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2018373 | w17421047/2

NFT-RecSys

A Trading Recommendations System for Non-fungible Tokens

Agenda

Background

Problem

NFTs

- Provably scarce **unique** digital assets
- Ownership represented by Blockchain
- The biggest thing of 2021
- Digital artworks have been the center-stage

NFT Market

- OpenSea - Amazon of NFTs
- Jan 2022 - monthly trading volume > **$3.5 Billion**
- 2021 - **$41 Billion** valuation (Locke, 2022) (Parashar, 2022)
- 2026 - expected market valuation > **$147 Billion**

(*Non-fungible Token (NFT) Market by Application and Geography - Forecast and Analysis* 2022-2026, 2022)

Recommendation Systems

- Driving engagement & consumption of content & items on every corner of the internet for the last decade
- Reduces information overload
- **35%** of Amazon's revenue (Naumov et al., 2019)
- **60%** of Youtube watch time (*Recommendations* 2021)

Problem

- No Recommendation System for NFT item recommendations
- Difficulty in finding/ recommending relevant, trending, timely items.

Research Gap - Technical

- Collaborative Filtering (the standard technique for the last decade) - can't be taken as the only model
  - by the time one NFT is viewed many times by other users, it may already be too late for another user to purchase that item.
  - Amazon identified that people prefer to watch recently released movies over highly rated, old ones (Larry, 2019)

- No previous research related to NFTs

Research Gap

Aim of the Project

Design, develop & evaluate a novel Recommendations Architecture that will provide relevant, trending, timely, and worthy NFTs for trading purposes by automating some of the decision-making steps that the user would otherwise have to do manually.

System Design

Trends-based RecSys - Algorithm

trend-score for one item

sentiment score

Tweet volume

matched bool

user priority

$$T_{t_s,i} = \frac{\sum_{i_s=1}^{N_{is}} \left[\sum_{k_w=1}^{k_w} s_c \left(\frac{t_{vt,c}}{Med(T_{vt})} \right) \frac{mu}{(\mu+n_m)} \right]}{N_{i_s}}$$

