Fake News Detection

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GitHub

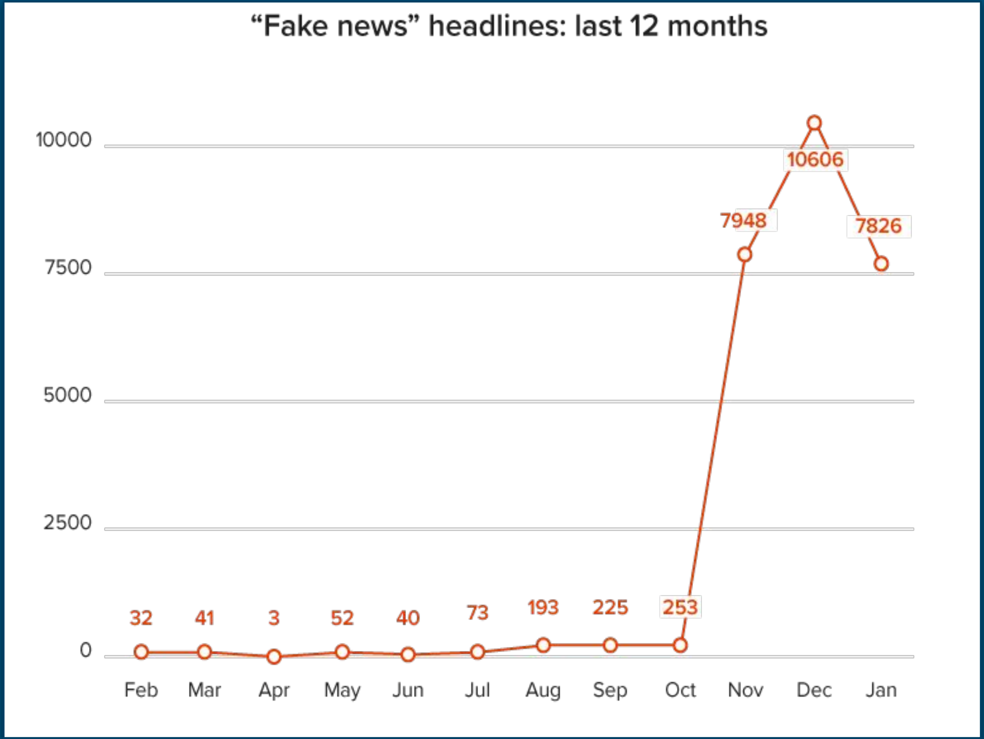
Motivation

♦ Prevalence of fake news on social media

♦ Emerging research area in Natural Language Processing

♦ Basic countermeasures inflexible and inefficient

♦ Current progress in this area



Problem Statement

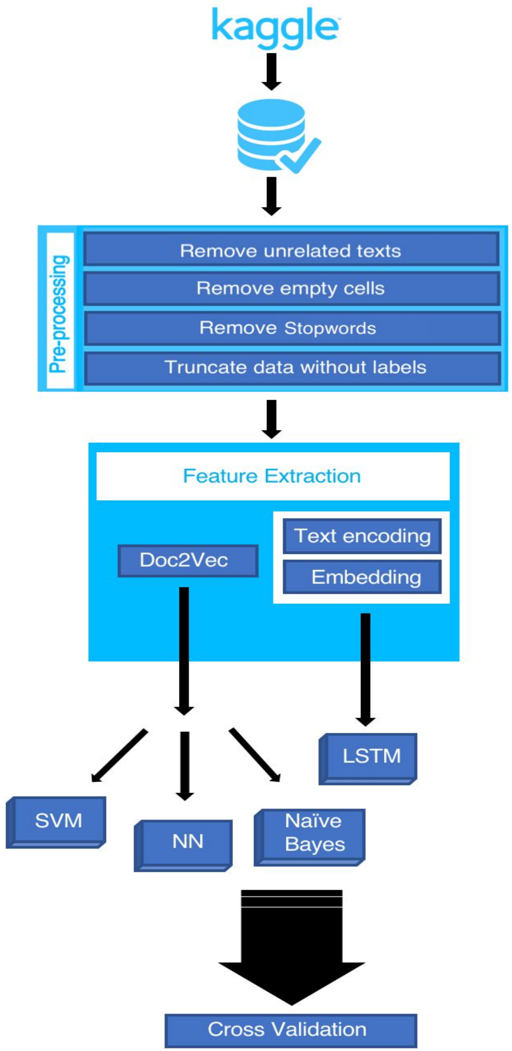
♦ Develop a machine learning program to identify fake/unreliable news based on content acquired.

