Reproducibility Study Of Learning Fair Graph Representations Via Automated Data Augmentations

Thijmen Nijdam, Juell Sprott, Taiki Papandreou-Lazos, Jurgen de Heus

UNIVERSITY OF AMSTERDAM

Code available

Graphair & Why fairness?

- Increasing popularity of GNN
- GNNs may inherit or even amplify bias in training data [2]

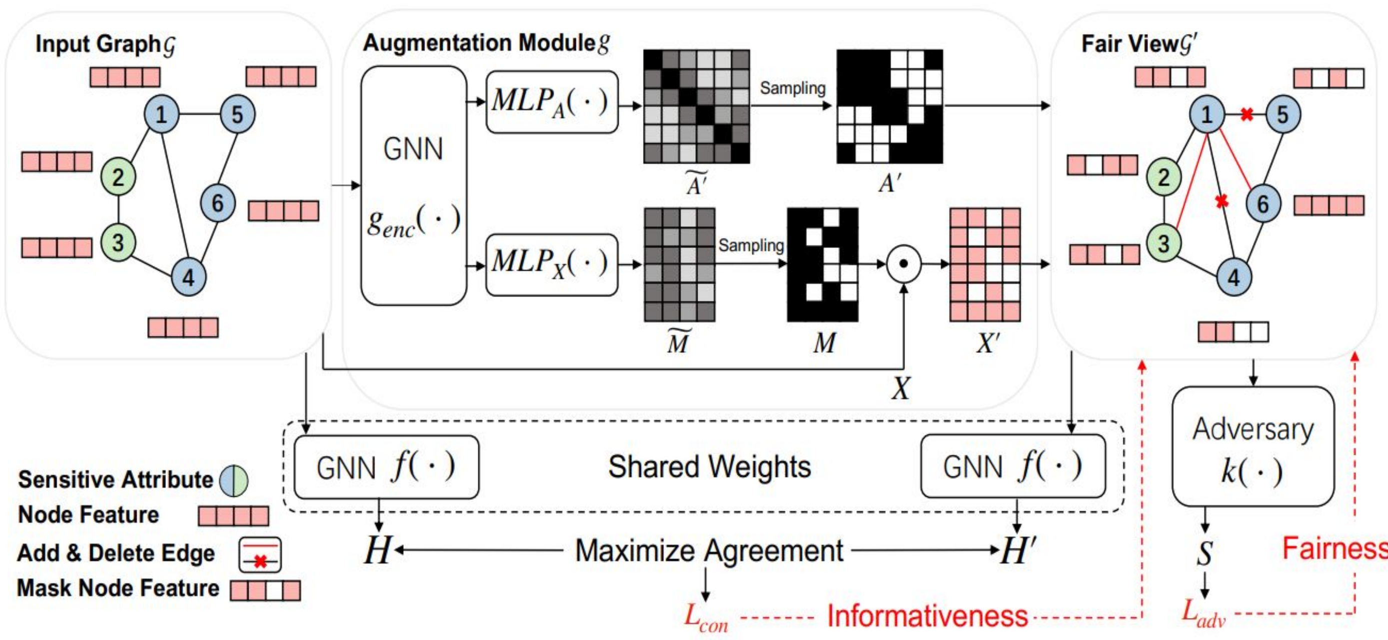


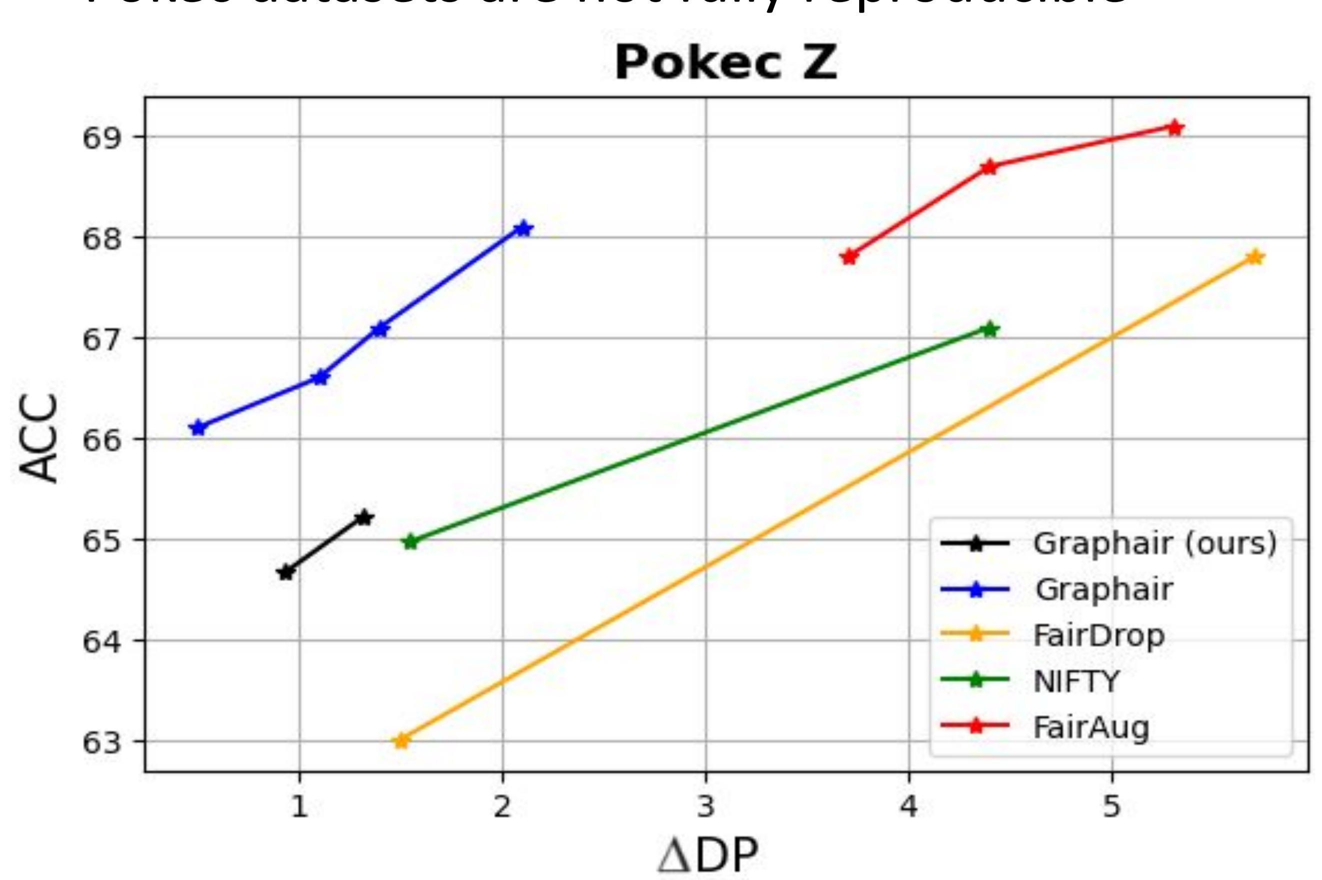
Figure 1. Graphair Architecture [3]

Reproduced Claims

- Claim 1: Graphair consistently achieves a better fairness-accuracy trade-off than baseline methods in node classification
- Claim 2: Fair node features and augmented graph topology reduce prediction bias
- Claim 3: Graphair learns to generate fair graph data without prior knowledge of fairness properties

Claim 1: Outperform Baselines

- NBA dataset is fully reproducible
- Pokec datasets are not fully reproducible



Extension Claim 1: Link Prediction

- Metrics: Mixed- and subgroup dyadic-level fairness
- Goal: Assess performance on different downstream task

