Project Demonstration on:

Improving Spam Twitter on Twitter using Deep Learning
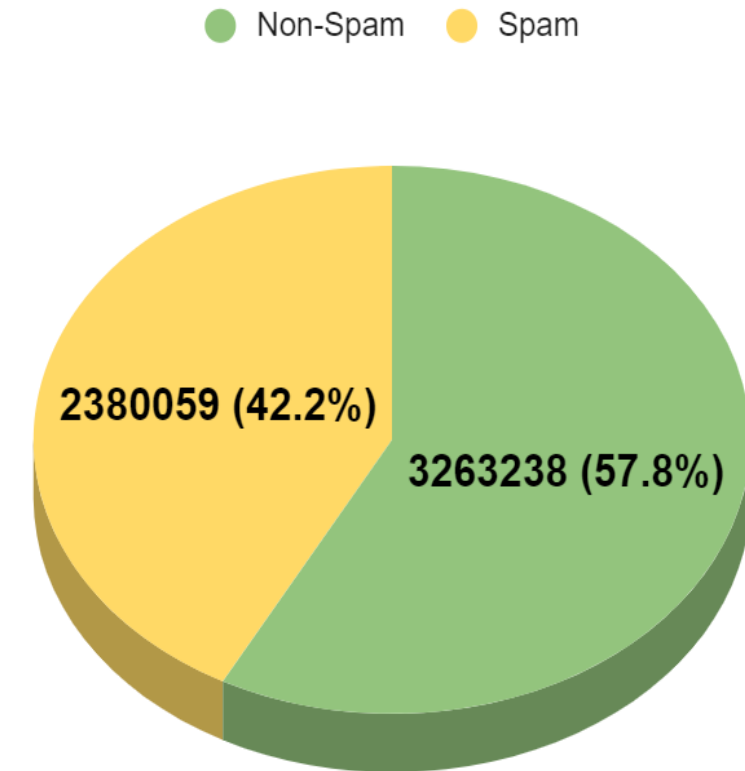
Project No: A1111-201