Data

- Dataset source - Kaggle
- ID, Title, Author, Text, Label
- Label 1 - Unreliable
- Label 0 - Reliable

id	title	author	text	label
0	House Der	Darrell Luc	House	1
1	FLYNN: Hi	Daniel J. F	Ever get th	0
2	Why the T	Consortiur	Why the	1
3	15 Civilian	Jessica Pu	Videos 15	1
4	Iranian wo	Howard Po	Print	1
5	Jackie Mas	Daniel Nus	In these tr	0
6	Life: Life C	nan	Ever	1
7	BenoÃ®t H	Alissa J. Ru	PARIS â€”	0
8	Excerpts F	nan	Donald J.	0
9	A Back-Ch	Megan Tw	A week be	0
10	Obamaâ€	Aaron Klei	Organizing	0
11	BBC Come	Chris Tom	The BBC p	0
12	Russian Re	Amando F	The	1
13	US Official	Jason Ditz	Clinton	1
14	Re: Yes, Th	AnotherAr	Yes,	
BART SIMPSONSON				
Hey	itâ€™s jus	channels	and programs fellating them da	
Itâ€™s not	I imagine	oil compa	difficult to know who to trust o	
In any soci	most people do nothing. Itâ€™s up to the minority to			
If I read the article correctly the government is targeting conserv				
The DNC is	stupid and	but these j@ck@sses ramp it up to 11.) Ta		
I almost p	which wa	especially	1	

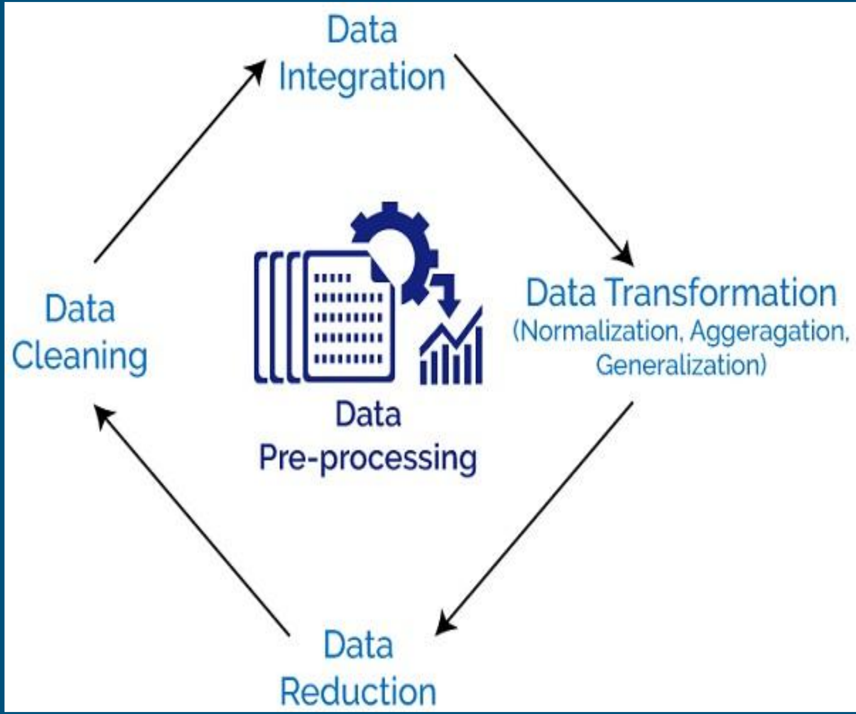
Workflow



kaggle
Pre-processing
Remove unrelated texts
Remove empty cells
Remove Stopwords
Truncate data without labels
Feature Extraction
Doc2Vec
Text encoding
Embedding
LSTM
SVM
NN
Naïve Bayes
Cross Validation

