

Abstract

As the global population continues to age, with the number of people aged 60 and over projected to double by 2050, it is worth noting that older adults are becoming increasingly tech-savvy and are actively engaging with e-commerce platforms. However, with the multitude of options available on these platforms, it can be difficult for users, especially older adults, to make informed decisions about which products to select.

Recommender systems are tools designed to support users' decision-making by offering suggestions for items that may be of interest to them. Recommender systems, while widely used, suffer from a significant weakness in that they heavily rely on a user's past decisions, assuming that their purchases, interactions, or high ratings accurately reflect their preferences and needs. However, human decision-making is often influenced by heuristics and cognitive biases, leading to suboptimal choices. This is especially true for older users, who may be more susceptible to the effects of cognitive aging. This thesis presents the results of two experiments supporting the hypothesis that a customer's age can impact their ability to make optimal choices in e-commerce systems.

The thesis aims to analyse the negative impact of users' sub-optimal decisions on the quality of recommender systems' proposals, resulting in a phenomenon elucidated in the thesis as a "self-induced bias". This work explores the concept of self-induced bias in the context of existing research on recommendation algorithms' fairness and bias. The proposed framework offers a means of quantifying the magnitude of self-induced bias and is applied to popular recommendation algorithms to analyze their impact.

To measure the impact of cognitive limitations on decision-making quality, a simulator of the e-commerce purchasing process supported by a recommender system was developed with a focus on modeling clients with cognitive limitations. Several versions of classical recommender systems were implemented, and their effectiveness was measured. Using the simulated environment, the magnitude of self-induced bias among older users of traditional recommender systems was compared to customers who did not use any system. The results provide insights into how cognitive limitations can impact users' decision-making quality.

Lastly, three new algorithms with an aim of reducing the self-induced bias among older users were designed and tested in the simulated model based on the theoretical research on cognitive aging. They proved to be effective in providing better recommendations both for younger and older users. The new recommendation algorithms also have a lower self-induced bias among older users than recommendation algorithms that disregard users' cognitive limitations.