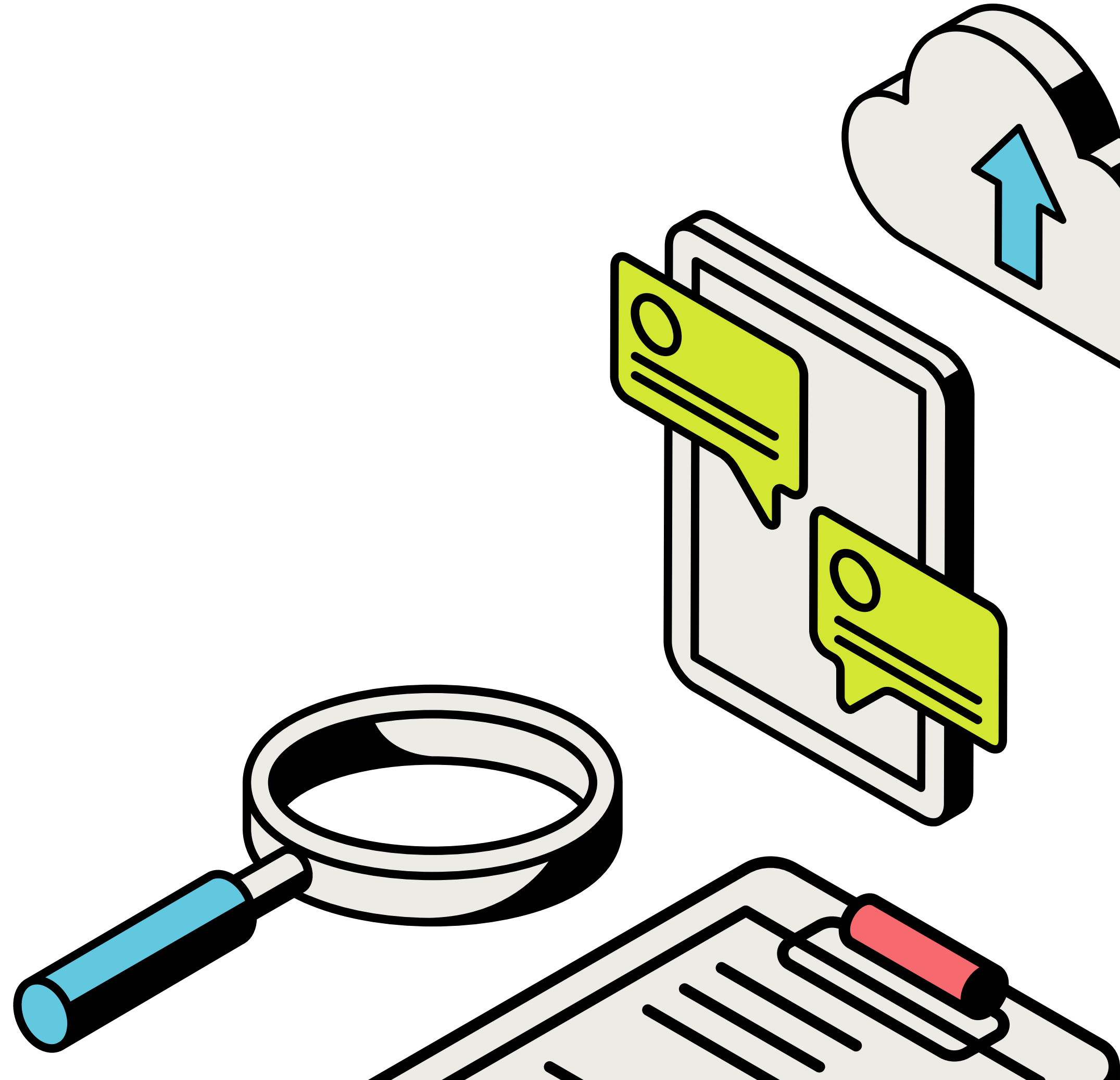


Fake News Detection

Date: Jan. 5, 2024

By: Keina Aoki



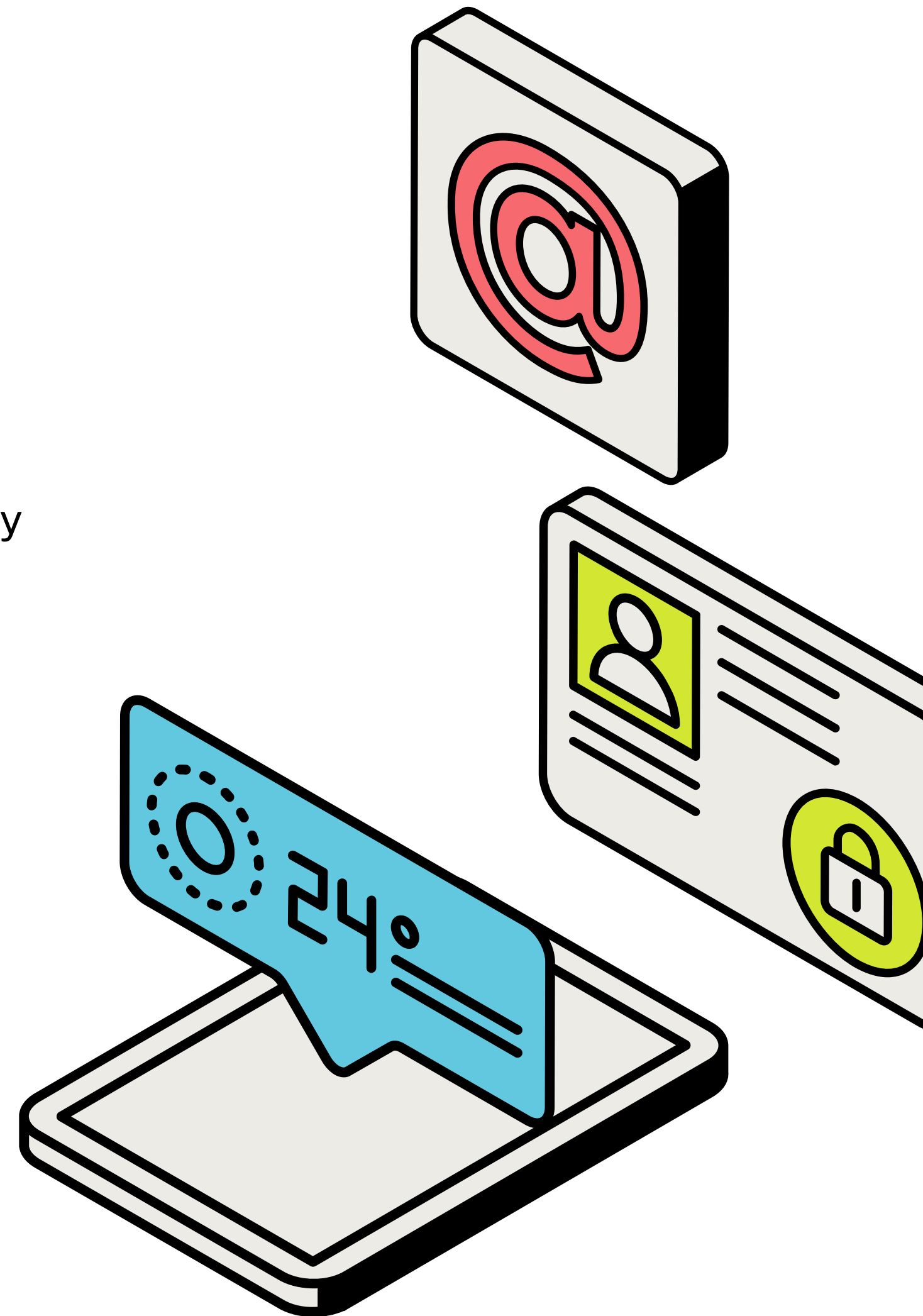
Introduction

There are vast amounts of information shared on a wide variety of digital platforms

- Easily accessed, created and shared
- Misinformation and disinformation is poses a threat to democracy
 - Reinforces polarizing viewpoints
 - Generates mistrust in persons and institutions
 - Destabilizes society

Proposed solution: Develop a tool to detect fake news to ensure we are well informed