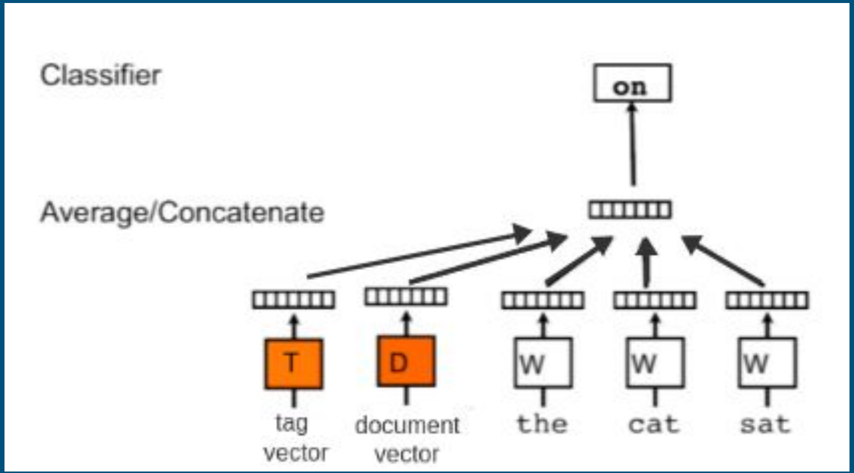
Data Preprocessing

- ➢ Perform various text cleaning steps (remove all non-alphanumeric characters, delete stopwords, delete missing rows, etc.)
- ➢ For Doc2Vec, convert to LabeledSentences(), comma separated word format



Doc2Vec Model

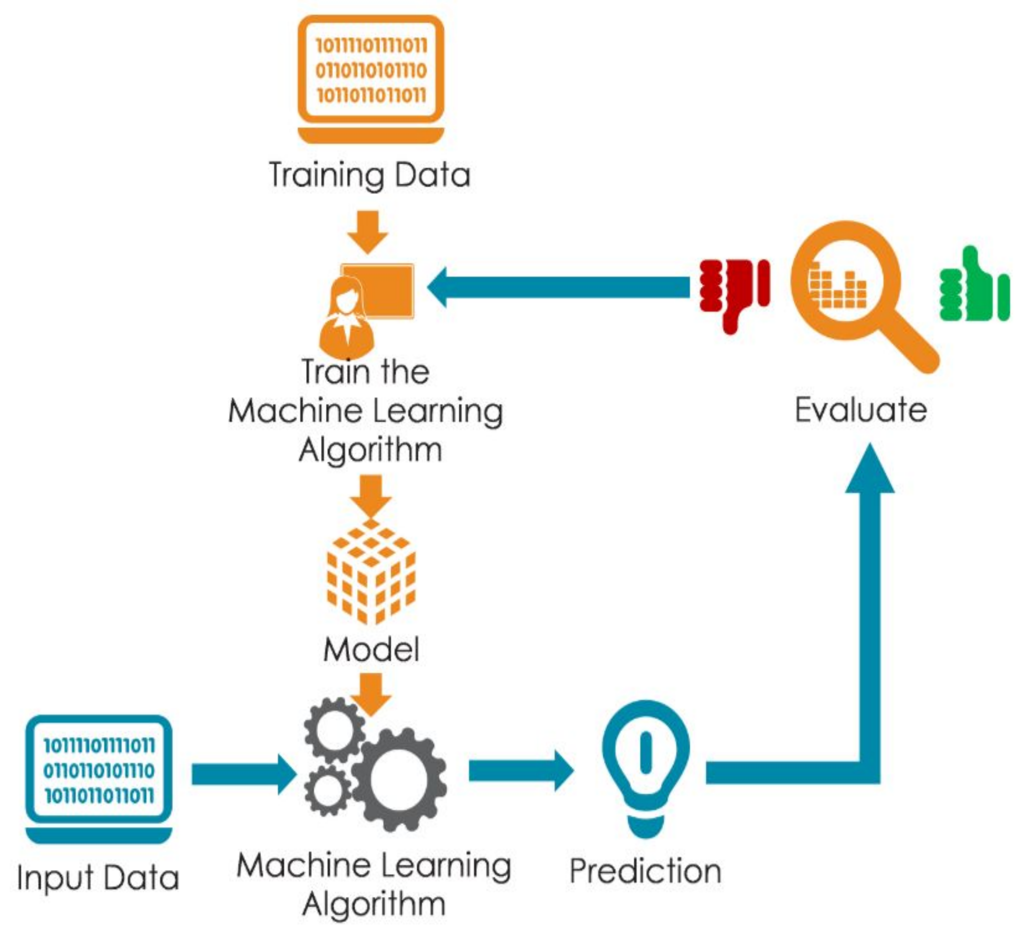
- ♦ Based on Word2Vec model
- ♦ Preserves word order information
- ♦ Extracts Word2Vec features and adds an additional "document vector" with information about the entire document



Training a Model

♦ Models used-

- Naive Bayes
- Support Vector Machine (SVM)
- Neural Network
- Long Short-Term Memory (LSTM)



