Detect-le-Defect

A Python Project

Smart Censoring Application for Live-streaming platforms
To identify and classify Chat behavior
Using Social Sentiment Analysis and Machine Learning

DSTI - 21

Meet le Team

Gustavo Chinchayan
Operations

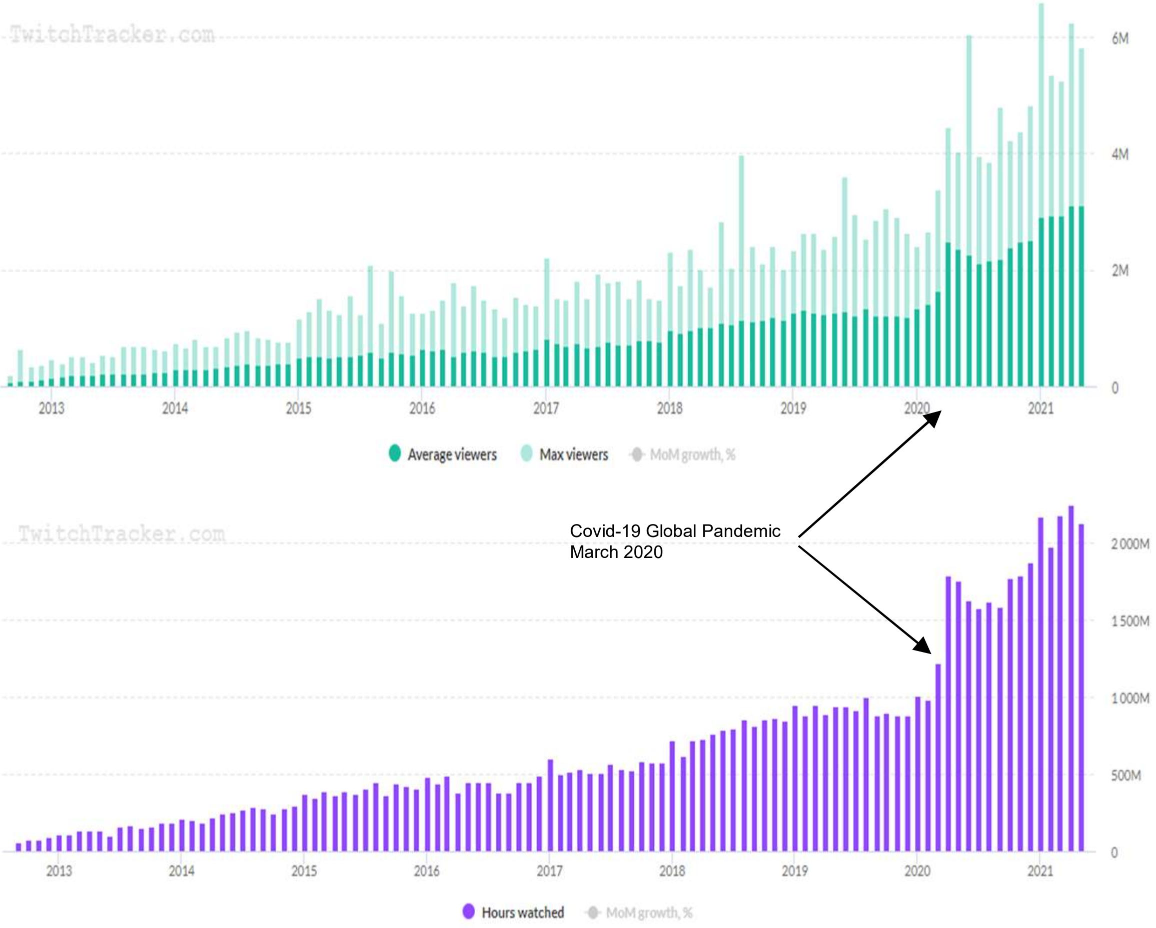
Aleksandra Lazic
Analytics

Felipe Lopez
Development

Manuel Gawert
Engineering

Twitch Platform

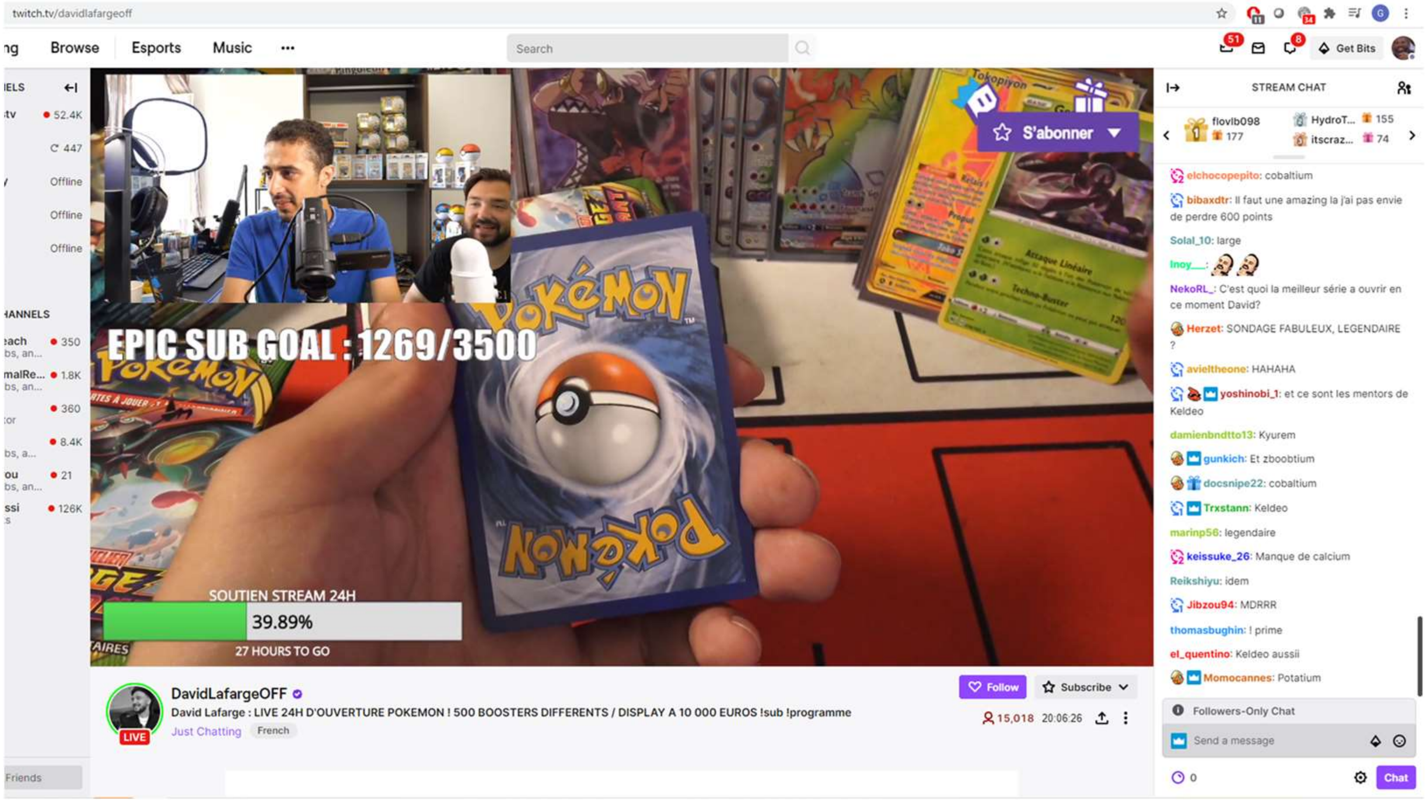
- Founded in 2011
- Acquired by Amazon for US$970 million
- Synergies with Amazon prime
- Optional subscription as a service
- Generates revenue via Twitch Partner/Affiliates and commercial deals
- Esports audience growth forecasting to be at 646 million by 2023



Covid-19 Global Pandemic
March 2020

Point of Interest

Just Chatting Section



DavidLafargeOFF
David Lafarge : LIVE 24H D'OUVERTURE POKEMON ! 500 BOOSTERS DIFFERENTS / DISPLAY A 10 000 EUROS !sub !programme
Just Chatting French

flovlb098 177
HydroT... 155
itscraz... 74

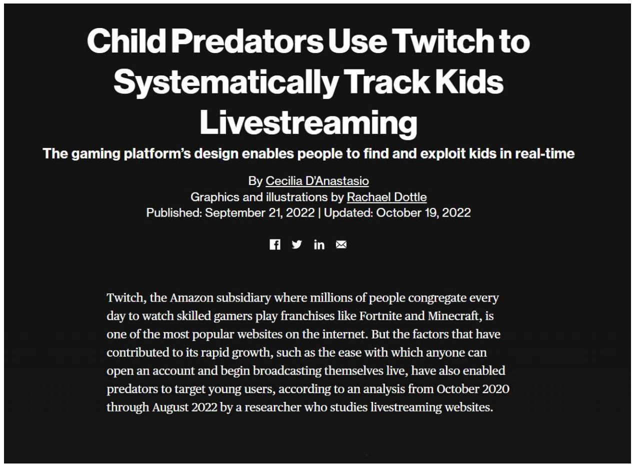
elchocopepito: cobaltium
bibaxdtr: Il faut une amazing la j'ai pas envie de perdre 600 points
Solal_10: large
Inoy___:
NekoRL_: C'est quoi la meilleur série a ouvrir en ce moment David?
Herzet: SONDAGE FABULEUX, LEGENDAIRE ?
avieltheone: HAHAHA
yoshinobi_1: et ce sont les mentors de Keldeo
damienbndtto13: Kyurem
gunkich: Et zboobtium
docsnipe22: cobaltium
Trxstann: Keldeo
marinp56: legendaire
keissuke_26: Manque de calcium
Reikshiyu: idem
Jibzou94: MDRRR
thomasbughin: ! prime
el_quentino: Keldeo aussii
Momocannes: Potatium

Followers-Only Chat
Send a message

- ❑ Comprised of content creators/ influencers as Twitch Partners
- ❑ Community-driven based on their genre and taste
- ❑ Avg stream length 3-4 hours
- ❑ Engaged audience providing live feedback every second
- ❑ User feedback made up of strings, integers, and emoji (coded as text)

Content Moderation

- ❑ Mature content is easily accessible
- ❑ Hate Speech and Harassment is an issue
- ❑ Emojis/memes being used to perpetuate racism
- ❑ Limited control and analysis over audience feedback



Child Predators Use Twitch to Systematically Track Kids Livestreaming

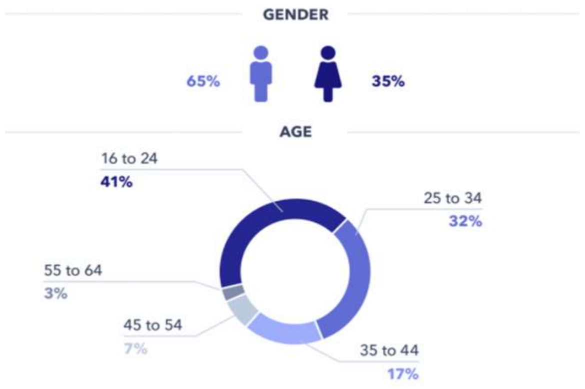
The gaming platform's design enables people to find and exploit kids in real-time

By Cecilia D'Anastasio
Graphics and illustrations by Rachael Dottle
Published: September 21, 2022 | Updated: October 19, 2022

Twitch, the Amazon subsidiary where millions of people congregate every day to watch skilled gamers play franchises like Fortnite and Minecraft, is one of the most popular websites on the internet. But the factors that have contributed to its rapid growth, such as the ease with which anyone can open an account and begin broadcasting themselves live, have also enabled predators to target young users, according to an analysis from October 2020 through August 2022 by a researcher who studies livestreaming websites.

