

Board Game Recommendation System

Chien Yuan Chang
11/12/2021





The Benefits of Playing Board Games



- Less Screen Time
- More Connections
- Memorable Moments
- Great Lessons for Children
- More Brain Function

131,744

Numbers of Board Games on BoardGameGeek (BGG)

Q: Any (*types of*) games like (*a board game*)?

- Post it on a forum and wait and wait... and wait.....
 - Put clothes on and go to or call a board game store to ask
➤ May encounter limited open hours or knowledge
 - Use an online **Board Game Recommendation System** which can let you ask questions or input like asking humans to get the recommendation **immediately at any time and location**



Rank	Title	Your Rating	Geek Rating	Avg Rating	Num Voters
1	Gloomhaven (2017) Vanquish monsters with strategic cardplay. Fulfill your quest to leave your legacy!	N/A	8.523	8.76	46410
2	Pandemic Legacy: Season 1 (2019) Managing diseases are spreading around the world - can your team save humanity?	N/A	8.448	8.60	44144
3	Braa! Birmingham (2019) Build networks, grow industries, and navigate the world of the Industrial Revolution.	N/A	8.414	8.67	24024
4	Terrestrial Mars (2016) Compete with real CEOs to make Mars habitable and build your corporate empire.	N/A	8.275	8.42	71811
5	Gloomhaven: Jaws of the Lion (2020) Vanquish monsters with strategic cardplay in a 25-scenario Gloomhaven campaign.	N/A	8.258	8.71	14164
6	Twilight Imperium: Fourth Edition (2017) Build an intergalactic empire through trade, research, conquest and grand politics.	N/A	8.255	8.68	15378
7	Gaia Project (2017) Explore, research, upgrade, and settle the galaxy with one of 14 alien species.	N/A	8.177	8.48	18354
8	Star Wars: Rebellion (2016) Strike from your hidden base as the Empire.	N/A	8.171	8.42	74041

Data Process

**Top 1,500 games
Web-scraped the list
and stats**

Total 56,951 comments
Planned to web-scraped 40 random over-500-character comments per game of Top 1500 board games

Vectorizer
• Countvectorizer
• TF-IDF Vectorizer

EDA and NLP(spacy)
✓ Remove foreign language
✓ Tokenization
✓ Lemmatization
✓ Lowercase
✓ Remove stopwords, numbers and punctuations

Dimensionality Reduction

Topic Modeling

- Truncated SVD
- NMF
- LDA
- Corex
- PCA

The screenshot shows the BGG homepage with a sidebar on the left containing links like 'Browse', 'Forums', 'GeekLists', 'Shopping', 'Community', and 'Help'. The main content area displays a table titled 'Top 1,500 games' with columns for Rank, Title, Your Rating, Geek Rating, Avg Rating, and Num Voters. The table lists several board games from 1 to 7, including 'Gloomhaven', 'Pandemic Legacy: Season 1', 'Brass: Birmingham', 'Terraforming Mars', 'Gloomhaven: Jaws of the Lion', 'Twilight Imperium: Fourth Edition', 'Gaia Project', and 'Star Wars: Rebellion'.

Rank	Title	Your Rating	Geek Rating	Avg Rating	Num Voters
1	Gloomhaven (2017) Vanguish monsters with strategic cardplay. Fulfill your quest to leave your legacy!	N/A	8.523	8.76	46410
2	Pandemic Legacy: Season 1 (2019) Managing diseases - are spreading around the world - can your team save humanity?	N/A	8.448	8.60	44144
3	Brass: Birmingham (2019) Build networks, grow industries, and navigate the world of the Industrial Revolution.	N/A	8.414	8.67	24024
4	Terraforming Mars (2016) Compete with real CEOs to make Mars habitable and build your corporate empire.	N/A	8.275	8.42	71811
5	Gloomhaven: Jaws of the Lion (2020) Vanguish monsters with strategic cardplay in a 25-scenario Gloomhaven campaign.	N/A	8.258	8.71	14164
6	Twilight Imperium: Fourth Edition (2017) Build an intergalactic empire through trade, research, conquest and grand politics.	N/A	8.255	8.68	15378
7	Gaia Project (2017) Explore, research, upgrade, and settle the galaxy with one of 14 alien species.	N/A	8.177	8.48	18354
	Star Wars: Rebellion (2016) Strike from your hidden base as the Empire.	N/A	8.171	8.42	74041

Data Process

Top 1,500 games
Web-scraped the list
and stats

Total 56,951 comments

Planned to web-scraped 40 random over-500-character comments per game of Top 1500 board games

Dimensionality Reduction

Topic Modeling

- Truncated SVD
- NMF
- LDA
- Corex
- ✓ PCA

Vectorizer

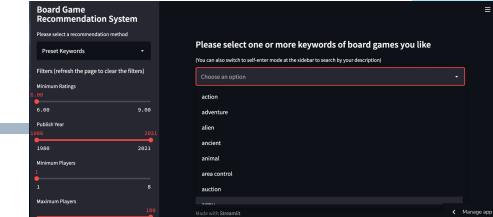
- Countvectorizer
- ✓ TF-IDF Vectorizer

EDA and NLP(spacy)