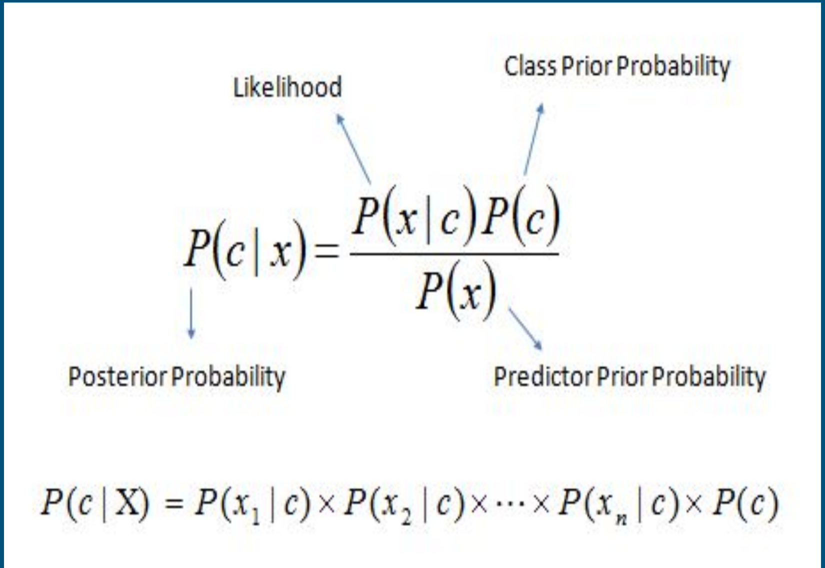
Naive Bayes

♦ Classification technique based on Bayes' theorem with an assumption of independence among predictors

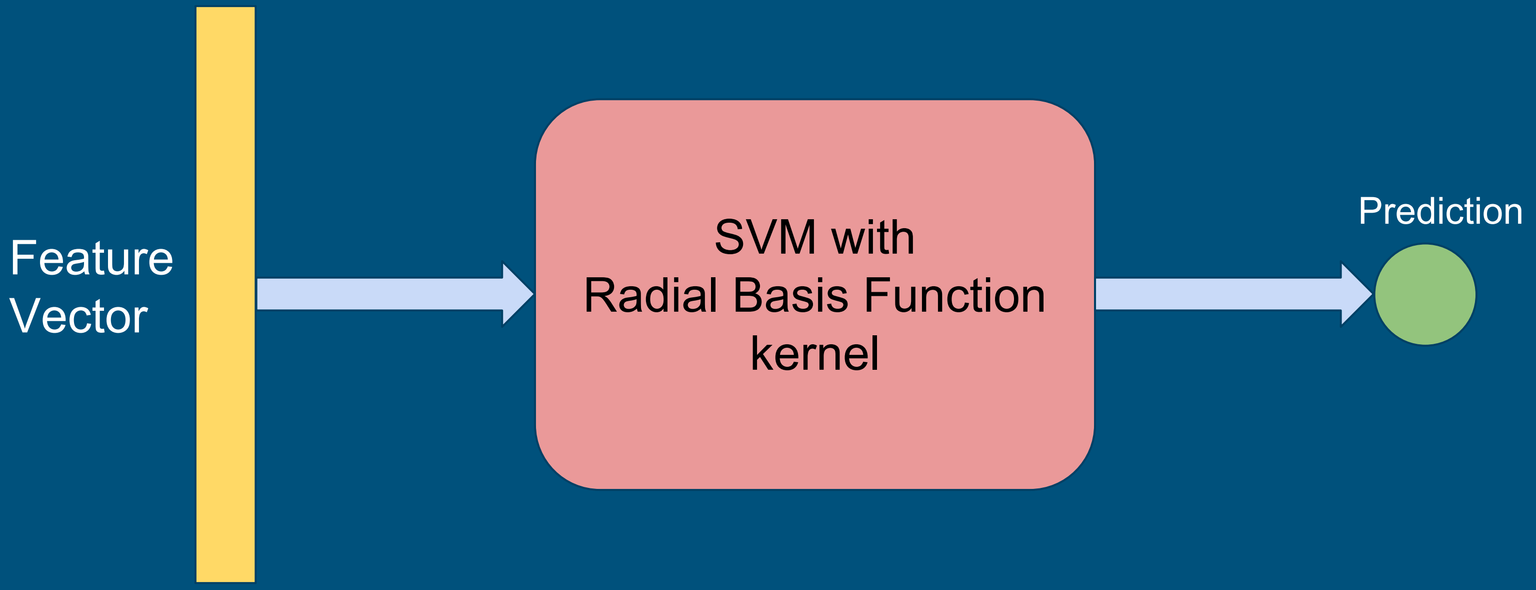
1. Convert data set into a frequency table

