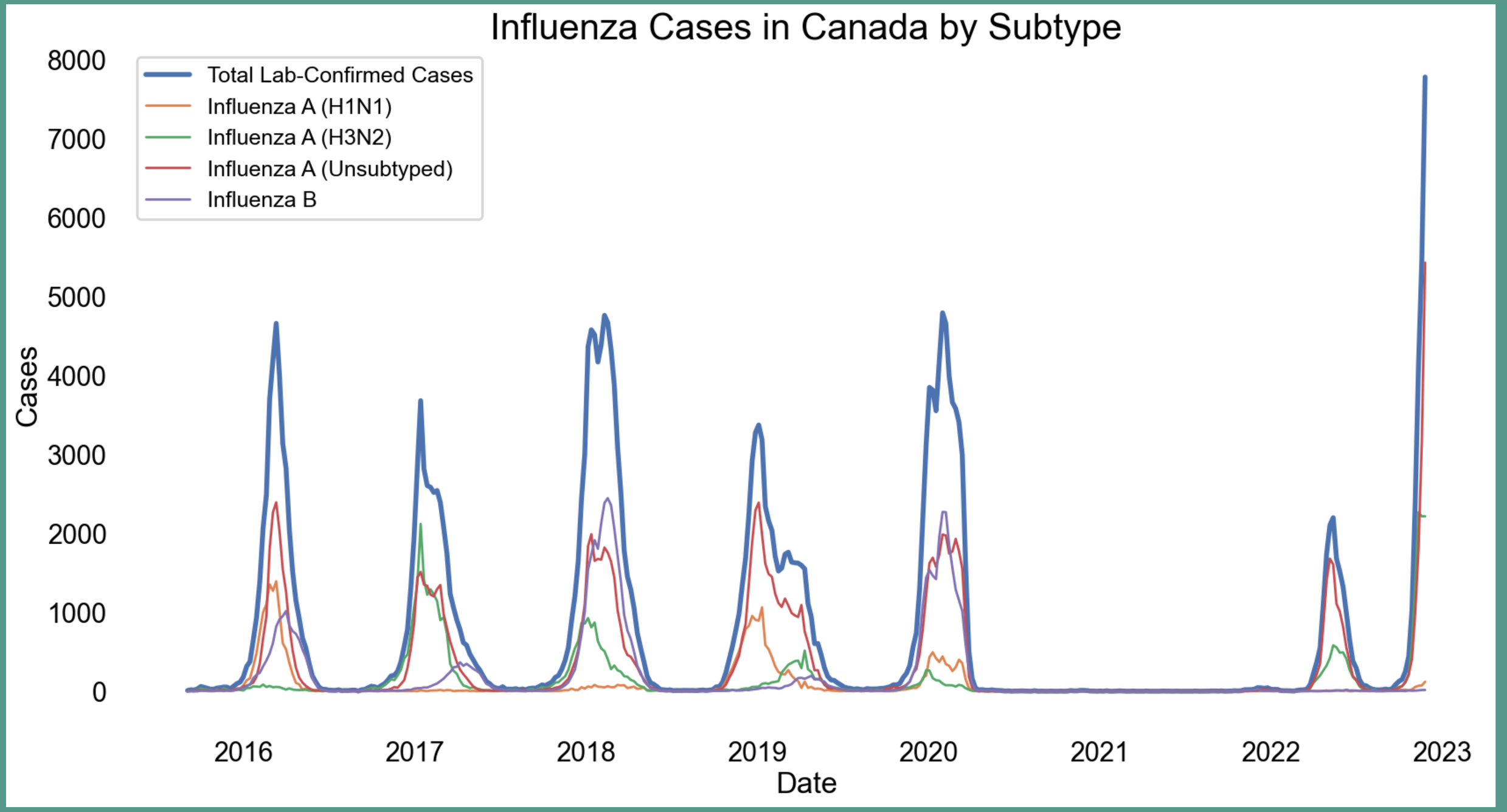
Fiddle Player!

Why Forecast Flu?

