

Board Game Analysis and Recommendation System

Team 1

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Motivation

- Board game as a social activity during COVID19 lockdown
- Research questions:
 - How did board games evolve over time?
 - How can we recommend board games to users?



Data Analysis

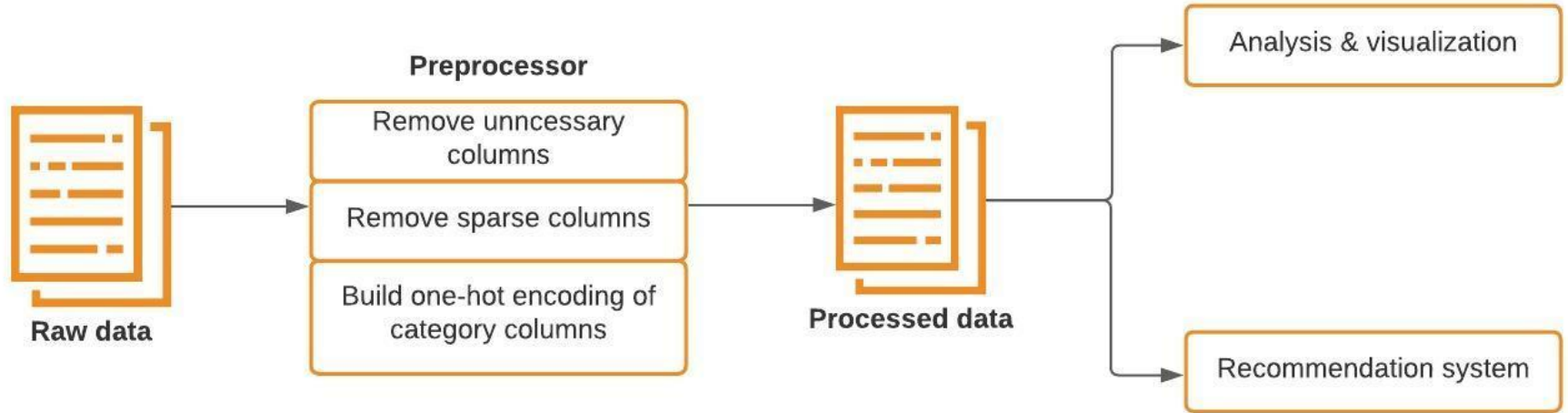
Data Overview



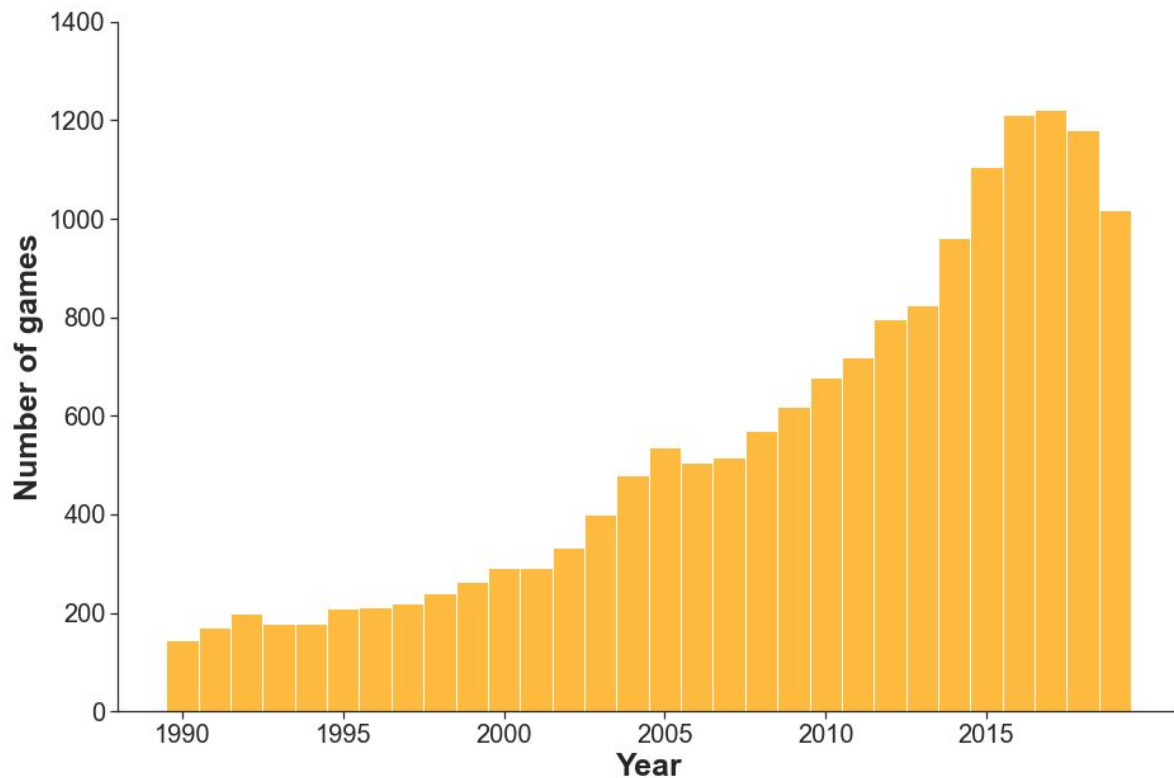
- Source: BoardGameGeek
- Size: 19230 rows (games), 55 columns (attributes)
- Columns include game features & ratings

name	description	yearpublished	minplayers	maxplayers	minplaytime	maxplaytime	complexity	category	mechanic	numratings	avgrating
Pandemic	In Pandemic, several virulent diseases have br...	2008	2	4	45	45	2.4148	['Medical']	['Action Points', 'Cooperative Game', 'Hand Ma...	96241	7.61567
Catan	In Catan (formerly The Settlers of Catan), pla...	1995	3	4	60	120	2.3264	['Economic', 'Negotiation']	['Dice Rolling', 'Hexagon Grid', 'Income', 'Mo...	96213	7.16265
Carcassonne	Carcassonne is a tile-placement game in which ...	2000	2	5	30	45	1.9158	['City Building', 'Medieval', 'Territory Build...	['Area Majority / Influence', 'Map Addition', ...	96228	7.41884