Submitted by: Ng Yi Rong
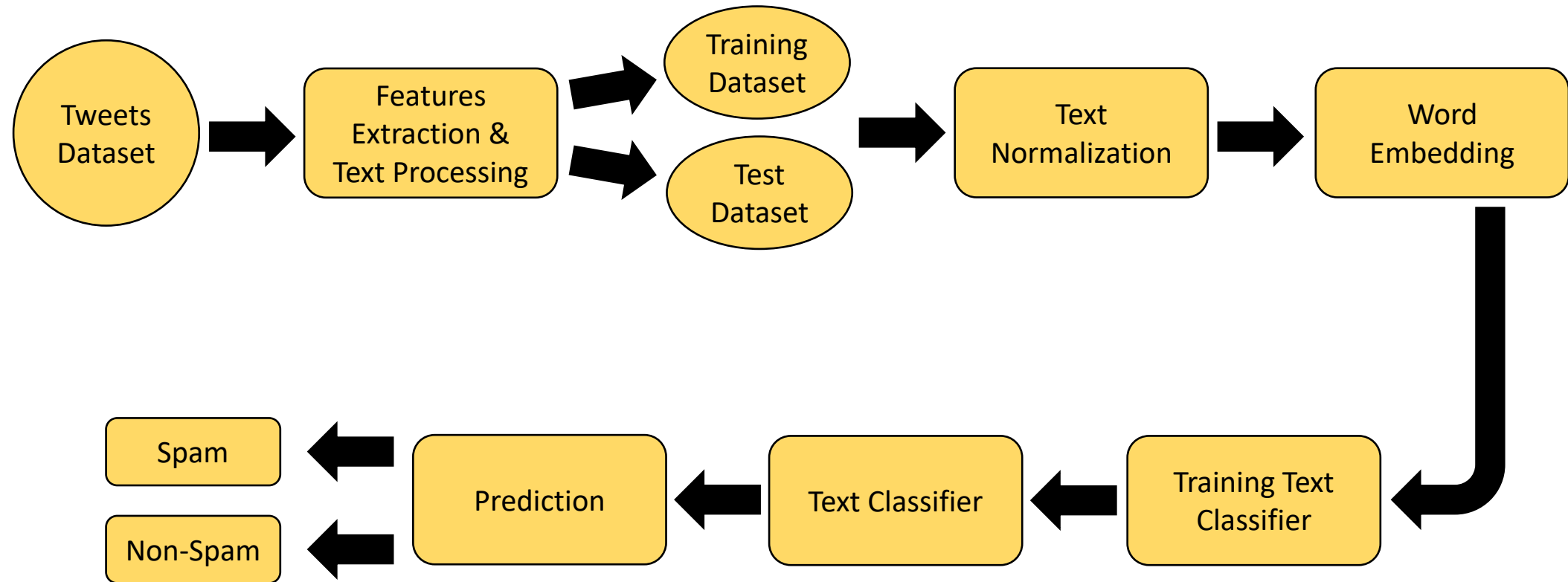
Overview of Twitter Dataset
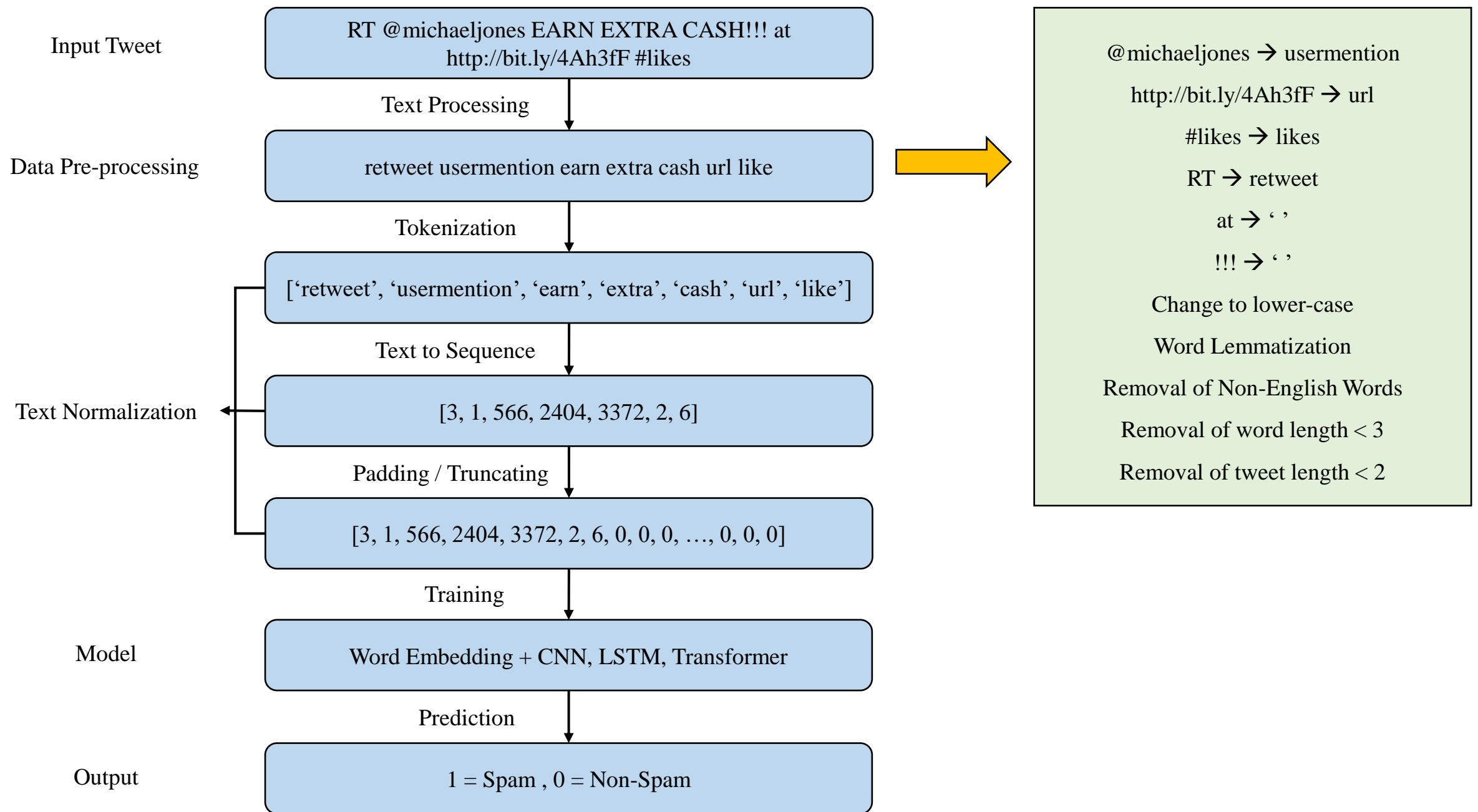
Text File	Features
"content_polluters.txt" "legitimate_users.txt"	UserID, CreatedAt, CollectedAt, NumberOfFollowings, NumberOfFollowers, NumberOfTweets, LengthOfScreenName, LengthOfDescriptionInUserProfile
"content_polluters_tweets.txt" "legitimate_users_tweets.txt"	UserID, TweetID, Tweet, CreatedAt
"content_polluters_followings.txt" "legitimate_users_followings.txt"	UserID, SeriesOfNumberOfFollowings