- ✓ Remove foreign language
- ✓ Tokenization
- ✓ Lemmatization
- ✓ Lowercase
- ✓ Remove stopwords, numbers and punctuations

Recommendation System

- ✓ Cosine Distance
- ✓ Deployed on Streamlit.io



Recommendation System Features

Board Game Recommendation System

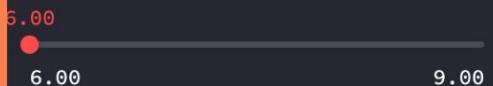
Please select a recommendation method

Preset Keywords

Filters (refresh the page to clear the filters)

Minimum Ratings

6.00



6.00 9.00

Publish Year

1980



1980 2021

Minimum Players

1



1 8

Maximum Players



100

Modes: (1) Input by Users (2) Preset Keywords

Please select one or more keywords of board games you like

(You can also switch to self-enter mode at the sidebar to search by your description)

Choose an option

- action
- adventure
- alien
- ancient
- animal
- area control
- auction

Keywords from
Topic Modeling
(NMF)

Made with Streamlit

< Manage app

Filters: published year, # of players, play time, minimum age, # of owners

More Personalized Recommendations

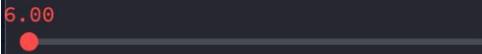
Board Game Recommendation System

Please select a recommendation method

Search by Your Description

Filters (refresh the page to clear the filters)

Minimum Ratings



Published Year



Minimum Players

1

Please write down the names, types, or any description of the board games you like or just type "game" to get random games.

(You can also switch to preset-keyword mode at the sidebar if you don't have any idea for now)

Made with Streamlit

Manage app

More Personalized Recommendations



Board Game Recommendation System

Please select a recommendation method

Search by Your Description



Filters (refresh the page to clear the filters)

Minimum Ratings



6.00

9.00

Published Year



2021

1980

2021

Minimum Players



2

Please write down the names, types, or any description of the board games you like or just type "game" to get random games.

(You can also switch to preset-keyword mode at the sidebar if you don't have any idea for now)

I like to play games with my kid and look for something cute, fun and easy to understand.

Made with Streamlit

Manage app

More Personalized Recommendations

Board Game Recommendation System

Please select a recommendation method

Search by Your Description

Filters (refresh the page to clear the filters)

Minimum Ratings

6.00

Published Year

1980 2021

Minimum Players

1

Please write down the names, types, or any description of the board games you like or just type "game" to get random games.

(You can also switch to preset-keyword mode at the sidebar if you don't have any idea for now)

I like to play games with my kid and look for something cute, fun and easy to understand.

[Zombie Kidz Evolution](#)

[Outfoxed!](#)

[My Little Scythe](#)

[Stuffed Fables](#)

[Loopin' Louie](#)

[Gulo Gulo](#)

[Ghost Fightin' Treasure](#)

[Animal Upon Animal](#)

REIMPLEMENTED: SCYTHE
RANK: OVERALL 625 FAMILY 135

7.3 My Little Scythe (2017)
Gather fruits and gems, encounter events, and start friendships (or pie fights!). ↗
4.3K Ratings & 898 Comments · GeekBuddy Analysis

1–6 Players Community: 1–6 — Best: 4 45–60 Min Playing Time Age: 8+ Community: 6+ Weight: 1.99 / 5 'Complexity' Rating ↗
Designer: Hoby Chou, Vienna Chou Artist: Noah Adelman, Katie Khau Publisher: Stonemaier Games + 11 more See Full Credits

My rating ★★★★★★★★★★
[Buy](#) [Add To Collection](#) [Log Play](#) 343 [Subscribe](#)

Manage app

More Personalized Recommendations

Board Game Recommendation System

Please select a recommendation method

Search by Your Description

Filters (refresh the page to clear the filters)

Minimum Ratings

6.00

Published Year

1980

2021

Minimum Players

1

Please write down the names, types, or any description of the board games you like or just type "game" to get random games.

(You can also switch to preset-keyword mode at the sidebar if you don't have any idea for now)

game

Provided information is not specific enough. Below are random games for your reference

[Cartographers](#)

[Vampire: The Eternal Struggle](#)

[Heroes of Normandie](#)

[UBOOT: The Board Game](#)

[La Granja](#)

[Hit Z Road](#)

[One Night Ultimate Werewolf: Daybreak](#)

Random games if not enough information

◀ Manage app

Better Recommendation than Title Search



Better Recommendation than Title Search

Only has the games with Coloretto in the title

Board Game Rank

Title	
564	Coloretto (2003) Collect colorful chameleons, but be careful! Don't take too many types.
13318	Coloretto (1993) Role dice and complete pictures with the correct colour.
9439	Coloretto Amazonas (2005)
N/A	Coloretto: The Extra Cards (2004)
N/A	Coloretto for two players (2006) Adapts the set collection game for two players.
N/A	Coloretto: The Limit Cards (2009)
N/A	Coloretto: Zwei Neue Übersichtskarten (2004)
N/A	Coloretto Amazonas: Erweiterung (2005)

Board Game Recommendation System

Please select a recommendation method

Search by Your Description

Filters (refresh the page to clear the filters)

Minimum Ratings

Published Year

1980 2021

1980 2021

Minimum Players

Please write down the names, types, or any description of the board games you like or just type "game" to get random games.