- Use twitter data with labelled fake and real news



Impact of Data-Driven Approach



Speed

Faster the automation and detection,
less harm fake news causes



Consistency

Decisions made based on patterns
not on personal opinions



Cost-Effective

Compared to traditional fact-checking,
expensive and time consuming



Well-informed citizens

67% of Americans think made-up news
creates confusion about current issues

Data Overview

- Canadian Institute for Cybersecurity Truth Seeker Dataset 2023
 - 134,198 records and 60 fields
- Features and target variable (fake = 0, real = 1)

	tweet
0	@POTUS Biden Blunders - 6 Month UpdateInflation, Delta mismanagement, COVID for kids, Abandoning Americans in Afghanistan, Arming the Taliban, S. Border crisis, Breaking job growth, Abuse of power (Many Exec Orders, \$3.5T through Reconciliation, Eviction Moratorium)...what did I miss?
1	@S0SickRick @Stairmaster_ @6d6f636869 Not as many people are literally starving and out in the streets as they were in the 19th century. Isn't capitalism grand?Meanwhile, were facing an eviction moratorium threatening to make millions of Americans homeless.Fuck off with this corporatist propaganda.
2	THE SUPREME COURT is siding with super rich property owners and over poor struggling AMERICANS by blocking the eviction moratorium during a pandemic which isn't even over yet. ASSHOLES! get ready for more homeless people!

Example Features:	• number of adjectives	• percentage of organization
	• word count	• percentage of person
	• follower count	• percentage of time
	• mentions	• percentage of work of art
	• retweets	• percentage of nationalities/groups
	• number of nouns	
	• number of verbs	
	• number of conjunctions	
	• number of exclamations	