2. Create likelihood table by finding probabilities

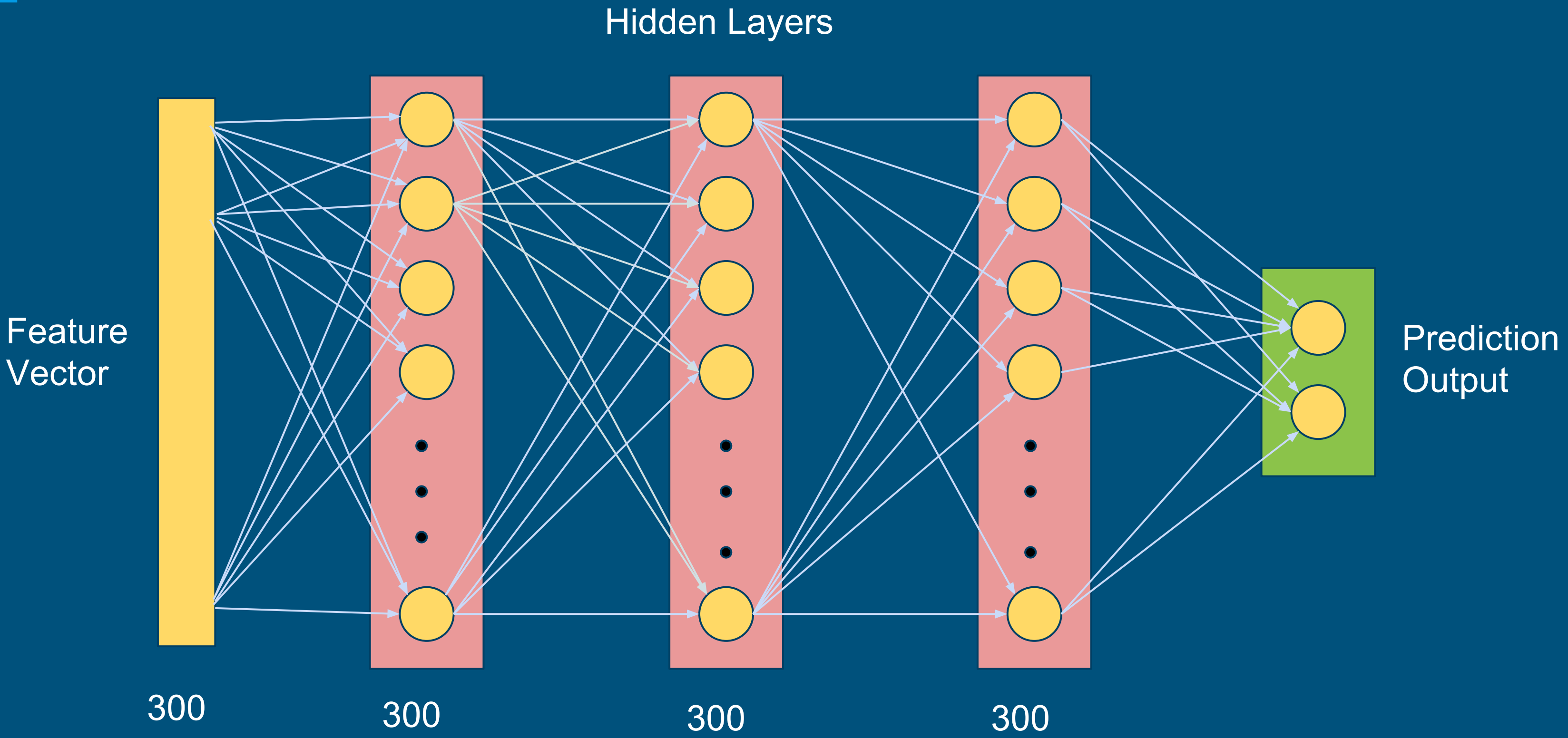
3. Use Naive Bayesian equation to calculate posterior probability for each class



Support Vector Machine (SVM)



Neural Network



Neural Network

TensorFlow

Hidden Layer Structure
(300, 300)
(300, 300, 300)