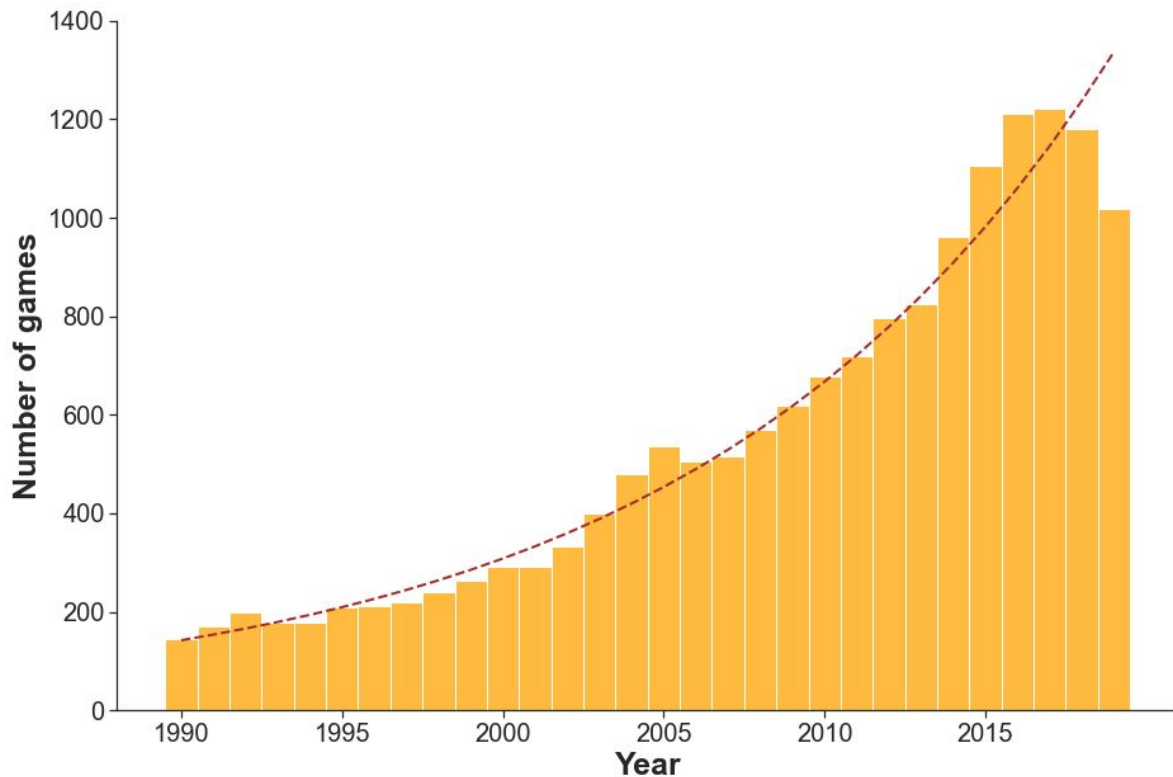
Methodology



Trend Analysis: Number of Published Games

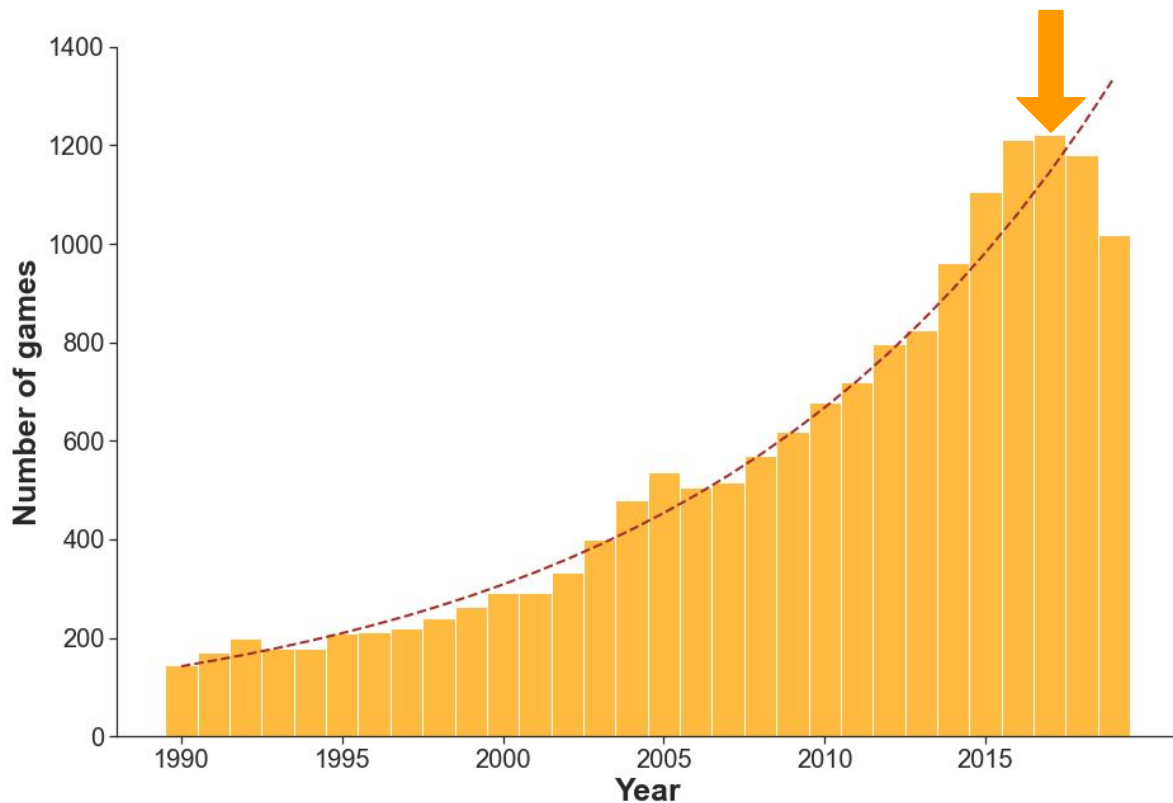


Trend Analysis: Number of Published Games