(You can also switch to preset-keyword mode at the sidebar if you don't have any idea for now)

Coloretto

Zooloretto

Coloretto

Aquaretto

Hansa

New York Zoo

Cat Lady

Coconuts

The games with similar mechanics stand out!

Conclusion

- Immediately, at any time and location
- Personalized and customized
- Better recommendation than title search

Welcome to try it!:

https://share.streamlit.io/kosczew/metis_module5_unsupervised_learning_project/main

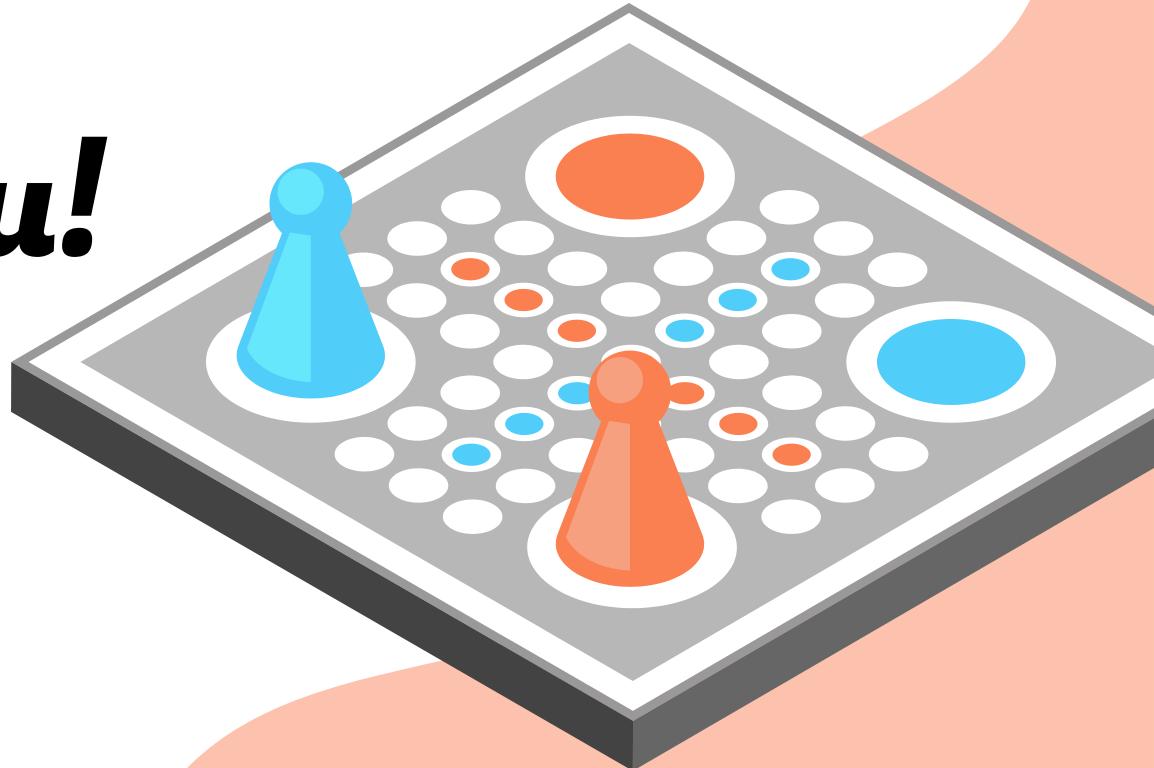
Future Work

- Include more board games
 - 3000 games with 25 comments each
- More interactive and filter features
- Random and surprise elements

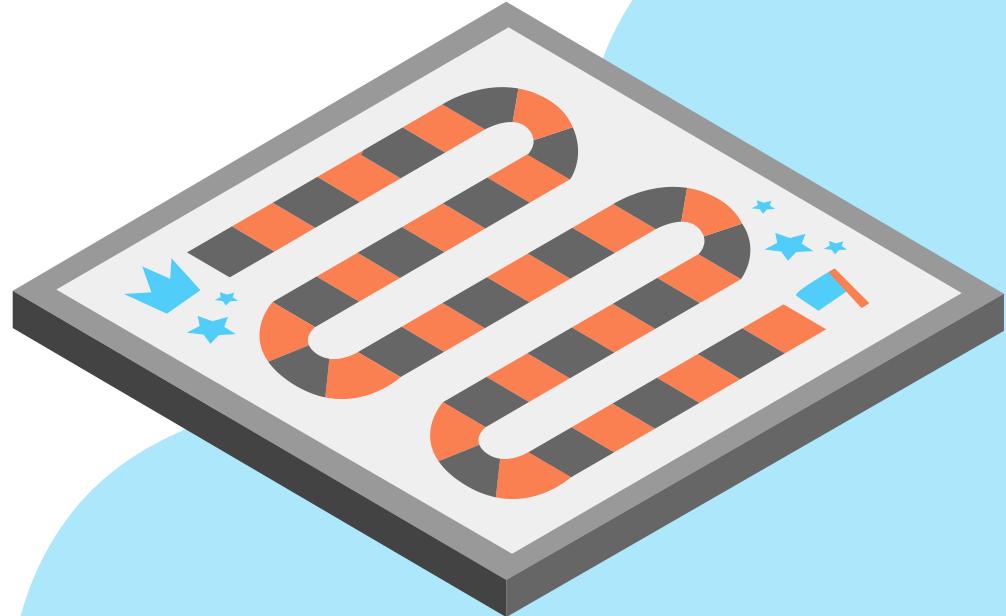
Thank You!

