

NLP and Social Impact: Opportunities and Challenges

ÖAW AI Winter School 2023

25.01.2023

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Time Plan

Talks

9:00 – 10:30	Introduction
	Sentiment Analysis
	Emotion Detection
11:00 – 12:30	Emotion Detection (cont.)
	Psychological Perspective
	Toxicity Detection
	Populism Detection



Exercises

14:00 – 16:00	Sentiment Analysis
	Emotion Detection
16:30 – 18:00	Critical Reflection
	Populism Detection

Team



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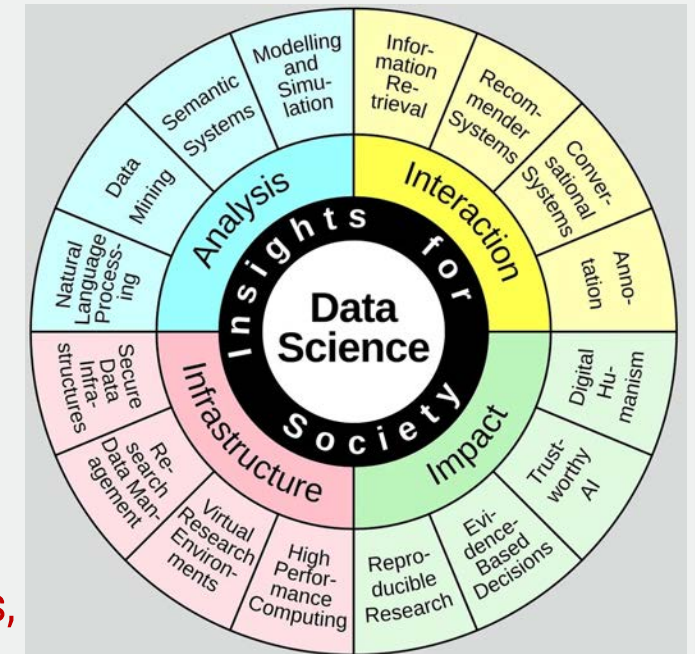
Ahmadou Wagne



INTRODUCTION

Data Science

- Interdisciplinary field to **extract knowledge and insights from structured and unstructured data**
- It involves:
 - Collection, cleaning, and management of large sets of data
 - Development of algorithms and models to analyze and make predictions from that data
- Uses techniques and theories from fields such as **mathematics, statistics, computer science, information science** and **integrates domain knowledge** from different fields
- Key techniques include: machine learning; natural language processing; data visualization
- Can be used to inform decisions in a wide range of fields such as governance, medicine, business, education



Research Unit Data Science at TU Wien
<https://informatics.tuwien.ac.at/orgs/e194-04>

Natural Language Processing (NLP)

- Use of **computational techniques to analyze and “understand” human language**
- Multi-disciplinary field that draws on expertise from computer science, linguistics, cognitive science, and artificial intelligence
- NLP techniques are used for a **wide range of tasks**, such as:
 - Language Translation
 - Named Entity Recognition
 - Question Answering
 - Text Classification and Text Summarization
 - Opinion Mining, Sentiment Analysis and Emotion Detection
- NLP plays important role in many areas of data science, where natural language and its “understanding” are crucial