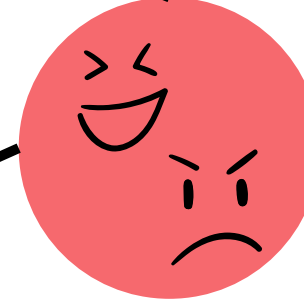


Workflow

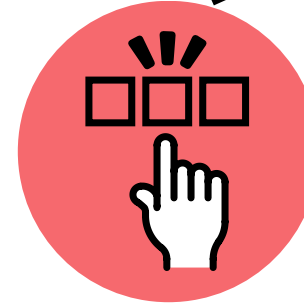
Clean Dataset



Sentiment
Scores



Feature
Selection



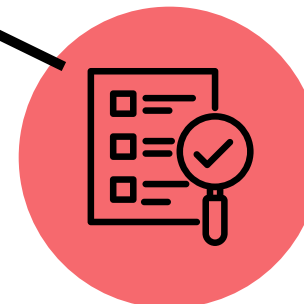
Exploratory Data
Analysis



Modelling



Model
Evaluation

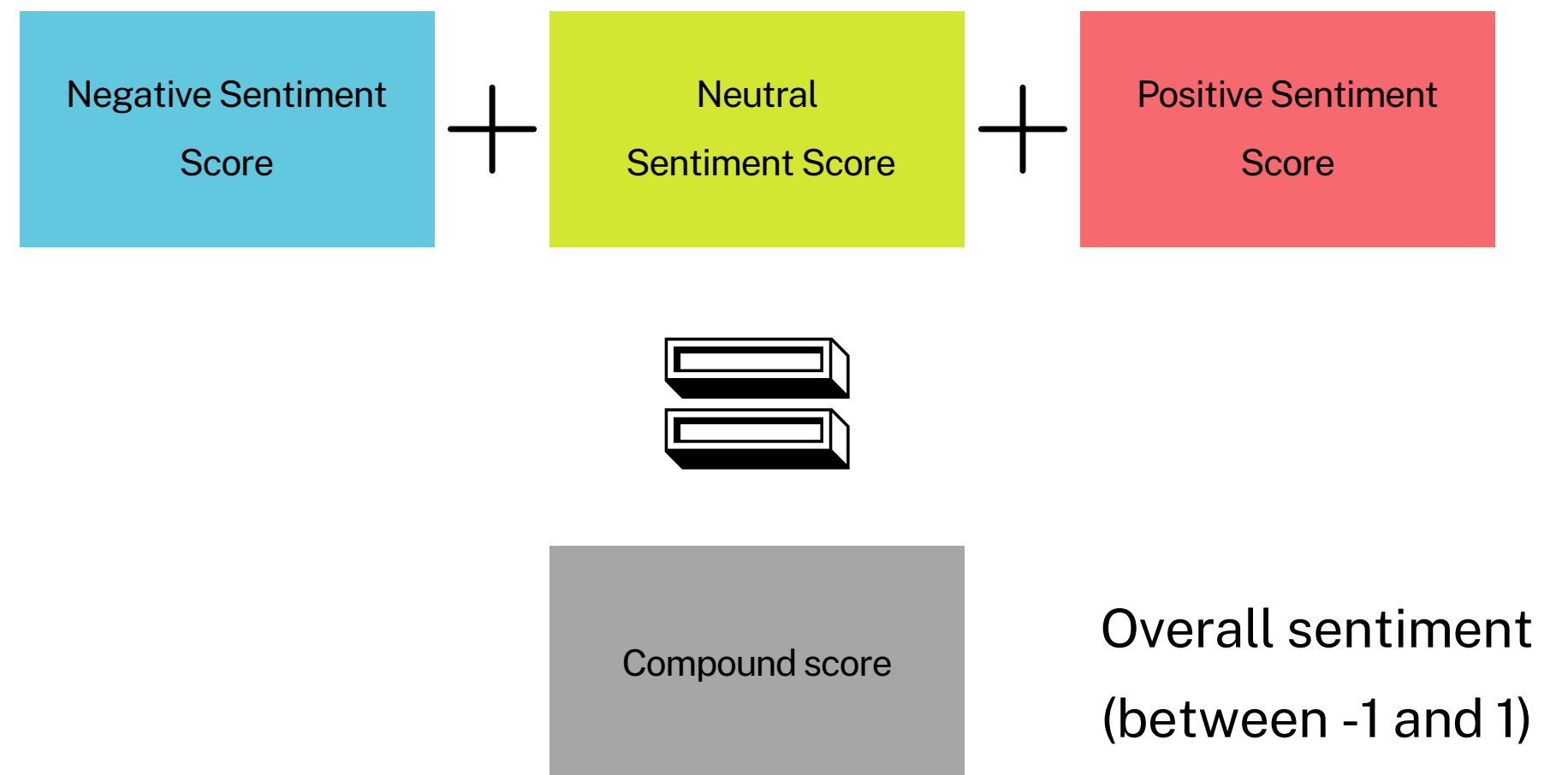


Data Preprocessing - Sentiment Score

VADER: Valence Aware Dictionary and sEntiment Reasoner

vaderSentiment package:

- a rule-based sentiment analysis tool
- attuned to sentiments expressed in social media
- detect polarity of sentiment