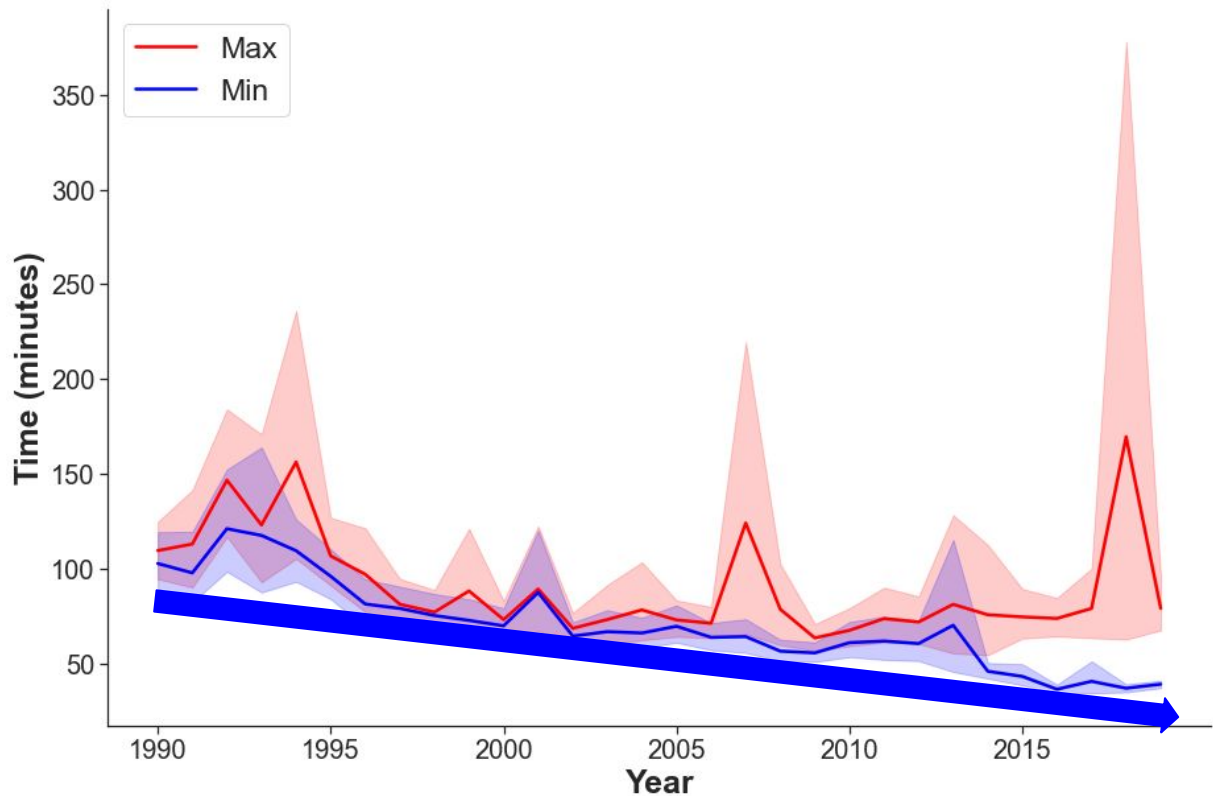
- Exponentially increasing trend

Trend Analysis: Number of Published Games



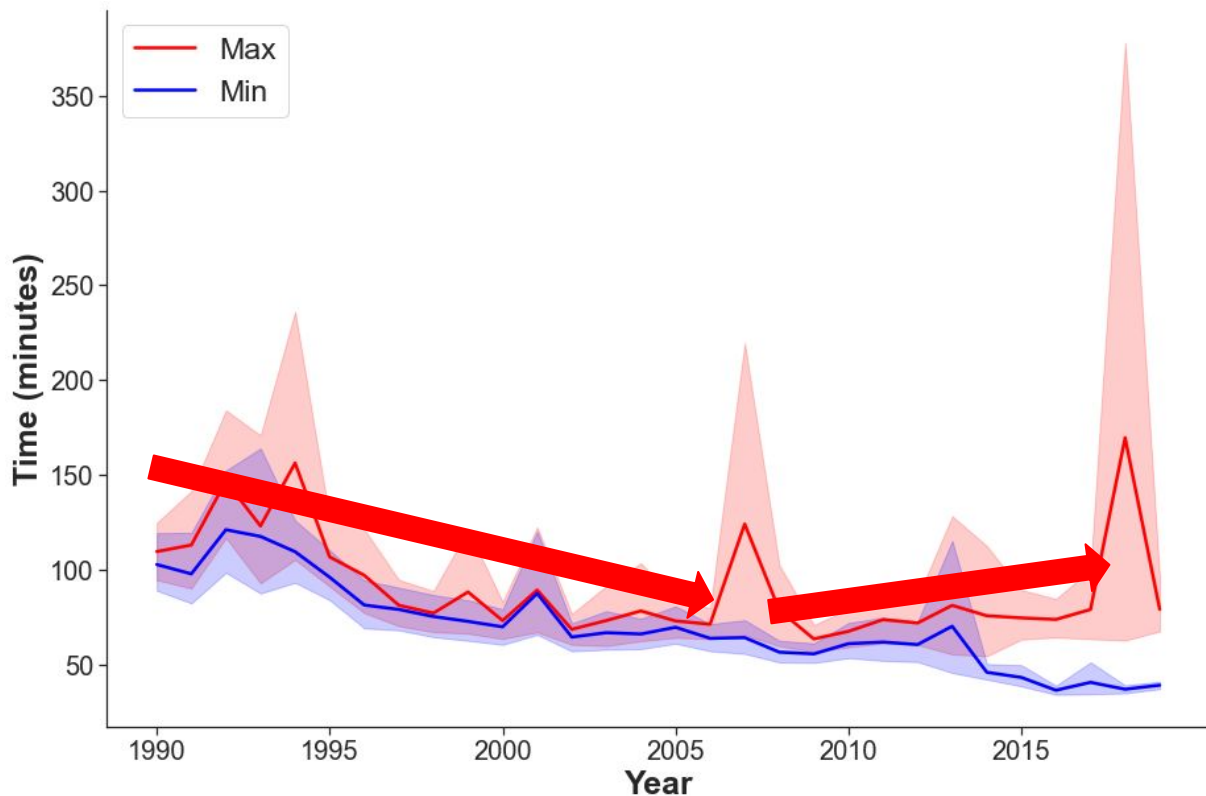
- Exponentially increasing trend
- Peak in 2017