Equation for social trend-match score for recommendations *(self-composed)*

median Tweet volume

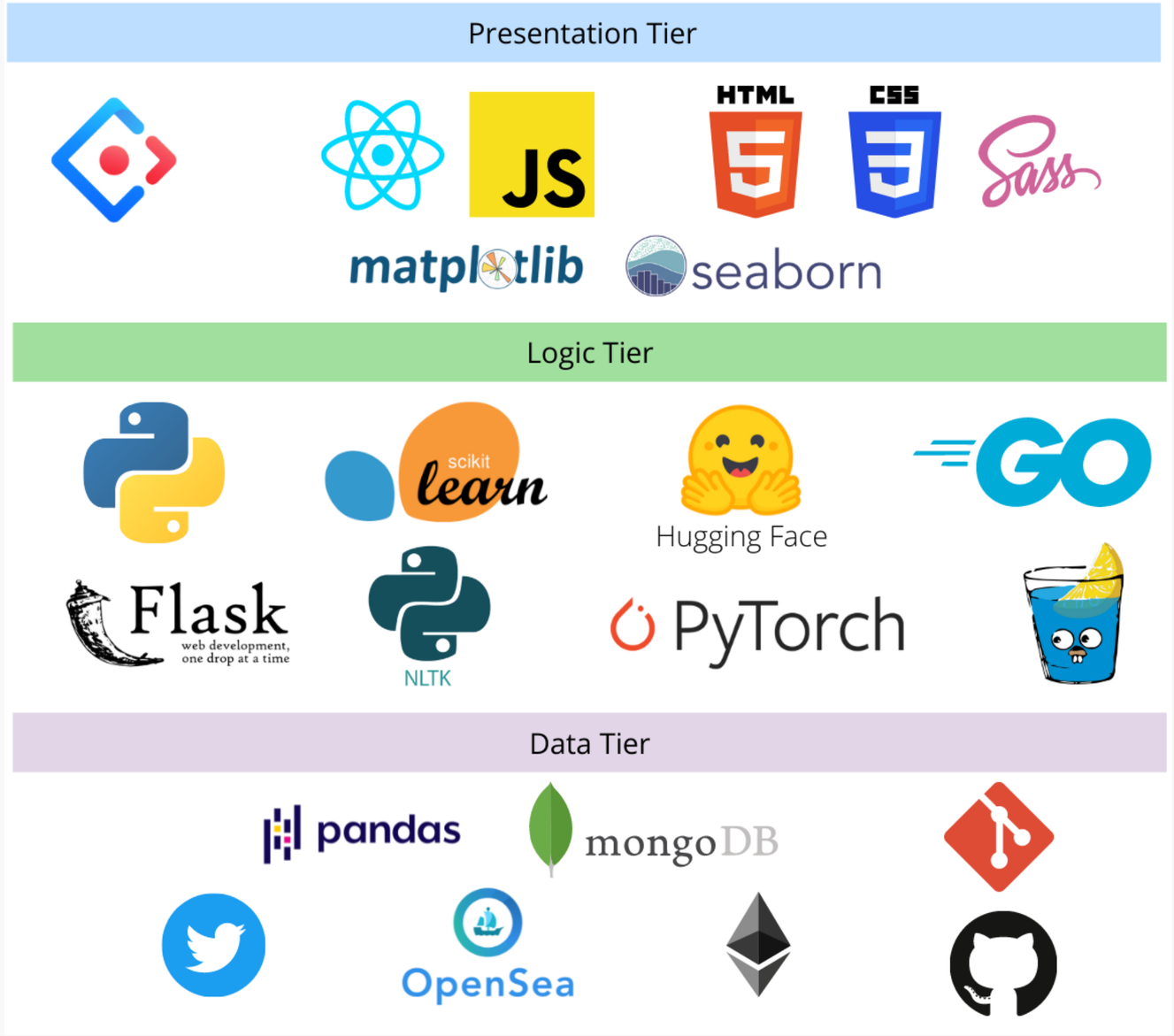
number of days since the trend

μ - constant, set to 0.1 to avoid division by 0 error for today's trends

kw - number of keywords in the current item

Nis - total number of information sources

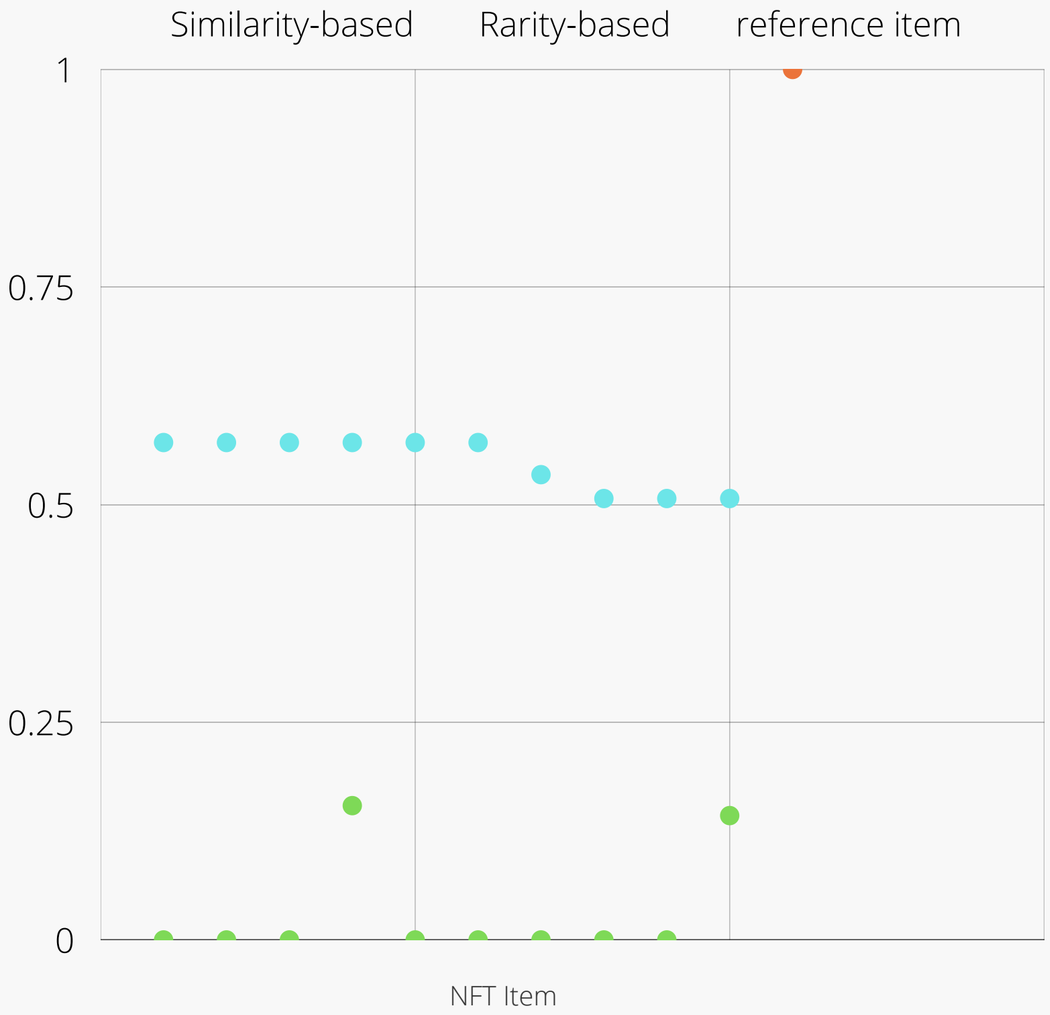
Implementation

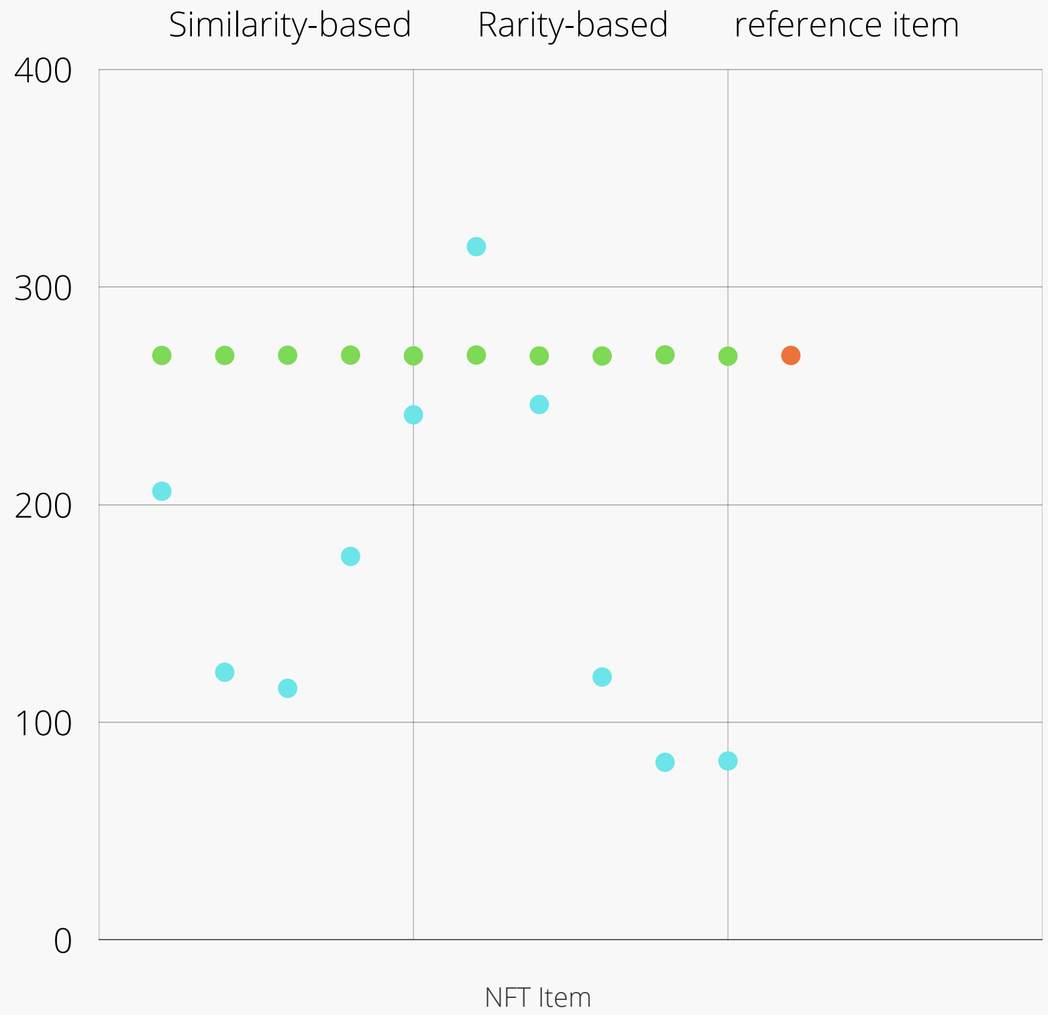


Demo

Testing & Evaluation

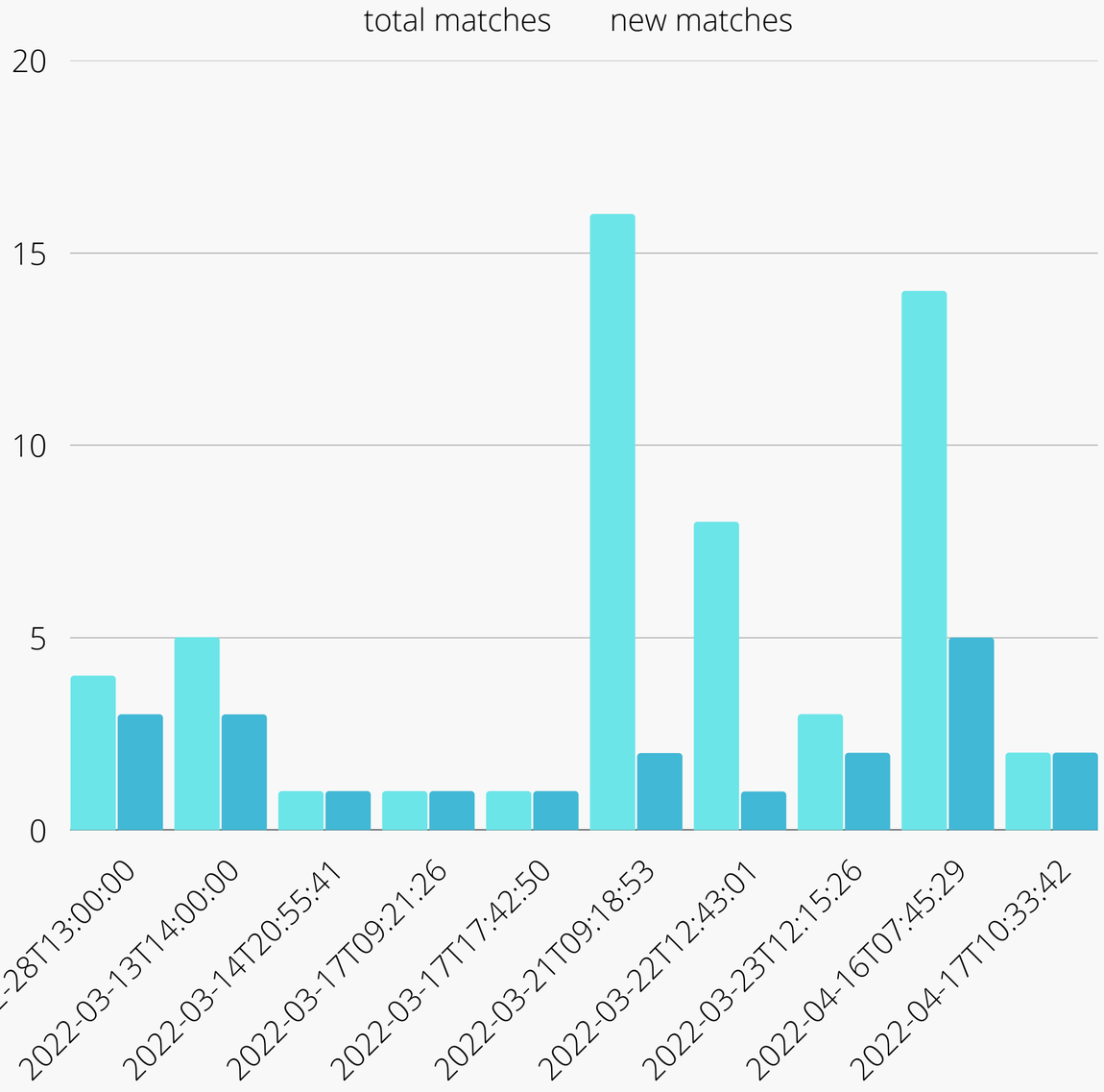
Trait Similarity & Rarity based RecSys

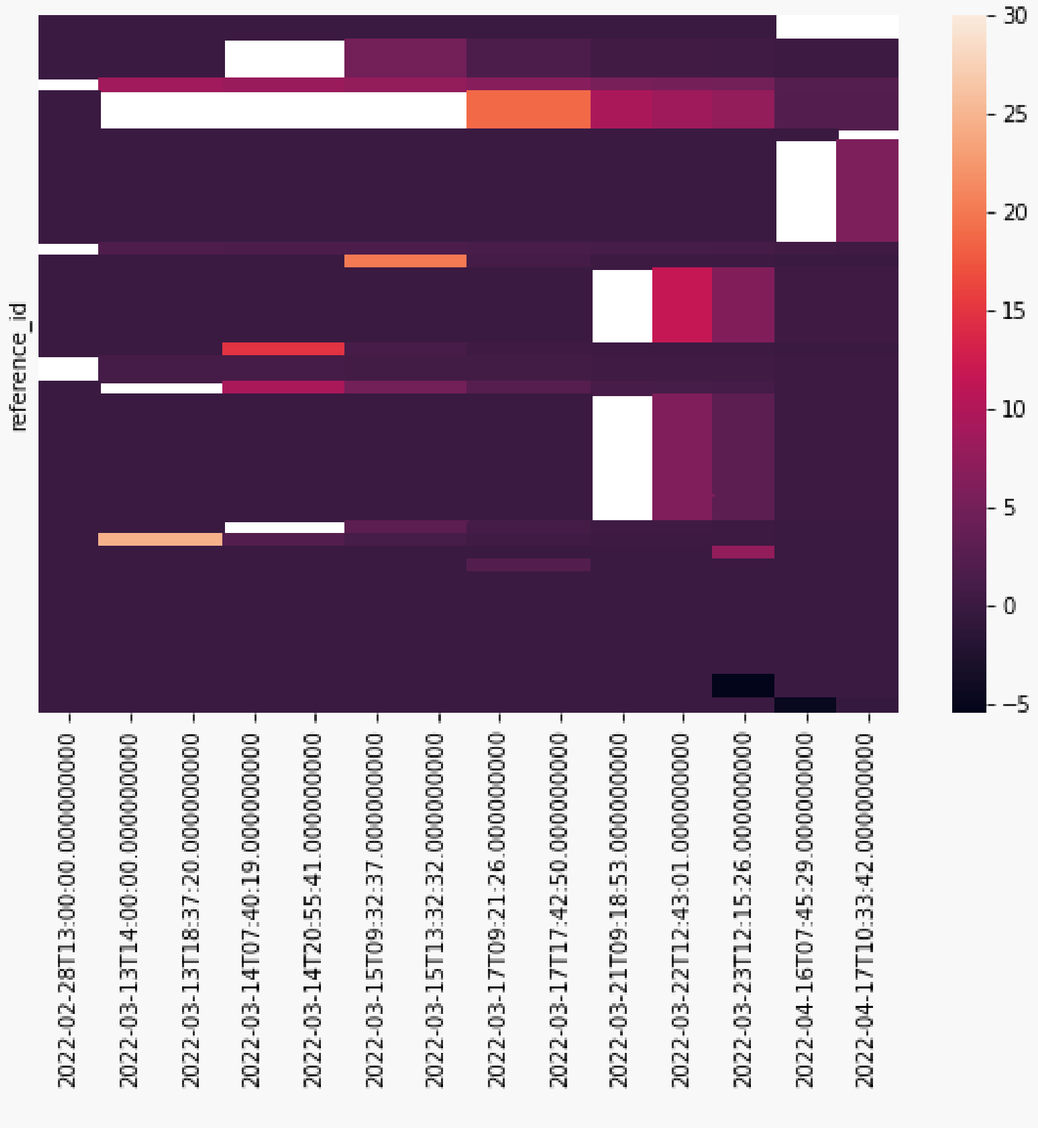




Testing & Evaluation

Trends-based RecSys





Evaluators

Name	Professional Occupation	Highest Academic Qualification
Prof. Narada Warakagoda	Principal Scientist at FFI/ Associate Professor at University of Oslo	PhD in Signal Processing/ Speech Recognition (Norway)
Dr. Upali Kohomban	Head of Research - Codegen (UK)	PhD in Computer Science - NUS (Singapore)
Dr. Akshika Wijesundara	Senior Technical Lead - Data Scientist (Growth) at WSO2, Founder & Chairperson of SEF	PhD in Computer Science - The Open University (UK)
Dr. Kaneeka Vidanage	Head Of Research - OREL IT	PhD in Artificial Intelligence (Malaysia)
