

# Twitter Bot

Final Presentation

Sina Behdidka  
Tim Mennicken  
Robert Rose

University of Applied Sciences Cologne

Tuesday the 4th of February, 2020

# Table of Contents

- Introduction
- Data Acquisition
  - Twitter API
  - GetOldTweets
- Pre-Processing
- Post-Processing
- Experiments
  - Character level
  - Word level
- Conclusion
- References

# Introduction

## Goal

- ▶ Develop neural network, which is able to create Tweets
- ▶ Tweets should imitate a person as good as possible
- ▶ People to imitate:

# Introduction

## Goal

- ▶ Develop neural network, which is able to create Tweets
- ▶ Tweets should imitate a person as good as possible
- ▶ People to imitate:



Twitter Bot

Sina Behdidka, Tim Mennicken, Robert Rose  
04.02.2020

Slide 2 of 25

# Introduction

## Goal

Workflow divided into three parts:

- ▶ Create a dataset
  - ▶ Crawl Tweets
  - ▶ Preprocess gathered Tweets

# Introduction

## Goal

Workflow divided into three parts:

- ▶ Create a dataset
  - ▶ Crawl Tweets
  - ▶ Preprocess gathered Tweets
  
- ▶ Design a network
  - ▶ Develop the architecture
  - ▶ Experiment with different setups

# Introduction

## Goal

Workflow divided into three parts:

- ▶ Create a dataset
  - ▶ Crawl Tweets
  - ▶ Preprocess gathered Tweets
- ▶ Design a network
  - ▶ Develop the architecture
  - ▶ Experiment with different setups
- ▶ Generate Tweets
  - ▶ Post-process predictions
  - ▶ Present the results

# Introduction

## Motivation

- ▶ Twitter is one of the big players in social media
- ▶ Microsoft tried to setup a chat bot to learn how young people communicate
  - ▶ Got taken down after 24 hours
- ▶ 9-17 % of Twitter users are bots
- ▶ Risk of political manipulation is high



Twitter Bot

Sina Behdidka, Tim Mennicken, Robert Rose  
04.02.2020

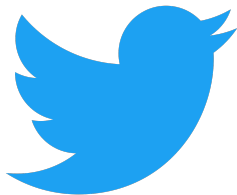
Slide 4 of 25

Technology  
Arts Sciences  
TH Köln



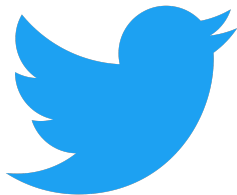
# Data Acquisition

- ▶ Twitter developer platform
  - ▶ Twitter developer account needed
  - ▶ Tweepy: Python wrapper
  - ▶ Complete functionality

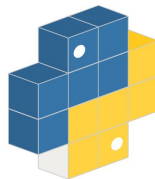


# Data Acquisition

- ▶ Twitter developer platform
  - ▶ Twitter developer account needed
  - ▶ Tweepy: Python wrapper
  - ▶ Complete functionality



- ▶ GetOldTweets
  - ▶ Fetches Tweets from the website
  - ▶ Python package
  - ▶ Read only access



# Data Acquisition

## Twitter API

- ▶ Amount of Tweets limited
  - ▶ Request windows are separated in 15 minutes chunks
  - ▶ Specific amount of requests per window
  - ▶ Can be bypassed by cyclic requests paired with pauses

# Data Acquisition

## Twitter API

- ▶ Amount of Tweets limited
  - ▶ Request windows are separated in 15 minutes chunks
  - ▶ Specific amount of requests per window
  - ▶ Can be bypassed by cyclic requests paired with pauses
- ▶ Cannot go arbitrarily far to the past
  - ▶ Returns no Tweets older than roundabout a month
  - ▶ Cannot be bypassed

# Data Acquisition

## Twitter API

- ▶ Amount of Tweets limited
  - ▶ Request windows are separated in 15 minutes chunks
  - ▶ Specific amount of requests per window
  - ▶ Can be bypassed by cyclic requests paired with pauses
- ▶ Cannot go arbitrarily far to the past
  - ▶ Returns no Tweets older than roundabout a month
  - ▶ Cannot be bypassed
- ▶ Account got blacklisted
  - ▶ No further access to the Twitter API
  - ▶ Got unblocked on request

# Data Acquisition

## GetOldTweets

- ▶ No limitation
  - ▶ Arbitrary amount of Tweets
  - ▶ No restrictions with respect to publication date

# Data Acquisition

## GetOldTweets

- ▶ No limitation
  - ▶ Arbitrary amount of Tweets
  - ▶ No restrictions with respect to publication date
- ▶ Shortened functionality
  - ▶ Limited meta data of Tweets
  - ▶ No functionality for publishing Tweets