Class Distribution of Tweets

● Non-Spam   ● Spam

2380059 (42.2%)

3263238 (57.8%)

Pipeline of Proposed Method

Input Tweet	RT @michaeljones EARN EXTRA CASH!!! at http://bit.ly/4Ah3fF #likes

Text Processing

Data Pre-processing	retweet usermention earn extra cash url like

Tokenization

['retweet', 'usermention', 'earn', 'extra', 'cash', 'url', 'like']

Text to Sequence

Text Normalization → [3, 1, 566, 2404, 3372, 2, 6]

Padding / Truncating

[3, 1, 566, 2404, 3372, 2, 6, 0, 0, 0, …, 0, 0, 0]

Training

Model	Word Embedding + CNN, LSTM, Transformer

Prediction

Output	1 = Spam , 0 = Non-Spam

@michaeljones → usermention

http://bit.ly/4Ah3fF → url

#likes → likes

RT → retweet

at → ' '

!!! → ' '

Change to lower-case

Word Lemmatization

Removal of Non-English Words

Removal of word length < 3

Removal of tweet length < 2
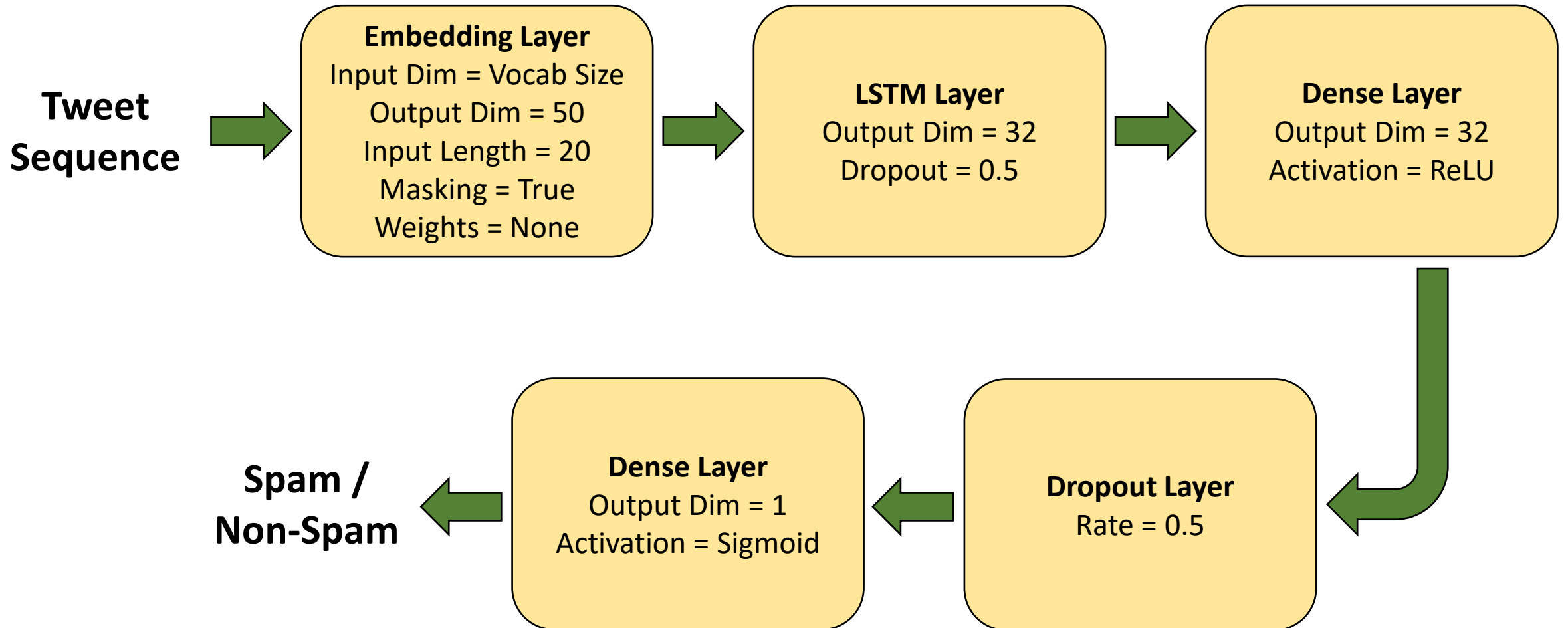
Word Embedding

1. Pre-trained GloVe Vectors

2. Word2Vec Model

3. Random Embedding Weights Initialization

Vector Representation of Word

Word: Day   Sequence Number: 8

```
array([-4.3403983 ,  0.40556964, -0.42501146,  1.4730797 ,  0.90421176,
        1.9075869 ,  0.08312437,  0.6439833 ,  2.5651932 ,  1.1874664 ,
       -1.0775348 , -2.8239334 ,  0.84565836, -0.9035908 , -1.4741738 ,
       -0.38576716,  0.03499779, -2.1147017 ,  0.85776967, -0.7507164 ,
        1.3248456 ,  0.8495753 ,  2.4046419 ,  1.4829855 ,  0.32771957,
        0.30922318,  0.6828054 , -1.3220766 , -1.3955446 ,  1.2230927 ,
       -0.46347642, -1.7479054 , -0.997003  , -1.7799075 ,  4.8689637 ,
        0.45992202, -2.0903652 ,  1.3692051 , -0.07983781,  1.9820805 ,
        2.676074  , -0.42747968, -0.3554965 ,  0.7534638 ,  1.4256805 ,
        0.11117712, -0.15307929, -2.5963352 , -0.25292033, -1.0869105 ],
      dtype=float32)
```