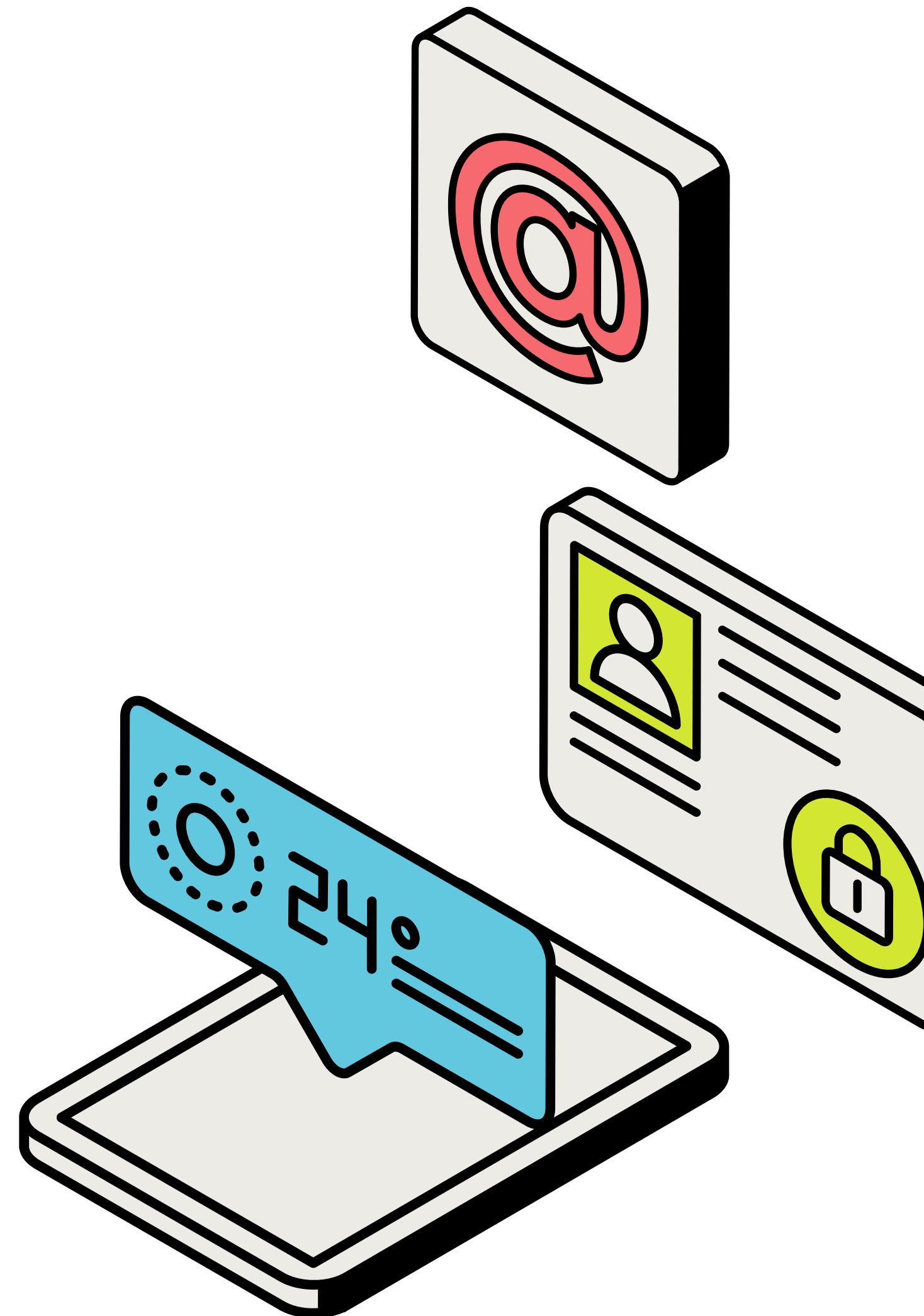
Data Preprocessing - Sentiment Score

	tweet	neg	neu	pos	compound
0	@POTUS Biden Blunders - 6 Month UpdateInflation, Delta mismanagement, COVID for kids, Abandoning Americans in Afghanistan, Arming the Taliban, S. Border crisis, Breaking job growth, Abuse of power (Many Exec Orders, \$3.5T through Reconciliation, Eviction Moratorium)...what did I miss?	0.303	0.646	0.051	-0.9169
1	@SOSickRick @Stairmaster_ @6d6f636869 Not as many people are literally starving and out in the streets as they were in the 19th century. Isn't capitalism grand?Meanwhile, were facing an eviction moratorium threatening to make millions of Americans homeless.Fuck off with this corporatist propaganda.	0.228	0.772	0.000	-0.8807
2	THE SUPREME COURT is siding with super rich property owners and over poor struggling AMERICANS by blocking the eviction moratorium during a pandemic which isn't even over yet. ASSHOLES! get ready for more homeless people!	0.292	0.457	0.252	-0.3147
3	@POTUS Biden BlundersBroken campaign promises, Inflation, Delta mismanagement, Dems without leadership, Abandoned Americans & Armed the Taliban, S. Border crisis, Breaking job growth, Abuse of power (61 Exec Orders, \$1.9T+ in Reconciliation, Eviction Moratorium, Vaccine Mandates)	0.231	0.612	0.157	-0.6828