Applications of NLP in Data Science – Examples

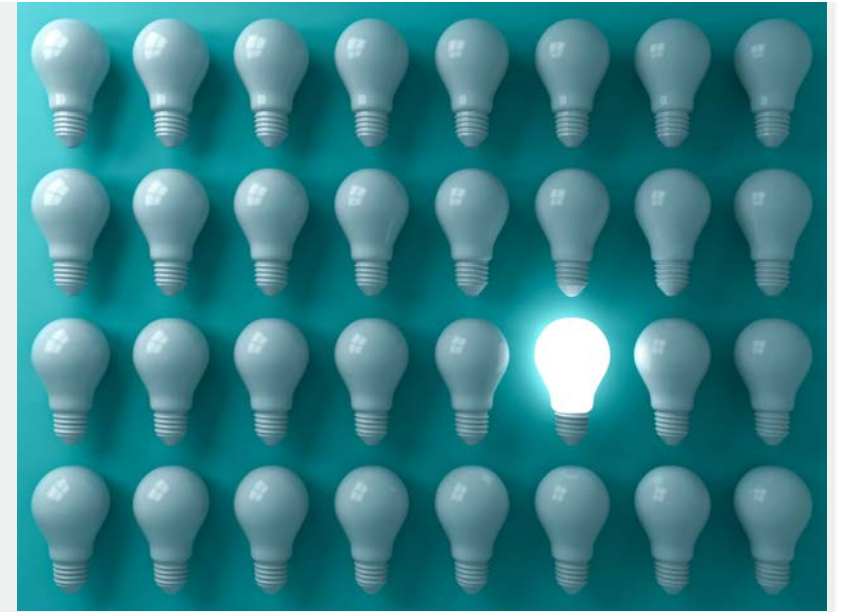
- **Chatbots and Virtual Assistants:**
 - analysing natural language input from users, interpreting their intent, and generating appropriate responses
 - NLP is crucial for interacting with users in a natural and intuitive way, improving the overall user experience
- **Social Media Monitoring:**
 - extracting insights from social media data, e.g., identifying trending topics, understanding sentiment and opinion, identifying influential users.
 - NLP is crucial for identifying context and meaning of text and speech in social media platforms.
- **Recommender Systems:**
 - extracting useful information from text data such as product reviews, movie descriptions, or news articles.
 - NLP is crucial for providing personalized recommendations to users based on their past behavior and preferences

Applications of NLP in Data Science – Examples (cont.)

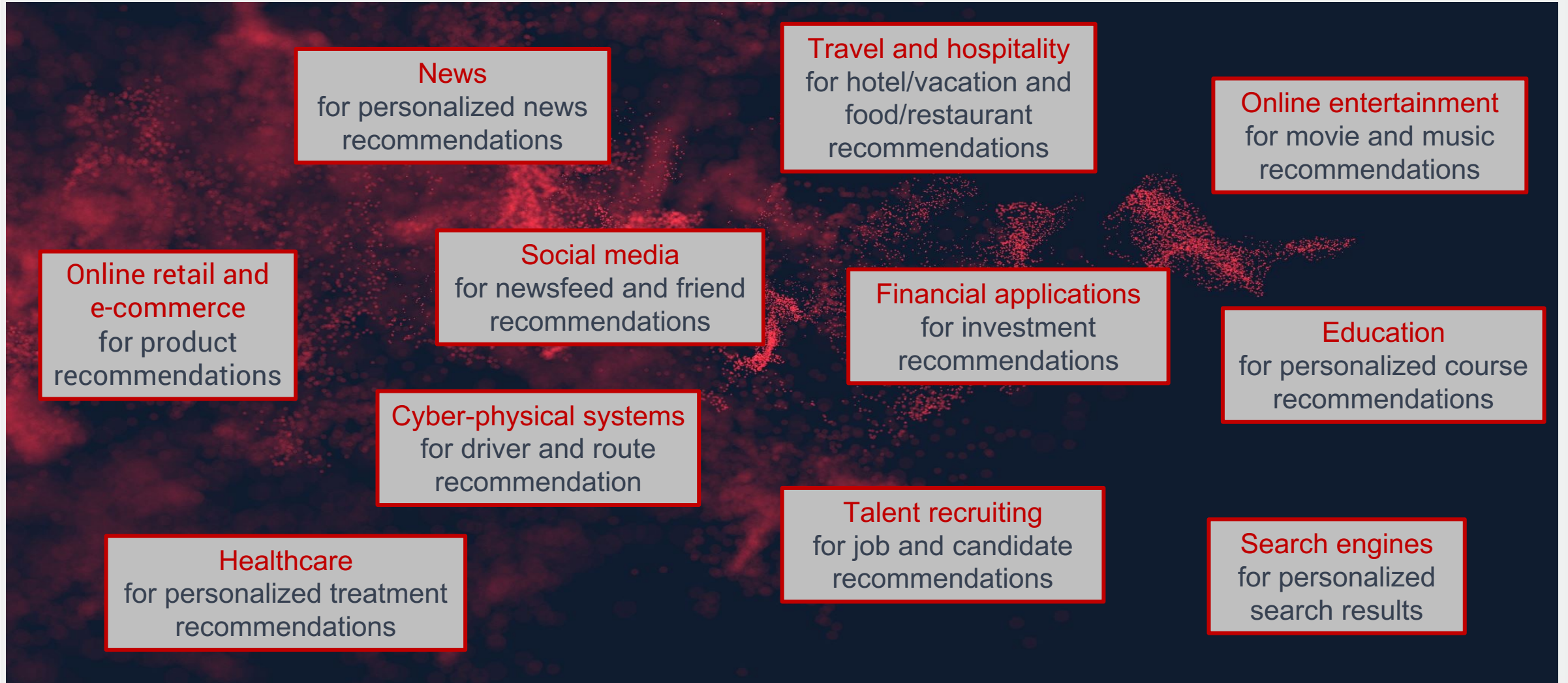
- **Toxicity Detection:**
 - techniques such as sentiment analysis, sentiment classification, and text classification are used to detect toxic or harmful content in online text such as hate speech, bullying, or harassment.
 - NLP is crucial for identifying context, meaning, and intent of the text
- **Populism Detection:**
 - analyzing large amounts of text data such as social media posts, news articles, or political speeches.
 - NLP is crucial for identifying patterns and trends in populist discourse, key actors, themes, and strategies associated with populist movements
- **Legal Document Analysis and Contract Review:**
 - extracting important information (e.g., key terms and concepts) from legal documents (e.g., contracts, laws)
 - NLP is crucial for the efficient and accurate review of large volumes of legal documents