The Twitch Demographic

% of Twitch users who are



Question: Which of the following best describes your gender?/How old are you?
Source: GlobalWebIndex Q2 2019 **Base:** 15,853 Twitch users aged 16-64 (excl. China)

Solution Stages

Provide a content feedback SaaS based on live stream user experience

Planning Stage

Setting Baseline

Data extraction and cleaning the data Frame

Analysis Stage

Action Plan

Discover trends and patterns

Modelling Stage

Optimize

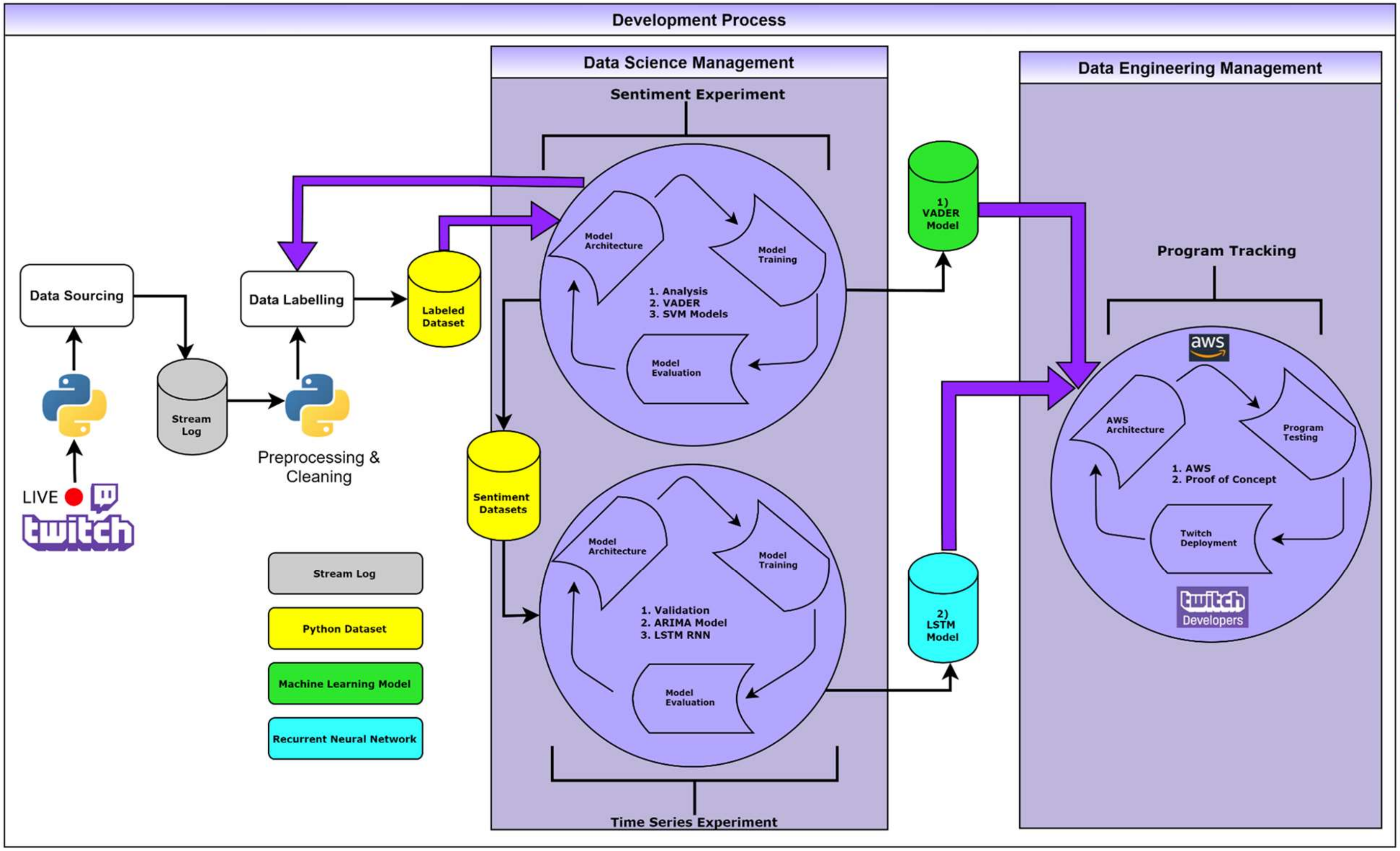
Machine Learning Model Tuning

Final Stage

Implementation

Extrapolate and Integrate

Methodology



Development Process

Data Science Management

Sentiment Experiment

Model Architecture

Model Training

1. Analysis
2. VADER
3. SVM Models

Model Evaluation

Time Series Experiment

Model Architecture

Model Training

1. Validation
2. ARIMA Model
3. LSTM RNN

Model Evaluation

Data Engineering Management

Program Tracking

aws

AWS Architecture

Program Testing

1. AWS
2. Proof of Concept

Twitch Deployment

twitch Developers

Data Sourcing

Stream Log

Data Labelling

Labeled Dataset

Preprocessing & Cleaning

Sentiment Datasets

1) VADER Model

2) LSTM Model

LIVE ● twitch

Stream Log

Python Dataset

Machine Learning Model

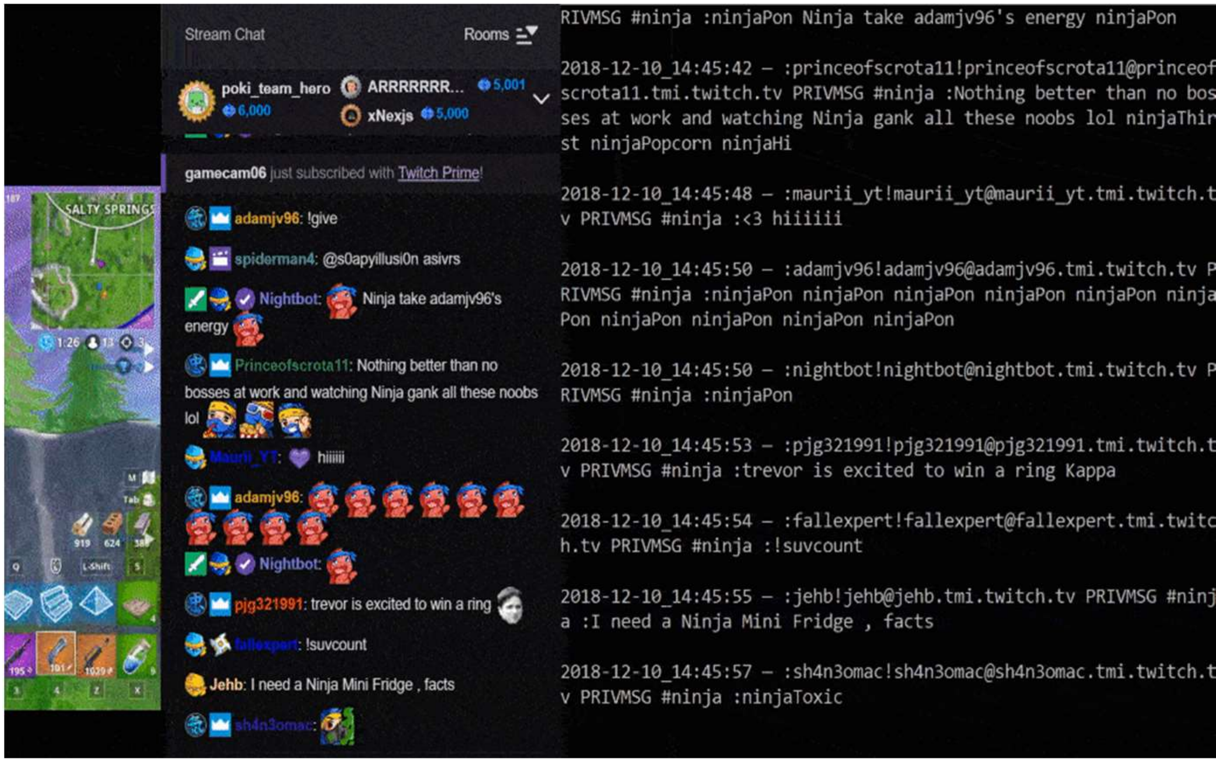
Recurrent Neural Network

Data Extraction

Web Scraping highly viewed streams

Via Twitch Internet Relay Chat (IRC)

- Twitch Developer Account
- Using Python socket library
- Socket based in Time (seconds)
- Dataset downloaded as a Log



gamecam06 just subscribed with Twitch Prime!

adamjv96: !give

spiderman4: @s0apyillusi0n asivrs

Nightbot: Ninja take adamjv96's energy

Princeofscrota11: Nothing better than no bosses at work and watching Ninja gank all these noobs lol

Maurii_YT: hiiiiii

adamjv96:

Nightbot:

pjg321991: trevor is excited to win a ring

fallexpert: !suvcount

Jehb: I need a Ninja Mini Fridge , facts

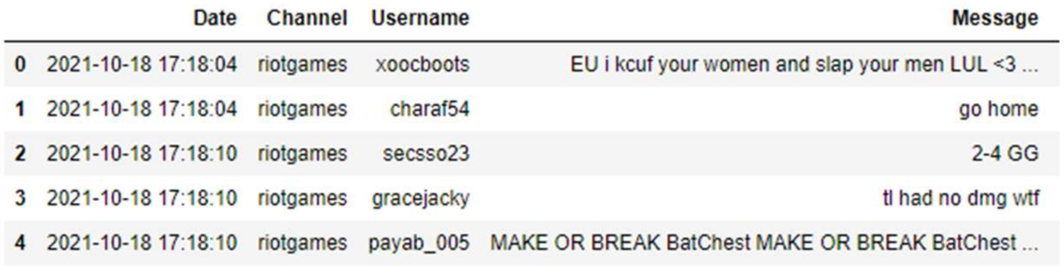
sh4n3omac:

```
RIVMSG #ninja :ninjaPon Ninja take adamjv96's energy ninjaPon

2018-12-10_14:45:42 – :princeofscrota11!princeofscrota11@princeof
scrota11.tmi.twitch.tv PRIVMSG #ninja :Nothing better than no bos
ses at work and watching Ninja gank all these noobs lol ninjaThir
st ninjaPopcorn ninjaHi

2018-12-10_14:45:48 – :maurii_yt!maurii_yt@maurii_yt.tmi.twitch.t
v PRIVMSG #ninja :<3 hiiiiii

2018-12-10_14:45:50 – :adamjv96!adamjv96@adamjv96.tmi.twitch.tv P
RIVMSG #ninja :ninjaPon ninjaPon ninjaPon ninjaPon ninjaPon ninja
Pon ninjaPon ninjaPon ninjaPon ninjaPon

2018-12-10_14:45:50 – :nightbot!nightbot@nightbot.tmi.twitch.tv P
RIVMSG #ninja :ninjaPon

2018-12-10_14:45:53 – :pjg321991!pjg321991@pjg321991.tmi.twitch.t
v PRIVMSG #ninja :trevor is excited to win a ring Kappa

2018-12-10_14:45:54 – :fallexpert!fallexpert@fallexpert.tmi.twitc
h.tv PRIVMSG #ninja :!suvcount

2018-12-10_14:45:55 – :jehb!jehb@jehb.tmi.twitch.tv PRIVMSG #ninj
a :I need a Ninja Mini Fridge , facts

2018-12-10_14:45:57 – :sh4n3omac!sh4n3omac@sh4n3omac.tmi.twitch.t
v PRIVMSG #ninja :ninjaToxic
```

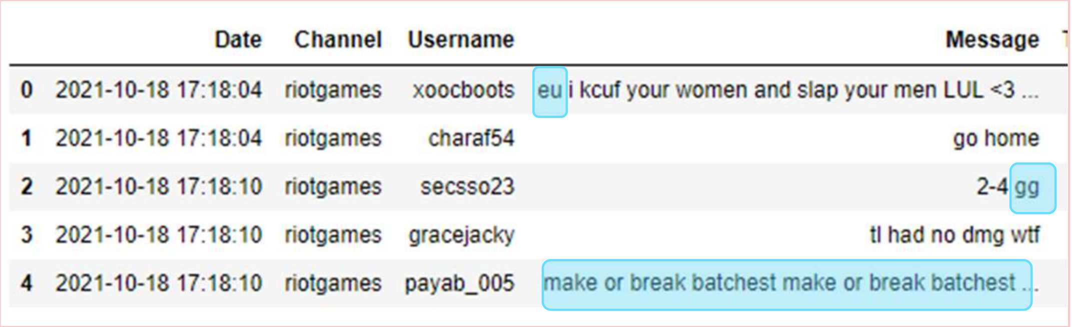
Data Preprocessing & Cleaning

Stemming : Stemming is the process of reducing inflected (or sometimes derived) words to their word stem, base or root form and lowercasing

Original message



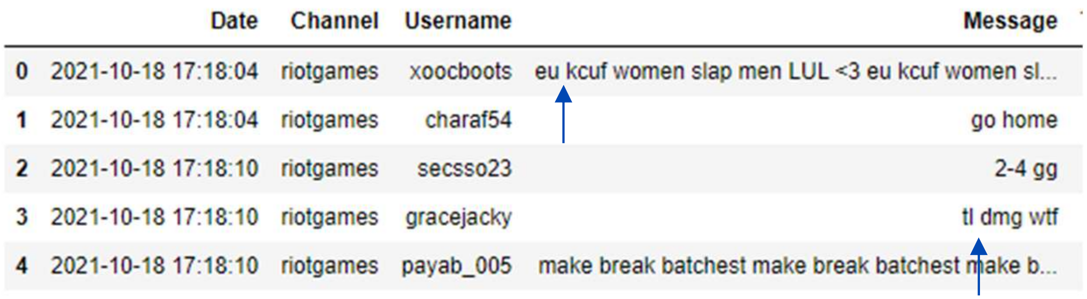
	Date	Channel	Username	Message
0	2021-10-18 17:18:04	riotgames	xoocboots	EU i kcuf your women and slap your men LUL <3 ...
1	2021-10-18 17:18:04	riotgames	charaf54	go home
2	2021-10-18 17:18:10	riotgames	secsso23	2-4 GG
3	2021-10-18 17:18:10	riotgames	gracejacky	tl had no dmg wtf
4	2021-10-18 17:18:10	riotgames	payab_005	MAKE OR BREAK BatChest MAKE OR BREAK BatChest ...



	Date	Channel	Username	Message
0	2021-10-18 17:18:04	riotgames	xoocboots	eu i kcuf your women and slap your men LUL <3 ...
1	2021-10-18 17:18:04	riotgames	charaf54	go home
2	2021-10-18 17:18:10	riotgames	secsso23	2-4 gg
3	2021-10-18 17:18:10	riotgames	gracejacky	tl had no dmg wtf
4	2021-10-18 17:18:10	riotgames	payab_005	make or break batchest make or break batchest ...

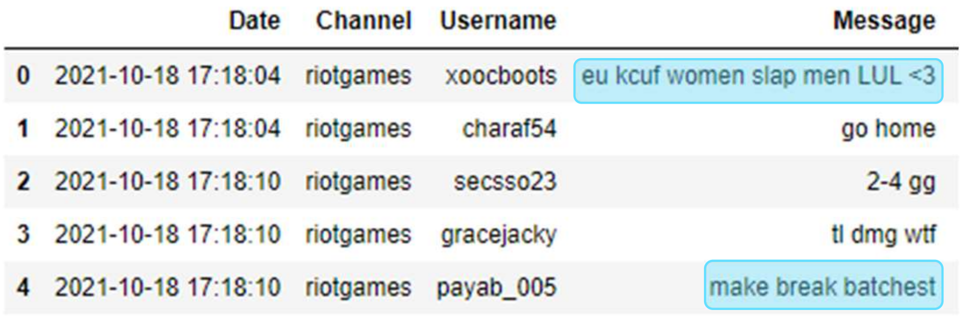
Data Preprocessing & Cleaning

Removal of Stopwords (i, me, my, myself, we, our, ours, ourselves, you, you're, you've, you'll, you'd, your, yours)



	Date	Channel	Username	Message
0	2021-10-18 17:18:04	riotgames	xoocboots	eu kcuf women slap men LUL <3 eu kcuf women sl...
1	2021-10-18 17:18:04	riotgames	charaf54	go home
2	2021-10-18 17:18:10	riotgames	secsso23	2-4 gg
3	2021-10-18 17:18:10	riotgames	gracejacky	tl dmg wtf
4	2021-10-18 17:18:10	riotgames	payab_005	make break batchest make break batchest make b...

Remove duplicate words



	Date	Channel	Username	Message
0	2021-10-18 17:18:04	riotgames	xoocboots	eu kcuf women slap men LUL <3
1	2021-10-18 17:18:04	riotgames	charaf54	go home
2	2021-10-18 17:18:10	riotgames	secsso23	2-4 gg
3	2021-10-18 17:18:10	riotgames	gracejacky	tl dmg wtf
4	2021-10-18 17:18:10	riotgames	payab_005	make break batchest

Remove words that only have one character

Data Preprocessing & Cleaning

Remove the rare words

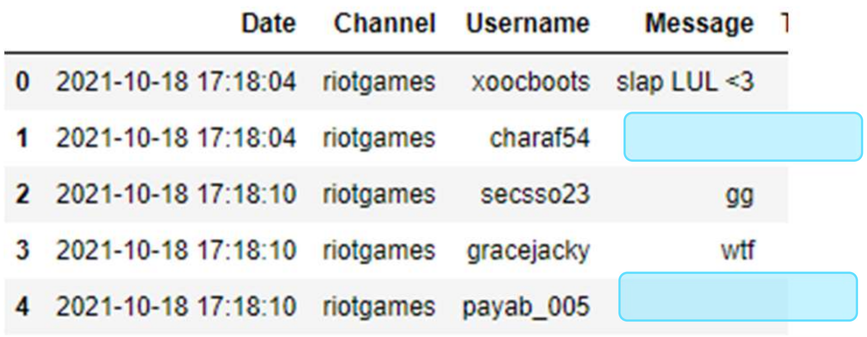
Remove all the links and page spam

if(('https' in message) or ('.com' in message))

We need to remove messages that contain only numbers.

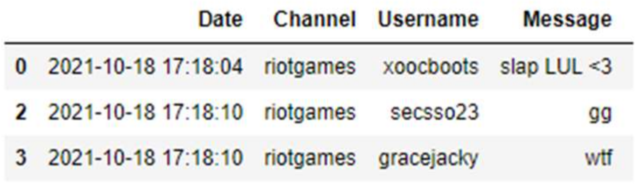
Make an spelling check for all the words that are in our lexicon (Vader lexicon) + emotes/emojis https://github.com/cjhutto/vaderSentiment/blob/master/vaderSentiment/vader_lexicon.txt

! After all this preprocessing we need to verify and remove if we have or not message



	Date	Channel	Username	Message
0	2021-10-18 17:18:04	riotgames	xoocboots	slap LUL <3
1	2021-10-18 17:18:04	riotgames	charaf54	
2	2021-10-18 17:18:10	riotgames	secsso23	gg
3	2021-10-18 17:18:10	riotgames	gracejacky	wtf
4	2021-10-18 17:18:10	riotgames	payab_005	