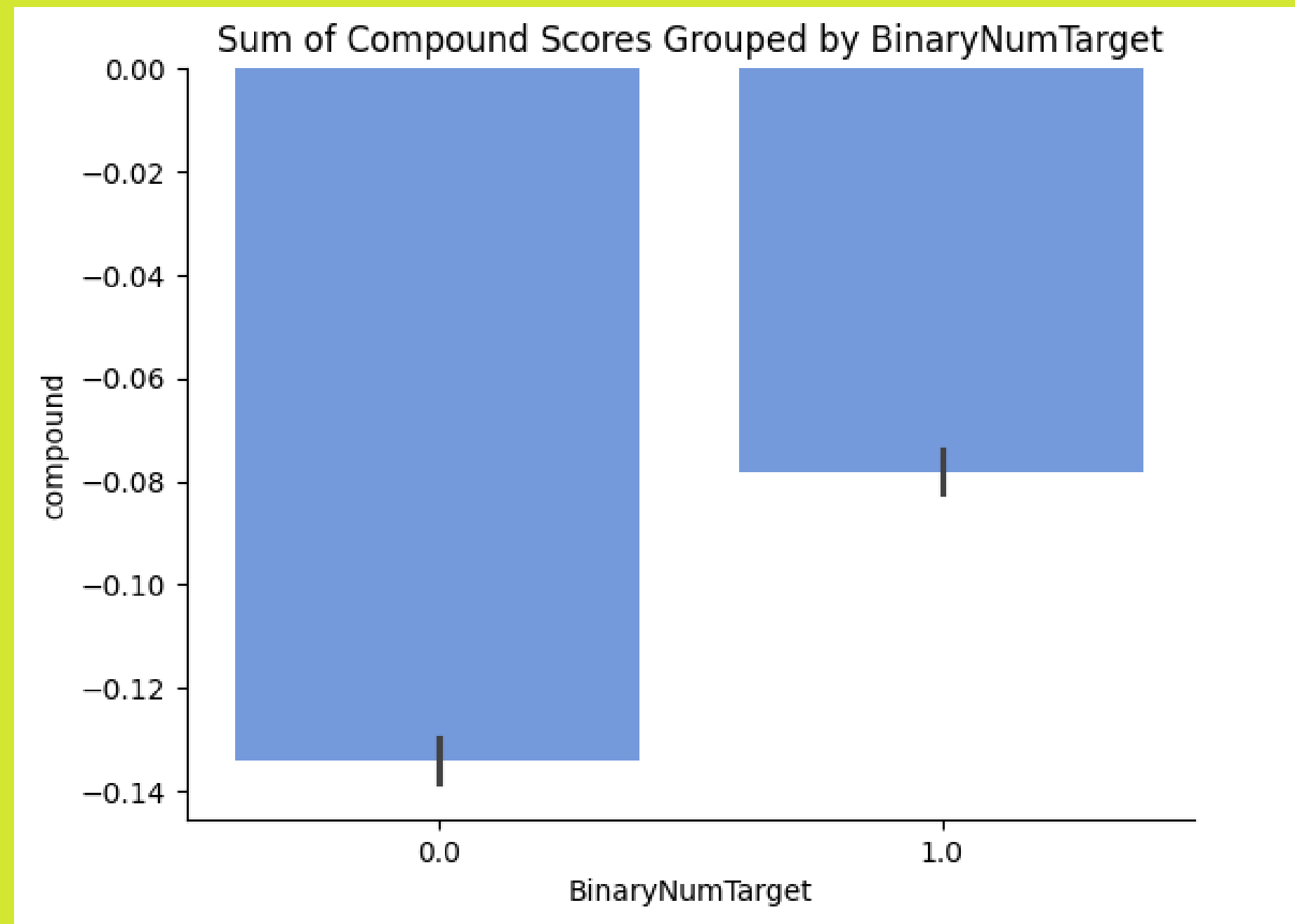
Feature Selection

- Vectorized tweets to see count of word used in tweet
- Final X features included:
 - Negative Score
 - Positive Score
 - Neutral Score
 - Compound
 - words
- 504 columns

	neg	neu	pos	compound	abort	access	accord	act	actual	ad	...
0	0.042	0.847	0.111	0.5994	0	0	0	0	0	0	...
1	0.162	0.838	0.000	-0.6124	0	0	0	0	0	0	...
2	0.189	0.727	0.084	-0.4404	0	0	0	0	0	0	...
3	0.134	0.866	0.000	-0.7517	0	0	0	0	0	0	...
4	0.000	0.862	0.138	0.6814	0	0	0	0	0	0	...