Trend Analysis: Playing Time



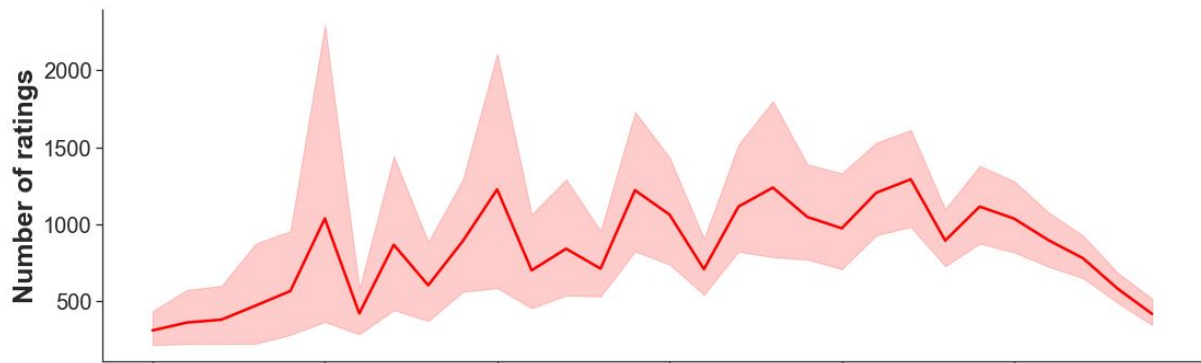
- Line: average
- Shade: 95% confidence interval

Trend Analysis: Playing Time

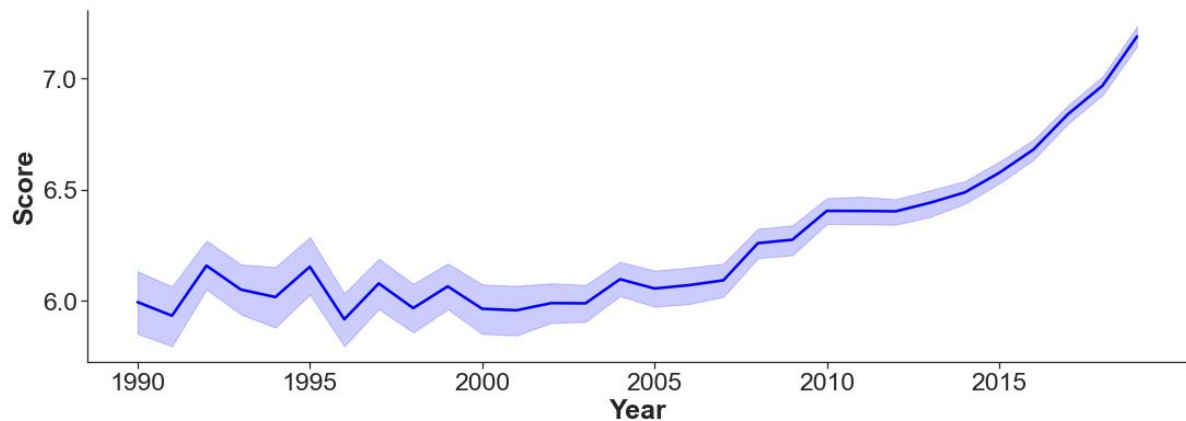


- Line: average
- Shade: 95% confidence interval
- Peak in **2007** followed by an upward trend