Do you have any
questions?

This presentation template was created by
Slidesgo, including icons by **Flaticon**, and
infographics & images by **Freepik**.



Appendix



Resources

- BoardGameGeek
 - <https://boardgamegeek.com/>
- BoardGameGeek XML API
 - https://boardgamegeek.com/wiki/page/BGG_XML_API#
- Final Board Game Recommendation System
 - https://share.streamlit.io/kosczew/metis_module_5_unsupervised_learning_project/main

Topic Modeling (NMF)

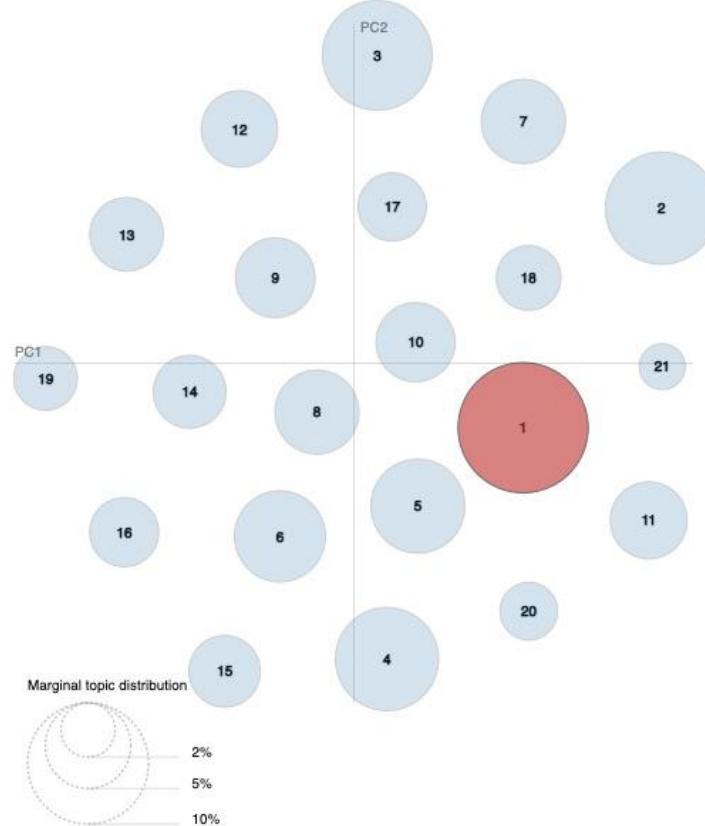
Topic	Keywords	% of Total
Card Drafting	card, hand, draft, draw, round, luck, score, filler, discard, set	15.3%
Strategy Economic	action, cube, area, board, euro, feld, control, round, rondel, selection	8.3%
Wargame	unit, war, wargame, battle, scenario, combat, army, asl, memoir, map	7.4%
Family Card Game	star, nostar, ize, size, halfstar, x2, x1, gg, x5, thumbsup	7.1%
Dice Rolling	dice, roll, die, luck, yahtzee, solo, write, number, use, high	6.7%
Thematic Dungeons	dungeon, monster, character, hero, quest, scenario, adventure, campaign, story, miniature	6.1%
Party Word Game	clue, deduction, word, party, werewolf, team, guess, role, codename, people	5.8%
City Building	tile, carcassonne, scoring, score, city, castle, place, lie, azul, board	5.4%
Deck Building	deck, card, dominion, building, expansion, builder, ascension, deckbuilde, villain, deckbuilder	5.3%
Abstract	piece, abstract, dexterity, board, chess, flick, tower, nostar, opponent, gipf	4.9%
Strategy Sci-Fi	worker, placement, resource, building, action, build, caylus, round, euro, place	4.4%
Adventure	pandemic, legacy, story, campaign, op, solo, cooperative, ghost, island, character	4.0%
Ship Space	ship, pirate, wing, alien, planet, captain, trek, crew, space, fleet	3.4%
Auction Bidding	auction, bid, bidding, money, ra, round, win, blind, knizia, value	3.0%
Strategy Wargame	faction, smash, coin, control, summoner, alliance, dune, expansion, area, war	2.3%
Zombie	zombie, zombicide, survivor, alien, scenario, mission, weapon, marine, traitor, human	2.1%
Civilization	civ, civilization, resource, building, city, build, tech, military, technology, race	1.9%
Family Children Animal	animal, agricola, kid, specie, zooloretto, ize, enclosure, dinosaur, zoo, adult	1.7%
Ticket to Ride	ticket, route, ttr, train, ride, passenger, city, map, europe, destination	1.7%
Trains 18xx	company, 18xx, stock, train, share, market, money, dividend, track, loan	1.7%
Puzzle	puzzle, exit, escape, unlock, solve, series, hint, room, clue, app	1.3%