Exploratory Data Analysis



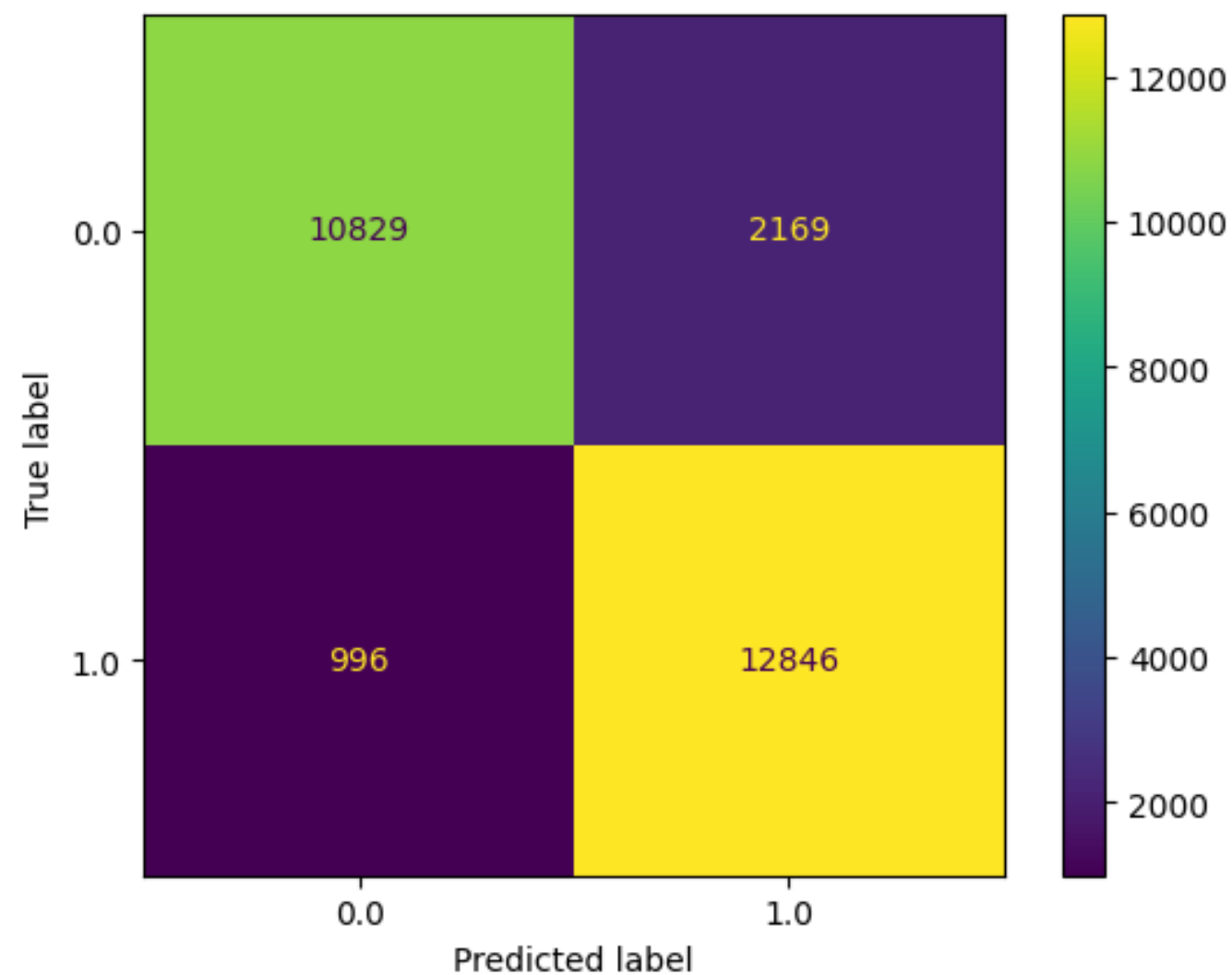
Modelling

3 CLASSIFICATION MODELS

Models	Hyperparameters	Train	Val
LogReg	None C=1 (default)	88.19% 88.19%	88.15% 88.15%
Decision Trees	None max_depth = 55, min_samples_leaf = 3	99.88% 92.24%	89.72% 88.57%
Naive Bayes (BernoulliNB)	None alpha = 0.5	84.32% 84.47%	84.32% 84.47%

