Wireless Telecommunications Symposium

Predictive Self-Learning Content Recommendation System

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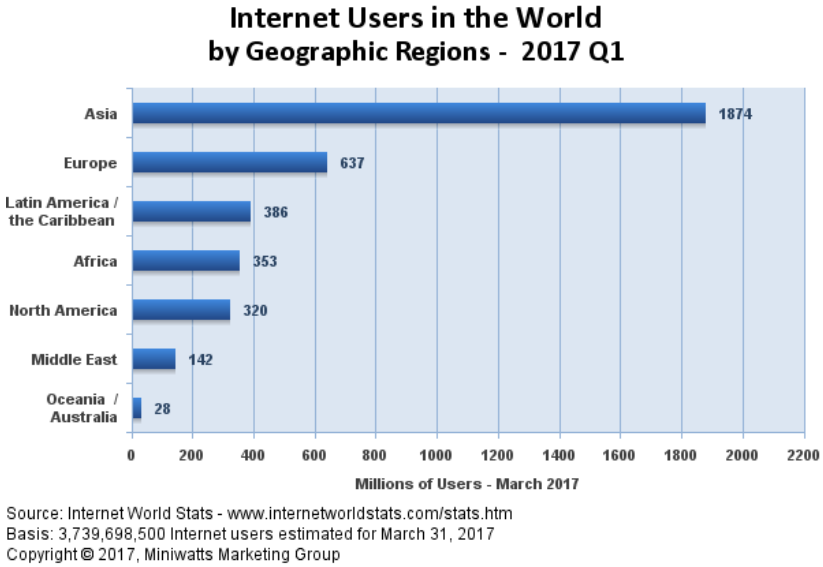
Outlines

- Introduction
- Objective
- Proposed Model
- Analysis
- Conclusion

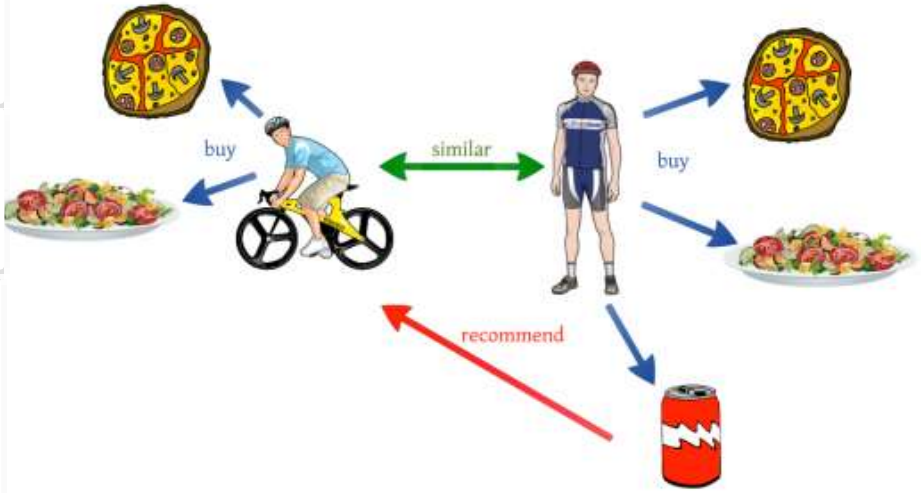
Introduction

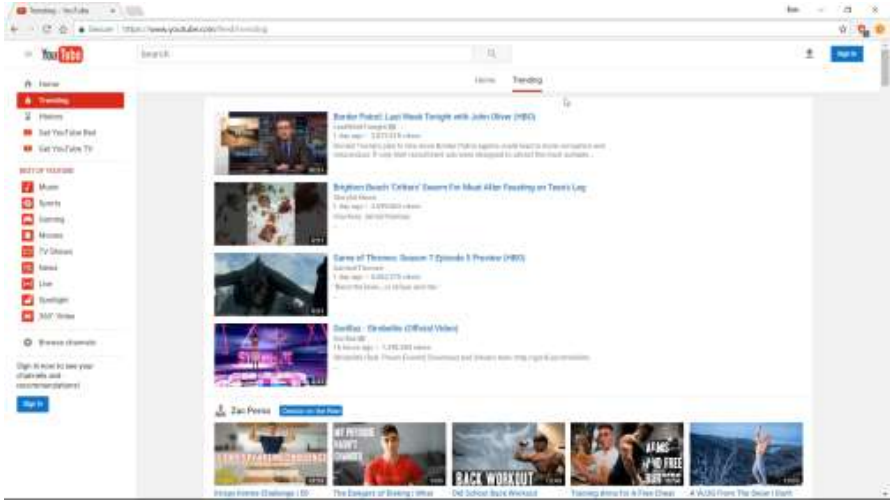
- Millions of daily internet users
- Entertainment, Education, Shopping etc.
- Key feature of online software is recommendation system
- Well known sites:
  - Youtube
  - Netflix
  - Amazon