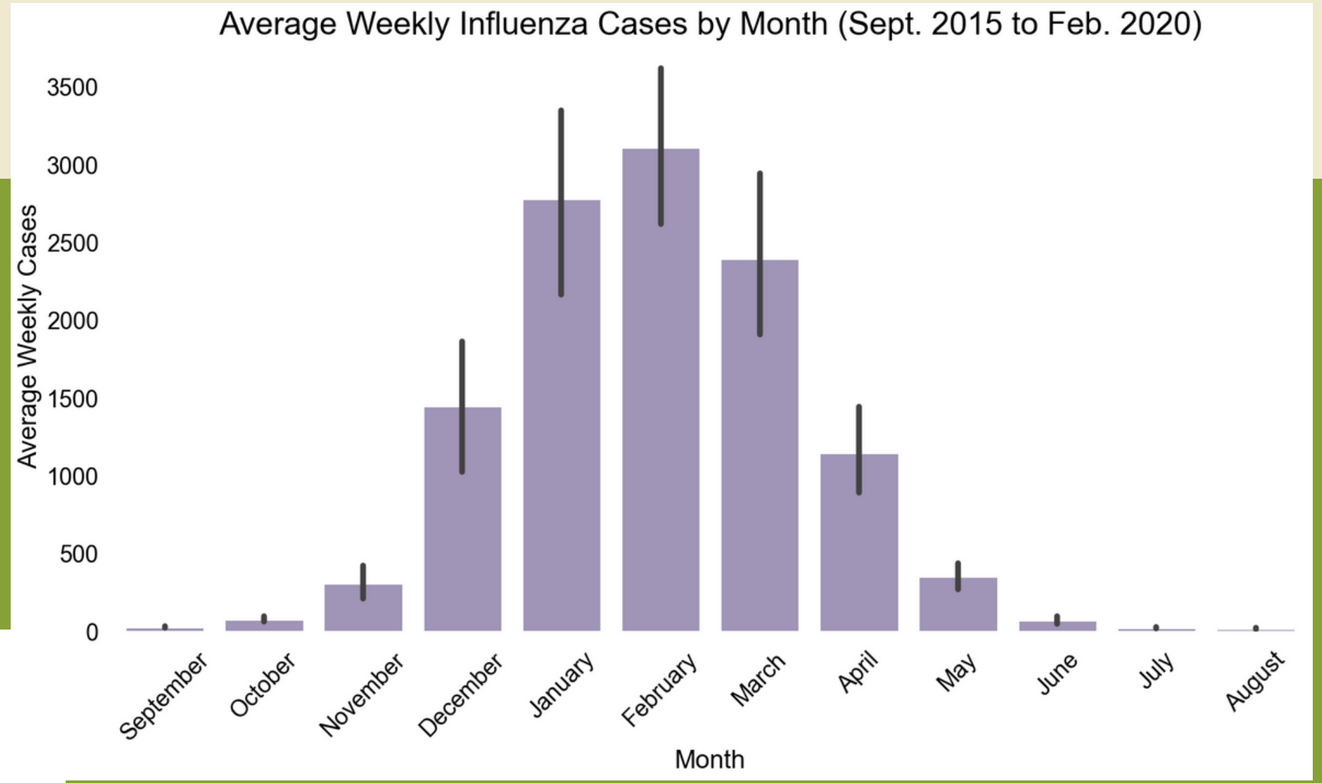
- 7,000 influenza deaths every year in Canada
- Accurate influenza predictions = more effective interventions