Learning rate:
0.001

Training Steps:
20000

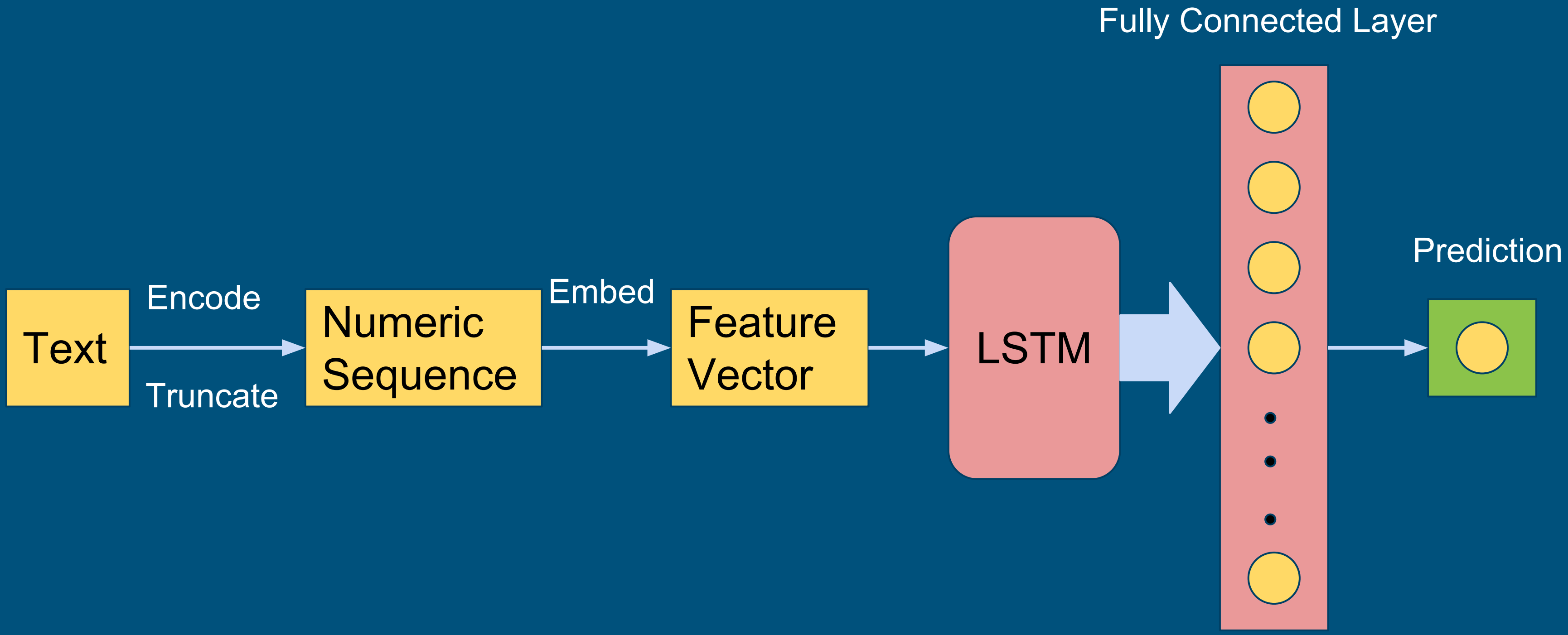
Keras

Hidden Layer Structure
(256, 256, 80)

