Application of Graph Neural Networks to Mitigate Popularity Bias in Content Recommendations

Recommender systems often overemphasize popular items, reducing diversity and limiting exposure to less popular but relevant content.

The problem

How can we leverage GNNs to address the popularity bias in content recommendations ensuring overall recommendation quality is not compromised?

The goal of the experiment

To analyze how the proposed model compares to existing baselines and determine which models perform best in balancing Precision and Fairness.

The data

Four datasets widely used in Popularity Bias research from different subject areas to demonstrate robustness, scalability and reproducibility of the models.
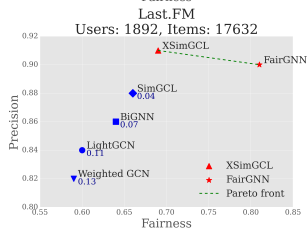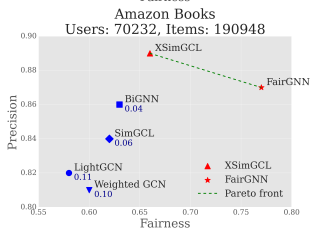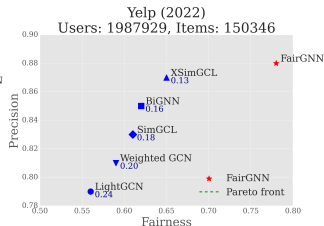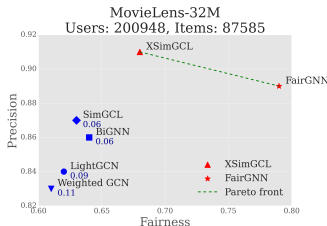
Pareto Analysis of Proposed Model and Baselines

The plot shows the trade-off between Precision and Fairness, highlighting Pareto-optimal models.

The error: $E = \min_{i \in \text{Pareto}} \sqrt{(P - P_i)^2 + (F - F_i)^2}$.

1. Models with similar Precision values can significantly differ in Fairness and vice versa.

2. Achieving a balance between metrics is an indication of well convergence.

FairGNN balances accuracy and fairness, providing robust performance in mitigating popularity bias.