Recommendation System

- Suggestions





Recommendation System Metric

- Parameters
  - Related content
  - Popularity
  - Channels
  - Location
  - Past Activity
  - Language
  - User Profile

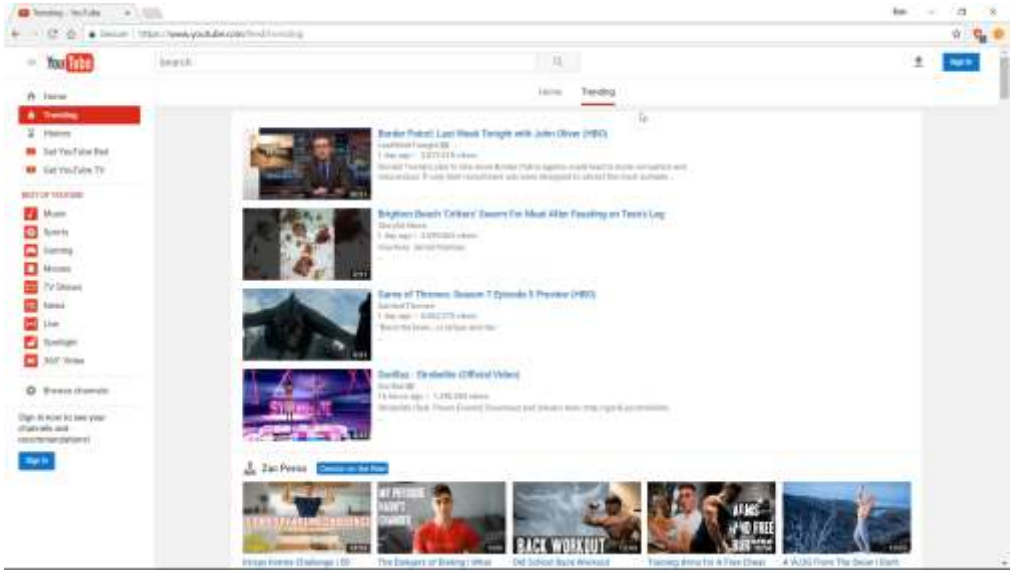
User Input

- Background information
  - Age
  - Location
  - Nationality
  - Occupation
  - Etc…

Ranking

- The most watched
- The most liked

- Input Analysis

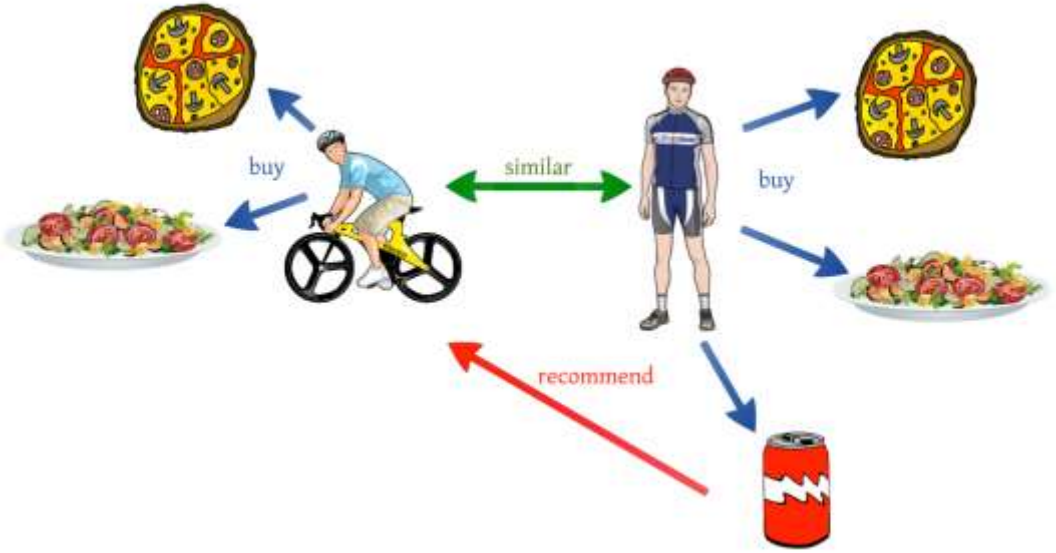


Feedback

- Accuracy
- Safety

Similarity and Grouping

- User history on products will allow the system to produce more suggestions.



