Exploring Self-Imposed Filter Bubbles in News Recommendation

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Introduction

Filter bubble: Recommender systems reinforce users' pre-existing perspectives and beliefs

Challenging area due to

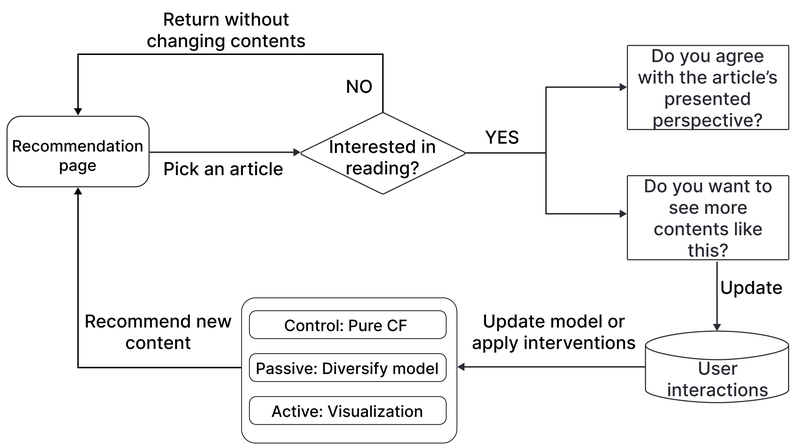
- mixed findings on algorithmic effects
- no universally accepted quantifiable metrics
- user preferences and cognitive biases
- unique dynamics of news consumption

Research Questions

RQ1: How do users' article-selection behaviours in a news recommendation setting shape the diversity of viewpoints they consume over time?

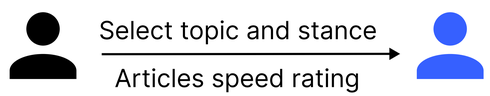
RQ2: Do diversity-enhanced model and visualization interventions reduce self-imposed filter bubbles in news consumption?

Recommendation Pipeline

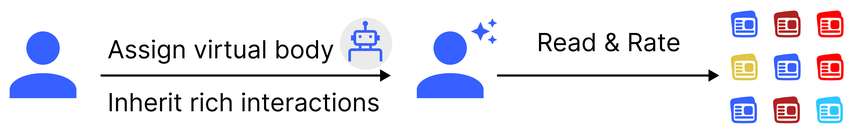


Design framework

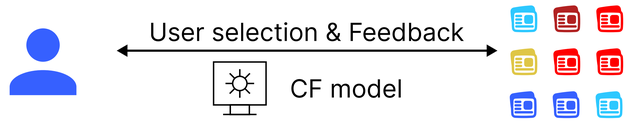
Stage 1: Pre Survey & Speed Initialization (Day 1)



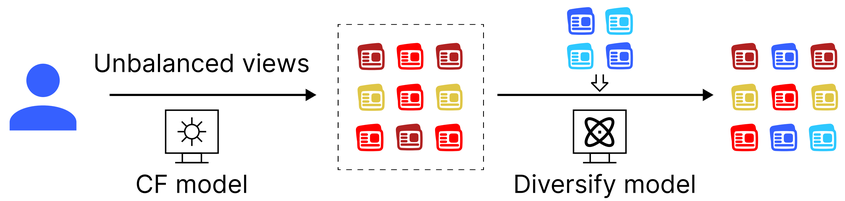
Stage 2: User Embeddings & Article Recommendations (Day 2-8)



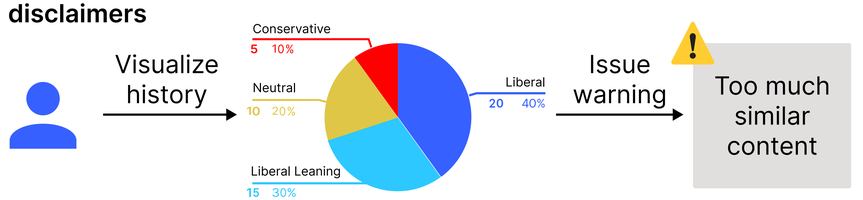
Control Group: No intervention



Experiment Group 1 (System): Guaranteed access to opposing views



Experiment Group 2 (Interface): Content consumption **visualization & disclaimers**



Stage 3 - Post Survey & Self Reflection (End of day 8)

System performance; perspective shifts, intervention usefulness

Evaluation Metrics

- Normalized Belief Challenge Score (nBCS)

$$\mathrm{nBCS}_\gamma = \frac{1}{N}\sum_{i=1}^{N}\left(\frac{\max\left(0,\ -\mathrm{sign}(u)\cdot(s_i-u)\right)}{d_{\max}}\right)^\gamma$$

- Normalized Stance Entropy

$$\text{entropy} = \frac{-\sum_{i=1}^{5} p_i \log p_i}{\log 5}$$

- Biased Score

$$\text{Biased score} = \frac{\#\text{ Aligned clicks - \#opposing clicks}}{\text{Total Selections}}$$

- Dwell Time & Scroll Percentage

Anticipated Contribution

- Two-stage experimental platform with simulated histories and real user-system interactions
- Multi-level filter bubble interventions analysis
- Novel behavioural metrics for quantifying the severity and long-term impact of filter-bubble effects

Reference

[1] P. Liu, K. Shivaram, A. Culotta, M. A. Shapiro, and M. Bilgic, "The interaction between political typology and filter bubbles in news recommendation algorithms". WWW '21. New York, NY, USA: Association for Computing Machinery, 2021, p. 3791–3801.

[2] A. R. Arguedas, C. Robertson, R. Fletcher, and R. Nielsen, "Echo chambers, filter bubbles, and polarisation: A literature review," Reuters Institute for the Study of Journalism, Oxford, UK, Tech. Rep., January 2022

[3] T. T. Nguyen, P.-M. Hui, F. M. Harper, L. Terveen, and J. A. Konstan, "Exploring the filter bubble: the effect of using recommender systems on content diversity". WWW '14. New York, NY, USA: Association for Computing Machinery, 2014, p. 677–686.