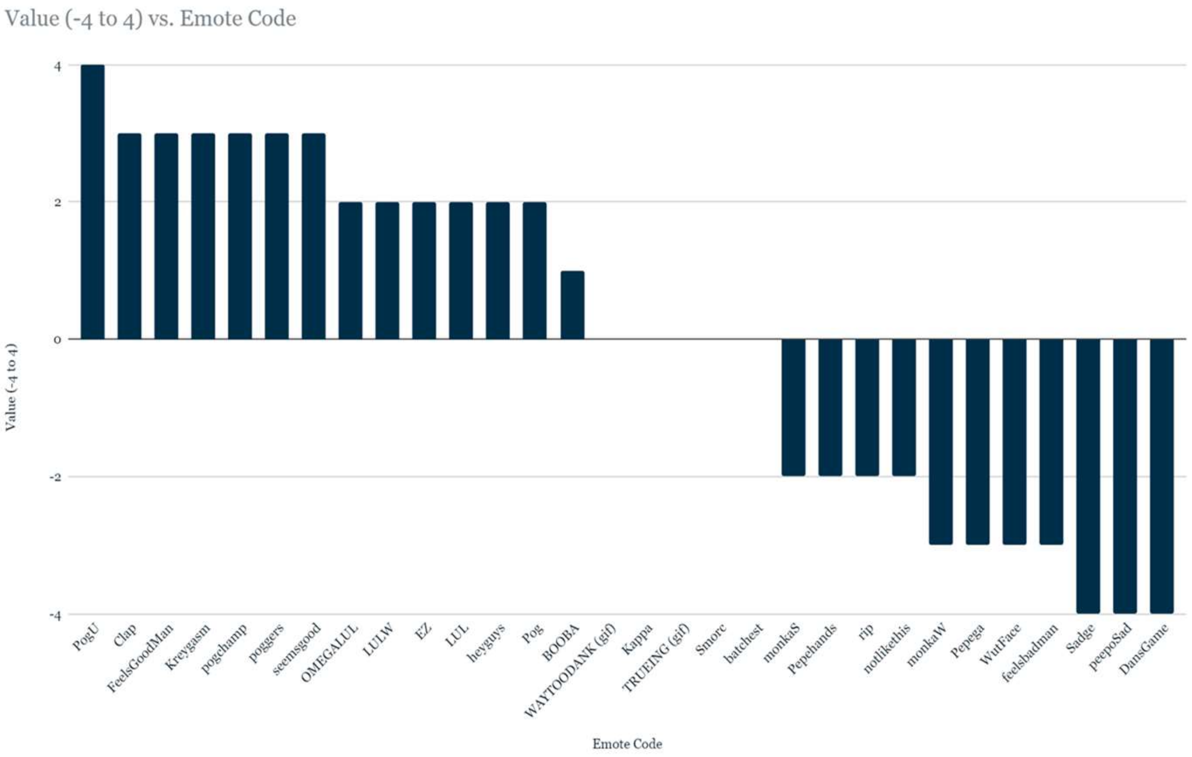
Cleanest message



	Date	Channel	Username	Message
0	2021-10-18 17:18:04	riotgames	xoocboots	slap LUL <3
2	2021-10-18 17:18:10	riotgames	secsso23	gg
3	2021-10-18 17:18:10	riotgames	gracejacky	wtf

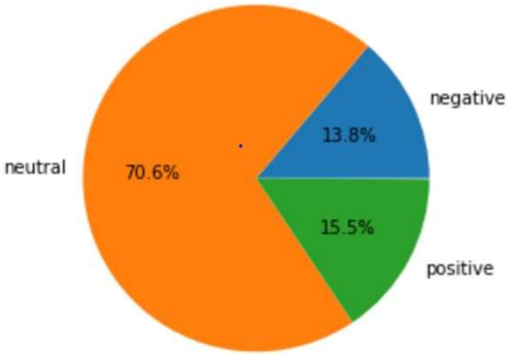
Sentiment Analysis

- Discovered 30 most common emotes based on Dataset
- Declare Sentiment and rating based on our judgement: LINK
- Declare Twitch emotes to Lexicon Dictionary

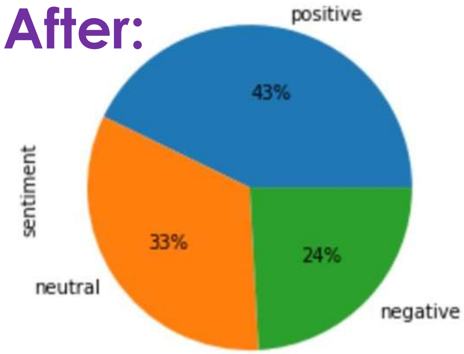


ValenceAware Dictionary for Sentiment Reasoning (VADER)

Before:

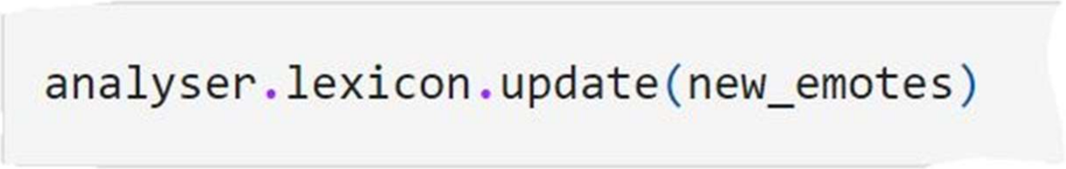


After:

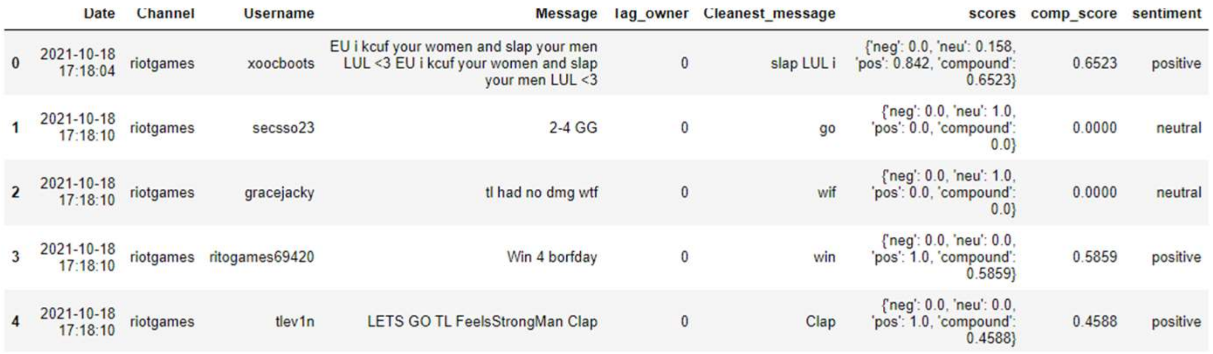


VADER (Valence Aware Dictionary and Sentiment Reasoner) is a lexicon and rule-based sentiment analysis tool that is specifically attuned to sentiments expressed in social media.

It is used for sentiment analysis of text which has both the polarities i.e. positive/negative. VADER is used to quantify how much of positive or negative emotion the text has and also the intensity of emotion.

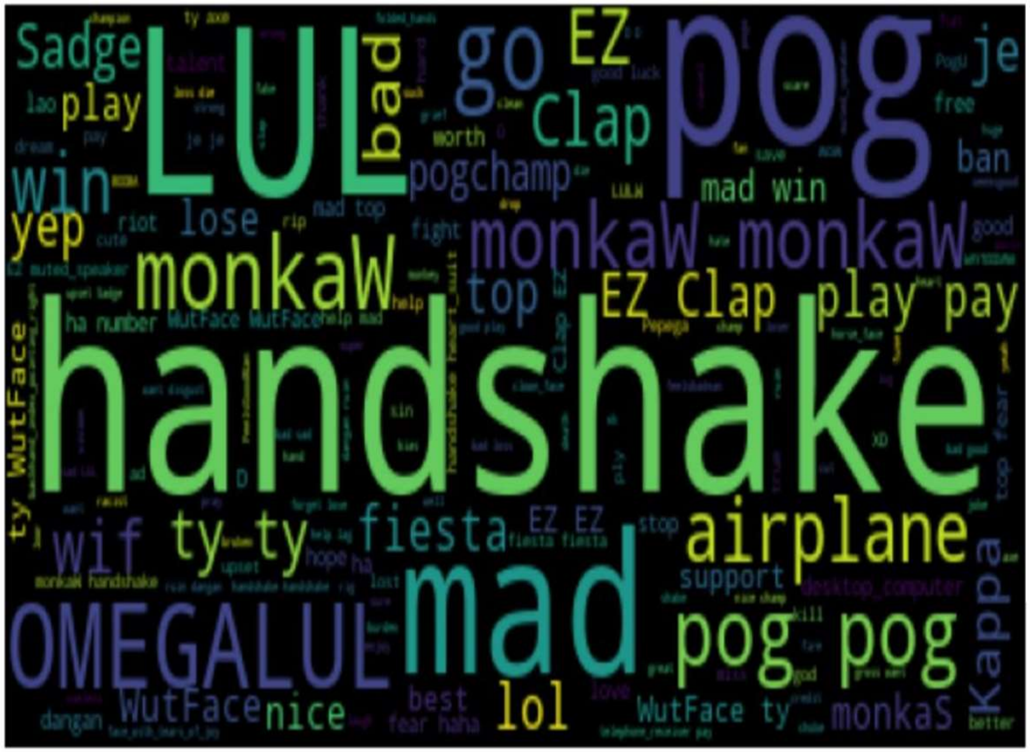


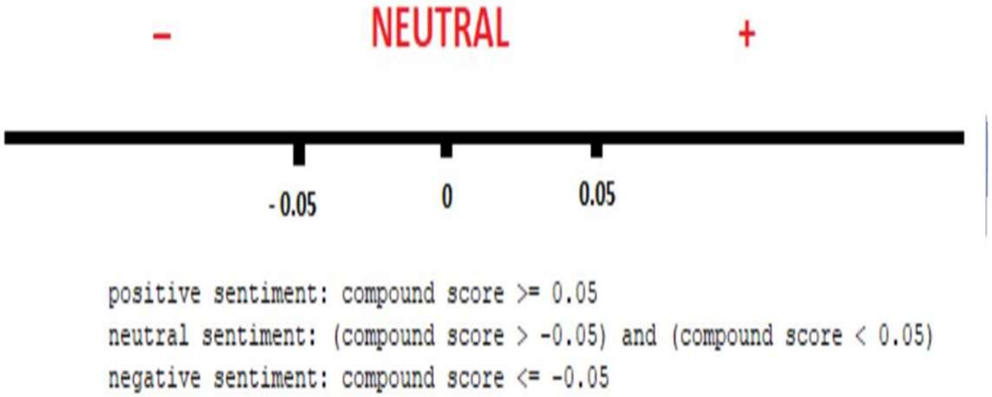
```
analyser.lexicon.update(new_emotes)
```