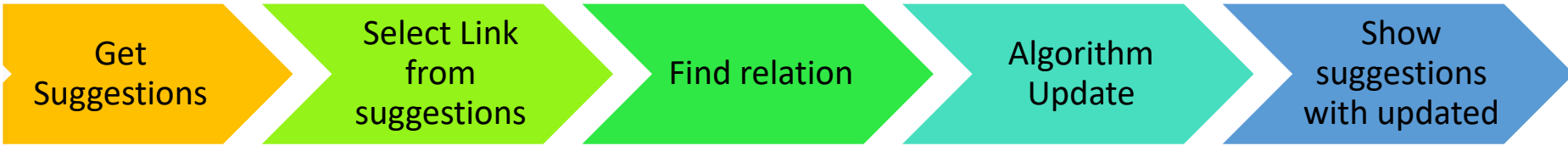
Problem

- Many parameters to consider
- Which parameters are more important for which user

Objective

Propose a predictive self-learning recommendation system that using history information and analyze the user behaviors for the future activity. Then, use a behavior analyzer to update the prediction system by monitoring users selections from suggested contents.

System Flow Model



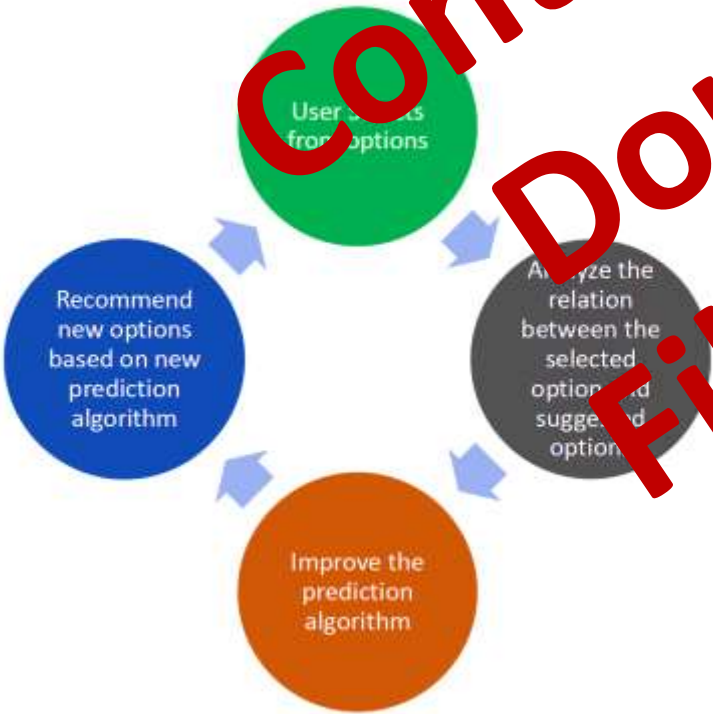
System Metrics

$$R = \alpha Uc + \beta(Fp - Fn) + \left(\gamma \frac{Pl}{10} + \eta \frac{Po}{10} + \kappa \frac{Pn}{10} + \varsigma \frac{pi}{10}\right) + \psi Oc$$

$$\min_{X^1,\ldots,Xnm} \frac{1}{2} \sum_{i=1}^{n_m} \sum_{j:r(i,j)=1} \left(\left(\theta^{(j)}\right)^T x^{(i)} - y^{(i,j)} \right)^2 + \frac{\lambda}{2} \sum_{i=1}^{n_m} \sum_{k=1}^{n} \left(x_k{}^{(i)}\right)^2$$

Parameters	
Uc	User Clicks
Fp and Fn	Positive and negative feedback
Pl	Location
Po	Occupation
Pn	Nationality
pi	Interests
Oc	Overall clicks

System Cycling



Continuous Double Filtering

Algorithm 1 Algorithm to improve recommendation systems

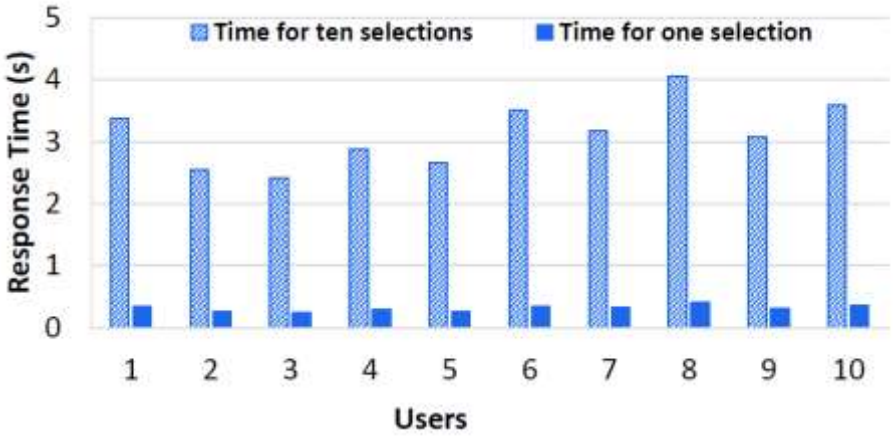
Require:
input - user profiles and past activities
output - suggestions