LSTM Model Architecture
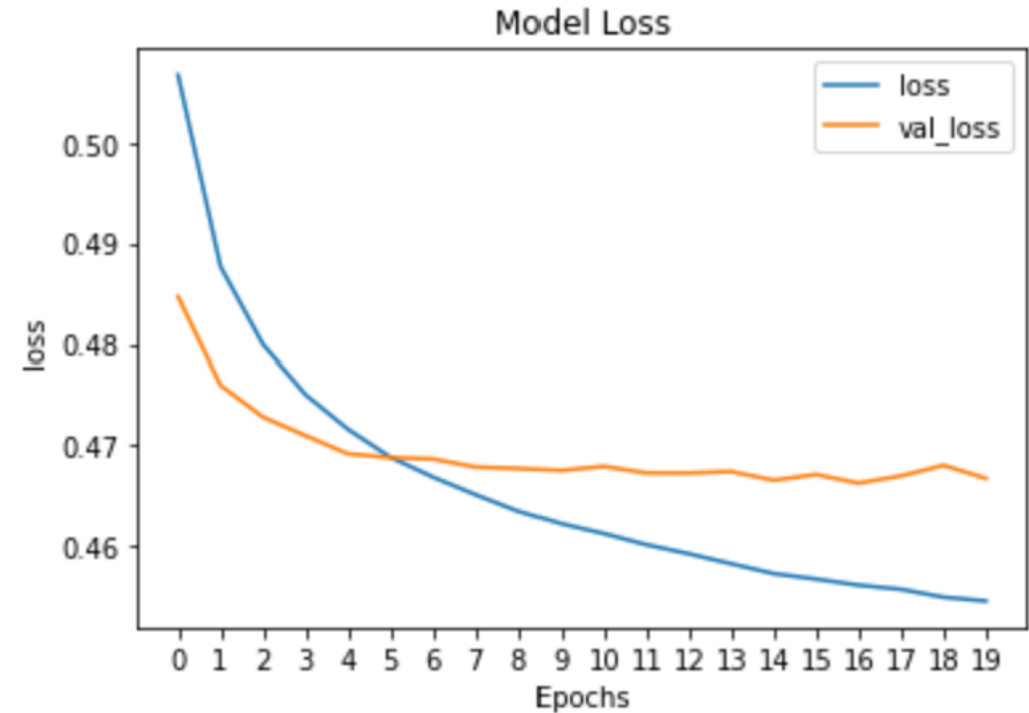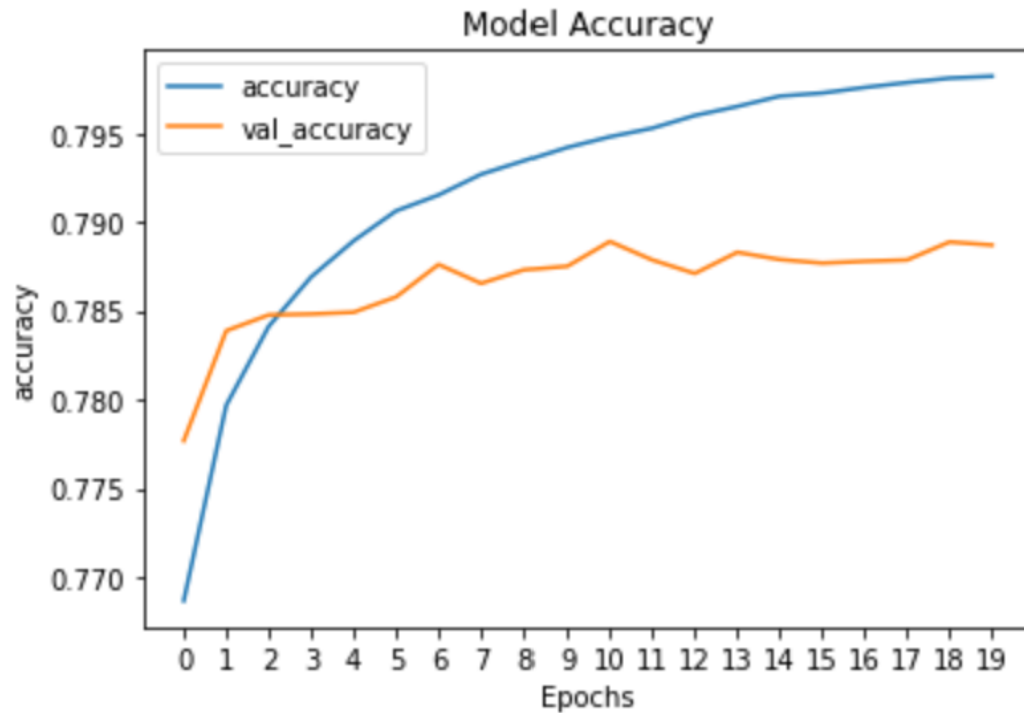
Tweet
Sequence