Topic Modeling (LDA)

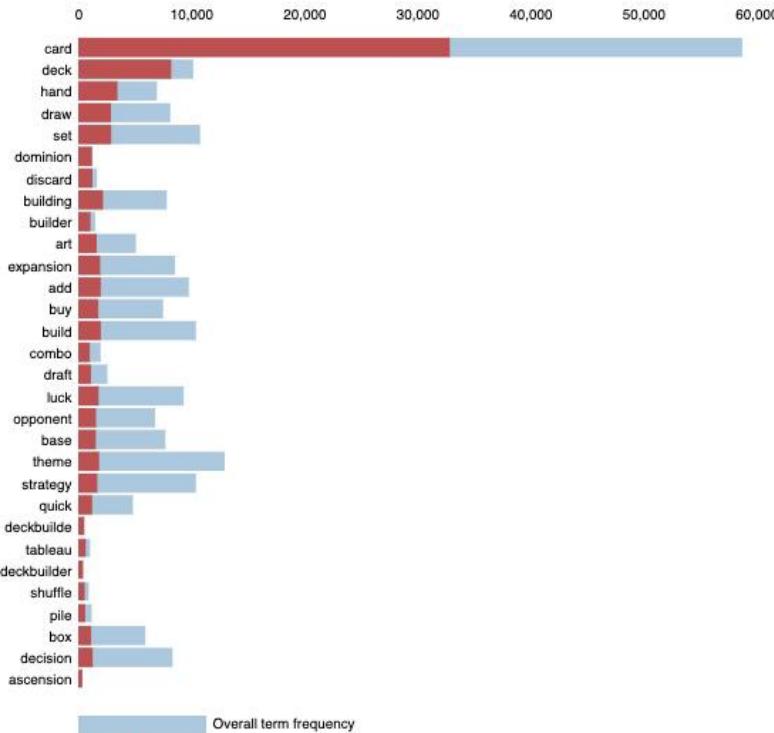
Selected Topic: 1 Previous Topic Next Topic Clear Topic

Slide to adjust relevance metric:⁽²⁾
 $\lambda = 0.6$

Intertopic Distance Map (via multidimensional scaling)



Top-30 Most Relevant Terms for Topic 1 (11.5% of tokens)

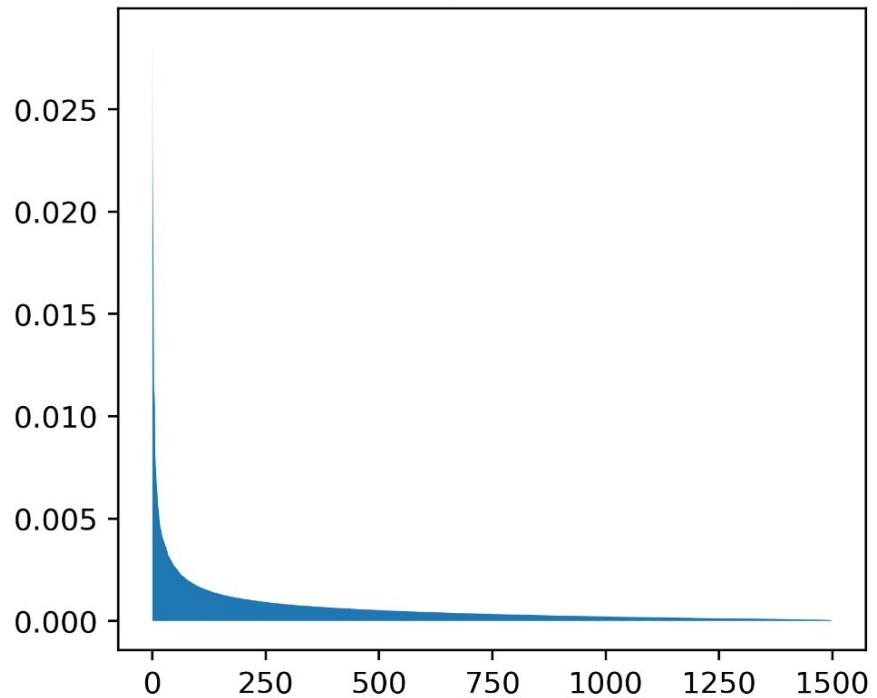


1. saliency(term, w) = frequency(w) * [sum_t p(t | w) * log(p(t | w) / p(t))]