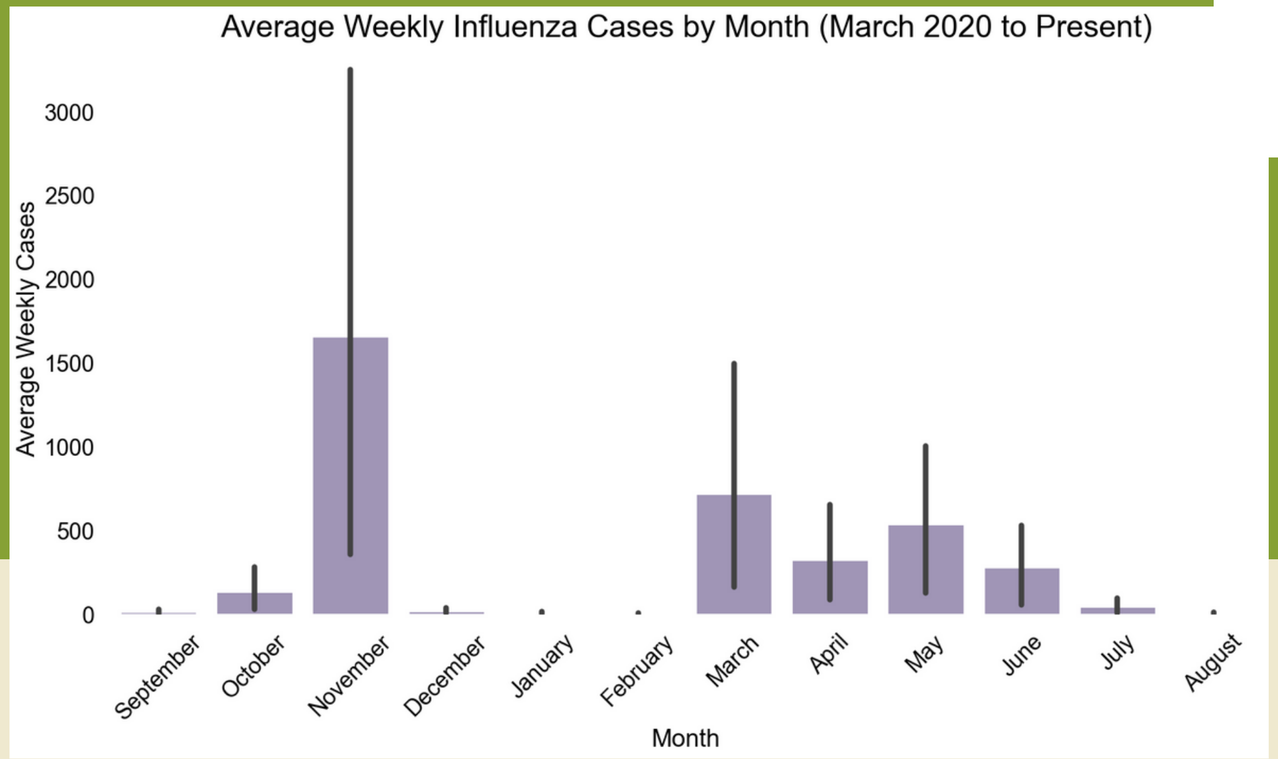





Influenza Cases in Canada by Subtype
Total Lab-Confirmed Cases
Influenza A (H1N1)
Influenza A (H3N2)
Influenza A (Unsubtyped)
Influenza B
8000
7000
6000
5000
4000
3000
2000
1000
0
Cases
2016
2017
2018
2019
2020
2021
2022
2023
Date

Before March 2020





After March 2020

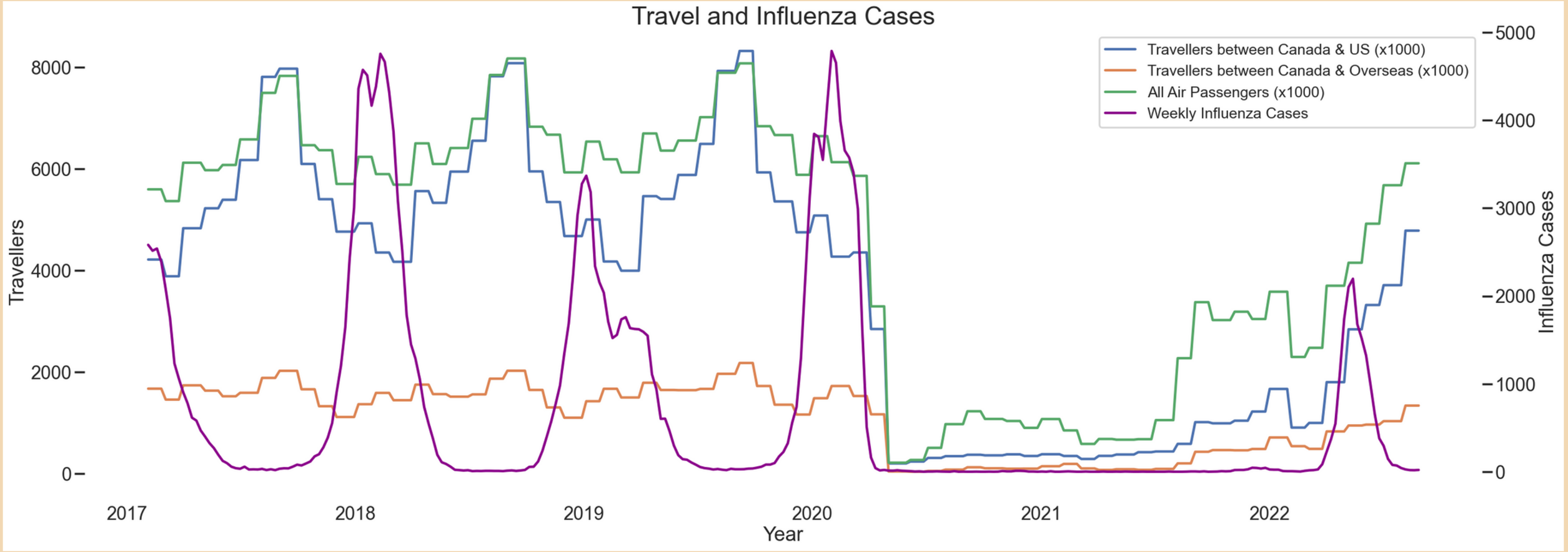
Correlated with Flu?

