# 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?

### 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.

### 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.
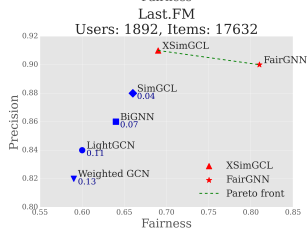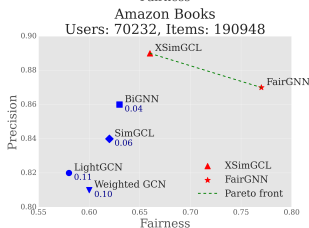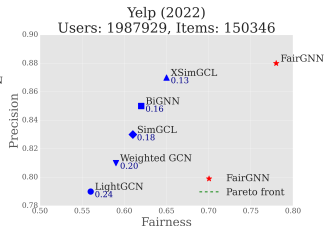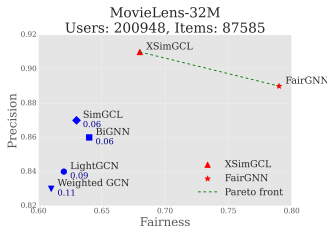


FairGNN balances accuracy and fairness, providing robust performance in mitigating popularity bias.