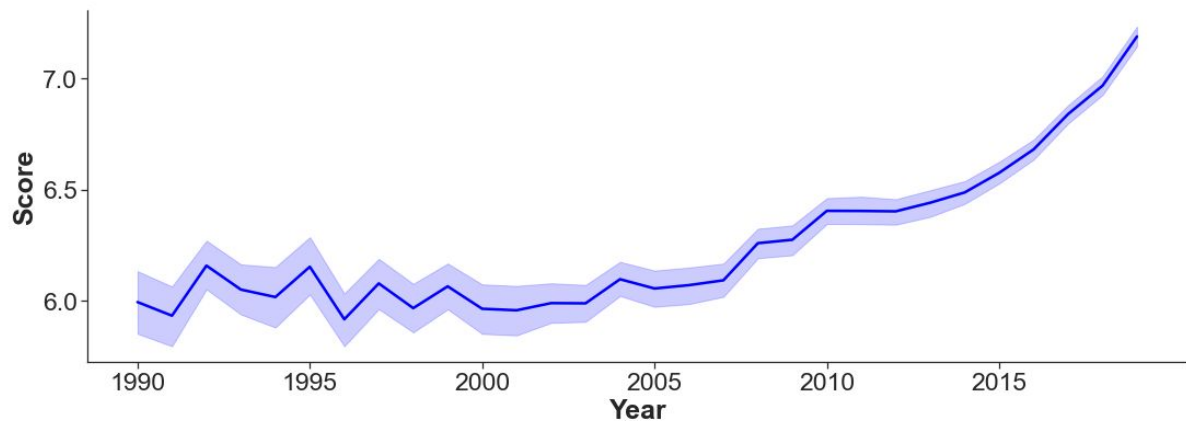
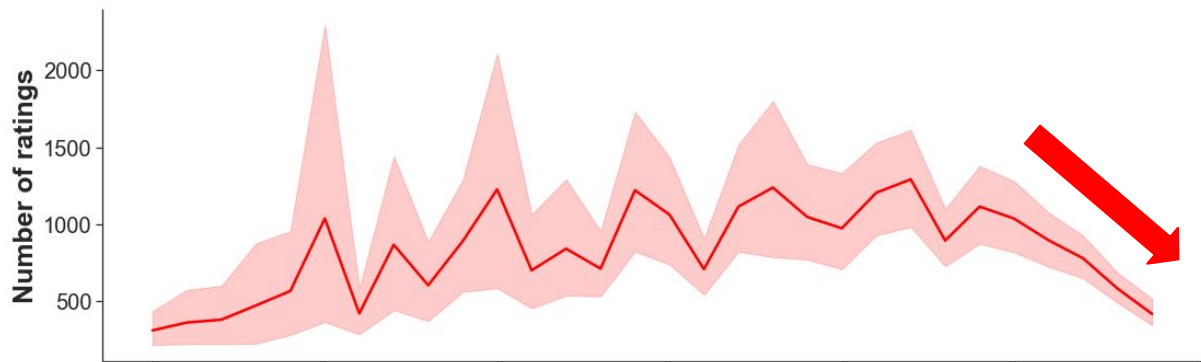
Trend Analysis: Rating



- Line: average
- Shade: 95% confidence interval

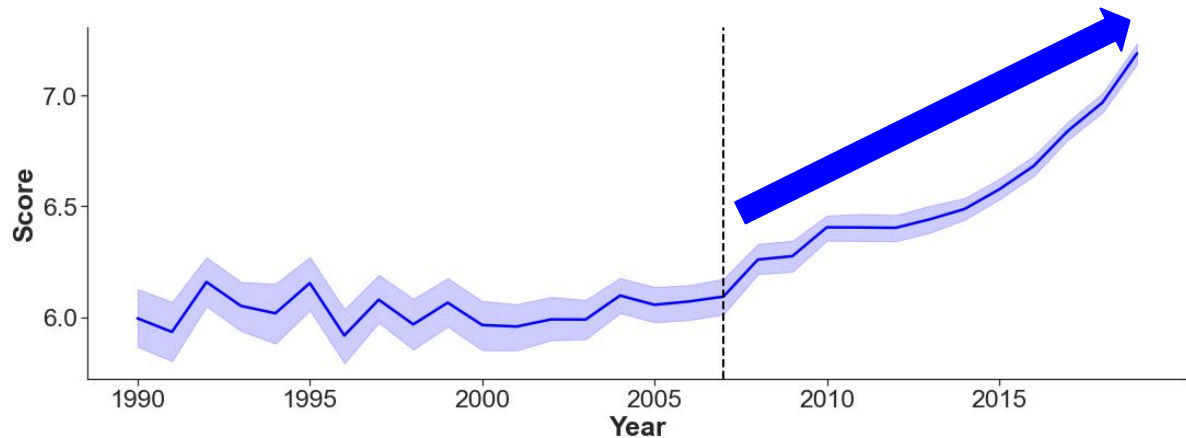
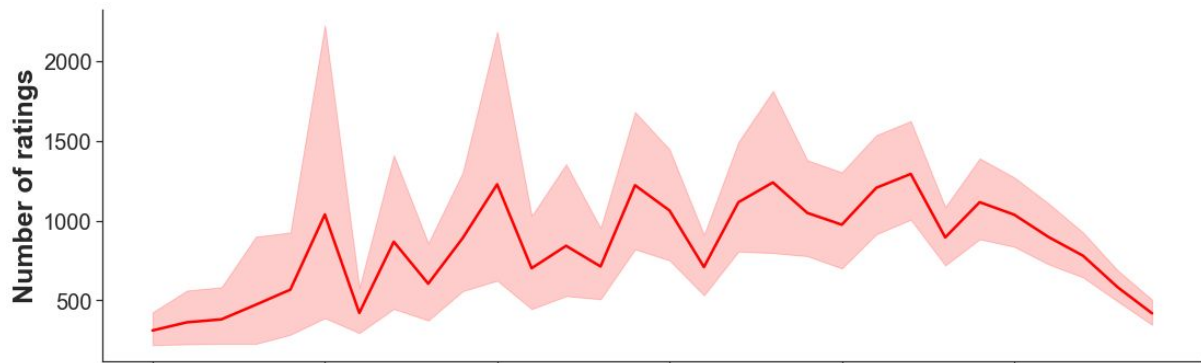


Trend Analysis: Rating



- Line: average
- Shade: 95% confidence interval
- Recently published games have fewer ratings