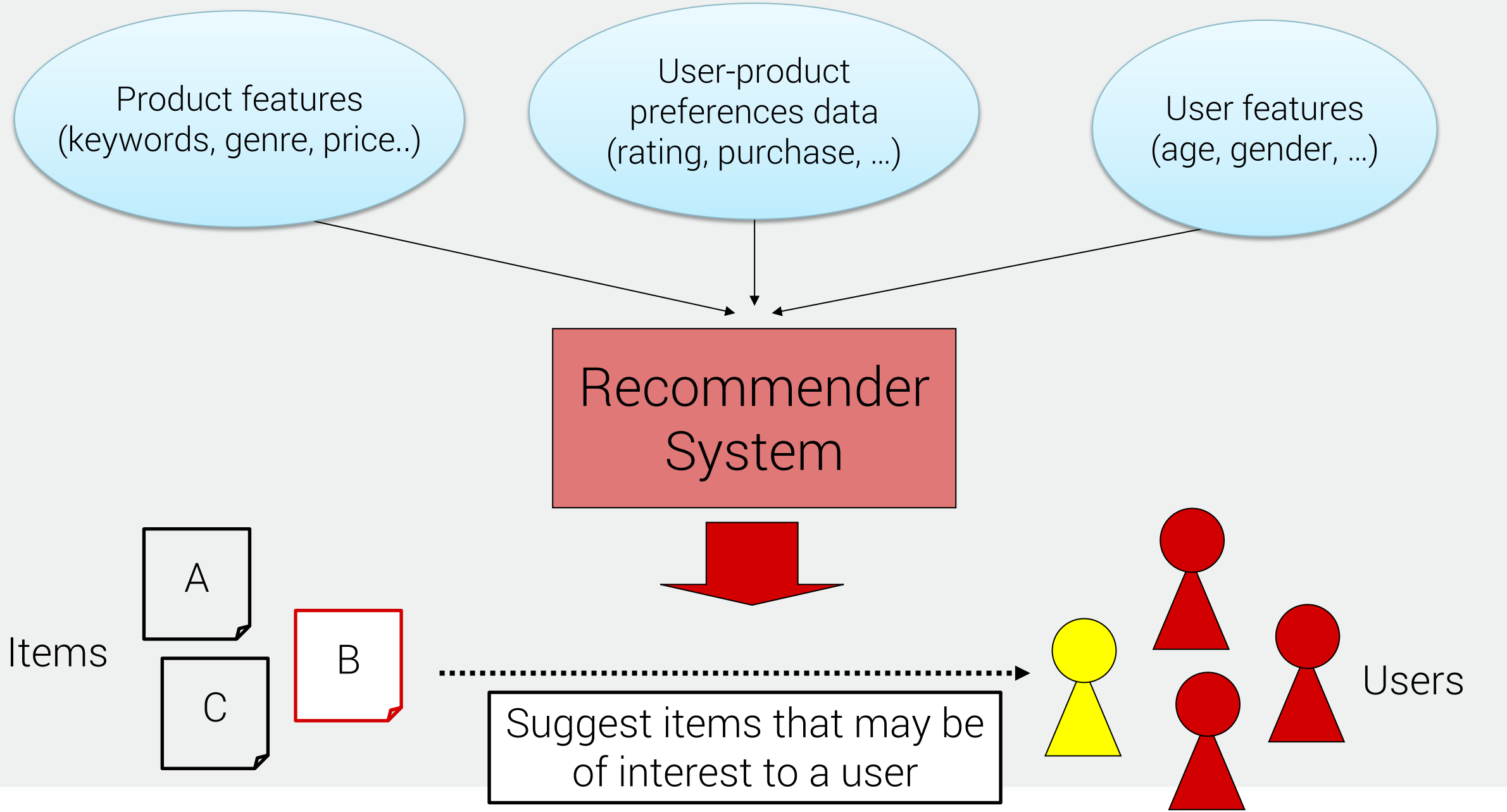
Recommender Systems

- Results of **digitization of all areas of life**:
 - Growing amounts of data artifacts available
 - User generated + commercial
 - Impossible to keep track/remain in charge of data
- Means to deal with these new opportunities by **providing tailored views onto data → personalization**
- Provide right items (options, answers, ...) at the right time
- Found in all areas, providing core services of digital (platform) economy



Recommender Systems are Everywhere





NLP for Recommender Systems



- Recommender systems use **various types of information** to suggest relevant items to users
 - Textual data one of the most important forms of content information
 - NLP is a key tool for extracting the meaning of textual data in recommender systems
- The processing of recommender systems can be divided into **two main phases**: offline modeling and online recommendation
- **Output** is typically a ranked list of personalized recommendations

NLP for Recommender Systems (cont.)

- Possible inputs and outputs with respect to text:
 - **Offline input:** typically data collected from past usage patterns of users and items, including textual reviews and item descriptions
 - **Online input:** *conversational recommenders* allow users to give details about their current needs in free-text
 - **Output:** recommender systems can include *explanations*, which can be generated through text generation techniques

Recommender Systems – Social Impact

- Recommender systems can make online experiences **more enjoyable and efficient** for users – but they
 - Can limit users' exposure to diverse perspectives and ideas, creating **“filter bubbles”**
 - Require collecting and analyzing large amounts of personal data, raising **privacy concerns**
 - May **perpetuate or amplify biases** present in the data, leading to unfair recommendations
 - Can give certain companies a competitive advantage and lead to **market monopolies**
 - Can be **highly engaging** and lead to **addiction** to online platforms



Digital Humanism

