CS-4053 Recommender System

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Lecture 1: Introduction

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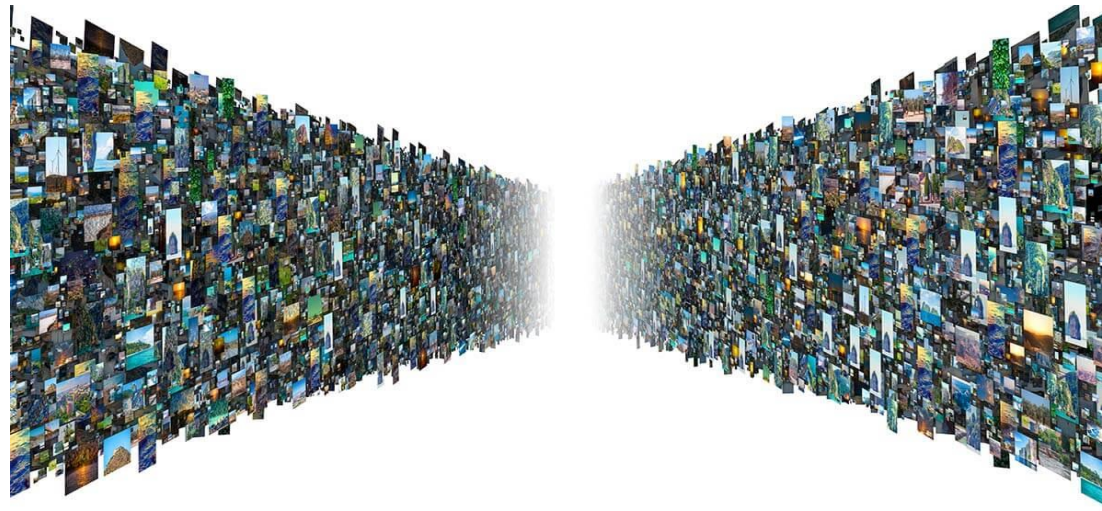*Email: zain.hassan@nu.edu.pk*

What is this course about?

- Understanding **systems** that **recommend** something
  (obviously — it's the title of this course!)

Too much information

- At times, we can suffer from **information overload**

- *"It's good to have choices as long as there aren't too many"*

  — Made-up quote

Too much information

- Have to try five new flavors of ice cream and tell your favorite

- Now try ten million flavors of ice cream and tell your favorite
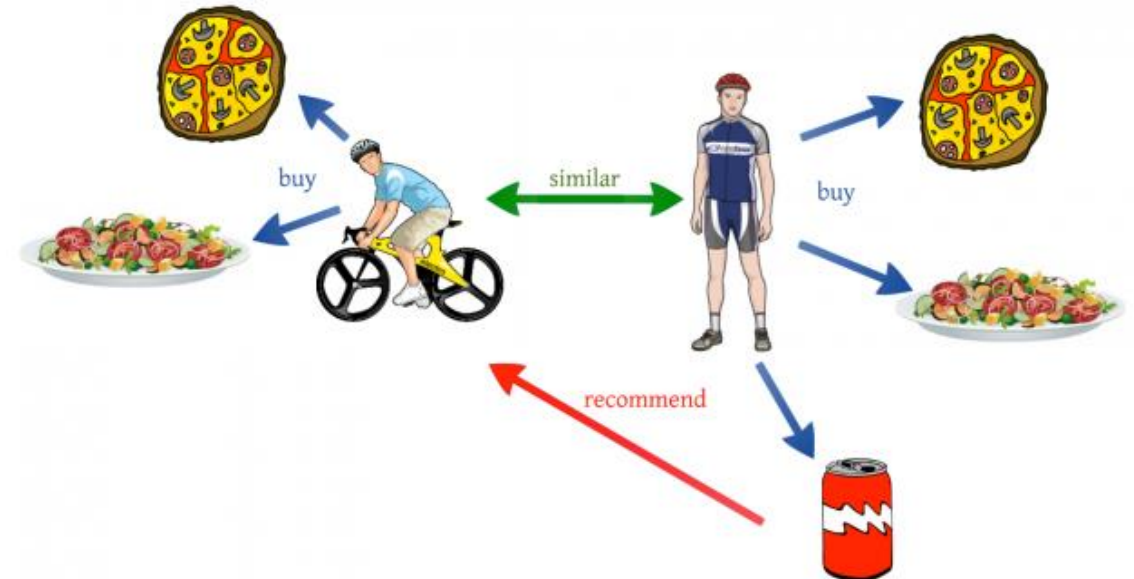
Importance of Recommendation

- Why are recommendations so important?

- Value of recommendation
    - *To increase sales*
    - *To improve user experience*
    - *To maximize productivity*

- Both **Spotify** and **Netflix** rely heavily on songs and movies recommendations to improve user experience

- A large part of sales for **Amazon** are recommendation-based

Recommendation

▪ A suggestion to help user in decision-making

Example

If **cyclist A** always orders *pizza* and *salad* at our food joint, and **cyclist B** eats *pizza* and *salad* as well. Then recommend cola to **cyclist A** if **cyclist B** had been ordering it lately

Recommendation: Example

Recommendation: Example

Formulation for Recommender System

- **U** = {*Users*}
- **I** = {*Items*}
- f = utility function measuring the usefulness of item i to user u

$$f : U \times I \rightarrow R$$

- R = {*Recommended Items — strictly an ordered list*}

- For each user $u,$ what we want to do is to choose the item i that maximizes f

$$S_u = \underset{i}{\text{argmax}}\ f(u,i)$$

Recommender System: Formal Definition

- **A Recommender System (RS)** helps match users with items
  - *It eases information overload*
  - *It helps improve user experience, increase sales and suggest novel items*

Recommender System: How does it work?

- Recommendations for a user may be based on:
  - *Past behavior (pattern) of that user*
  - *Similarity with other users*
  - *Item similarity*
  - *Context*

    so on...

Paradigms of Recommender System

- Some of the approaches to designing a Recommender System are:
  - *Collaborative*
  - *Content-based*
  - *Demography-based*
  - *Social or trust-based*
  - *Hybrid*

Collaborative Approach

- **Collaborative:** *"Tell me what's popular among my peers"*

- **Collaborative Filtering (CF)** is still one of the most common technique to develop a Recommender System based on collaborative paradigm

- **Collaborative Filtering** can be:
  - **User-based:** Find users *similar* to me and recommend to me what they like
  - **Item-based:** Recommend to me an item *similar* to the ones I normally like

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    Question: How do you measure this "similarity"?

Content-based Approach

- **Content-based:** *"Recommend to me an item based on the features of what I just liked or searched"*

- This approach does not require usage history for other users or the user's own usage pattern i.e. minimal collaboration

Demography-based Approach

- **Demography-based:** *"Recommend to me an item keeping in view either my age, where I live or my education"*

- The main idea behind Knowledge-based Recommendation Systems

Other Approaches

- Social or trust-based approach involves recommendations based on what people in a user's connections like
  - **<u>Example:</u>** Facebook *groups recommendations*

- Hybrid approaches are usually a combination of two or more of the previously mentioned design strategies

Serendipity

- Expand the user's taste into neighboring areas
  Basic Idea: At times, it's good to recommend something different to the user

Summary

- Course Introduction

- Recommender System basics

- Common approaches

References
Ladislav Pleska NSWI66 lectures
X. Amat's NF Prize presentation
Recommender System handbook by Ricci et al