

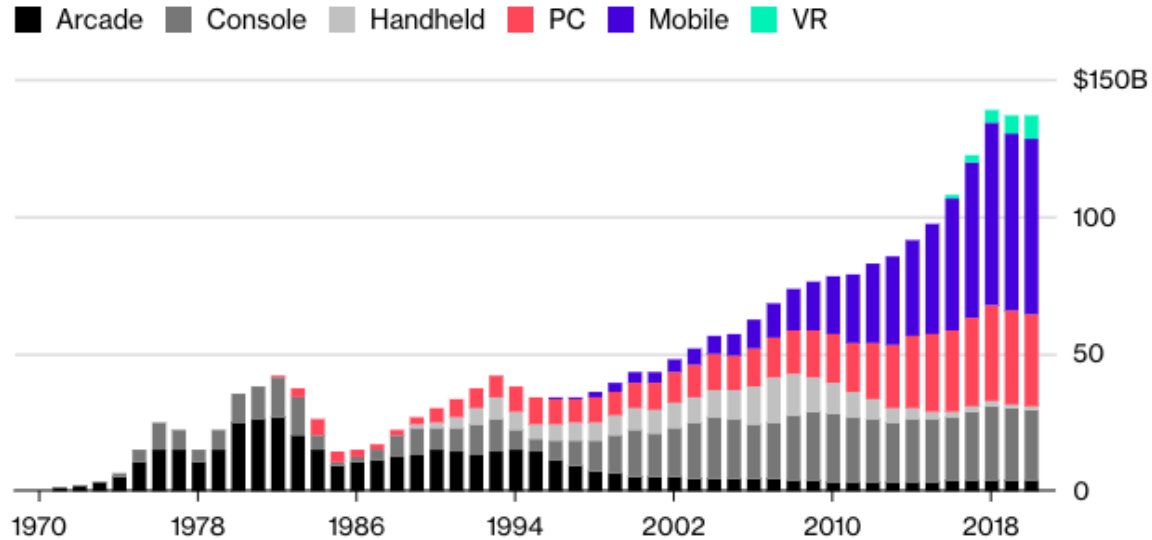


Sentiment Analysis & Topic Modelling of Steam game reviews

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50 years of video game revenue



Source: Pelham Smithers

WISHLIST (7)


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PLAYERUNKNOWN'S BATTLEGROUNDS

Community Hub



PLAYERUNKNOWN'S BATTLEGROUNDS is a battle royale shooter that pits 100 players against each other in a struggle for survival. Gather supplies and

55% of the 18,316 user reviews in the last 30 days are positive.

RECENT REVIEWS: Mixed (18,316)
ALL REVIEWS: Mixed (1,374,634)

RELEASE DATE: 21 Dec, 2017

DEVELOPER: KRAFTON, Inc.
PUBLISHER: KRAFTON, Inc.

Popular user-defined tags for this product:

Survival Shooter Multiplayer Battle Royale +

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'55% of the 18,316 user reviews in the past 30 days are positive'

Review scores on digital distribution systems such as Steam are often **correlated with sales revenue**

Problem Statement



BUILD CLASSIFICATION MODEL

Classify game reviews as
positive or **negative**

Investigate **top predictive terms**
of sentiment

Scored on **accuracy, ROC-AUC**



TOPIC MODELLING

Segregated by **sentiment**

Scored on **topic coherence
score**

Topic classification



DATA-DRIVEN DECISIONS

Game publisher to work with
developers to **quickly address
any player concerns**

Find out the game elements that
modern video gamers enjoy to
**produce higher quality games/
release new content patches**

Methodology

DATA COLLECTION

3 popular games with mixed reviews chosen, from varying genres

- **PlayerUnknown's Battlegrounds** (battle royale shooter)
- **Cyberpunk 2077** (open world action RPG)
- **Fall Guys** (platformer/party battle royale)

Scraped using **steamreviews** API

1

DATA CLEANING

Filtering out non-English reviews with **langdetect**

Cleaning with Regex and user-defined functions to remove hyperlinks, Steam markup codes, spam posts, etc.