	Date	Channel	Username	Message	Tag_owner	Cleanest_message	scores	comp_score	sentiment
0	2021-10-18 17:18:04	riotgames	xoocboots	EU i kcuf your women and slap your men LUL <3 EU i kcuf your women and slap your men LUL <3	0	slap LUL i	{'neg': 0.0, 'neu': 0.158, 'pos': 0.842, 'compound': 0.6523}	0.6523	positive
1	2021-10-18 17:18:10	riotgames	secsso23	2-4 GG	0	go	{'neg': 0.0, 'neu': 1.0, 'pos': 0.0, 'compound': 0.0}	0.0000	neutral
2	2021-10-18 17:18:10	riotgames	gracejacky	tl had no dmg wtf	0	wif	{'neg': 0.0, 'neu': 1.0, 'pos': 0.0, 'compound': 0.0}	0.0000	neutral
3	2021-10-18 17:18:10	riotgames	ritogames69420	Win 4 borfday	0	win	{'neg': 0.0, 'neu': 0.0, 'pos': 1.0, 'compound': 0.5859}	0.5859	positive
4	2021-10-18 17:18:10	riotgames	tlev1n	LETS GO TL FeelsStrongMan Clap	0	Clap	{'neg': 0.0, 'neu': 0.0, 'pos': 1.0, 'compound': 0.4588}	0.4588	positive

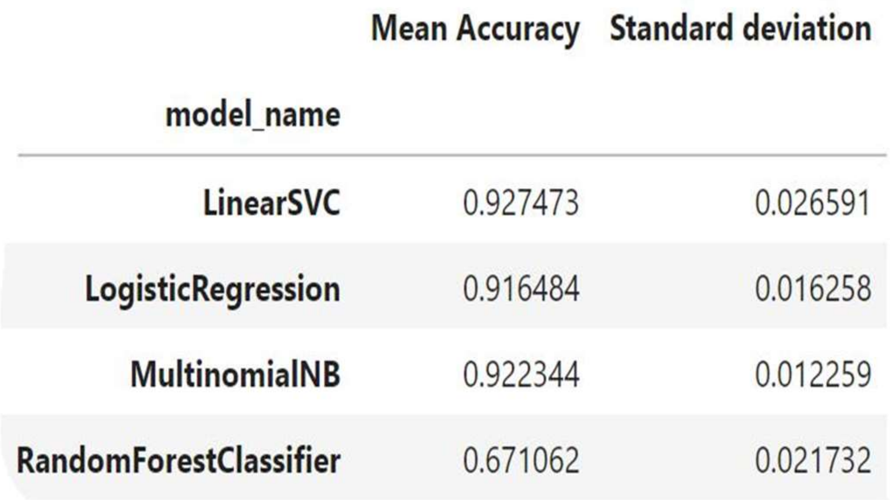
VADER Analysis



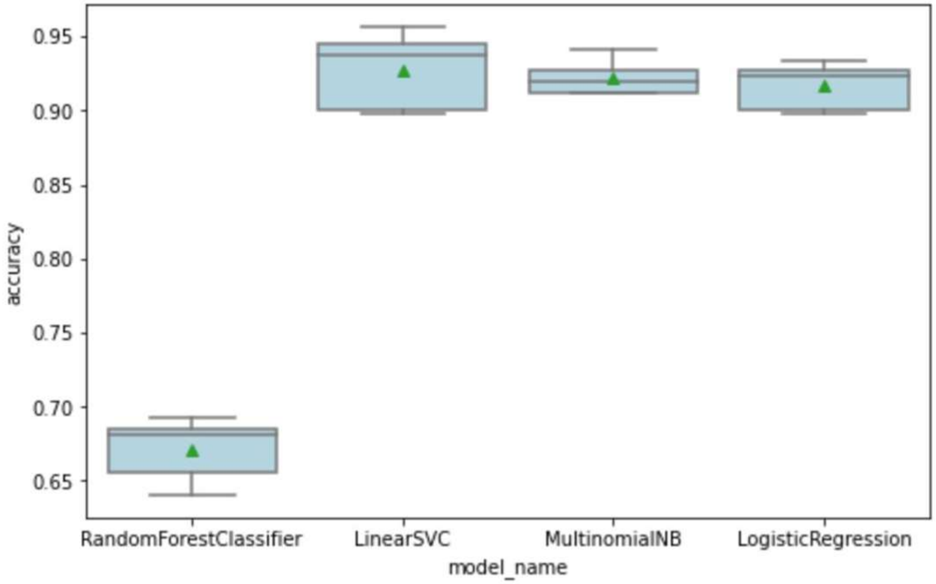


```
positive sentiment: compound score >= 0.05
neutral sentiment: (compound score > -0.05) and (compound score < 0.05)
negative sentiment: compound score <= -0.05
```

SVM Model

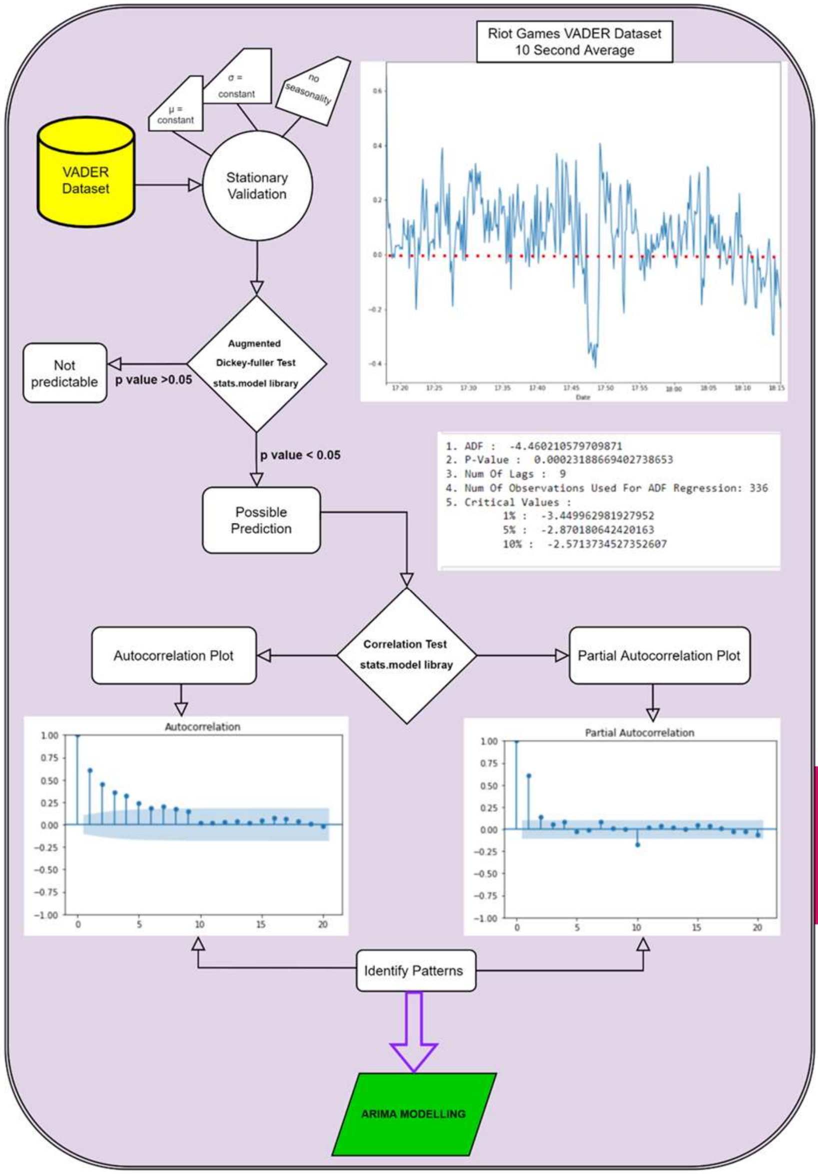


	Mean Accuracy	Standard deviation
model_name		
LinearSVC	0.927473	0.026591
LogisticRegression	0.916484	0.016258
MultinomialNB	0.922344	0.012259
RandomForestClassifier	0.671062	0.021732



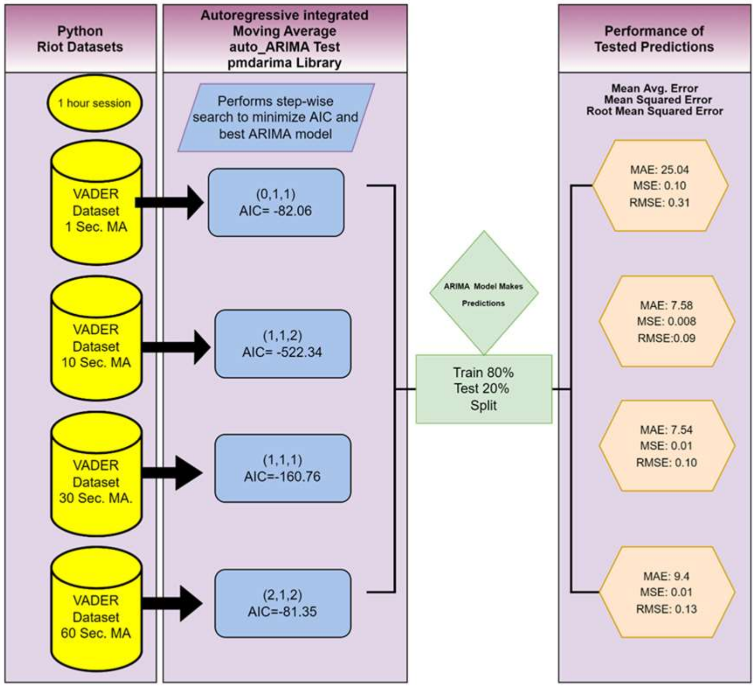
Time Series: Validation

- Stationary Test
- Augmented Dicker Fuller Test
- Correlation Test (ACF & PACF)



```
1. ADF :  -4.460210579709871
2. P-Value :  0.00023188669402738653
3. Num Of Lags :  9
4. Num Of Observations Used For ADF Regression: 336
5. Critical Values :
        1% :  -3.449962981927952
        5% :  -2.870180642420163
        10% :  -2.5713734527352607
```

ARIMA Model


Python Riot Datasets

Autoregressive integrated Moving Average auto_ARIMA Test pmdarima Library

Performance of Tested Predictions

1 hour session

VADER Dataset 1 Sec. MA

VADER Dataset 10 Sec. MA

VADER Dataset 30 Sec. MA.