Embedding Layer
Input Dim = Vocab Size
Output Dim = 50
Input Length = 20
Masking = True
Weights = None

LSTM Layer
Output Dim = 32
Dropout = 0.5

Dense Layer
Output Dim = 32
Activation = ReLU

Spam /
Non-Spam

Dense Layer
Output Dim = 1
Activation = Sigmoid

Dropout Layer
Rate = 0.5

Model Training

Optimizer	Learning Rate	Loss Function	Training Batch Size	Training Epoch

Model Accuracy

Model Loss

Prediction Result of LSTM Model

Summary of Spam Detection Performance

Best Model	Best Word Embedding	Spam Precision	Specificity
LSTM	Random Weights	80%	87%
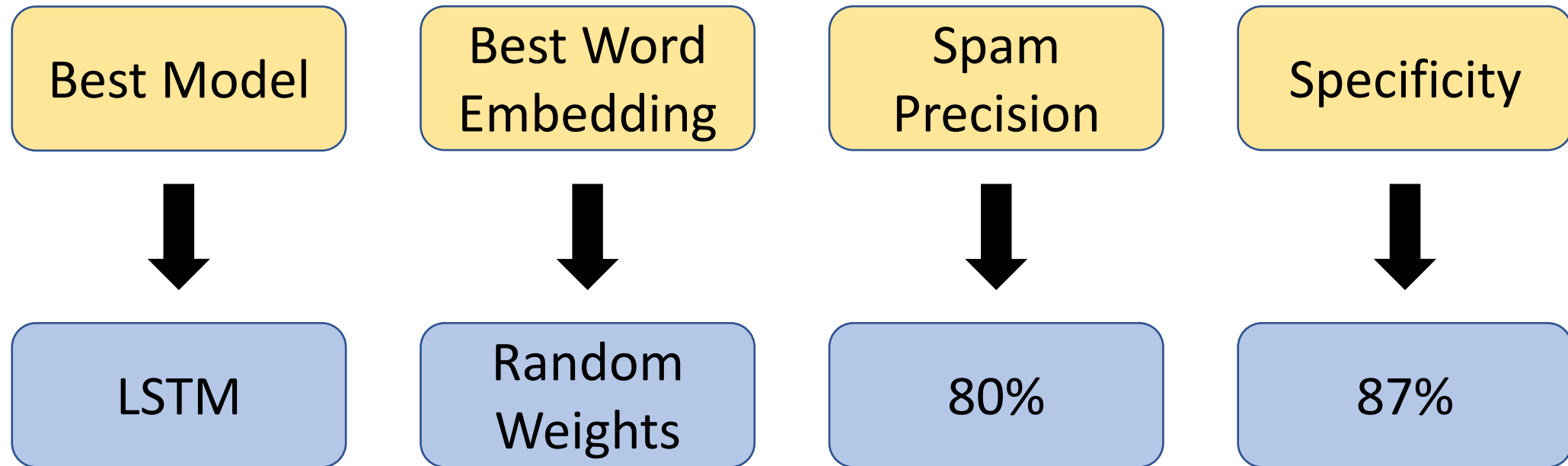
DEMO