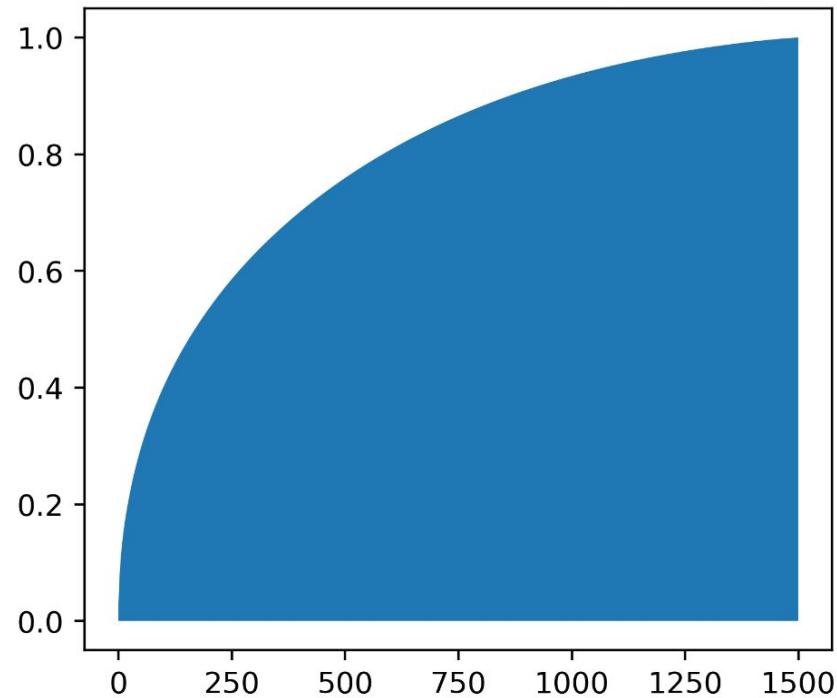
2. relevance(term, w | topic, t) = $\lambda * p(w | t) + (1 - \lambda) * p(w | t) / p(w)$; see Sievert & Shirley (2014)

PCA

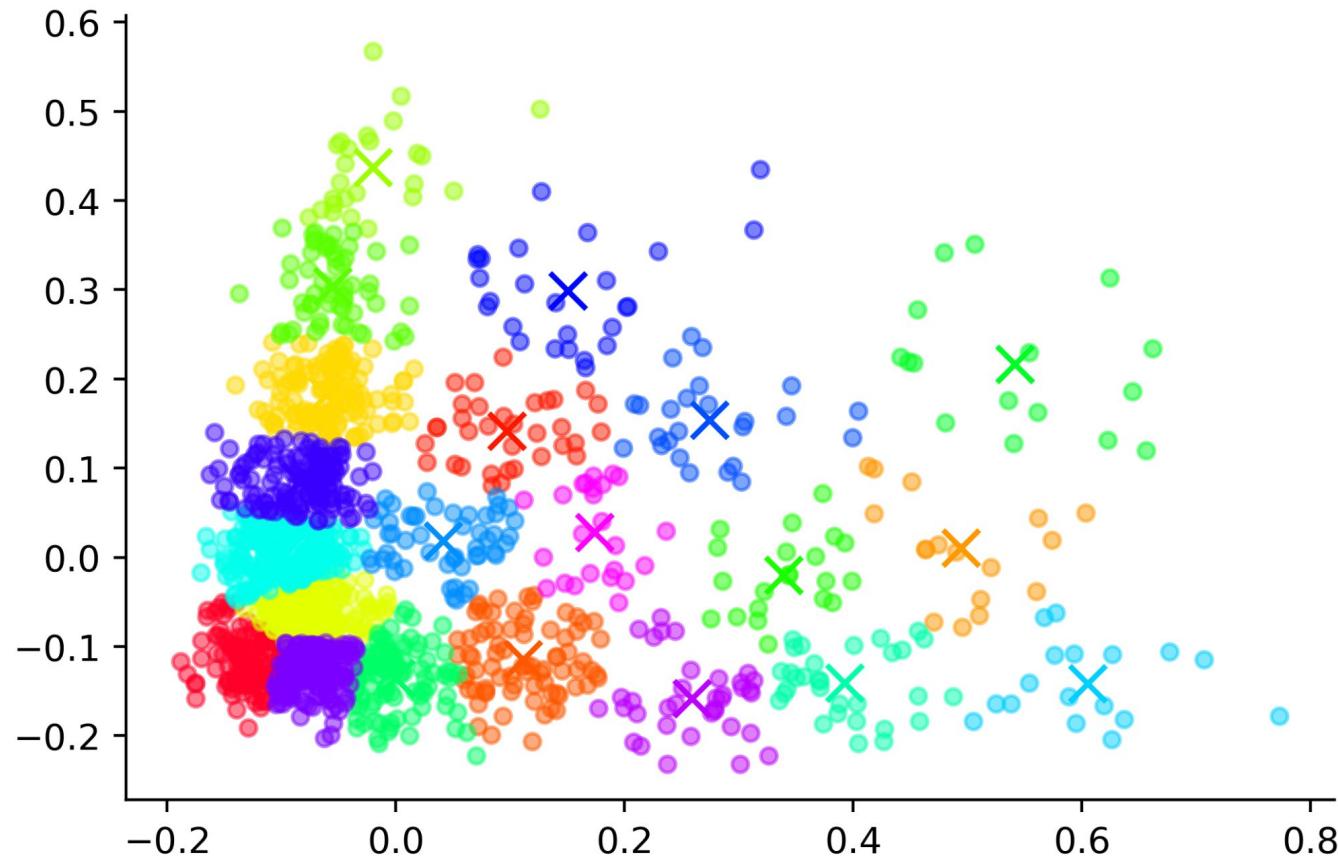
Variance Explained by Nth Principal Component