“We understand the term as describing, analyzing, and, predominantly, influencing the complex interplay of technology and humankind for a more humane and fair society, respecting universal human rights and dignities”



- The use of technology has grown in many areas of life and it is hard to tell the difference between the physical and digital world
- Recent years (e.g., COVID-19) showed how important technology is and the need to consider its effects on people and society
- Technology can be used in ways that are not good for people, e.g., controlling and watching them
- People's private information is often shared without their permission and they are only treated as data producers
- It is important to think about the effects of technology on society and make sure it is used in a fair and ethical way

→ Digital Humanism

Digital Humanism (cont.)



- Digital Humanism calls for a **human-centered approach** and for prioritizing democratic and humanistic values in technology development
- In April 2019 an international and interdisciplinary workshop took place at TU Wien; the **Vienna Manifesto on Digital Humanism** was an important outcome of it
- Initiative led to the formation of an international community of researchers across disciplines and various activities (include a lecture series, workshops, and a summer school)
- Initiative has gained positive reception and support from similar initiatives, academic institutions, civil society organizations, and governments, with a **focus on the responsibility and accountability of IT industry in a larger societal context**

Christian Doppler (CD) Lab for Recommender Systems



- Established 2022 at TU Wien Informatics
- Strong relations to DigHum Initiative and the Center of AI and Machine Learning (CAIML)
- **(Some) aims:**
 - Develop advanced methodologies for recommender systems that accurately capture nuances of user behavior, through a multi-faceted approach to user modeling, leading to **more diverse recommendations**
 - Examination of **long-term dynamics of bias** and taking proactive measures to counteract it
 - **Continuously improve the systems** by monitoring and analyzing performance and fairness

