

Quantifying User Agency vs. Algorithmic Influence in Movie Recommender Systems

Marco Conti
University of Illinois
Chicago, Illinois, USA

Sai Shridhar Balamurali
University of Illinois
Chicago, Illinois, USA

Nitheesh Mannava
University of Illinois
Chicago, Illinois, USA

1 INTRODUCTION

Recommender systems have become integral to our digital experiences. These systems leverage user data and algorithms to provide personalized suggestions, aiming to enhance user experience. While they offer convenience, concerns have been raised about "filter bubbles"—situations where users' choices are isolated from diverse perspectives, potentially reinforcing biases and limiting exposure to new ideas [5, 6]. As the influence of recommender systems grows, a critical question emerges: Are the recommendation algorithms truly responsible for these filter bubbles, or are the people to blame?

The phenomenon is complex and has been investigated by several researchers, sometimes with contradictory results. The works by Jiang et al. [3] provided a method for analyzing echo chamber and filter bubble effects in recommender systems. They have based their research on a recommender system simulation method, used to generate data and perform analysis. Bakshy et al. [1] demonstrated that individual choice plays a stronger role than Facebook's ranking algorithm in limiting exposure to cross-cutting content. However, Facebook's network reflects different offline social contexts rather than just shared interests. The ranking is done among posts from friends, resulting in a mixture of content that is heavily influenced by their orientations, thereby limiting the algorithm's overall impact. Furthermore, the study focuses on an already polarized audience, which is typically less susceptible to influences, such as the one of algorithms.

2 PROBLEM DESCRIPTION

A filter bubble occurs when algorithms automatically narrow the range of contents based on user's previous behavior, creating self-reinforcing patterns that limit exposure to diverse genres. This has ethical but also economical impacts, because a user may get bored of the lack of diversity, leaving the platform. This phenomenon must be disentangled from the echo chamber, a social phenomenon where individuals are exposed only to information from like-minded individuals.

Our research focuses on movie streaming platforms, where the echo chamber effect plays a limited role. It aims to quantify user agency versus algorithmic influence in movie selection and filter-bubble formations. Furthermore, we aim to propose a system capable of differentiating between algorithm-induced filter bubbles and those created by users' choices. This will provide a strategy to promote user satisfaction, content diversity, and economic returns.

3 DATASETS

This project will leverage two primary datasets: MovieLens 32M [2] and a version of the Netflix Prize dataset [4], which contains 17,770 movies and 480,189 users with over 100 million ratings. MovieLens 32M is a widely used benchmark dataset in recommender systems

research, containing 32 million ratings and two million tag applications applied to 87,585 movies by 200,948 users. We also intend to utilize a recommender system simulation to gather additional data.

4 RESEARCH PLAN

For our study, we aim to develop a methodology that combines simulation analysis with real-world datasets, similar to the works presented in Jiang et al. [3].

4.1 Phase I

We'll start with an extensive literature review on movie recommender systems, user behavior, and algorithmic influence. This will help us define and operationalize key concepts such as "user agency," "algorithmic influence," and "content diversity." We'll design a simulation environment that mimics user interactions with a movie recommender system. We'll use this environment to generate synthetic data, allowing us to test our metrics and explore the interplay between user choices and algorithmic recommendations. Causal inference techniques, such as counterfactual analysis, will be employed to disentangle the effects of user agency and algorithmic influence on users' movie selection patterns.

4.2 Phase II

In the second phase, we'll apply our developed metrics and methodologies to real-world datasets, specifically the MovieLens 1M and Netflix Prize datasets. This empirical testing will allow us to validate our approach and refine our metrics based on actual user behavior and recommendation patterns. We'll conduct a comprehensive analysis to quantify the relative contributions of user agency and algorithmic influence in shaping users' movie choices and potential filter bubble formation. Finally, we'll explore the potential for developing tools that can automatically monitor and optimize the balance between user agency and algorithmic influence in movie recommender systems.

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