Ms. Gayani Nanayakkara	Academic Tutor & Research Assistant	PhD in Artificial Intelligence (Reading) - Robert Gordon University (Scotland)
Mr. Sharmilan Somasundaram	CEO of Niftron	Certified Blockchain Solution Architect (CBSA), MSc Big Data Analytics
Mr. Narada Wickramage	Assistant Director - MIS & Statistics, Public Utilities Commission of Sri Lanka	MSc, MBA
Mr. Aadhil Rushdy	Senior Data Engineer/Team Lead - Sysco Labs	MSc Computer Science - specialized in Data Science Engineering & Analytics (University of Moratuwa)
Mr. Jajeththanan Sabapathipillai	Chief Product Officer - Niftron	BE (Hons) Computer Software Engineering
Mr. Sasila Hapuarachchi	Incoming Engineer - Amazon (Canada)	BE Electrical Engineering (Co-op) (Canada)

Evaluators

Name	Professional Occupation	Highest Academic Qualification
Mr. Nipuna Senanayake	Senior Lecturer - IIT	MS Computer Science (USA)
Mr. Achala Aponso	Senior Lecturer - IIT	MSc Artificial Intelligence
Mr. Prasan Yapa	Level 2 Coordinator - BSc (Hons) in Artificial Intelligence & Data Science Program, Lecturer - Software Engineering - IIT	MSc (Major Component in Research) in CS
Anonymous	Lecturer	Blockchain Masters Researcher
Ms. Areefa Thassim	Software Engineer - MillenniumIT ESP	MSc Big Data Analytics