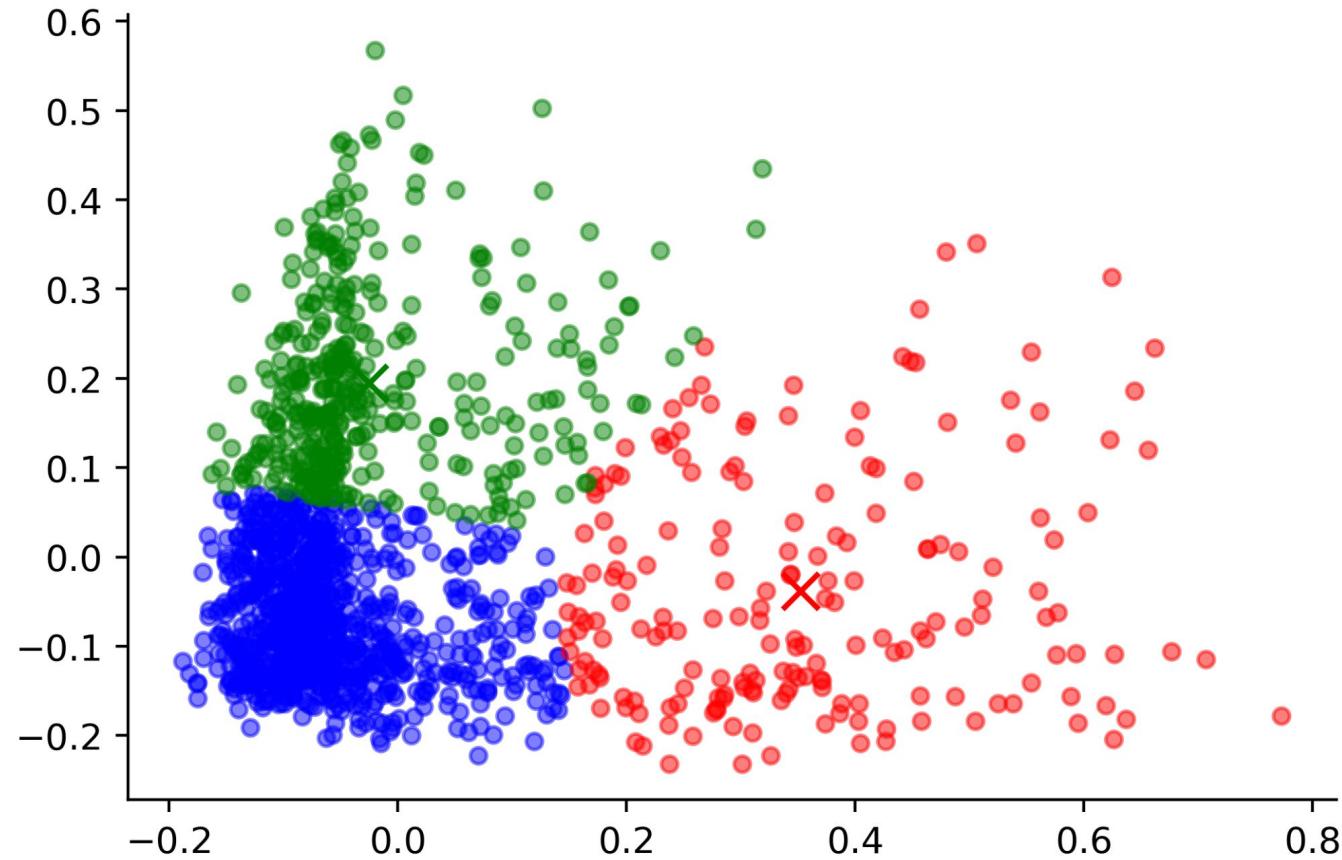
Cumulative Variance Explained by N Components