Learning rate:
0.01

Training Steps:
10000

LSTM

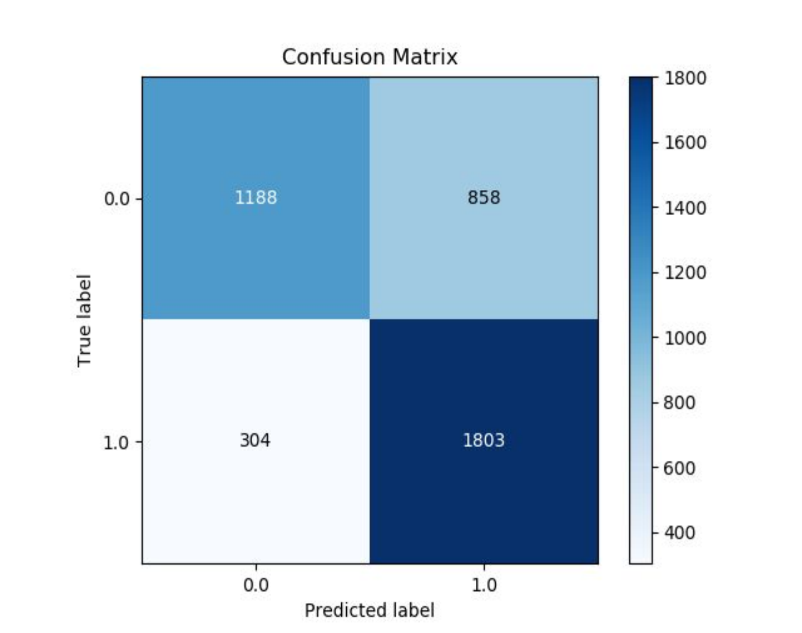


Fully Connected Layer
Text
Encode
Truncate
Numeric Sequence
Embed
Feature Vector
LSTM
Prediction

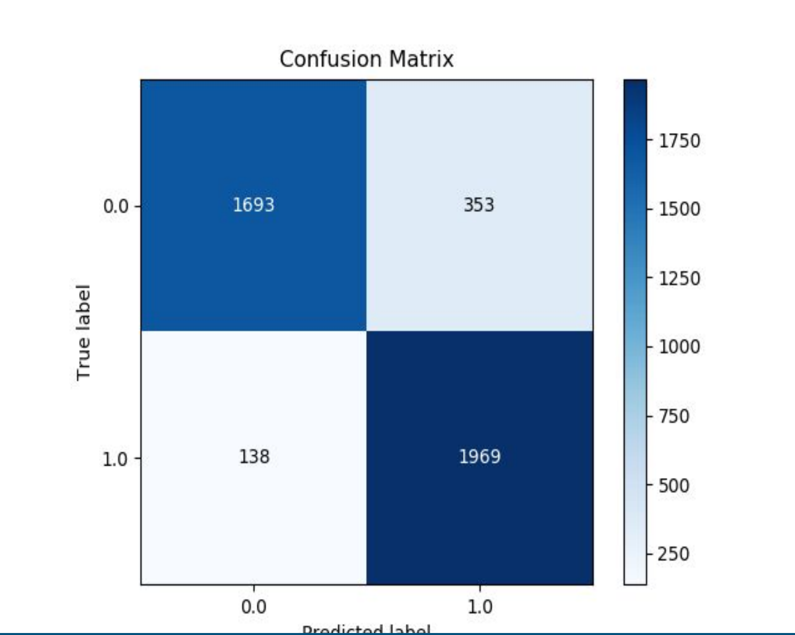
Comparison of Models

Model	Accuracy
Naive Bayes	72.94%
SVM	88.42%
Neural Network using TensorFlow	81.42%
Neural Network using Keras	92.62%
LSTM	94.53%