2

EXPLORATORY DATA ANALYSIS

Investigate trends in the following:

- Word count distribution
- Date of review
- Number of comments
- Helpfulness score
- Whether game received for free

3

Methodology

LEXICON-BASED SENTIMENT ANALYSIS

Vader and **Textblob** used to generate overall polarity of each review

Each review represented as **bag of words**

Sentiment values from a **valence-based lexicon** are assigned to all positive and negative words

4

ML-BASED SENTIMENT ANALYSIS

Lemmitization using POS tagging and **stopword removal**

Logistic Regression

MultinomialNB

Support Vector Classifier

LSTM

5

TOPIC MODELLING

Gensim library to perform LDA

Documents comprise **distribution of topics**

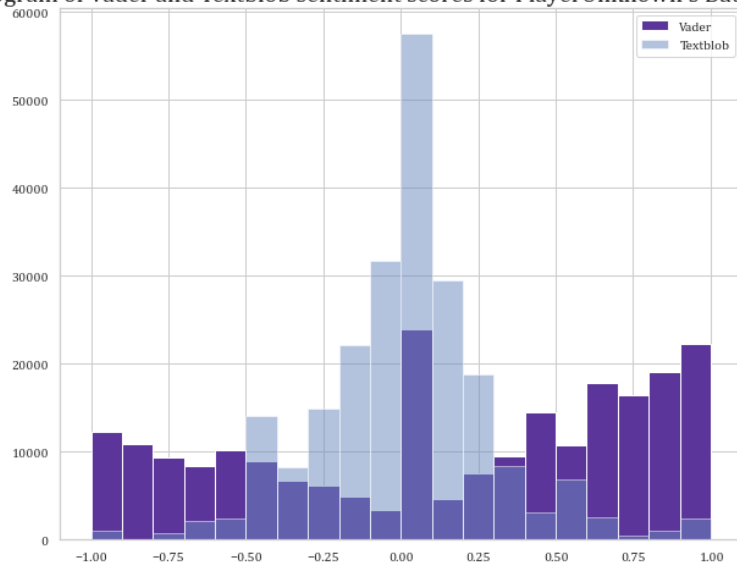
Topics comprise **distribution of words**

Interpretation of topics by sentiment and **topic classification**

6

Lexicon-based SA

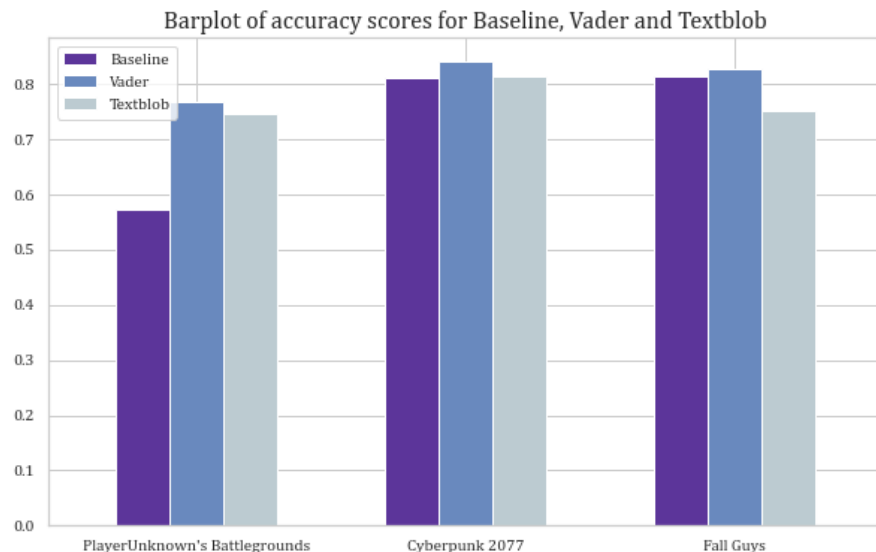
Histogram of Vader and Textblob sentiment scores for PlayerUnknown's Battlegrounds



Vader outputs a broader range of sentiments between -1 and 1

Textblob outputs score which are highly clustered at the neutral ~0.00 range

Lexicon-based SA



Vader tends to predict **more false negatives**

Textblob tends to predict **more false positives**

Vader **consistently outperformed** Textblob for each dataset, and **scored better than the baseline accuracy**