Influenza Vaccination

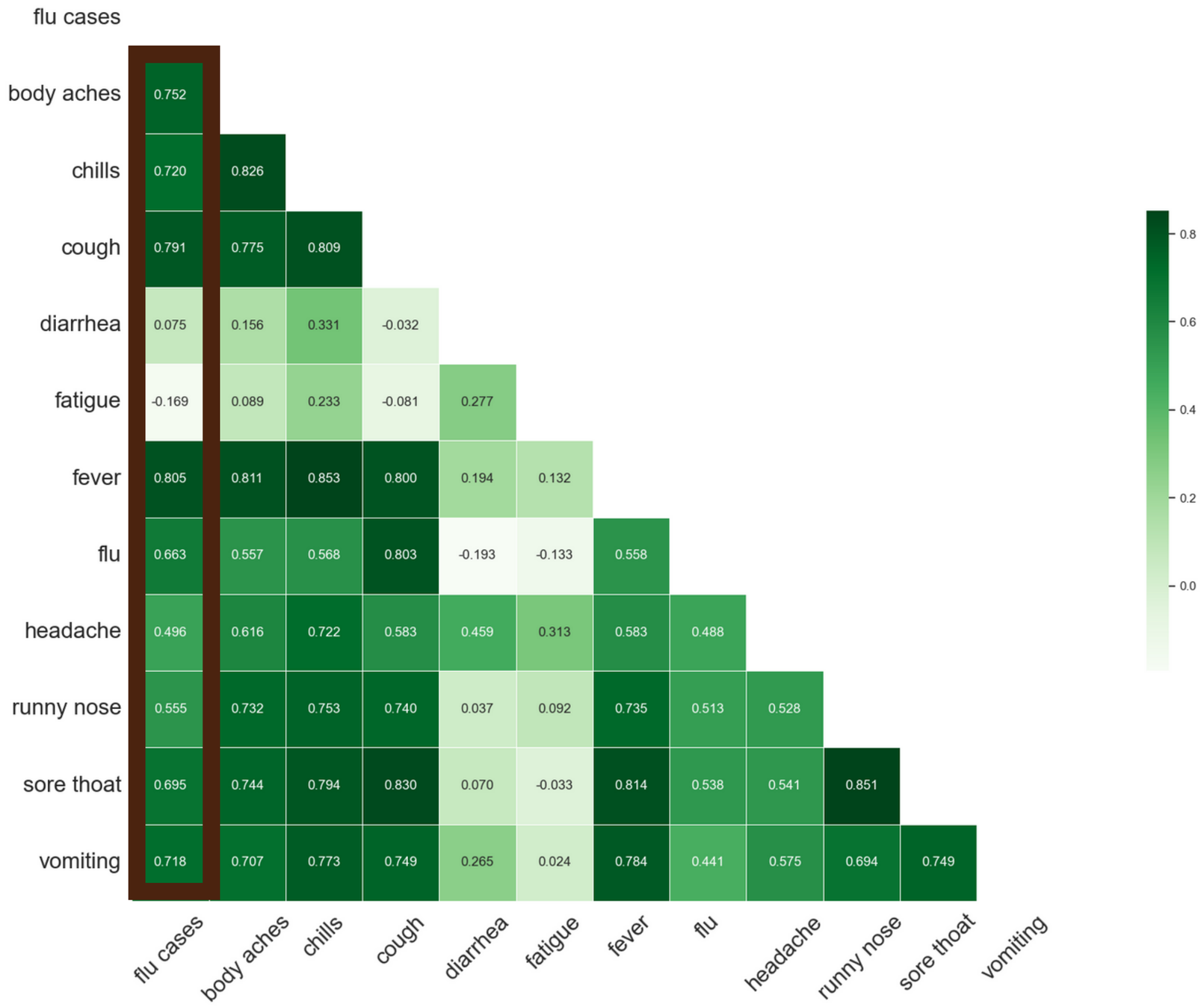
Flu Symptom Google Search

Movement of People

COVID term Google Search

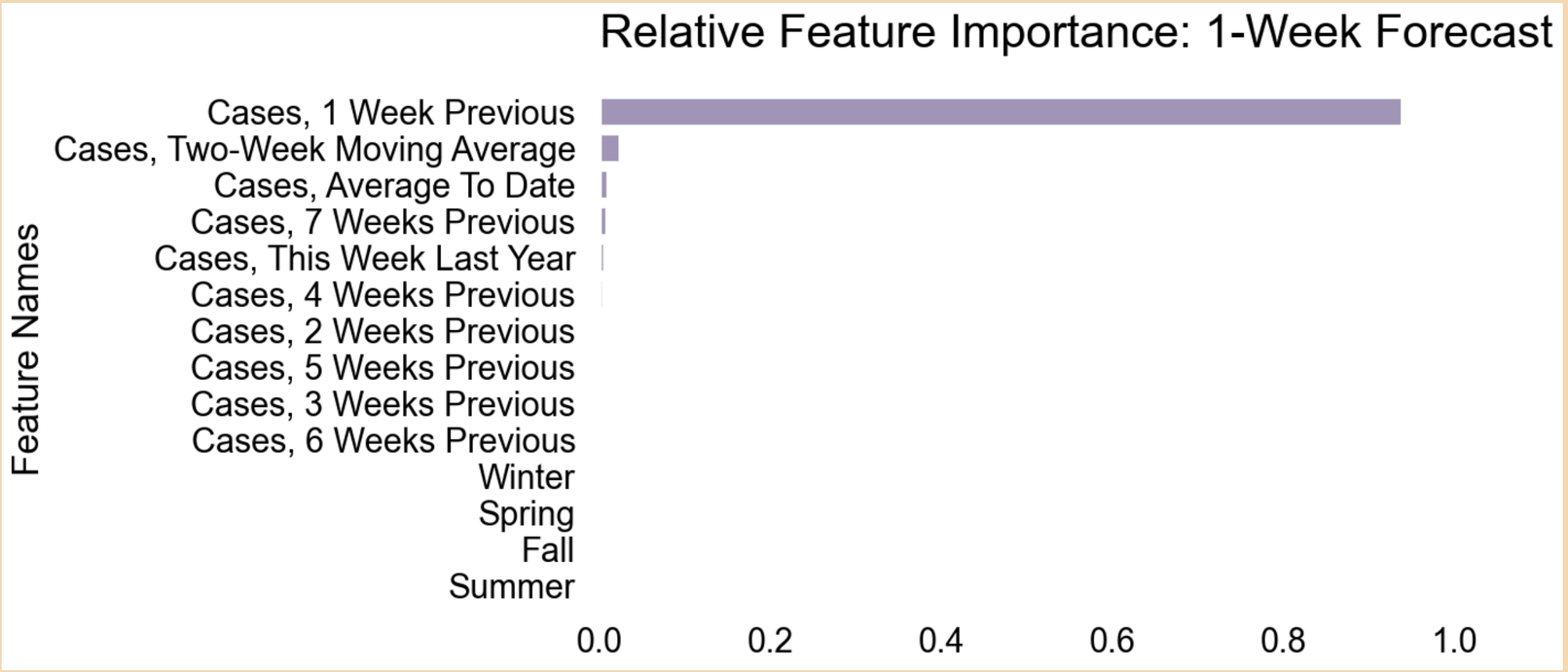

Travel and Influenza Cases
Travellers between Canada & US (x1000)
Travellers between Canada & Overseas (x1000)
All Air Passengers (x1000)
Weekly Influenza Cases
Travellers
Influenza Cases
Year
0
2000
4000
6000
8000
0
1000
2000
3000
4000
5000
2017
2018
2019
2020
2021
2022