# Data Acquisition

## GetOldTweets

- ▶ No limitation
  - ▶ Arbitrary amount of Tweets
  - ▶ No restrictions with respect to publication date
- ▶ Shortened functionality
  - ▶ Limited meta data of Tweets
  - ▶ No functionality for publishing Tweets
- ▶ Better suited for getting large data sets



# Pre-Processing

## Particular Content

- ▶ Weblinks
- ▶ Picture & video links
- ▶ Punctuation symbols
- ▶ Special characters
- ▶ Retweets
- ▶ Hashtags
- ▶ Username references

# Pre-Processing

## Particular Content

### Content we keep:

1. Selected punctuation symbols  
point, comma, exclamation mark, interrogation mark, colon  
and hash
2. Hashtags
3. References to usernames

# Pre-Processing

## Space characters

- ▶ Union of several space characters
- ▶ The Tokenizer splits the input text at space characters

# Pre-Processing

## Space characters

- ▶ Union of several space characters
- ▶ The Tokenizer splits the input text at space characters

### Why we need to add spaces

house.  $\Rightarrow$  ["house."]

house .  $\Rightarrow$  ["house", "."]

# Pre-Processing

## Termination Symbol

- ▶ Model does not know when to stop
- ▶ Stopping generation at an arbitrary number looks choppy
- ▶ Termination symbol is introduced

# Post-Processing

- ▶ Remove unfitting space characters
  - ▶ E.g. before punctuation symbols

# Post-Processing

- ▶ Remove unfitting space characters
  - ▶ E.g. before punctuation symbols
- ▶ Make words uppercase
  - ▶ E.g. at the beginning of a sentence

# Post-Processing

- ▶ Remove unfitting space characters
  - ▶ E.g. before punctuation symbols
- ▶ Make words uppercase
  - ▶ E.g. at the beginning of a sentence
- ▶ Restrict generation
  - ▶ Lower limit
  - ▶ Upper limit

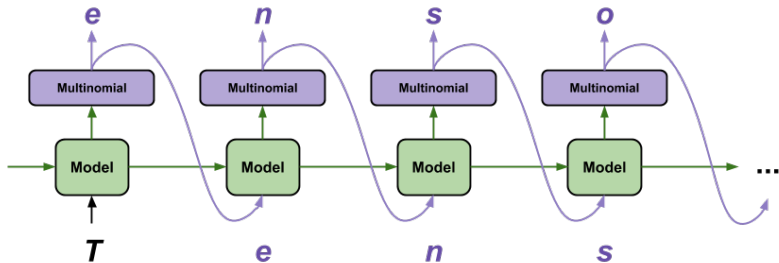


# Experiments

- ▶ Character level model
- ▶ Word level model

# Experiments

## Character level model



# Experiments

## Character level model

▶ Seed:

“i just realized that if you listen to ca”

▶ Generated text:

“nt beloels like scobous dweb ! vote selffiending up. #fitn graham  
of his tonight dominater wsa an ands. comfuntstaheos,”

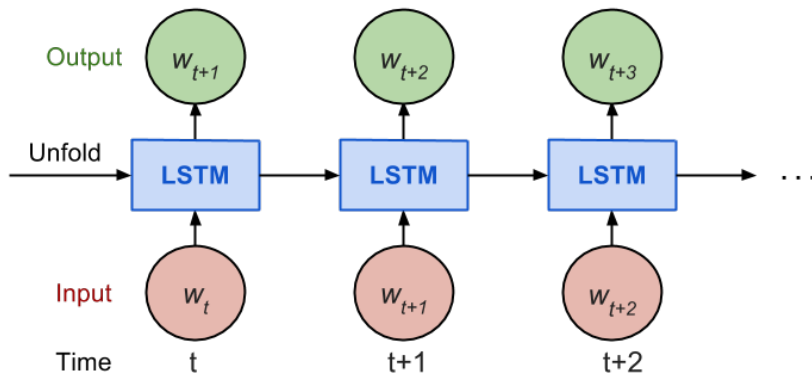
# Experiments

## Word level model

- ▶ Multiple unidirectional LSTM
- ▶ Single bidirectional LSTM
- ▶ Multiple bidirectional LSTM

# Experiments

## Word level model – Multiple unidirectional LSTM



# Experiments

## Word level model – Multiple undirectional LSTM

▶ Seed:

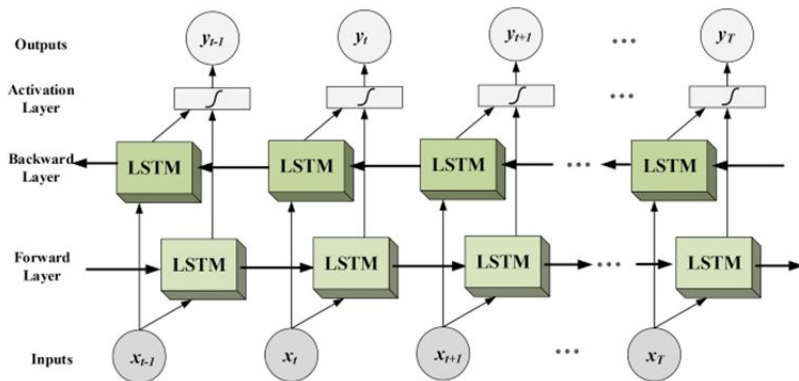
“and how innocent she is , ask her to read peters insurance policy text , to her , just in case hillary loses . also , why were the lovers text messages scrubbed after he left mueller . where are they lisa ? ; the republican party has never been so”

▶ Generated text:

“easy to gain. They are entrapping people with china. They have gone bonkers, and I havent seen millions of americans!”

# Experiments

## Word level model – Single bidirectional LSTM



# Experiments

## Word level model – Single bidirectional LSTM

### ▶ Seed:

“co-founder of greenpeace: the whole climate crisis is not only fake news , its fake science . there is no climate crisis , theres weather and climate all around the world , and in fact carbon dioxide is the main building block of all life . @foxandfriends wow ! ; jewish”

### ▶ Generated text:

“people are leaving the democratic party. The fires lost in favor of our seniors. Presidential world”



# Experiments

## Word level model – Multiple bidirectional LSTM

### ▶ Seed:

“fraudulent speech knowingly delivered as a ruthless con , and the illegal meetings with a highly partisan whistleblower & lawyer . @60minutes forgot to report that we are helping the great farmers of the usa to the tune of 28 billion dollars , for the last two years , paid for”

### ▶ Generated text:

“the democrats . the democrats are a very good of the democrats . the democrats are a very good of the democrats . the democrats are a very good of”

# Experiments

## Suggested Model

Layer (type)	Output Shape	Param #
embedding_1 (Embedding)	(None, 50, 50)	503500
lstm_1 (LSTM)	(None, 50, 128)	91648
dropout_1 (Dropout)	(None, 50, 128)	0
bidirectional_1 (Bidirection	(None, 256)	263168
dense_1 (Dense)	(None, 100)	25700
dense_2 (Dense)	(None, 10070)	1017070

Total params: 1,901,086

Trainable params: 1,901,086

Non-trainable params: 0

# Conclusion

## Results

- ✓ Char-level tweet creation
- ✓ Word-level creation
- ✓ Readable results
- Still easy to distinguish
- Clinton model sometimes won't predict readable results

# Conclusion

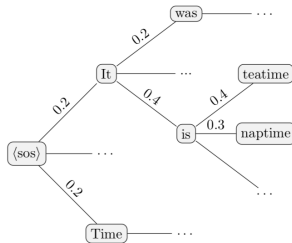
## Possible Improvements

- ▶ Gather more data
- ▶ Deeper network
- ▶ Use optimization tools to find good hyperparameter combinations
- ▶ Implement beam search
- ▶ Use Attention techniques

# Conclusion

## Possible Improvements

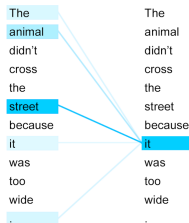
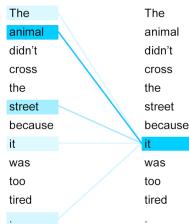
- ▶ Gather more data
- ▶ Deeper network
- ▶ Use optimization tools to find good hyperparameter combinations
- ▶ Implement beam search
- ▶ Use Attention techniques



# Conclusion

## Possible Improvements

- ▶ Gather more data
- ▶ Deeper network
- ▶ Use optimization tools to find good hyperparameter combinations
- ▶ Implement beam search
- ▶ Use Attention techniques



# References

- ▶ Twitter Developers – <https://developer.twitter.com/en.html>
- ▶ GetOldTweets – <https://github.com/Jefferson-Henrique/GetOldTweets-python>
- ▶ Transformer – <https://ai.googleblog.com/2017/08/transformer-novel-neural-network.html>
- ▶ Beam Search – <https://towardsdatascience.com/the-arti-canon-neural-text-generation-2wwa8f032c2a68>
- ▶ Tay (German source) – <https://www.faz.net/aktuell/wirtschaft/netzwirtschaft/microsofts-bot-tay-wird-durch-nutzer-zum-nazi-und-sexist-14.html>