More **tuned for social media sentiment analysis**

ML-based SA

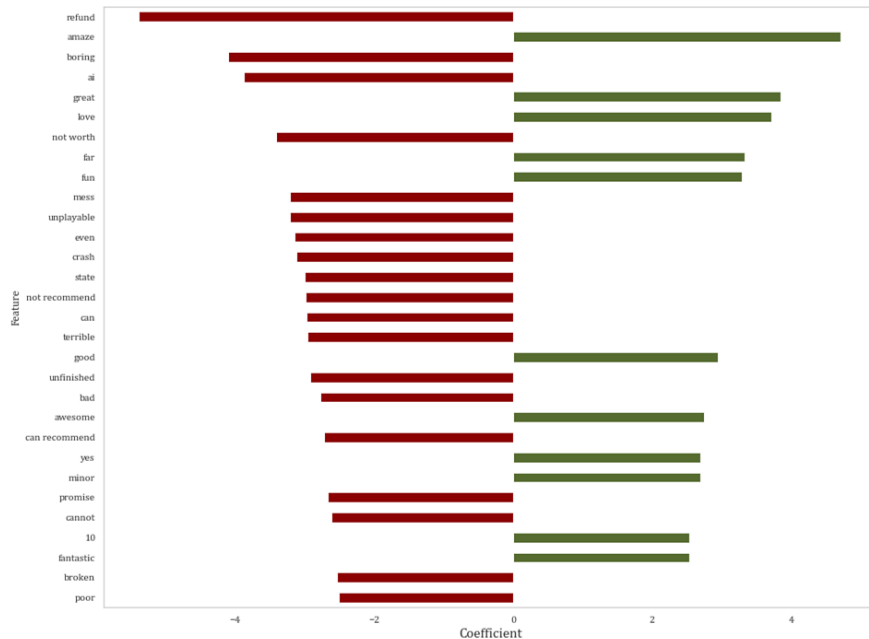
Game	Metric	Baseline	Logistic Regression	Naïve Bayes Classifier	Support Vector Classifier	LSTM
PUBG	Train Accuracy	0.5349	0.8611	0.8729	0.8777	0.8570
	Test Accuracy		0.8555	0.8548	0.8641	0.8411
	Test ROC-AUC		0.9267	0.9255		0.9159
Cyberpunk	Train Accuracy	0.7459	0.9057	0.9403	0.9338	0.9087
	Test Accuracy		0.8955	0.8975	0.9102	0.8573
	Test ROC-AUC		0.9578	0.9565		0.8976
Fall Guys	Train Accuracy	0.7022	0.8955	0.9107	0.9242	0.8271
	Test Accuracy		0.8683	0.8676	0.8816	0.8253
	Test ROC-AUC		0.9364	0.9333		0.9064

 Positive is majority class  Negative is majority class

Top LogReg Features

Negatively-correlated features

refund
boring
ai
not worth
mess
unplayable
even
crash
state
not recommend
can
terrible
unfinished
bad



Positively-correlated features

amaze
great
love
far
fun
good
awesome
yes
minor
10
fantastic

Barplot of Logistic Regression feature coefficients for **Cyberpunk 2077**

Positive

Very atmospheric, great game play, voice acting, graphics, story, environments, npcs, and very complex RPG systems. Crafting, hacking, upgrading...lots of things to do. **Very high quality.**

Some things I don't like are that there's only one female and one male voice to choose from. I wanted to be a dude but his accent was annoying me so I went with female and that's a bit more neutral. Would also like to be able to visit a barber shop and change my hair, as well as have an animation where I eat. But aside from that, **amazing game.**

Obviously **there are some bugs but those will get resolved** and I wouldn't judge a game by temporary stuff like that.

Negative

Terrible game full of glitches, horrible AI, and bland boring side missions. The fact that they advertised this as an RPG is insane as its nothing more than a rebranding of GTA but with none of the polish. CDPR should be in trouble for **false advertising** as well as delivering a **completely unplayable game** to ps4/xbox one users. **Don't waste your money on this piece of shit.**