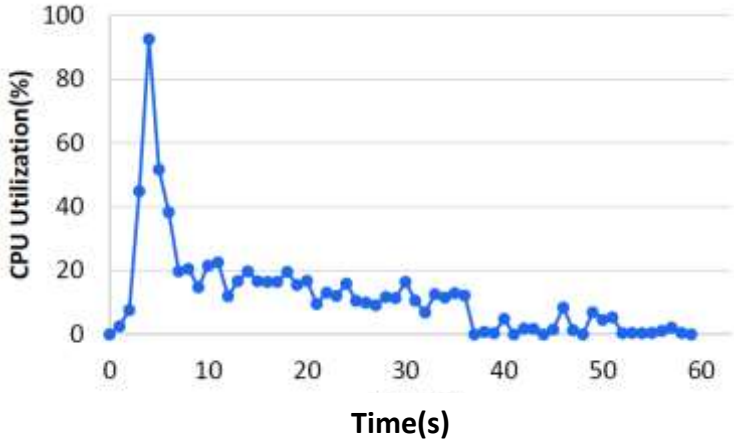
1: **procedure**
2: **while** user not done **do**
3: display suggestions
4: get user selections
5: **if** selection in DB **then**
6: display the content
7: create a relation: selected and suggested options
8: update user recommendation system
9: display some suggestions according to the new recommendation and some based on the previous recommendation system
10: **end if**
11: **end while**
12: **end procedure**

Simulation-based Analysis

- Data Type – Meta Data from YouTube
- Test Cases
  - Response Time
  - CPU Utilization
  - Suggestion Uniqueness
- Simulation Design
  - Java Implementation
  - Quad Core 2.4GHz, 16GB Memory, 32MB cache

Results

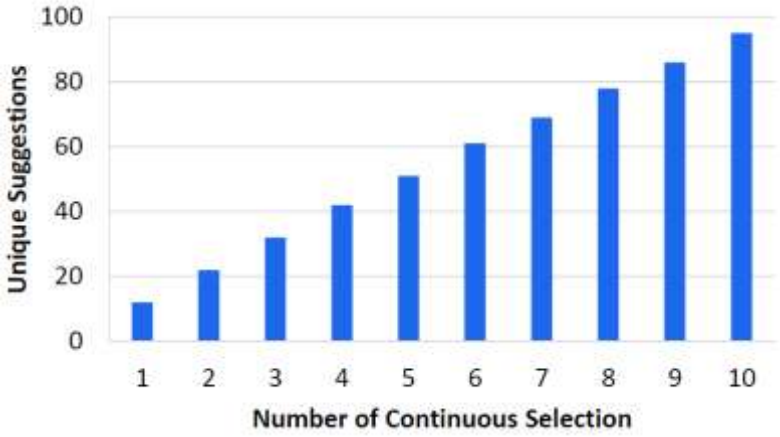




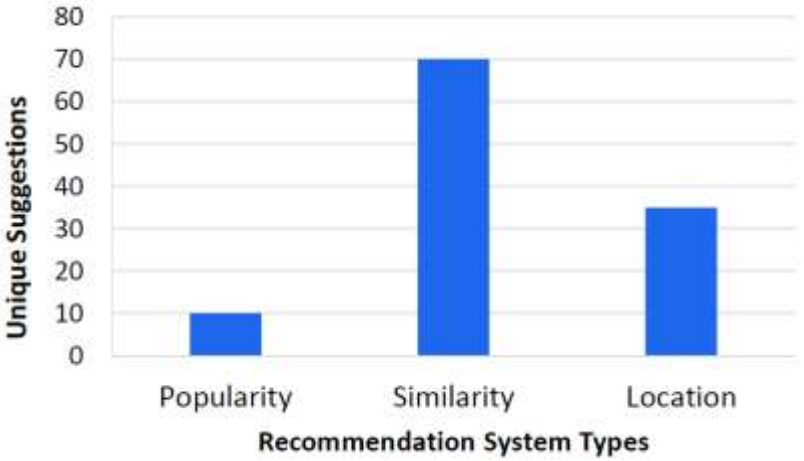
- User selection response time for:
  - One selection
  - Ten selections

- CPU Utilization over 60 seconds

Results



- Unique results returned by the system after continuous user selections over 10 rounds.



- Comparison of unique suggestions return by different recommendation systems

Conclusion and Future Works

- Predictive Self-Learning Recommendation System.
- Analyzed according to integrity, CPU performance and Time efficiency.
- Need more experiment.
- Creating relation between medias should be investigated more.

Thank You

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