Anonymous	Data Engineer	BEng (Hons) Software Engineering
Lasal Jayawardena	-	Undergraduate - BSc (Hons) Artificial Intelligence and Data Science
Nazhim Kalam	Software Engineering Trainee - 99x	Undergraduate - BSc (Hons) Computer Science
Ammar Raneez	Trainee Software Engineer - 99x	Undergraduate - BSc (Hons) Computer Science
Gibran Kasif	Trainee Software Engineer - Vestoria	Undergraduate - BSc (Hons) Computer Science

Evaluators' Evaluation Highlights

"highly technical core problem that is addressed, which is a complex one on its own even as a theoretically modeled one.

the problem itself is intriguing and quite relevant as an interesting problem.

The level of details covered in the thesis on the software aspects is exceptionally good and well thought out.

decisions made on the architectural aspects, such as building the components in a microservices architecture, are in line with the matured industry standards, but not common to see in undergraduate-level work.

the problem addressed, and the solution proposed is interesting, and the work carried out is ambitious."

Dr. Upali Kohomban, Head of Research - Codegen (UK)
PhD in Computer Science - NUS (Singapore)

"The researcher has implemented and evaluated recommendation systems suitable for NFTs, and hence contributed with novel results. The research work carried out is impressive."

Prof. Narada Warakagoda, Principal Scientist at FFI/ Associate Professor at University of Oslo
PhD in Signal Processing/ Speech Recognition (Norway)

Limitations & Future Enhancements

- Build a price-prediction model for NFTs
  - Difficult due to the uniqueness of NFTs, lack of data
  - Try using a dataset of rare-physical artwork
- The trends-based model is only effective if accurate, diverse descriptions are provided for NFTs.
- Currently, only Twitter trends are used
  - Source trends from multiple platforms (Reddit, Discord, Google, private forums)
- Create a decentralized Recommendations Eco-system using the Trends-based RecSys
- Extends NLP preprocessing
  - Pre-process & separate hashtags in trends
- As a substitute for recently released movies, integrate trends to bolster recommendations
  - Due to the lack of data and open code bases, this couldn't be attempted
- Extend the trends-based recommendations to personalized recommendations
  - trends could be categorized for this purpose
  - would be almost impossible to implement without collecting user-specific data.