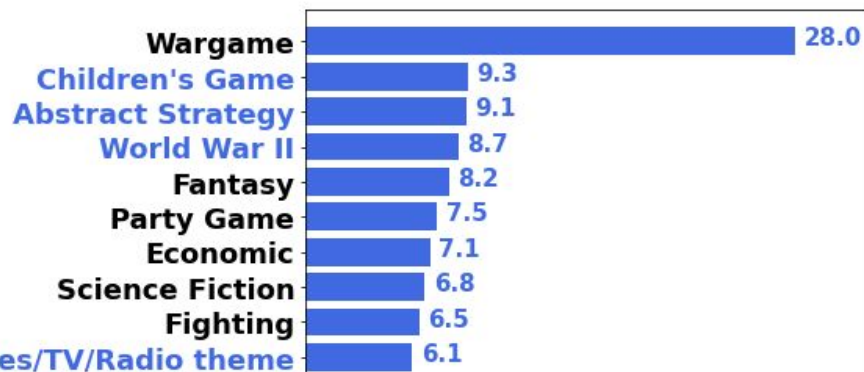
Trend Analysis: Rating



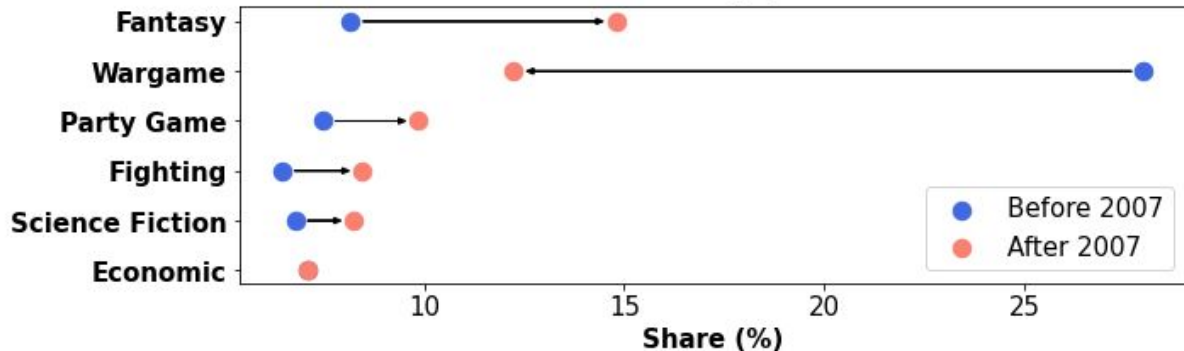
- Line: average
- Shade: 95% confidence interval
- Average score in increasing trend since 2007

Comparison: Top 10 Categories

Before 2007

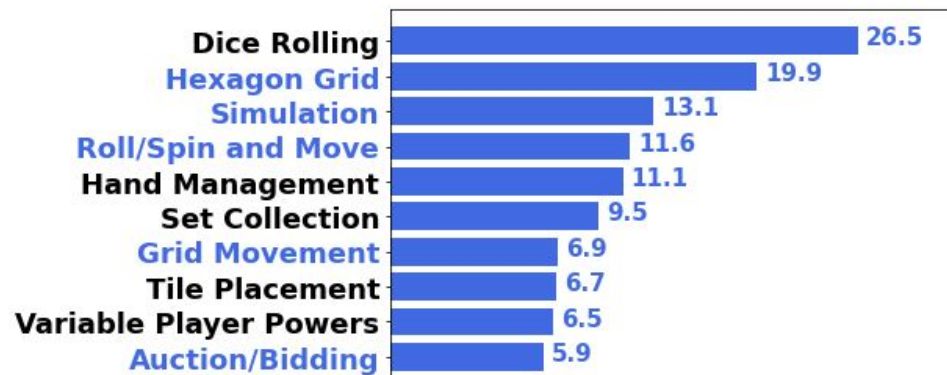


After 2007



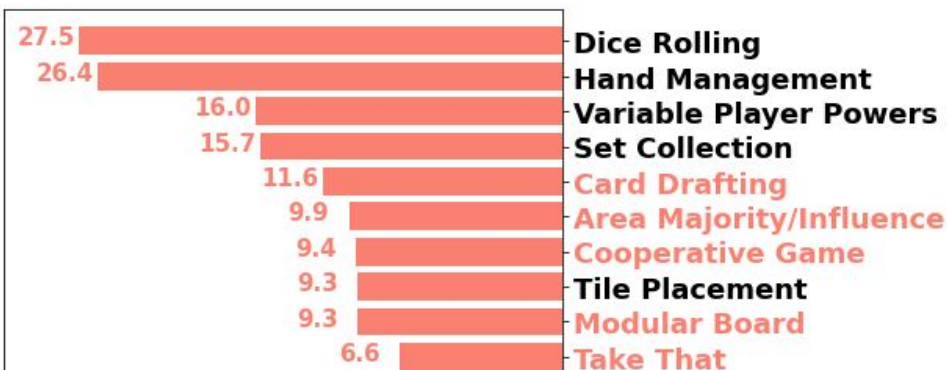
Comparison: Top 10 Mechanics

Before 2007

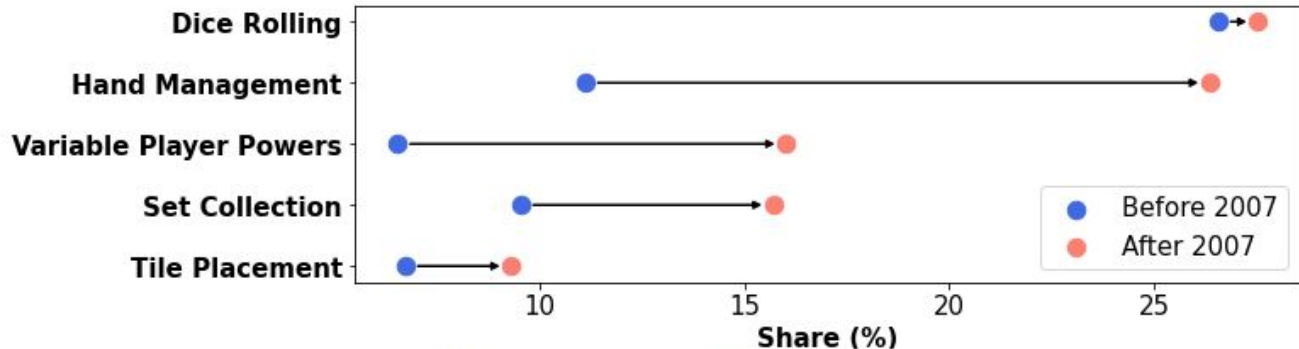


Share (%)

After 2007



Share (%)





Recommendation System



Task

- Recommend games based on other liked/disliked games
- Use ratings data to automatically suggest games