VADER Dataset 60 Sec. MA

Performs step-wise search to minimize AIC and best ARIMA model

(0,1,1) AIC= -82.06

(1,1,2) AIC= -522.34

(1,1,1) AIC=-160.76

(2,1,2) AIC=-81.35

ARIMA Model Makes Predictions

Train 80% Test 20% Split

Mean Avg. Error
Mean Squared Error
Root Mean Squared Error

MAE: 25.04 MSE: 0.10 RMSE: 0.31

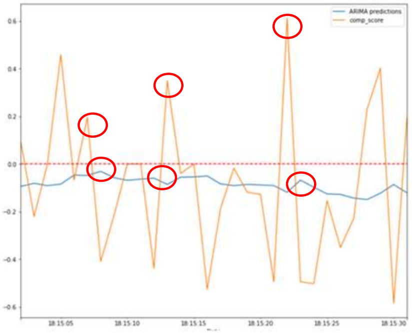
MAE: 7.58 MSE: 0.008 RMSE:0.09

MAE: 7.54 MSE: 0.01 RMSE: 0.10

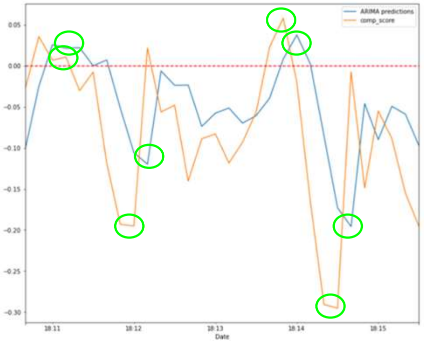
MAE: 9.4 MSE: 0.01 RMSE: 0.13

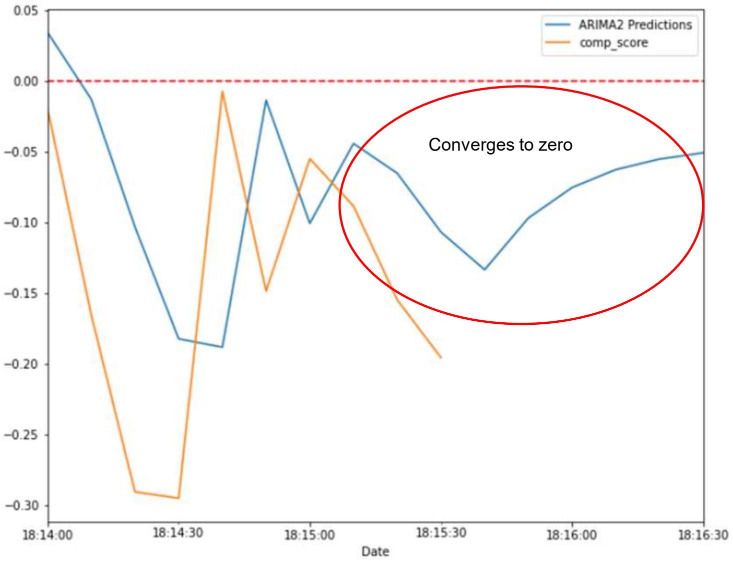
- Performed ARIMA test on 4 different Models
- ARIMA model (1,1,2) performed the best for making predictions
- Limitations of forecasting with ARIMA
- Our requirement to make faster predictions in shorter time frame

ARIMA model (0,1,1)
Vader 1 sec. Dataset



ARIMA model (1,1,2)
Vader 10 sec. Dataset

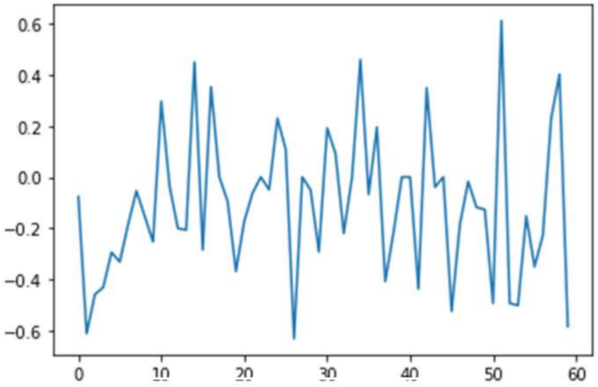




Converges to zero

LSTM RNN

Take a minute sample

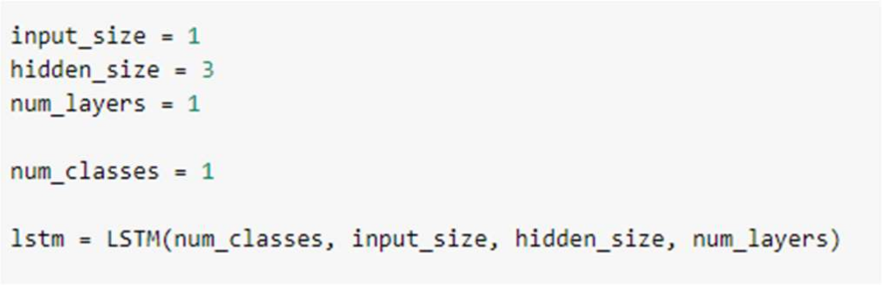


VADER
Riot Games Dataset

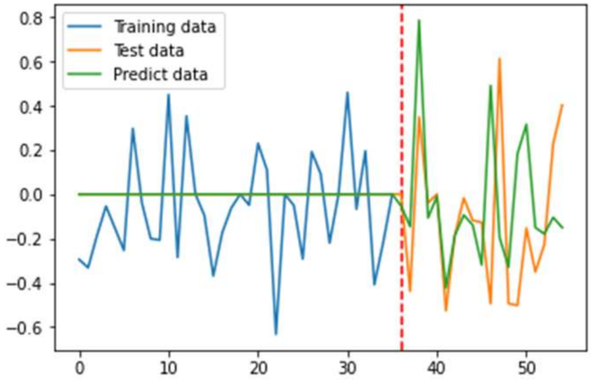
80% Train
20% Test
Split

Training and test

Create the model

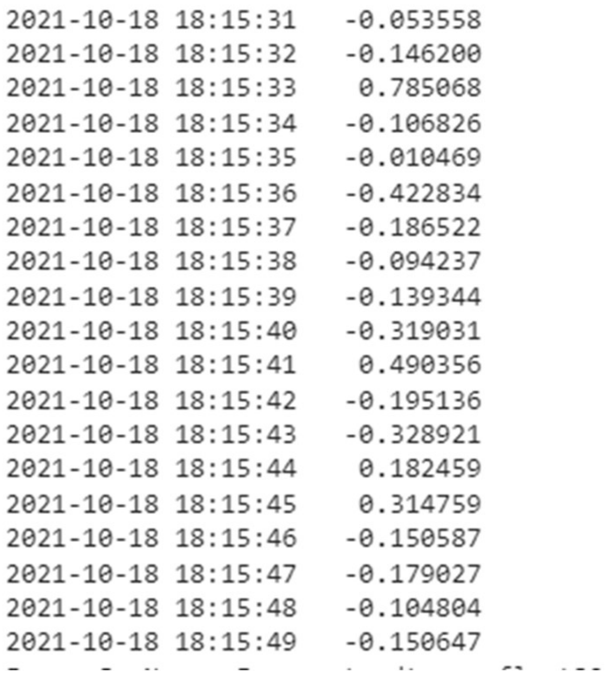


```
input_size = 1
hidden_size = 3
num_layers = 1

num_classes = 1

lstm = LSTM(num_classes, input_size, hidden_size, num_layers)
```



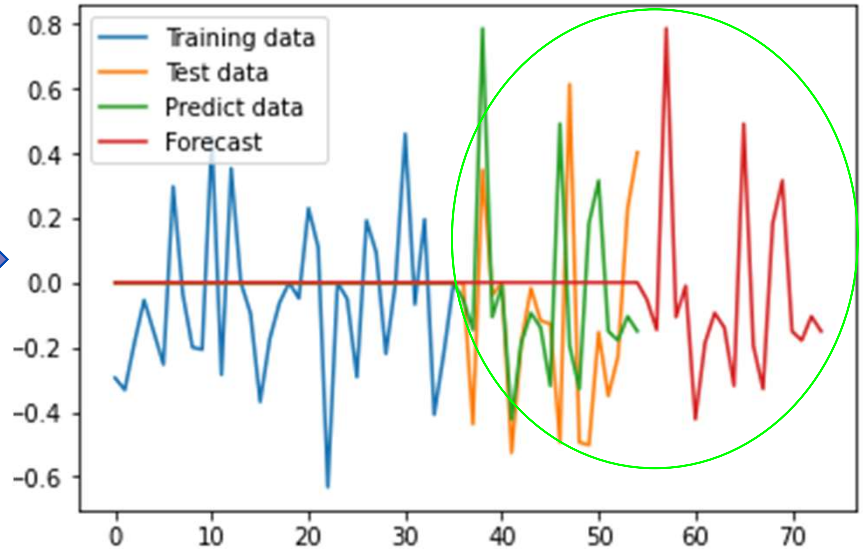
LSTM RNN

Forecast

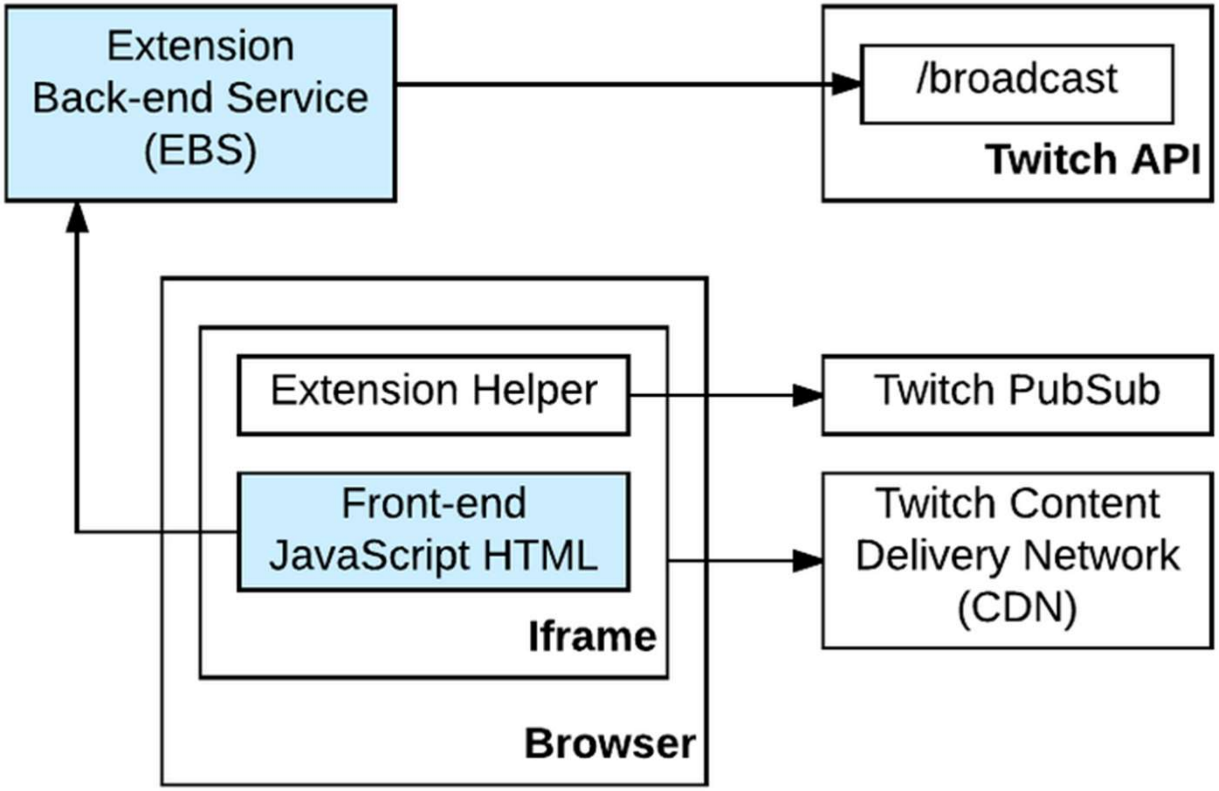


```
2021-10-18 18:15:31    -0.053558
2021-10-18 18:15:32    -0.146200
2021-10-18 18:15:33     0.785068
2021-10-18 18:15:34    -0.106826
2021-10-18 18:15:35    -0.010469
2021-10-18 18:15:36    -0.422834
2021-10-18 18:15:37    -0.186522
2021-10-18 18:15:38    -0.094237
2021-10-18 18:15:39    -0.139344
2021-10-18 18:15:40    -0.319031
2021-10-18 18:15:41     0.490356
2021-10-18 18:15:42    -0.195136
2021-10-18 18:15:43    -0.328921
2021-10-18 18:15:44     0.182459
2021-10-18 18:15:45     0.314759
2021-10-18 18:15:46    -0.150587
2021-10-18 18:15:47    -0.179027
2021-10-18 18:15:48    -0.104804
2021-10-18 18:15:49    -0.150647
```