Conclusion - Contributions

Technical Contribution (Recommendations Systems)

1. Social Trends influenced Recommendation Model - a novel, innovative concept & approach taken
2. Trends-score calculation equation & algorithm

Domain Contribution (NFTs)

Identification & Analysis of factors that can be used to produce NFT item recommendations.

Additional Contributions

1. Data Preprocessing scripts
    a. Social media trends extraction
    b. NFT Data extraction
        - Trait rarity calculation
2. NFT Asset datasets - made available on Kaggle
3. Created a Latex template for the expected thesis structure that can be used by IIT students in the future

(Contributions made by Visal Rajapakse, Isala Piyarisi & Akassharjun Shanmugarajah).

Publications - all have been published as preprints on ArXiv

1. Exploration of the possibility of infusing social media trends into generating NFT recommendations.
2. An Analysis of the Features Considerable for NFT Recommendations.
3. A Review on Pushing the Limits of Baseline Recommendation Systems with the integration of Opinion Mining & Information Retrieval Techniques.

Conclusion - Skills

Existing Skills

Fullstack R&D

Golang

Blockchain

Machine Learning
Deep Learning

Python - Pandas

Acquired Skills

Recommendation Systems

NLP

Data Engineering
Data Mining
Information Retrieval

LaTeX

Summary

Novel Algorithm & Architecture to produce Social Trends based Recommendations

Inception of research related to NFTs

Pre-processed NFT datasets made available on Kaggle

NFT-RecSys

2 Research Papers

1 Review Paper

4 Recommendation Models

Use of Latex for Documentation

Identification of features that can be used for NFT Recommendations

Latex Template that can be used by future students of IIT

20 Evaluations

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Thank you for listening!

References

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4. Locke, T., 2022. The NFT market is probably not as down as you think it is. [online] Fortune. Available at: <https://fortune.com/2022/05/05/nft-market-sales-not-flatlining-data-shows/> [Accessed 16 May 2022].
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A New way of looking at Recommendations