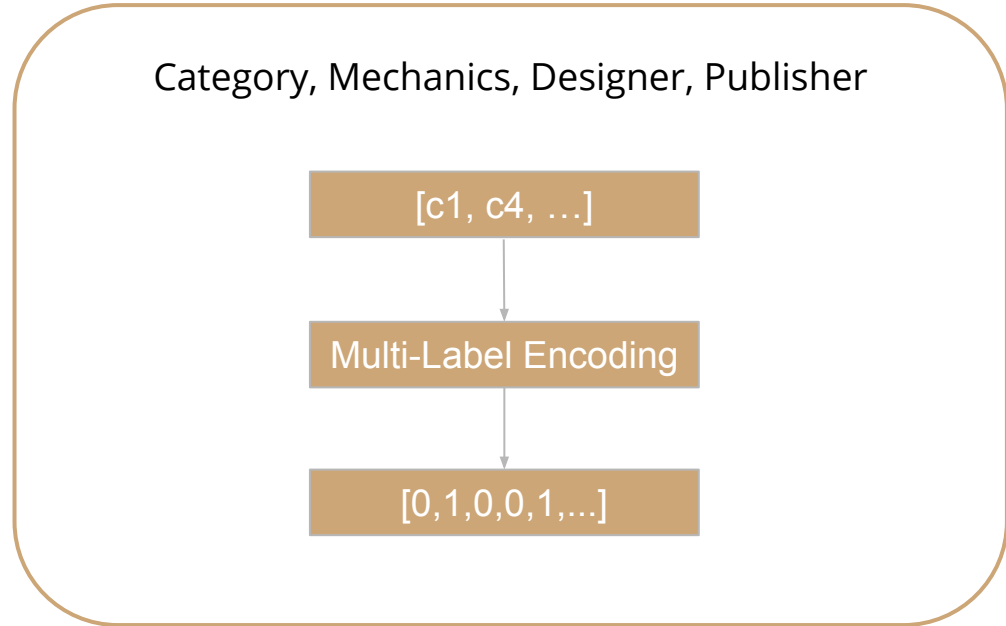
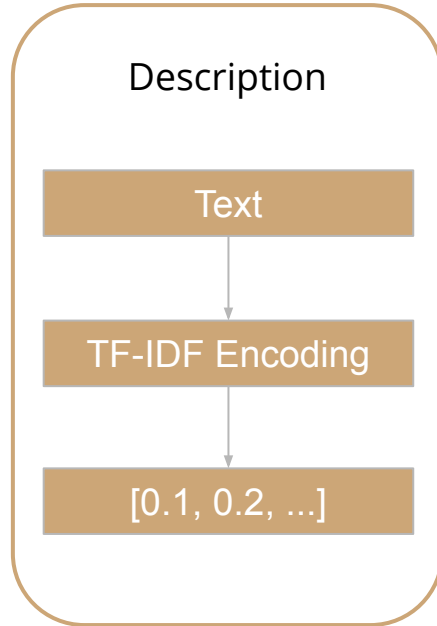
user	rating	comment	ID	name
Mandrake	8.0	A spooky, atmospheric delight, with ridiculous...	29368	Last Night on Earth: The Zombie Game
qwertywraith	9.0	NaN	102680	Trajan
madchow	6.0	I just don't get the appeal. I enjoy Wizard or...	215	Tichu
kalevi1999	6.5	I dont know... we played it once but it didnt ...	135281	Serenissima (Second Edition)

Methodology



Nearest Neighbours

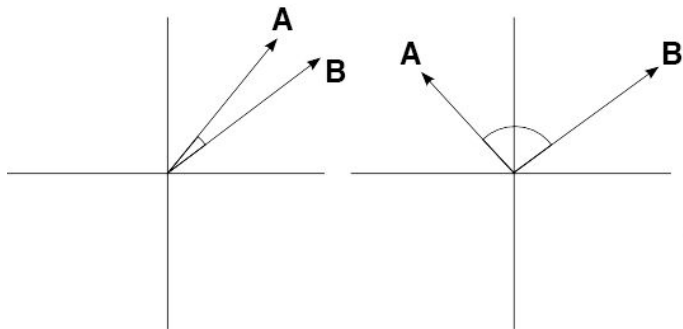
Methodology



Mathematical Representation

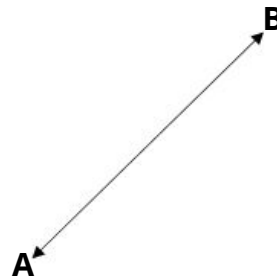
Methodology

Cosine Similarity



High Dimensional Encodings

Euclidean Distance



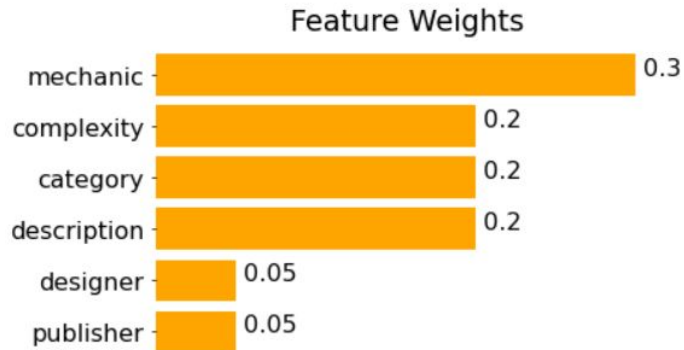
Scalars

Define Similarity

Heuristics

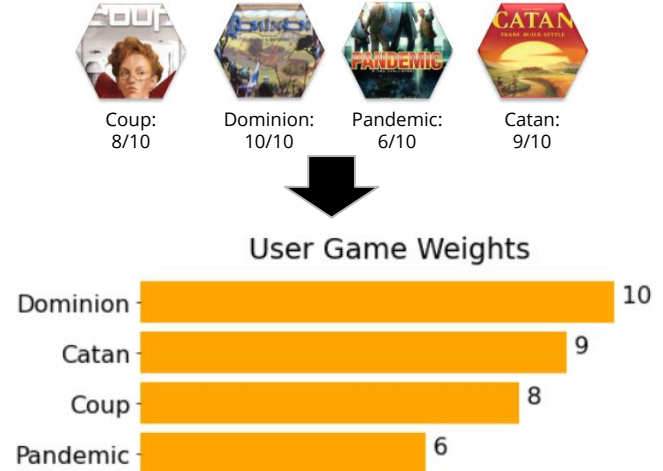
Feature Importance

- Give some features more weightage when calculating cumulative similarity score



User Game Importance

- Give highly rated games more weightage when generating user recommendations



Results

User Rated Games:

Game	Rating
Mythic Battles: Pantheon	9
Concordia	8.5
Scythe	8.4
Splendor	8

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	name	mechanic	category	complexity
0	Mythic Battles: Pantheon	[Area Movement, Campaign / Battle Card Driven, Card Drafting, Cooperative Game, Dice Rolling, Hand Management, Player Elimination, Simulation, Variable Player Powers]	[Ancient, Card Game, Miniatures, Mythology, Wargame]	3.0101
1	Concordia	[Action Retrieval, Advantage Token, Card Drafting, Hand Management, Movement Points, Moving Multiple Units, Point to Point Movement, Variable Setup]	[Ancient, Economic, Nautical]	3.0391
2	Scythe	[Area Majority / Influence, Force Commitment, Grid Movement, Hexagon Grid, King of the Hill, Movement Points, Moving Multiple Units, Narrative Choice / Paragraph, Race, Simultaneous Action Selection, Solo / Solitaire Game, Tech Trees / Tech Tracks, Variable Player Powers]	[Economic, Fighting, Science Fiction, Territory Building]	3.4002
3	Splendor	[Card Drafting, Contracts, Set Collection]	[Card Game, Economic, Renaissance]	1.8005

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Top 5 Suggestions:

	name	mechanic	category	complexity
0	Concordia Venus	[Action Retrieval, Card Drafting, Deck, Bag, and Pool Building, Hand Management, Point to Point Movement, Team-Based Game]	[Ancient, Economic]	3.1600
1	7 Wonders	[Card Drafting, Drafting, Hand Management, Set Collection, Simultaneous Action Selection, Variable Player Powers]	[Ancient, Card Game, City Building, Civilization, Economic]	2.3321
2	51st State	[Card Drafting, Hand Management, Variable Player Powers]	[Card Game, City Building, Economic, Science Fiction]	3.1144
3	Mundus Novus	[Card Drafting, Hand Management, Set Collection, Trading]	[Card Game, Economic, Nautical, Renaissance]	2.1863
4	Masters of Renaissance: Lorenzo il Magnifico – The Card Game	[Card Drafting, Set Collection, Slide/Push]	[Card Game, Economic, Renaissance]	2.2000

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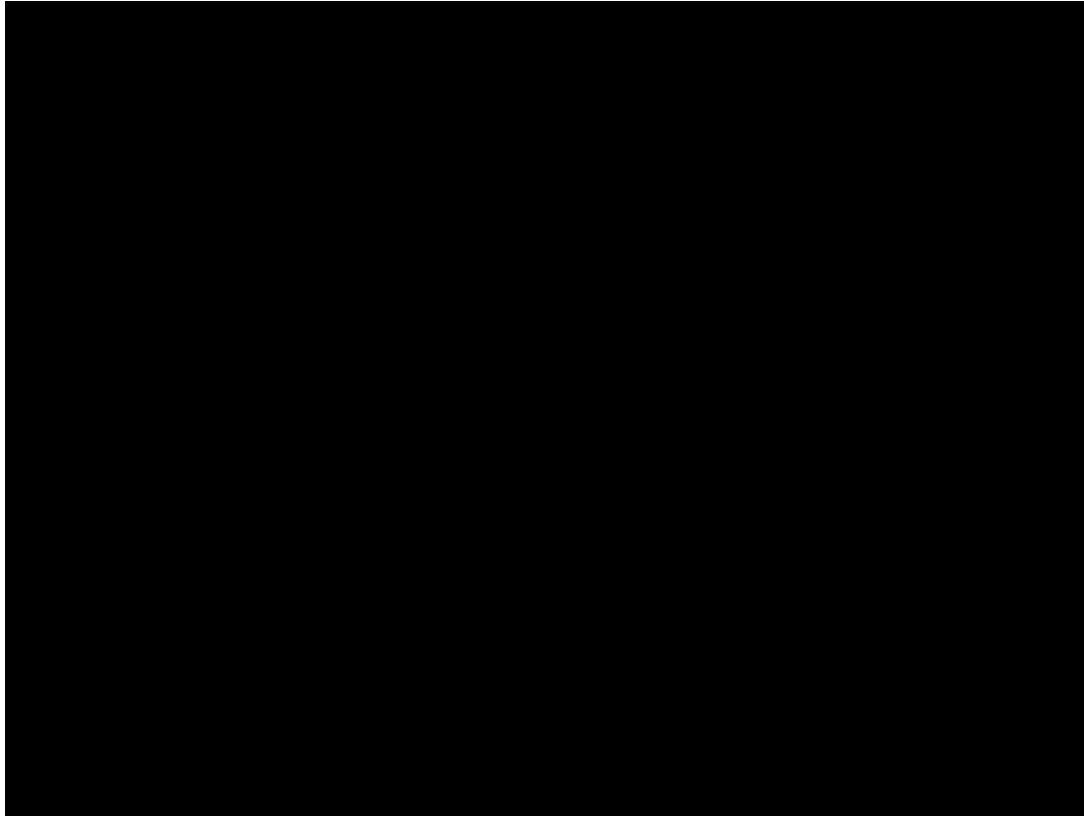
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Demo



Summary and Future Work

- Mid-2000s: turning point in board game industry
 - More published
 - More highly rated
 - Change in top 10 categories and mechanics
- Recommendation system is able to suggest games that are similar
 - In future combine with collaborative filtering
 - Collect user activity to improve heuristics

Thank You!