Decision Tree Classifier

CONFUSION MATRIX

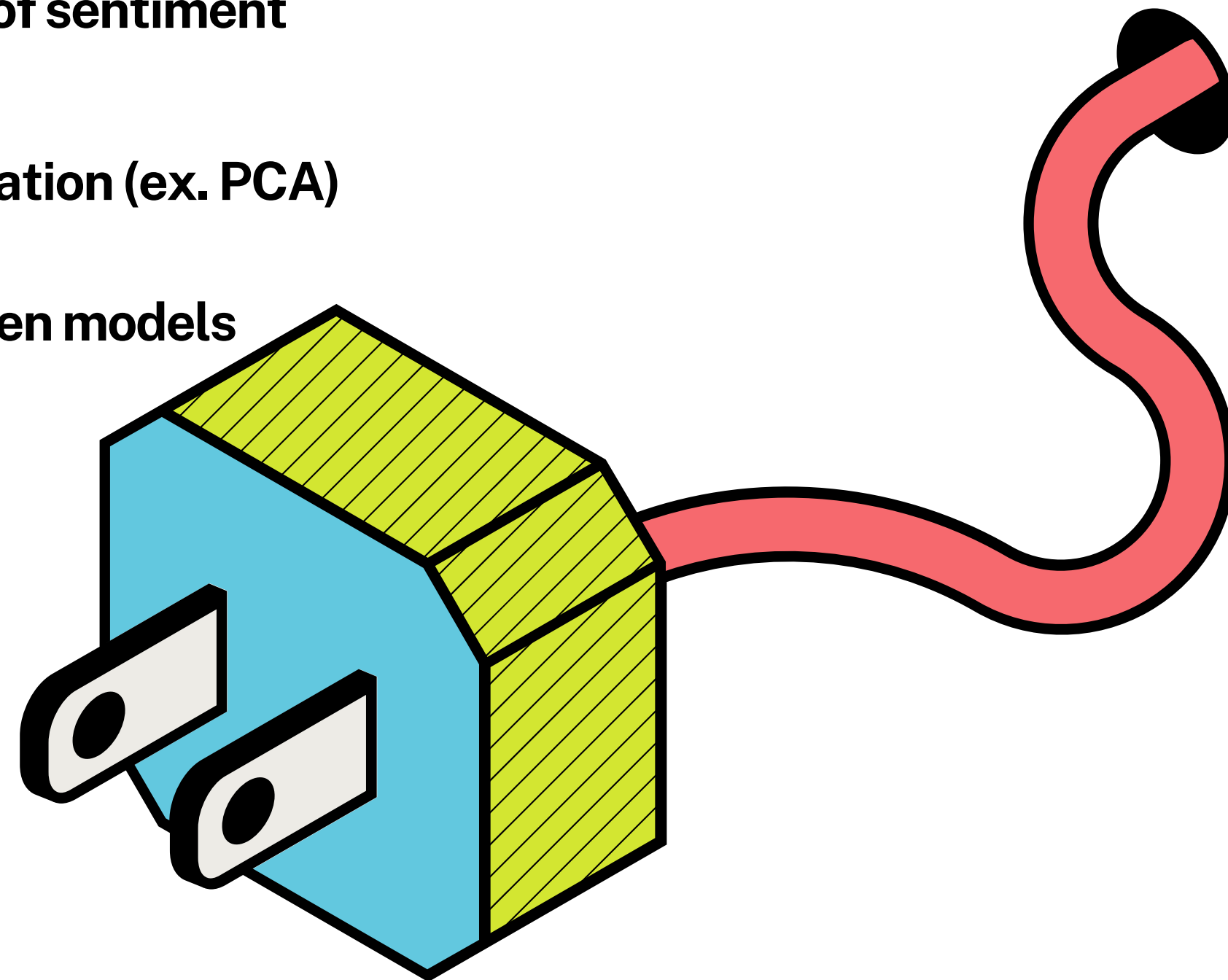


	precision	recall	f1-score	support
0.0	0.92	0.83	0.87	12998
1.0	0.86	0.93	0.89	13842
accuracy			0.88	26840
macro avg	0.89	0.88	0.88	26840
weighted avg	0.88	0.88	0.88	26840

- High accuracy for real news
- Good accuracy for fake news

Next Steps

- Go back to feature engineering, determine importance of sentiment
 - hypothesis test
- Build pipelines for ease during hyperparameter optimization (ex. PCA)
- Grid search for cross validation, compare results between models
- **Final Steps:** Deploy on Streamlit.io to input new twitter post and classify as real or fake



Thank you.

Stay in touch



<https://www.linkedin.com/in/keina-aoki/>



aokikeina@gmail.com

