FIZ Karlsruhe
Leibniz-Institut für Informationsinfrastruktur

Karlsruher Institut für Technologie

Responsible News Recommender Systems (ReNewRS)

Prof. Dr. Harald Sack

Workshop Future Democracies
28.06.2021

Information Service Engineering @ FIZ Karlsruhe & AIFB/KIT

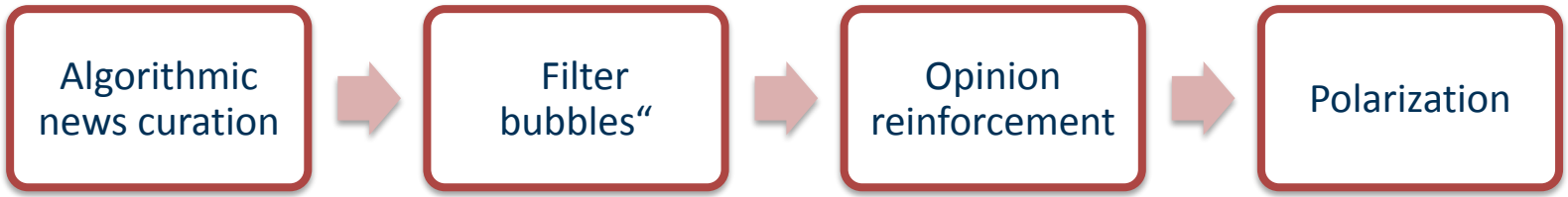
- Forschungsschwerpunkte:
  - Knowledge Graphen und semantische Technologien
  - Knowledge Mining & Natural Language Processing
  - Semantische und explorative Suche, intelligente Empfehlungssysteme
- Ausgewählte Projekte:
  - ReNewRS - Responsible News Recommender Systems (BW Stiftung)
  - ITFLOWs - IT Tools and Methods for Managing Migration Flows (EU 2020)
  - NFDI4Culture (NFDI4Chem, NFDI4MatWerk, MaRDI, NFDI4DataScience)

ReNewRS - Responsible News Recommender Systems

- Programm “Verantwortliche künstliche Intelligenz”
- Laufzeit: August 2020 to November 2022
- Konsortium:
  - Prof. Dr. Heiko Paulheim (**Universität Mannheim**, Lehrstuhl für Data Science)
  - Dr. Philipp Müller (**Universität Mannheim**, Institut für Medien- und Kommunikationswissenschaft)
  - Prof. Dr. Harald Sack (**FIZ Karlsruhe,** Information Service Engineering)
  - Prof. Dr. Christof Weinhardt (**KIT Karlsruhe**, Information & Market Engineering)

ReNewRS - Research Hypothesis

- The increase in online news consumption
- leads to increase in the use of automated algorithms for exposing the news articles to the end-user.
- Hypothesis in the societal debate:



ReNewRS - Starting Position

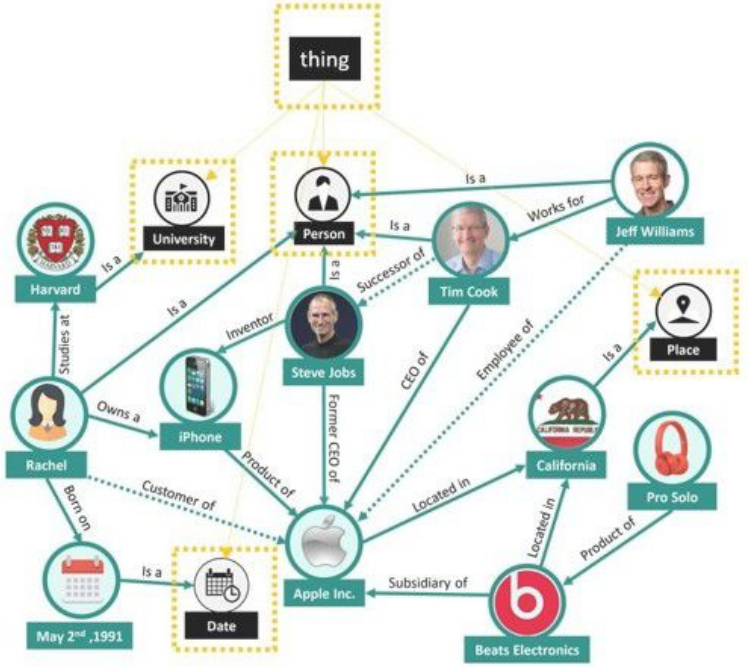
- Empirical evidence for the emergence of *"filter bubbles"* as a product of news recommenders is mixed at best (e.g., Flaxman et al., 2016; Haim et al., 2017; Möller et al., 2018; Nikolov et al., 2015; Munger & Phillips, 2019)
- However: Longitudinal studies suggest **algorithmic news exposure increases ideological polarization over time** (e.g., Beam et al., 2018; Groshek & Koc-Michalska, 2016; Heiss & Matthes, 2019)
- These studies mostly focus on the news articles from social media