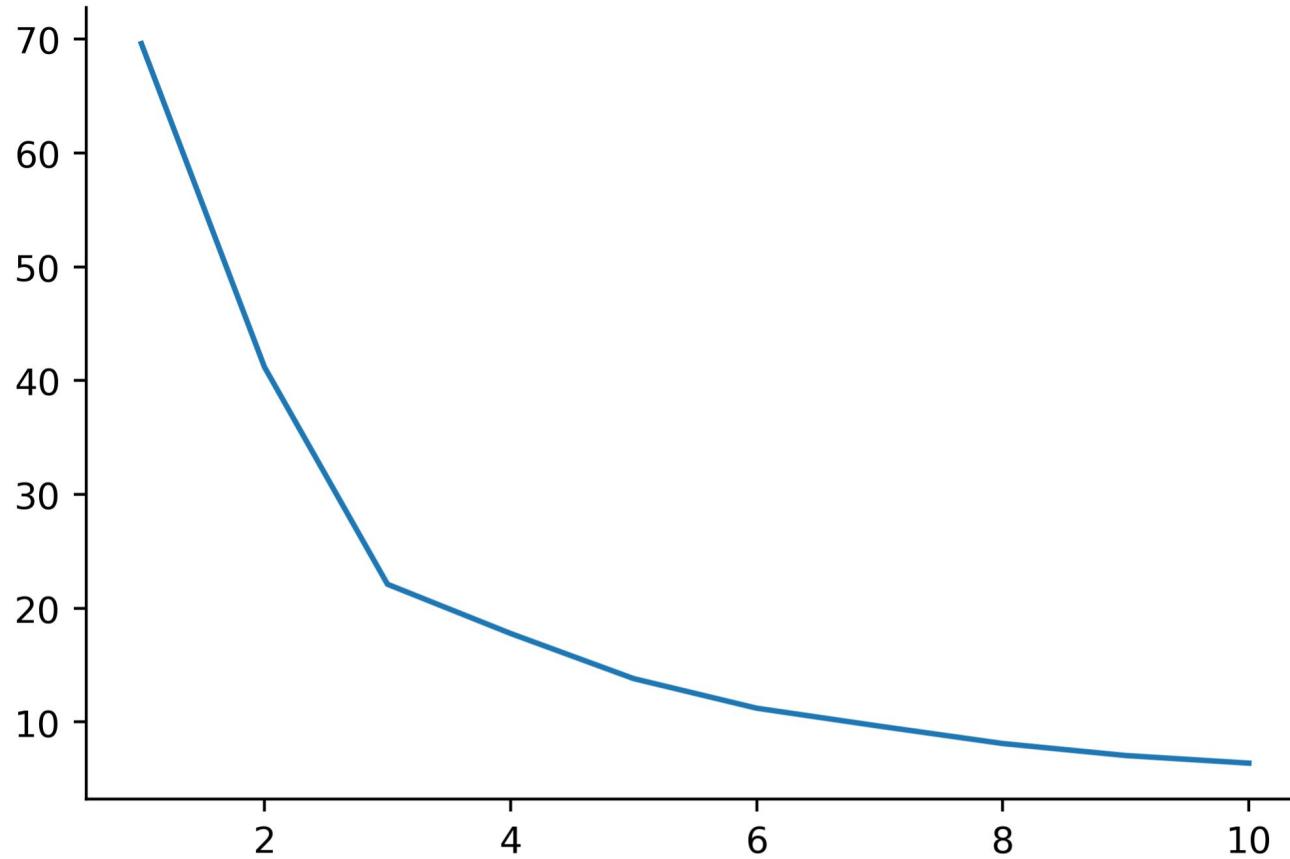
k-mean (21)



k-mean (3)



k-mean (inertia)



Rank	Title	Your Rating	Geek Rating	Avg Rating	Num Voters
1	Gloomhaven (2017) Vanguish monsters with strategic cardplay. Fulfill your quest to leave your legacy!	N/A	8.523	8.76	46410
2	Pandemic Legacy: Season 1 (2019) Managing diseases are spreading around the world - can your team save humanity?	N/A	8.448	8.60	44144
3	Braa: Birmingham (2019) Build networks, grow industries, and navigate the world of the Industrial Revolution.	N/A	8.414	8.67	24024
4	Terraforming Mars (2016) Compete with real CEOs to make Mars habitable and build your corporate empire.	N/A	8.275	8.42	71811
5	Gloomhaven: Jaws of the Lion (2020) Vanguish monsters with strategic cardplay in a 25-scenario Gloomhaven campaign.	N/A	8.258	8.71	14164
6	Twilight Imperium: Fourth Edition (2017) Build an intergalactic empire through trade, research, conquest and grand politics.	N/A	8.255	8.68	15378
7	Gaia Project (2017) Explore, research, upgrade, and settle the galaxy with one of 14 alien species.	N/A	8.177	8.48	18354
8	Star Wars: Rebellion (2016) Strike from your hidden base as the Empire.	N/A	8.171	8.42	74041

Data Process

Top 1,500 games
Web-scraped the list
and stats

Total 56,951 comments

Planned to web-scraped 40 random over-500-character comments per game of Top 1500 board games

Dimensionality Reduction

Topic Modeling

- Truncated SVD
- NMF
- LDA
- Corex
- ✓ PCA

Vectorizer

- Countvectorizer
- ✓ TF-IDF Vectorizer

EDA and NLP(spacy)

- ✓ Remove foreign language
- ✓ Tokenization
- ✓ Lemmatization
- ✓ Lowercase
- ✓ Remove stopwords, numbers and punctuations

Recommendation System

- ✓ Cosine Distance
- Euclidean Distance
- ✓ Deployed on Streamlit.io