VADER
Riot Games Dataset



Twitch Extension



Services created by extension developers are blue.

EBS Design Choices

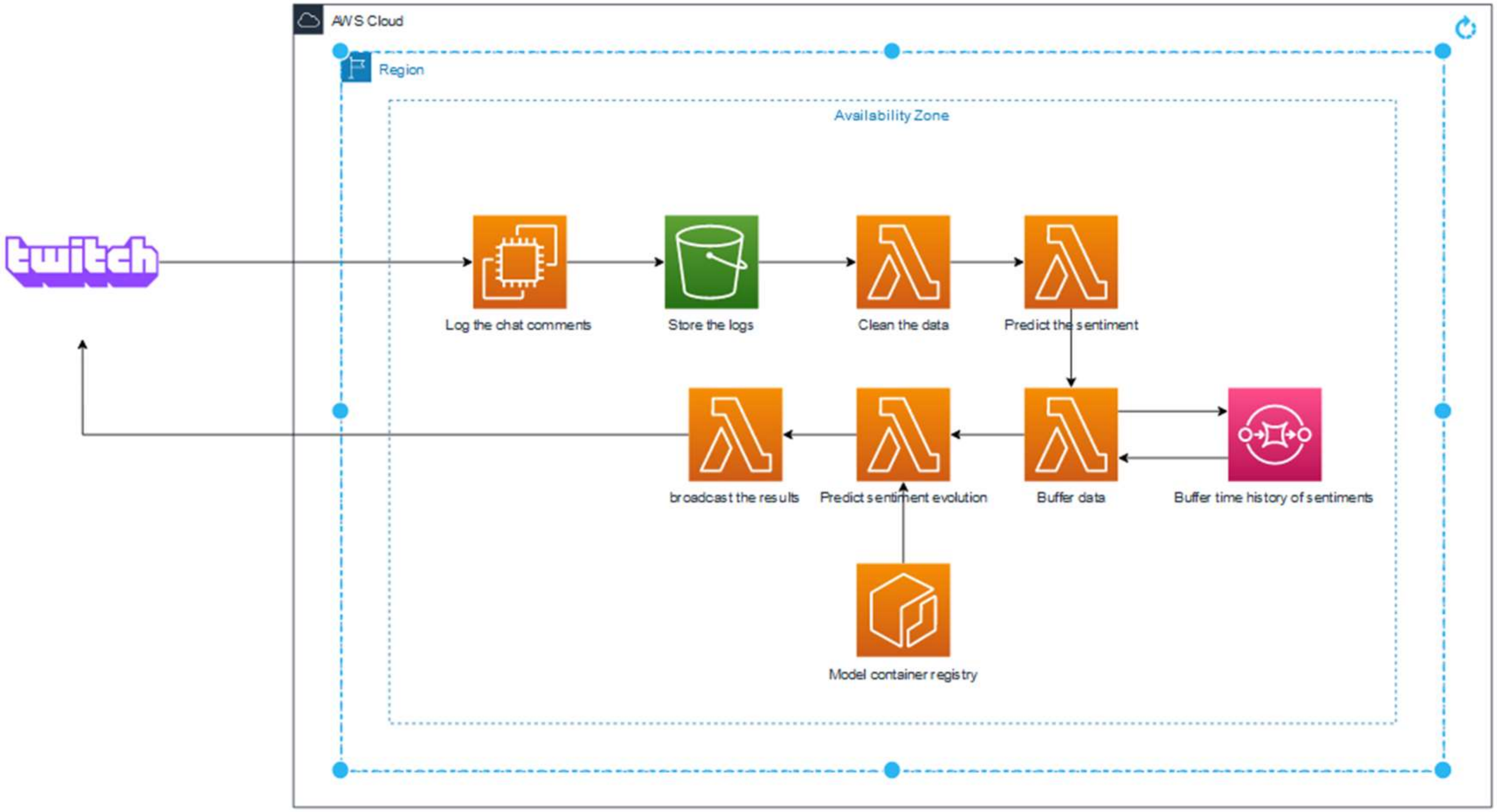
Hosting Solution

- Architecture is cost driven => Serverless Solution
- Chosen host : AWS

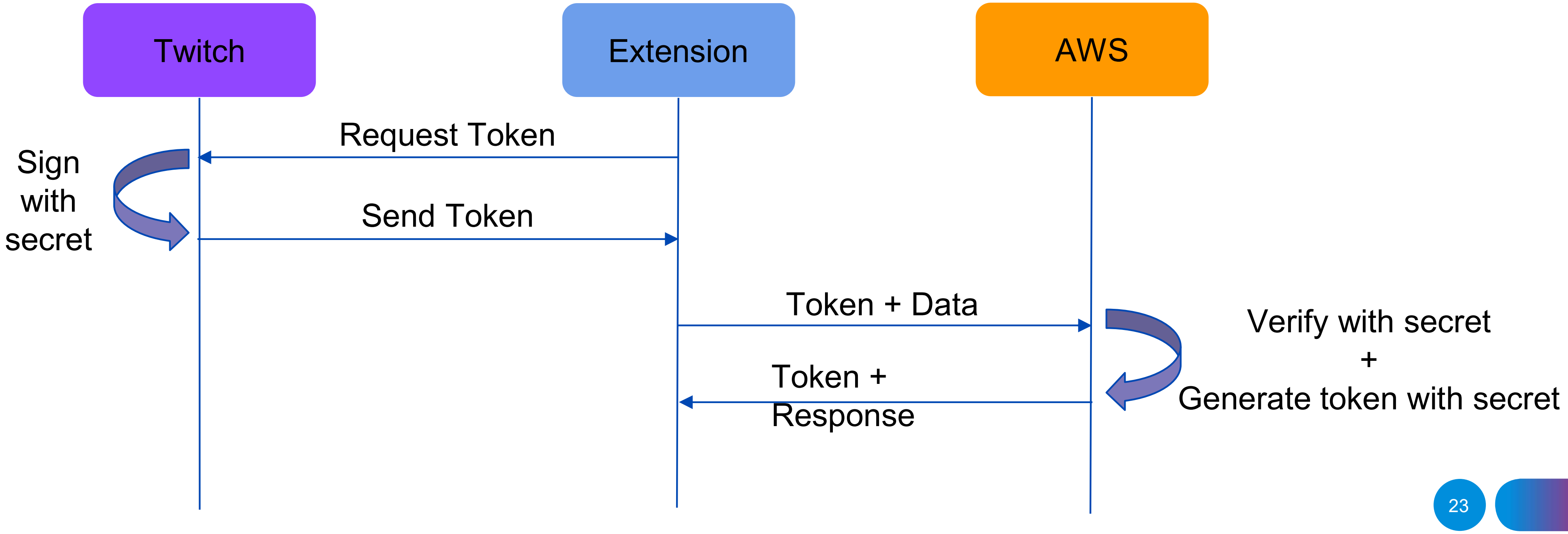
Stream Data Collection

- Communication with Twitch via PubSub / Websocket
- EC2 endpoint : t3.micro more cost effective due to number of connections

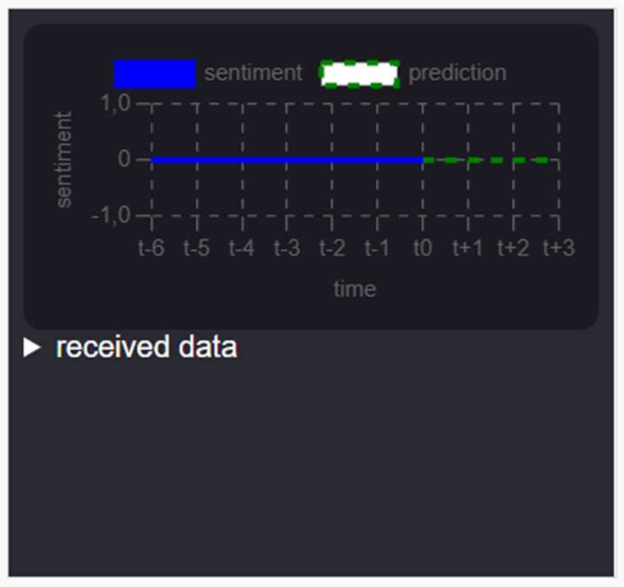
AWS Architecture



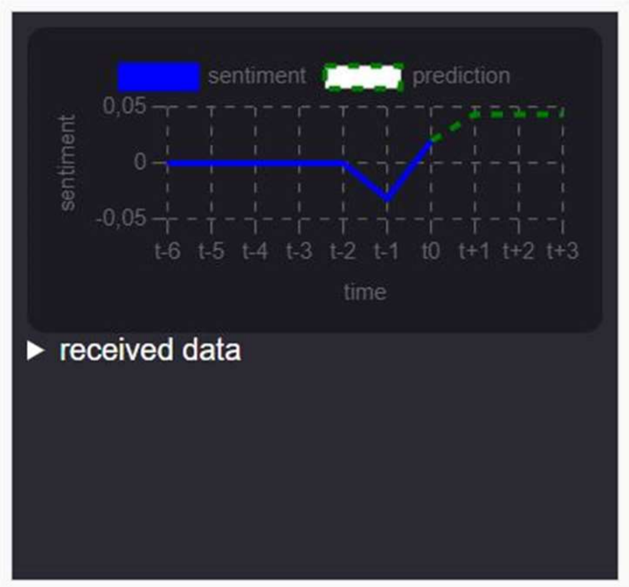
Data Transfer with JWT



MVP

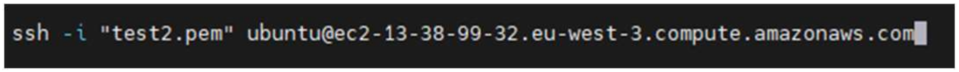


🟦 sentiment
▨ prediction
sentiment
1,0
0
-1,0
t-6
t-5
t-4
t-3
t-2
t-1
t0
t+1
t+2
t+3
time
▶ received data