Flu Symptom Searches & Cases



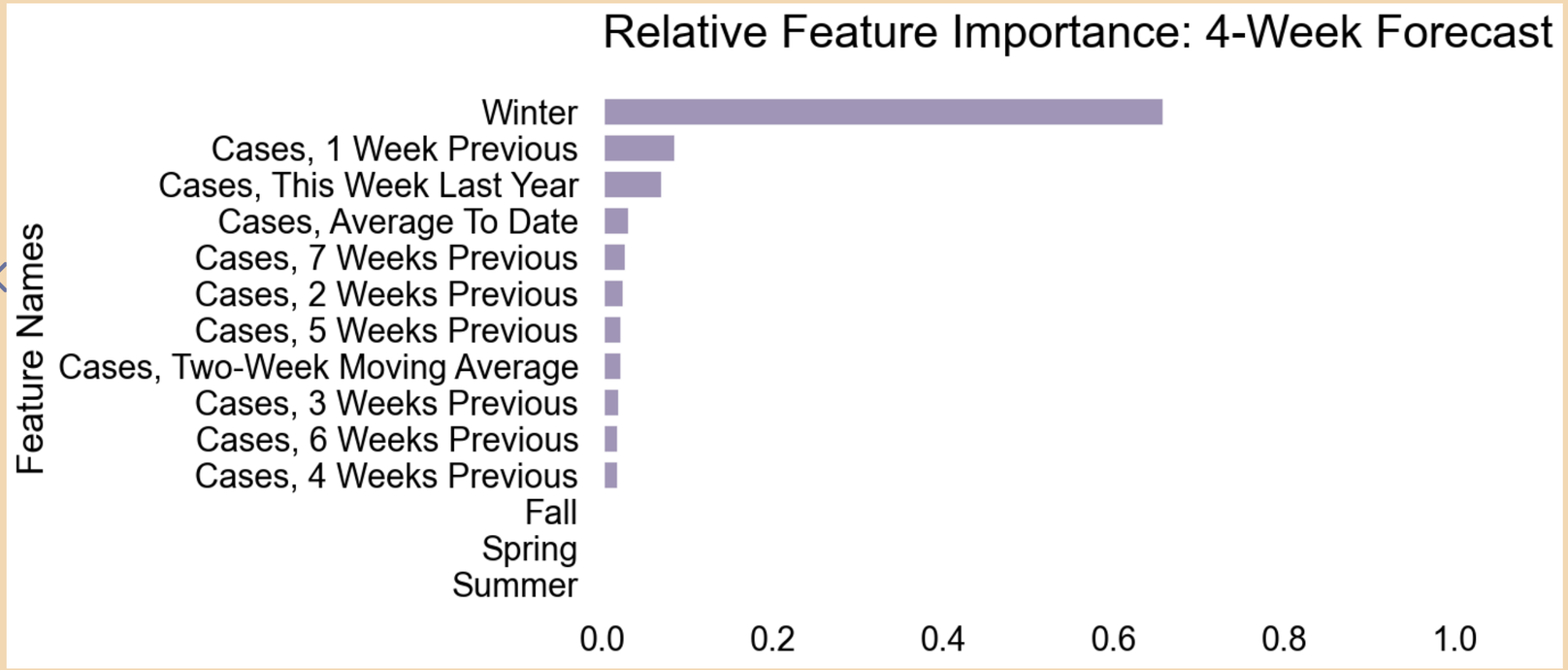
1-week forecast:

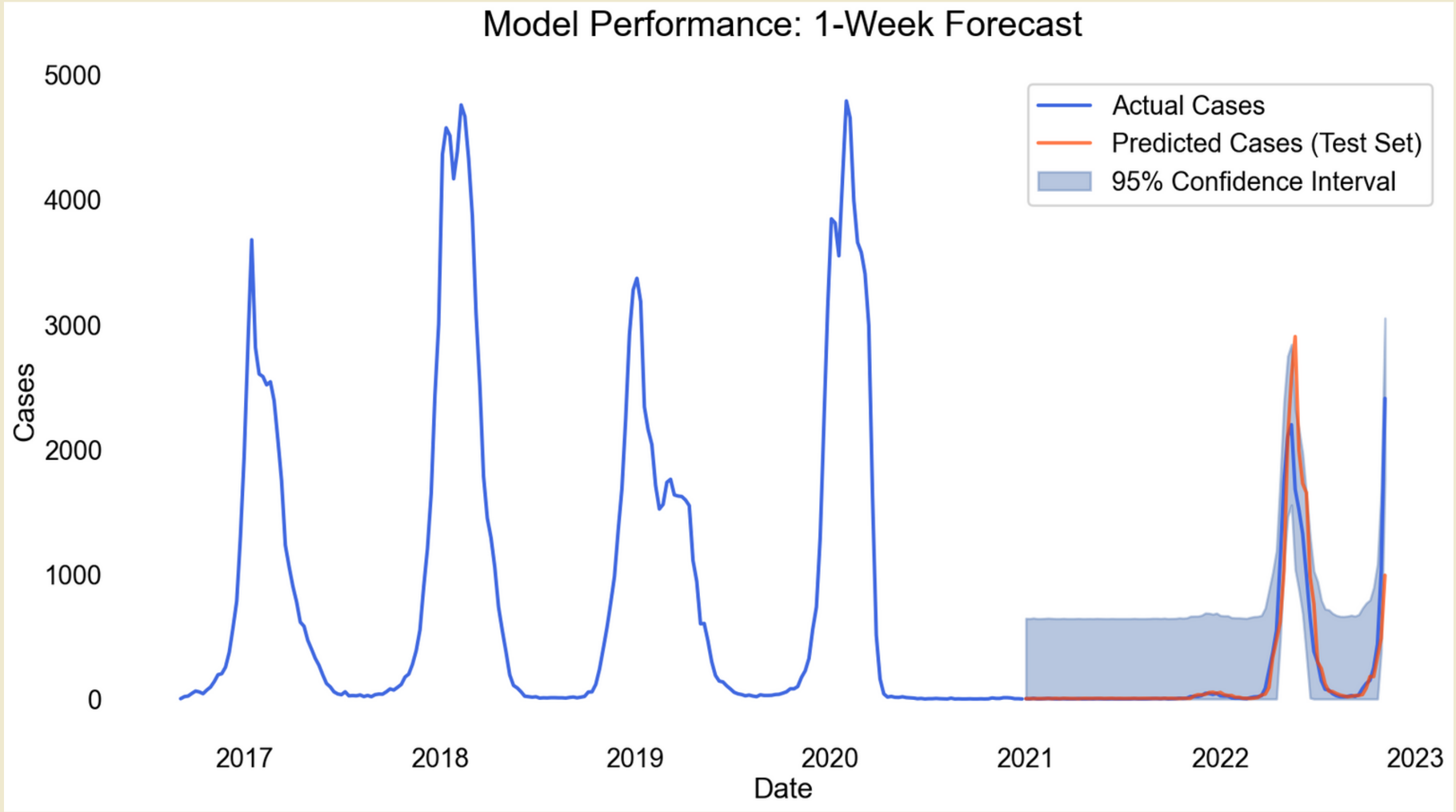
Most important feature = previous week

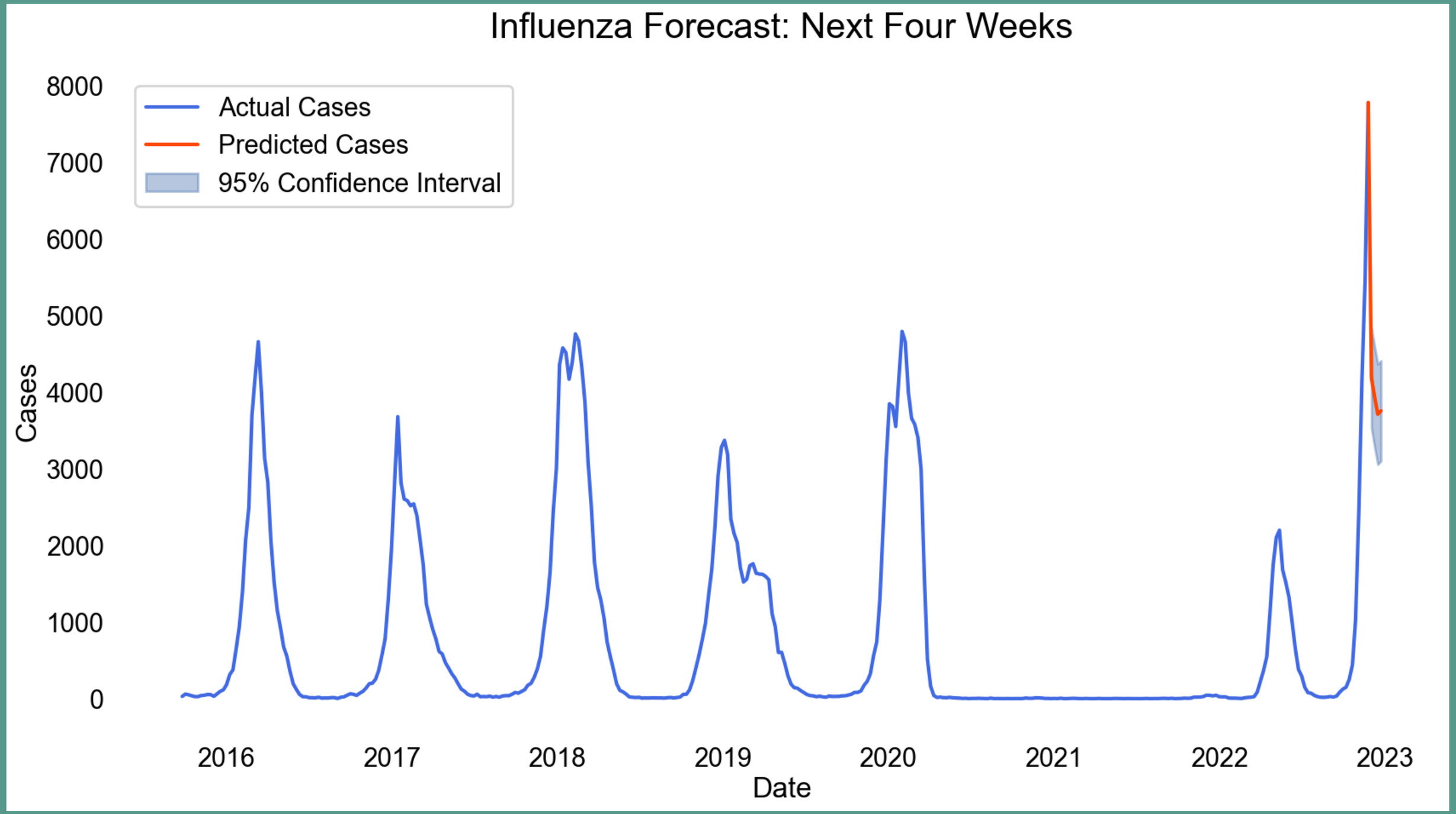


4-week forecast:

Most important feature = winter




Model Performance: 1-Week Forecast
Actual Cases
Predicted Cases (Test Set)
95% Confidence Interval
Cases
5000
4000
3000
2000
1000
0
2017
2018
2019
2020
2021
2022
2023
Date


Influenza Forecast: Next Four Weeks
Actual Cases
Predicted Cases
95% Confidence Interval
8000
7000
6000
5000
4000
3000
2000
1000
0
Cases
2016
2017
2018
2019
2020
2021
2022
2023
Date

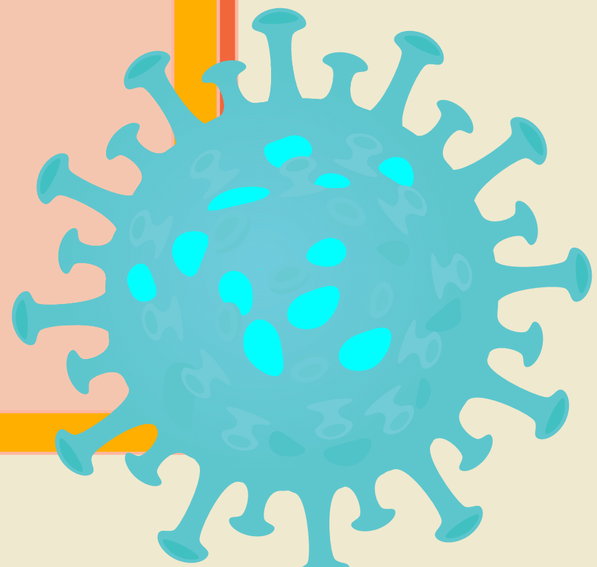
Model	RMSE	MAE	R Squared
Gradient Boosting Regressor	222.63	94.66	0.81

Compared With

Baseline - Moving Average	481.41	190.93	0.73
Benchmarks Viboud C, Boëlle PY, Carrat F, Valleron AJ, Flahault A. Prediction of the spread of influenza epidemics by the method of analogues. Am J Epidemiol. 2003 Nov 15;158(10):996-1006. doi: 10.1093/aje/kwg239. PMID: 14607808. Xia Jiang, Garrick Wallstrom, Gregory F. Cooper, Michael M. Wagner, Bayesian prediction of an epidemic curve, Journal of Biomedical Informatics, Volume 42, Issue 1, 2009, Pages 90-99, ISSN 1532-0464, https://doi.org/10.1016/j.jbi.2008.05.013.			0.81 - 0.96

Next Steps

- Try other models:
  - Compartmental model with particle filtering
  - Transformer model
- Try other features:
  - Health news article titles



Thank you for listening!

Don't hesitate to ask any questions!