Confusion Matrices

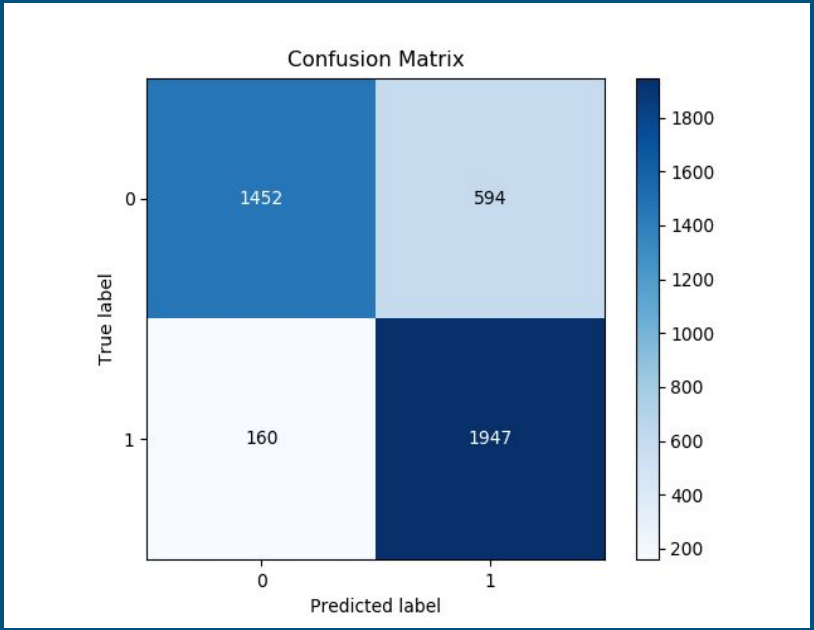


Naive Bayes

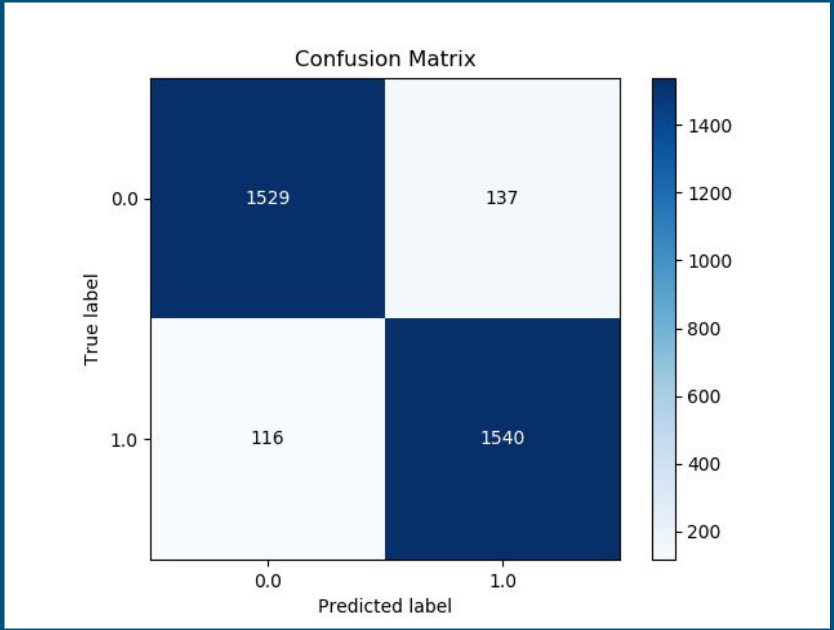


SVM

Confusion Matrices

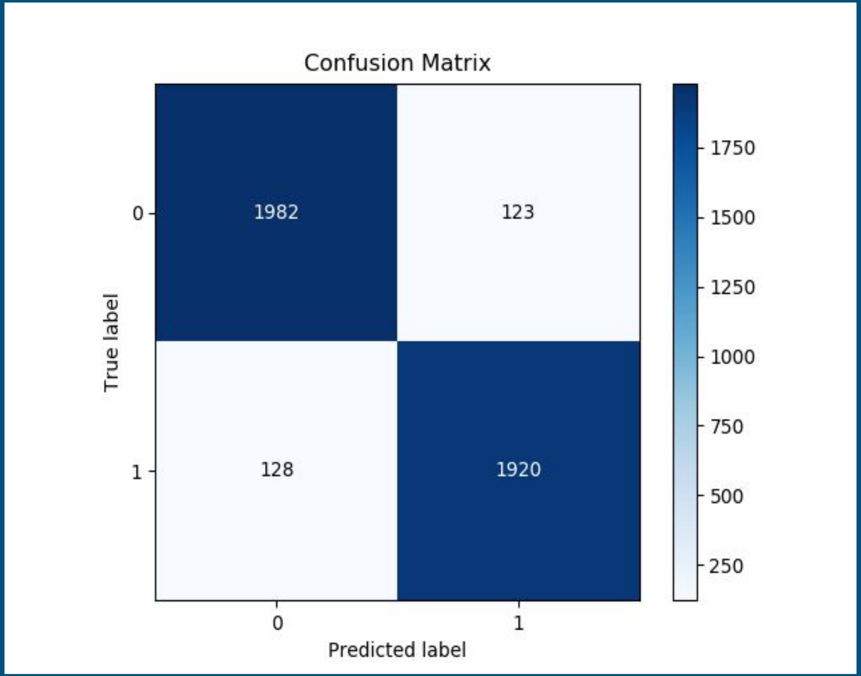


Neural Network using TensorFlow



Neural Network using Keras

Confusion Matrices



LSTM

Challenges Faced

♦ Lack of clean data to directly work with might have slowed down our progress

♦ The loss to value of information in a real scenario for news is very high

♦ Content based classification is just a part of the whole picture

♦ Distinguish between click-bait and actual fake news

Future Work

♦ Assemble the classifiers to achieve better performance - Adam Boost

♦ Check the sources of the news

♦ Search the news on the web to check the content of the news

Data's all, folks!
Thank You!

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and Ken Zhou for their guidance!

References

- Fake News Detection: A Data Mining Perspective
- Fake News Identification - Stanford CS 229
- BS Detector
- Datasets from Kaggle