Sample Test Tweets

	Text	Label
0	50% off ticket price 4 Ruby Revue Melbourne 2nite. 1st 20 buyers!! Only $12.50! Normally 25pp!!$ http://www.therubyrevue.com CODE "STAR"	1
1	Vote for your TOP 50 Burlesque Performers!!: VOTE NOW! http://bit.ly/7cBoC9	1
2	Please follow this link to submit your articles for publishing on the Jac Bowie site http://bit.ly/5zQ4k9	1
3	Hi Guys my Facebook account has been disabled. Please show your support by adding this page :) http://bit.ly/611JQe xx Jac	1
4	FOLLOWS, FOLLOWS, FOLLOWS! IF YOU NEED FOLLOWERS FAST THEN YOU HAVE GOT TO SEE THIS SITE!ITS COMPLETELY AUTOMATED! http://bit.ly/8Q3K8r	1
5	RT @shivsingh: Learning more about @traackr. Service/tool to help you identify social influencers. Seems interesting	1
6	Wow, the chapel is chilly this morning â€" at LDS Chapel http://gowal.la/s/gEq	0
7	Four Teens Charged With Murder of U of M Student - http://fwix.com/article/31_b226ae886c	0
8	@MCRforever Thanks, I Though That Was Earlier.Its Currently 9:30pm D: I'm Confused. But Oh Well Thanks For Letting Me Know x]	0
9	â€¦ It's Election Day! If you're in SLC, please vote YES on Prop 1. Find polling places + sample ballots here: http://elections.utah.gov/	0
10	Pls don't call her!! She jst signed my leave o!! RT @sleek04: Dnt tel me u @work @Lil_Yvette *dialin ur boss* u leave me n0 opti0n	0
11	Watching The Daily Show with Jane Goodall. Inspiring woman. http://bit.ly/1FYrXq	0

Processed Test Tweets

	Text	Label
0	ticket price ruby revue buyer normally url code star	1
1	vote top burlesque performer vote url	1
2	please follow link submit article bowie site url	1
3	guy account disabled please show support page url	1
4	need follower fast got see site completely url	1
5	retweet usermention learning usermention service tool help identify social interesting	1
6	wow chapel chilly morning chapel url	0
7	four teen murder student url	0
8	usermention thanks though currently confused well thanks know	0
9	election day please vote yes prop find polling place sample ballot url	0
10	call leave retweet usermention usermention usermention dialin leave	0
11	watching daily show jane inspiring woman url	0

Prediction

	Text	Label	Prediction
0	50% off ticket price 4 Ruby Revue Melbourne 2nite. 1st 20 buyers!! Only $12.50! Normally 25pp!!$ http://www.therubyrevue.com CODE "STAR"	1	1
1	Vote for your TOP 50 Burlesque Performers!!: VOTE NOW! http://bit.ly/7cBoC9	1	1
2	Please follow this link to submit your articles for publishing on the Jac Bowie site http://bit.ly/5zQ4k9	1	1
3	Hi Guys my Facebook account has been disabled. Please show your support by adding this page :) http://bit.ly/611JQe xx Jac	1	1
4	FOLLOWS, FOLLOWS, FOLLOWS! IF YOU NEED FOLLOWERS FAST THEN YOU HAVE GOT TO SEE THIS SITE!ITS COMPLETELY AUTOMATED! http://bit.ly/8Q3K8r	1	1
5	RT @shivsingh: Learning more about @traackr. Service/tool to help you identify social influencers. Seems interesting	1	0
6	Wow, the chapel is chilly this morning â€" at LDS Chapel http://gowal.la/s/gEq	0	0
7	Four Teens Charged With Murder of U of M Student - http://fwix.com/article/31_b226ae886c	0	1
8	@MCRforever Thanks, I Though That Was Earlier.Its Currently 9:30pm D: I'm Confused. But Oh Well Thanks For Letting Me Know x]	0	0
9	â€¦ It's Election Day! If you're in SLC, please vote YES on Prop 1. Find polling places + sample ballots here: http://elections.utah.gov/	0	0
10	Pls don't call her!! She jst signed my leave o!! RT @sleek04: Dnt tel me u @work @Lil_Yvette *dialin ur boss* u leave me n0 opti0n	0	0
11	Watching The Daily Show with Jane Goodall. Inspiring woman. http://bit.ly/1FYrXq	0	1