User Click Data per day

8 GB

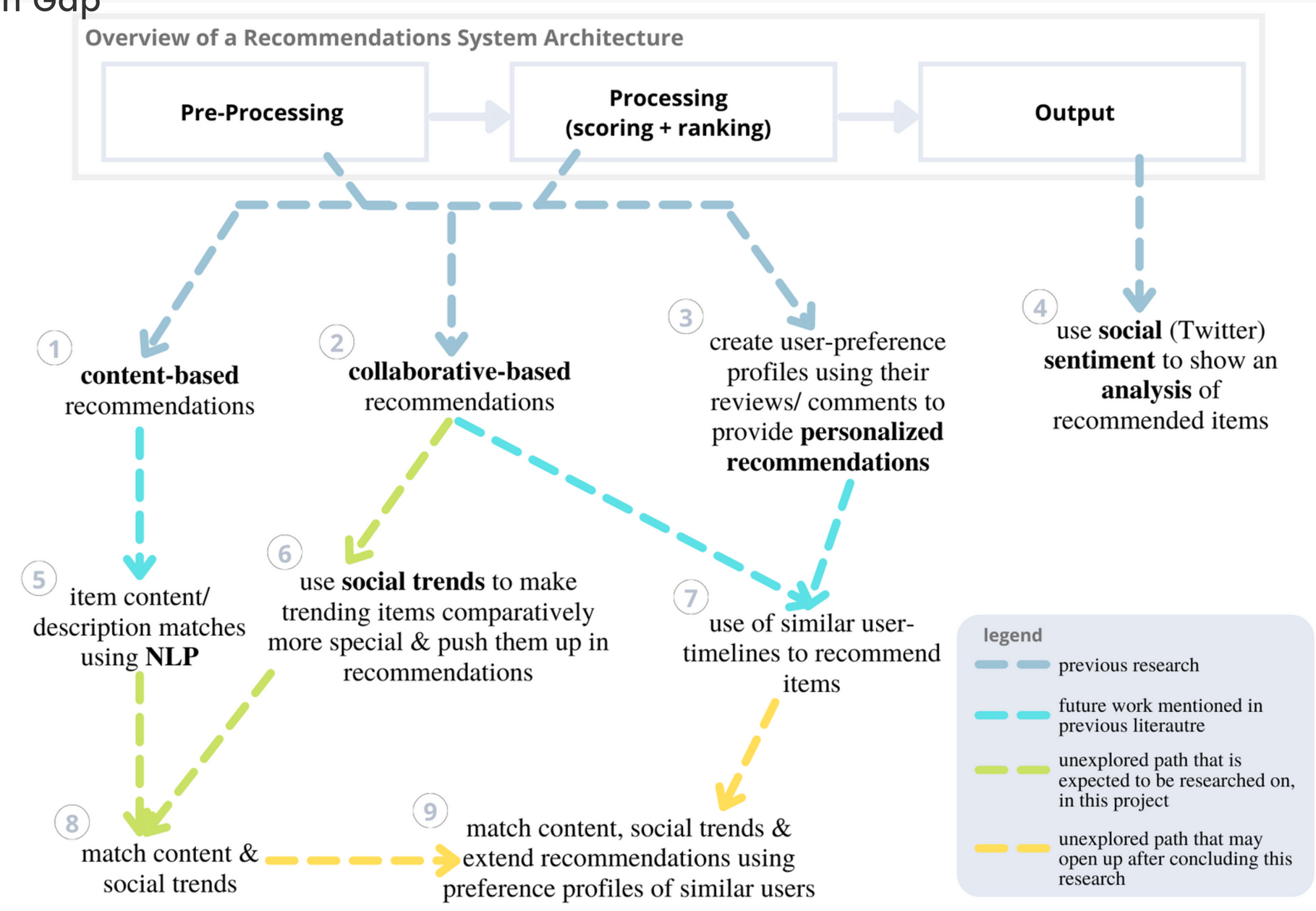
Trends Data for 15 days

136KB

58,823.5 X

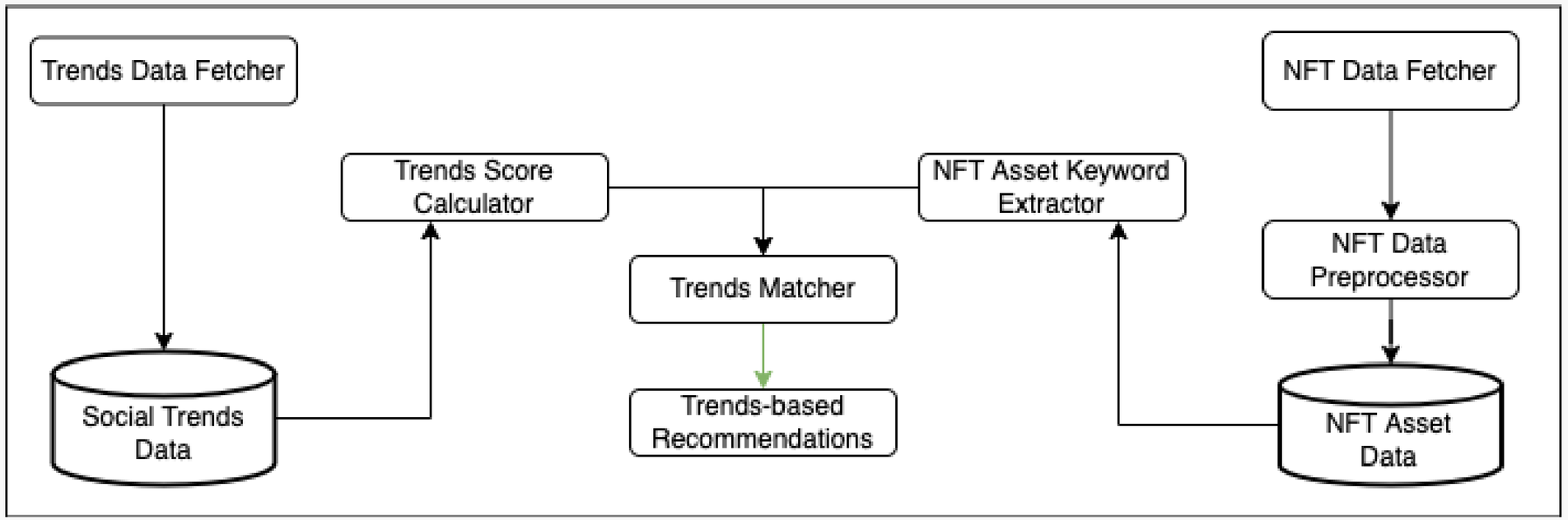
Less Storage

Research Gap

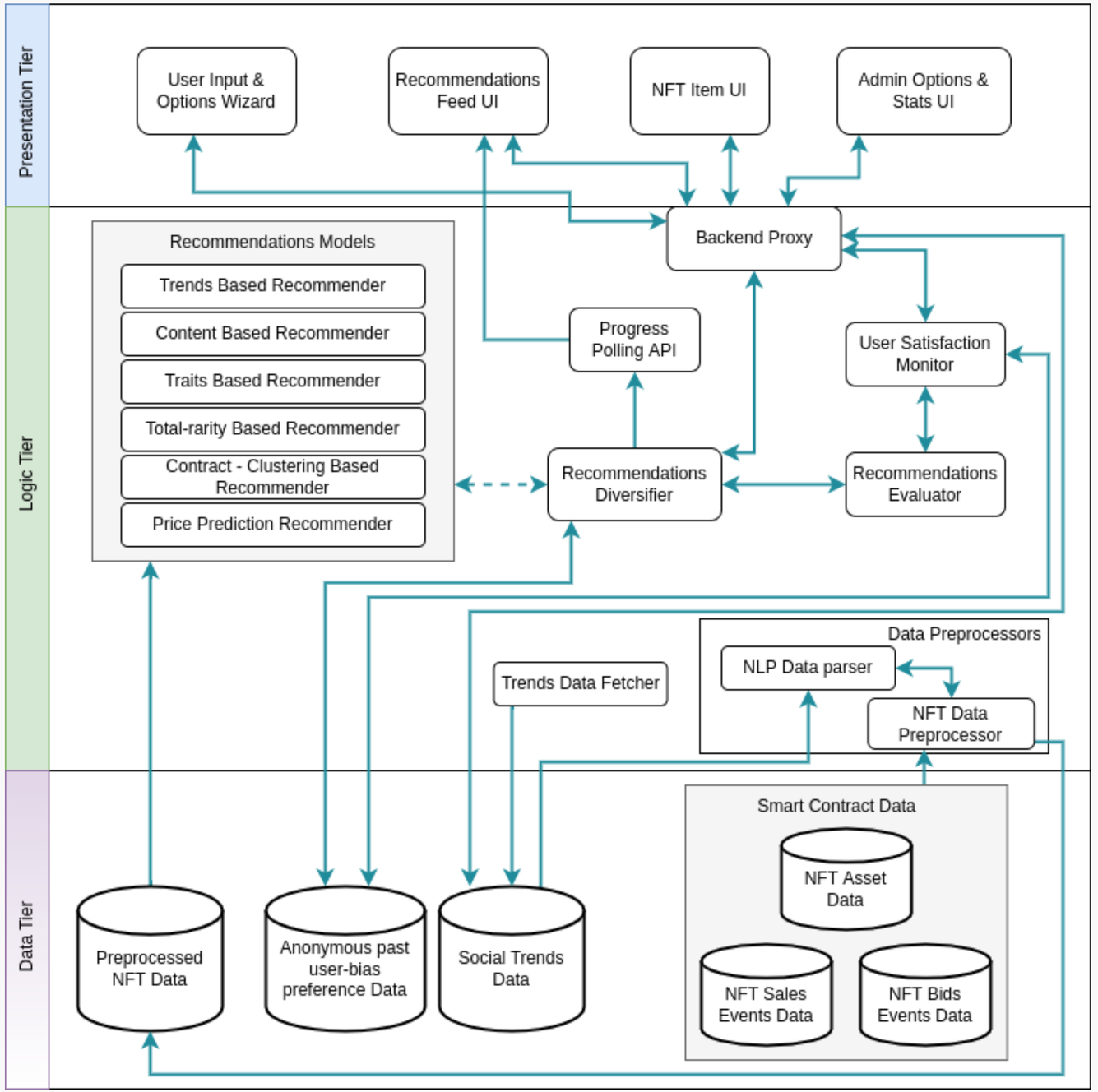


System Design

Trends-based RecSys - Process



System Design - Architecture

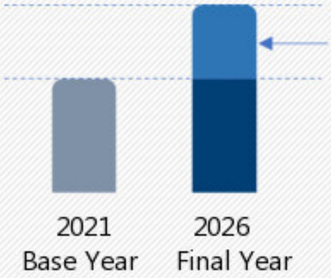


Growth of NFT market

GLOBAL NON-FUNGIBLE TOKEN (NFT) MARKET 2022-2026

CAGR of (2021-2026)

35.27%



Growth difference
(Base year - Final year)

$147.24
bn

The market is **FRAGMENTED** with several players occupying the market share

One of the **key drivers** of the market will be the **increasing demand for digital artworks**

Key Players

- Asynchronous Art Inc.
- Binance Services Holdings Ltd.
- Dapper Labs Inc.
- Decentraland Foundation
- Enjin Pte. Ltd.

43%

of the growth will originate from **APAC**

Market Segmentation By Application

- Collectibles
- Sports
- Arts
- Others

OpenSea - Job Req

Web3 Community Data Scientist

OpenSea · San Francisco, CA 3 days ago · 59 applicants

Full-time · Entry level

51-200 employees · Software Development

See how you compare to 59 applicants. Retry Premium Free

Actively recruiting

Apply Save

About the job

OpenSea is the first and largest marketplace for non-fungible tokens , or NFTs. Applications for NFTs include collectibles, gaming items, domain names, digital art, and many other items backed by a blockchain. OpenSea is an open, inclusive web3 platform, where individuals can come to explore NFTs and connect with each other to purchase and sell NFTs. At OpenSea, we're excited about building a platform that supports a brand new economy based on true digital ownership and are proud to be recognized as Y Combinator's #4 ranked top private company.

When hiring candidates, we look for signals that a candidate will thrive in our culture, where we default to trust, embrace feedback, grow rapidly, and love our work. We also know how critical it is to celebrate and support our differences. Employing a team rich in diverse thoughts, experiences and opinions enables our employees, our product and our community to flourish. We are dedicated to equal employment opportunities regardless of race, color, ancestry, religion, sex, national origin, sexual orientation, age, citizenship, marital status, disability, gender identity or Veteran status. To help facilitate this, we support remote, hybrid or onsite work at either New York City or San Francisco for the majority of our opportunities.

OpenSea is looking for an experienced, entrepreneurial and web3 native analyst to help size community feedback, surface early trends and analyze sentiment data to help inform our community and product roadmaps. This individual will work very closely with our Community, Data and Product teams.

Responsibilities

- Collect and combine data—have your ear to the ground (Crypto Twitter, Discord, etc.) and analyze sentiment data on our social platforms; be able to combine this data, blockchain data, and our internal data using analytics tools including SQL and Python/R
- Analyze data—sort through the noise to find the signal of early trends that should be on our radar; quantitatively size these trends on our larger user base to help us prioritize our roadmap (e.g. how many of our users are experiencing the same issue but haven't taken the time to Tweet at us about it?)