Recommender Systems (RS)

- RS aim to filter large incoming streams of information according to the user's preferences and/or help them discover additional items of interest.
- Main RS flavours:
  - Content-based RS:
    - Items with similar characteristics to the user's previous preferences are recommended
    - Based on the description of the item and a profile of the user's preferences
  - Collaborative filtering
    - Items liked in the past by similar users to the current user are recommended
    - Based on the rating profiles of different users
  - Demographic
    - The correlation between a user and an item depends on the individual's demographic information (e.g. age, gender, education)
  - Hybrid RS
    - Recommendations are computed using a combination of different approaches

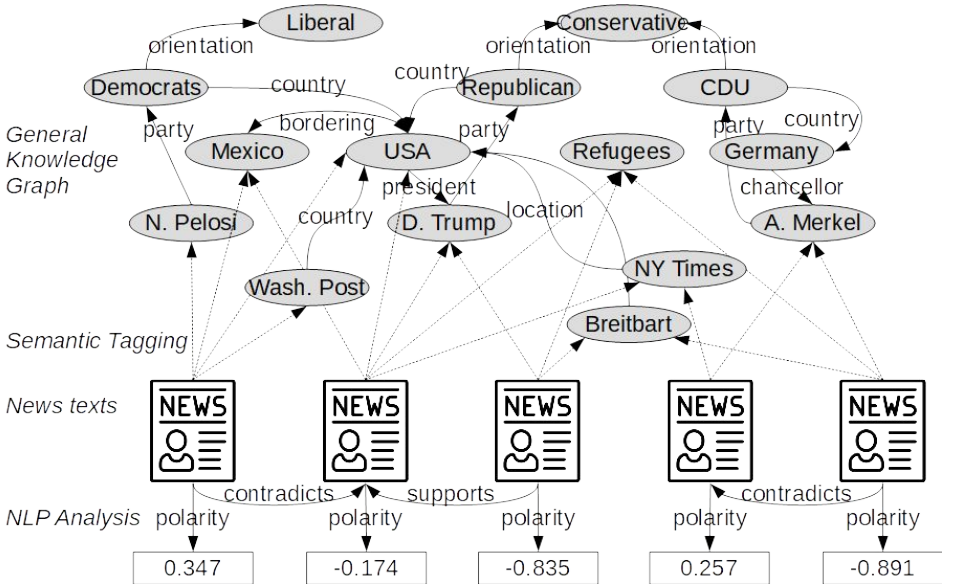
What are Knowledge Graphs?

- Symbolic knowledge representations that describe real world entities and their interrelations, organized in a graph;
- Define possible classes and relations of entities in a schema;
- Allows for potentially interrelating arbitrary entities with each other;



Knowledge Graphs for Representing News Articles

- Knowledge Graphs as a means to represent news:
  - for **analyzing user interactions** with the news articles,
  - for **creating recommendations**,
  - for **generating explanations**.
- Knowledge Graph based RS
  - takes one user and one item as input, and outputs the predicted probability that the user will click the item.



(Open) Research Questions related to the Project

- Do **different types of RSs** result in actual “filter bubbles”?
- Along which routes do users with different attitudinal pre-conditions navigate through a news corpus if they use the different RSs versions? Which “**blind spots**” do they miss?
- Can we find evidence for the promotion of **political polarization through news RSs** use? Are there indirect effects on **discussion behavior** and **prosocial behaviors**?
- If so: Can we **manipulate RS** versions for which we identify problematic outcomes in a way that mitigates them?

Thank you for your attention!

Prof. Dr. Harald Sack
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