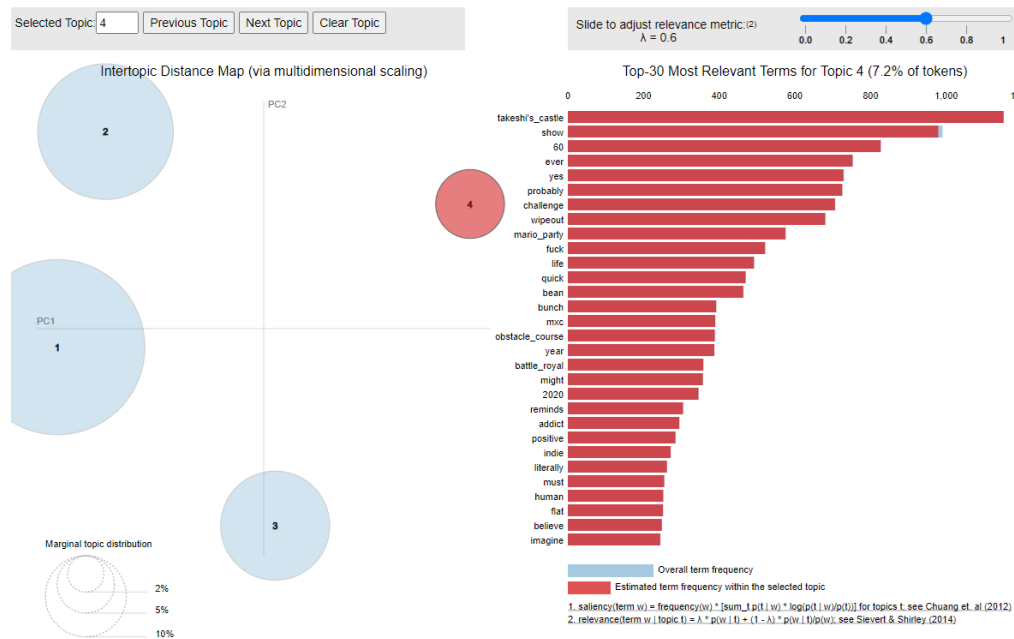
Sadly just **EXTREMELY unfinished and mostly unplayable in its current state. No fun** in challenge due to high peak in difficulty when playing in Hard; alongside the constant interruption of **Buggy gameplay**, audio, **graphical issue** and just straight up **DUMB AI** continue to bring me out of the game and am unwilling to sit through constant Save-Loading. Purchase at your own risk, I would recommend waiting for MANY future updates.

Misclassification Analysis

Predicted...		Actual
<p>I played this game since closed beta. i loved it. i, and many others had high hopes for it to become the best battle royale experience ever. it had the potential. BUT that is not the case. It went downhill pretty fast and the devs are just like many others: Not listening to the community and just cash grabbing. It WAS a phenomenal experience! Rest in Pepperonis my dear loved friend.</p>	<p>TBH I wanted to play this game. But it kept crashing when i loaded ingame for a couple minutes and IDK whats the deal or whats causing it. I heard the game is good and fun. But Im just too pissed off to tell if its the developments fault or its somehow me. Rip.</p>	<p>Positive Negative</p>
<p>I like dis game, I shoot idiot in the head and frick on them! They can't stand a chance against my pwn. I will snipe all chinese invaders from my rooftop of pochinkie... Don't frick with me or ill kiss.</p>	<p>I want to took this game and one of my friend refund it (no problem) but now i have 20.58euro in account and 29.99(from pubg) and now i am at my cousin birthday and 5 of them have pubg. What i am asking is to pay with my 20.58euro and 29.99 from pending i want to pay with my 20.58 euro and the difference from pending</p>	<p>Negative Positive</p>

Sample misclassification text for **PUBG**

Topic Modelling



pyLDAvis visualization of Topic Modelling for **Fall Guys (positive sentiment)**

Top Relevant Terms (Topic 4)

takeshi's_castle
show
wipeout
mario_party
mxc
obstacle_course
battle_royale
...

Topic Interpretation

Topic 1: overall positive sentiments about the game

Topic 2: suggestions to developers for improvements (add, new, level, release, mode)

Topic 3: gameplay terms (physics, grab, crown, currency)

Topic 4: comparisons with similar popular TV shows/games (takeshi's castle, MXC, wipeout, mario party), nature of the game (indie, addictive)

GATHER DATA

Social media platforms (e.g. YouTube, Facebook, Twitter, reddit, game review sites)

Typically **unlabelled**



MONITOR

Monitor number of positive/negative reviews

Identify the need for balance/patches to fix issues, or which game features are well-received



EXTRACT INSIGHTS

Perform **lexicon-based SA** for a quick overview of sentiment

ML-based SA for **deeper insights** into key predictive features, better accuracy



PRIORITIZE RESOURCES

Topic modelling and **classification** allows developers to prioritize and focus efforts on more important aspects (e.g. gameplay features, technical issues)



Limitations



CLASSIFICATION MODEL

Many user reviews contain **multiple sentiments**

Model **unable to generalize well** between games of different genres

Steam reviews are full of **irrelevant noise** (memes, cypypastas, spam, typos)



TOPIC MODELLING & CLASSIFICATION

Highest topic coherence scores ranged between **0.38 to 0.48**

Difficult to extract topics from **short comments**

Topic classification is only logical if the topics are well-defined and make sense

Reviews may have **multiple topics**



Thank you!