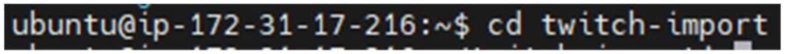


🟦 sentiment
▨ prediction
sentiment
0,05
0
-0,05
t-6
t-5
t-4
t-3
t-2
t-1
t0
t+1
t+2
t+3
time
▶ received data

DEMO

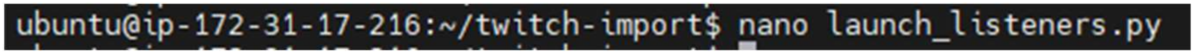


```
ssh -i "test2.pem" ubuntu@ec2-13-38-99-32.eu-west-3.compute.amazonaws.com
```

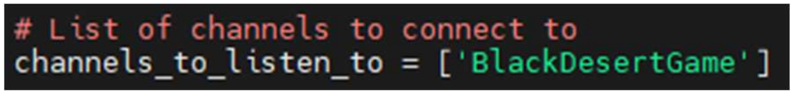


```
ubuntu@ip-172-31-17-216:~$ cd twitch-import
```

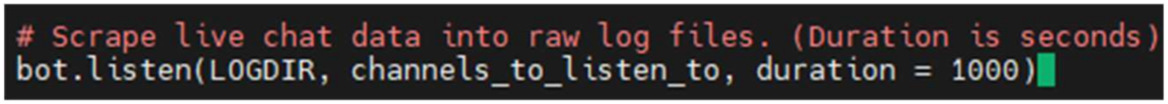
Export the environment variables (credentials)



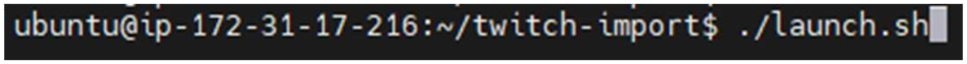
```
ubuntu@ip-172-31-17-216:~/twitch-import$ nano launch_listeners.py
```



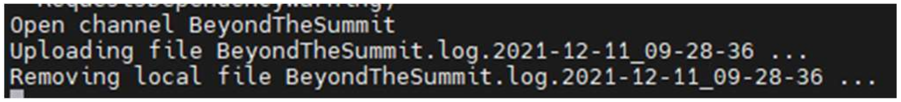
```
# List of channels to connect to
channels_to_listen_to = ['BlackDesertGame']
```



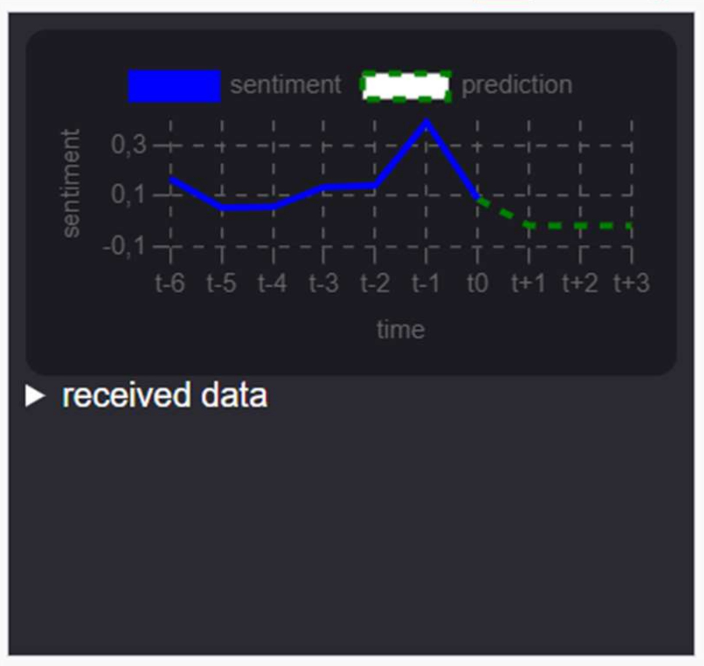
```
# Scrape live chat data into raw log files. (Duration is seconds)
bot.listen(LOGDIR, channels_to_listen_to, duration = 1000)
```



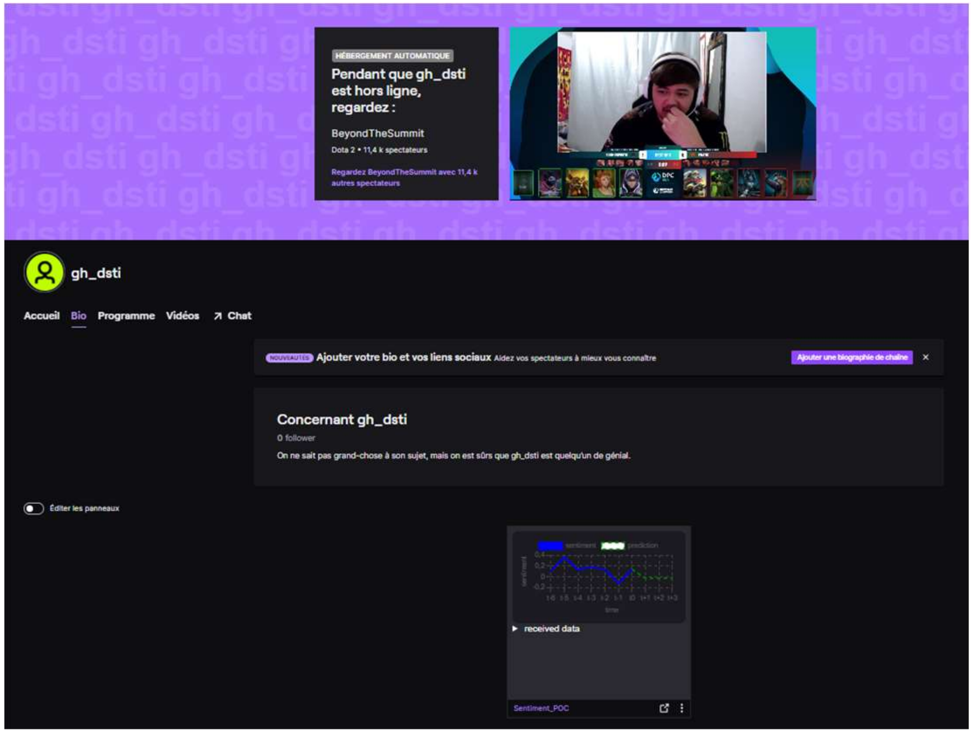
```
ubuntu@ip-172-31-17-216:~/twitch-import$ ./launch.sh
```



```
Open channel BeyondTheSummit
Uploading file BeyondTheSummit.log.2021-12-11_09-28-36 ...
Removing local file BeyondTheSummit.log.2021-12-11_09-28-36 ...
```



DEMO



HÉBERGEMENT AUTOMATIQUE

Pendant que gh_dsti est hors ligne, regardez :

BeyondTheSummit

Dota 2 • 11,4 k spectateurs

Regardez BeyondTheSummit avec 11,4 k autres spectateurs

gh_dsti

Ajouter votre bio et vos liens sociaux Aidez vos spectateurs à mieux vous connaître

Concernant gh_dsti

0 follower

On ne sait pas grand-chose à son sujet, mais on est sûrs que gh_dsti est quelqu'un de génial.

https://vimeo.com/703474180

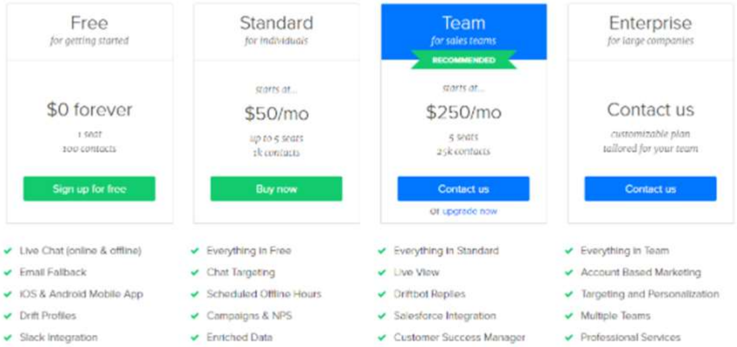
Future Improvements

- Continually update Lexicon for new Emotes
- Enhance the cloud infrastructure
- Find the best values for the LSTM models.
- Upgrading the architecture for scaling to 10s of simultaneous users
- Add additional features and metrics to the app

Revenue Scheme

Twitch represents an important example of a major service looking for new opportunities to monetize its enthusiastic streaming community.

- Subscription model
- 4 tier model for pricing
- Based on user traffic and added features



Free	Standard	Team	Enterprise
for getting started	*for individuals*	*for sales teams*	*for large companies*
		RECOMMENDED	
	starts at...	*starts at...*	
$0 forever	$50/mo	$250/mo	Contact us
1 seat *100 contacts*	*up to 5 seats* *1k contacts*	*5 seats* *25k contacts*	*customizable plan* *tailored for your team*
Sign up for free	Buy now	Contact us or upgrade now	Contact us
✓ Live Chat (online & offline)	✓ Everything in Free	✓ Everything in Standard	✓ Everything in Team
✓ Email Fallback	✓ Chat Targeting	✓ Live View	✓ Account Based Marketing
✓ IOS & Android Mobile App	✓ Scheduled Offline Hours	✓ Driftbot Replies	✓ Targeting and Personalization
✓ Drift Profiles	✓ Campaigns & NPS	✓ Salesforce Integration	✓ Multiple Teams
✓ Slack Integration	✓ Enriched Data	✓ Customer Success Manager	✓ Professional Services