

# **PLETHORA**



## **SEMANTIC E-COMMERCE WEBSITE WITH ITEM-BASED COLLABORATIVE FILTER RECOMMENDATION SYSTEM**

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# INTRODUCTION



- Era of E-commerce
- High relevance over sifting through variety
- Relevant, High Precision Results necessary
- Need to make suggestions according to user's interest
- Use of Recommender Systems

# CURRENT SEARCH



- Keyword, Syntactic Based
- No Unified View – Back and Forth Jumping Of Data
- Bottleneck for sharing Product Data

# SEMANTIC SEARCH



- Search Based on Information not Documents
- Data is Structured
- Use of XML/RDF constructs
- SparQL for querying the endpoint data

# PROBLEM STATEMENT



- Build E-Commerce Website with Semantic Search on Closed Domain
- Include a search bar in the Website to Query Data Semantically
- Use of an Item Based Collaborative Filter Recommender System for prediction

# METHODOLOGY



- Semantic Search Bar

Use of RDF/XML construct to define an ontology

Use Semantic Query to Retrieve data from the ontology

# RDF GRAPH



- Defines entities in the concept
- Defines properties of the object
- Defines relations between entities
- Implements a Graphical Representation

# SEMANTIC E-COMMERCE



## Entities :

Buyer

Seller

Items

Brand

Category

## Data Properties

Buys

Sells

Has\_Category



# ITEM BASED COLLABORATIVE FILTER



- Training Space : User-Item Matrix
- M users and N items
- Compute Similarity between two items  $i$  and  $j$
- Predict user ratings for items

# Similarity Computation



## Cosine Based Similarity

$$\text{sim}(i, j) = \cos(\vec{i}, \vec{j}) = \frac{\vec{i} \cdot \vec{j}}{\|\vec{i}\|_2 * \|\vec{j}\|_2}$$

## Correlation Based Similarity

$$\text{sim}(i, j) = \frac{\sum_{u \in U} (R_{u,i} - \bar{R}_i)(R_{u,j} - \bar{R}_j)}{\sqrt{\sum_{u \in U} (R_{u,i} - \bar{R}_i)^2} \sqrt{\sum_{u \in U} (R_{u,j} - \bar{R}_j)^2}}$$

## Adjusted Cosine Similarity

$$\text{sim}(i, j) = \frac{\sum_{u \in U} (R_{u,i} - \bar{R}_u)(R_{u,j} - \bar{R}_u)}{\sqrt{\sum_{u \in U} (R_{u,i} - \bar{R}_u)^2} \sqrt{\sum_{u \in U} (R_{u,j} - \bar{R}_u)^2}}$$

# PREDICTION COMPUTATION



- Weighted Computation

$$P_{u,i} = \frac{\sum_{\text{all similar items, } N} (s_{i,N} * R_{u,N})}{\sum_{\text{all similar items, } N} (|s_{i,N}|)}$$

# WORK DONE



- Data Set
  - Web Scrapping using python BeautifulSoup Library.
  - Website Used : Myntra
  - User Specific Ratings : MovieLens Dataset

# WEBSITE DESIGN



Primarily HTML/CSS Bootstrap

PHP

MySQL Database

Protégé

Apache Jena Server / SparQL

ARC Library

# SEMANTIC SEARCH BAR IMPLEMENTATION



- **Ontology Creation**

- Protégé 5.0.0
- Entities, Data Properties, Object Properties Defined
- RDF/XML Construct used.

- **SparQL**

- Apache Jena Server
- Upload of the Ontology File Triples

# Linking of SparQL and PHP



- Apache Jena Server Runs on localhost:3030
- Endpoint Data store link defined in PHP
- ARC 2 PHP library used for Parsing SparQL
- Execute SparQL Query
- Use Result for displaying data accordingly
- Semantic Search in a closed domain

# Recommendation System Implementation



- **Details**

943 users and 1683 items

Users and Items both increase with buyer's ratings on items and sellers increasing items to be sold

- **Recommendation Algorithm**

Python Based Script : Function requires 2 parameters

a) User-ID b) Similarity type

Methods to compute each of the similarities

Method to compute prediction

Returns array in descending order of ratings



# RESULTS and DISCUSSION



- Semantic Query Executes a Meaningful Search over the closed Domain
- Item Based Recommendation System outperforms existing collaborative recommender techniques
- Complete characterisation cannot be made due to sparsity of dataset used

# CONCLUSION and FUTURE WORK



- Open Web Domain for Semantic Search
- Integration of Products Available on all E-Commerce Websites
- Improved Results over Traditional Techniques
- Ability to Scale Larger datasets

# References



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THANK YOU