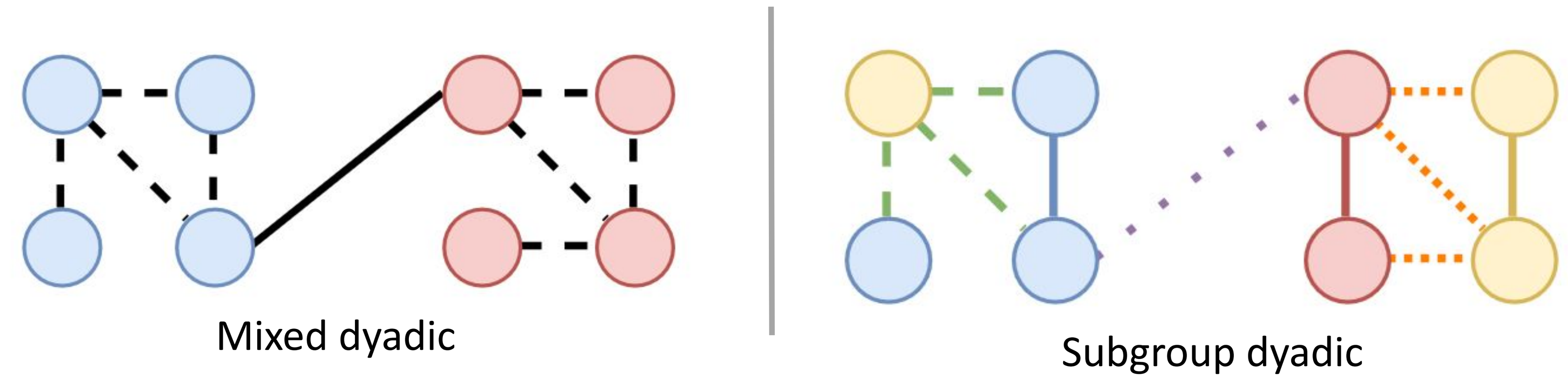
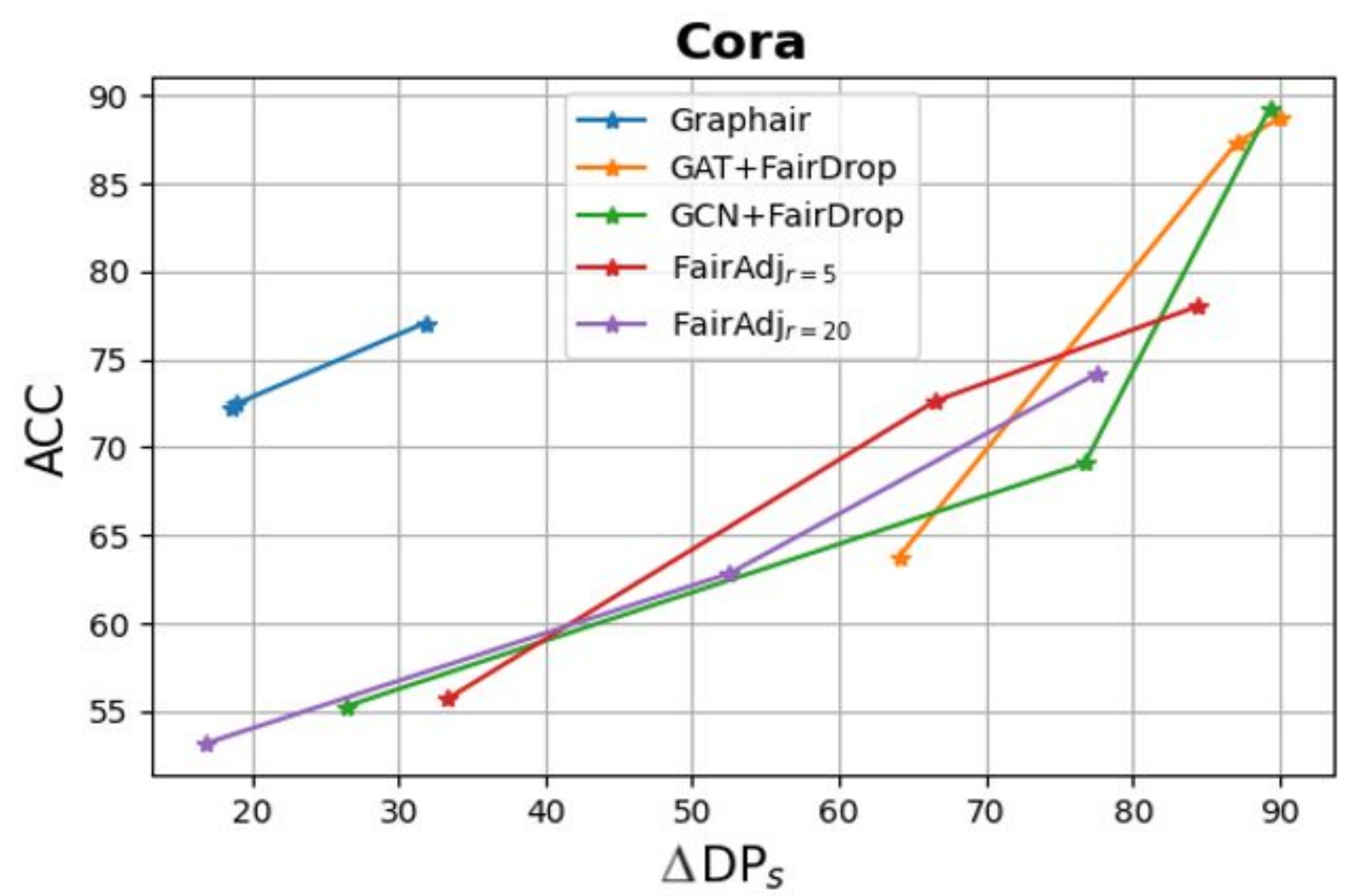
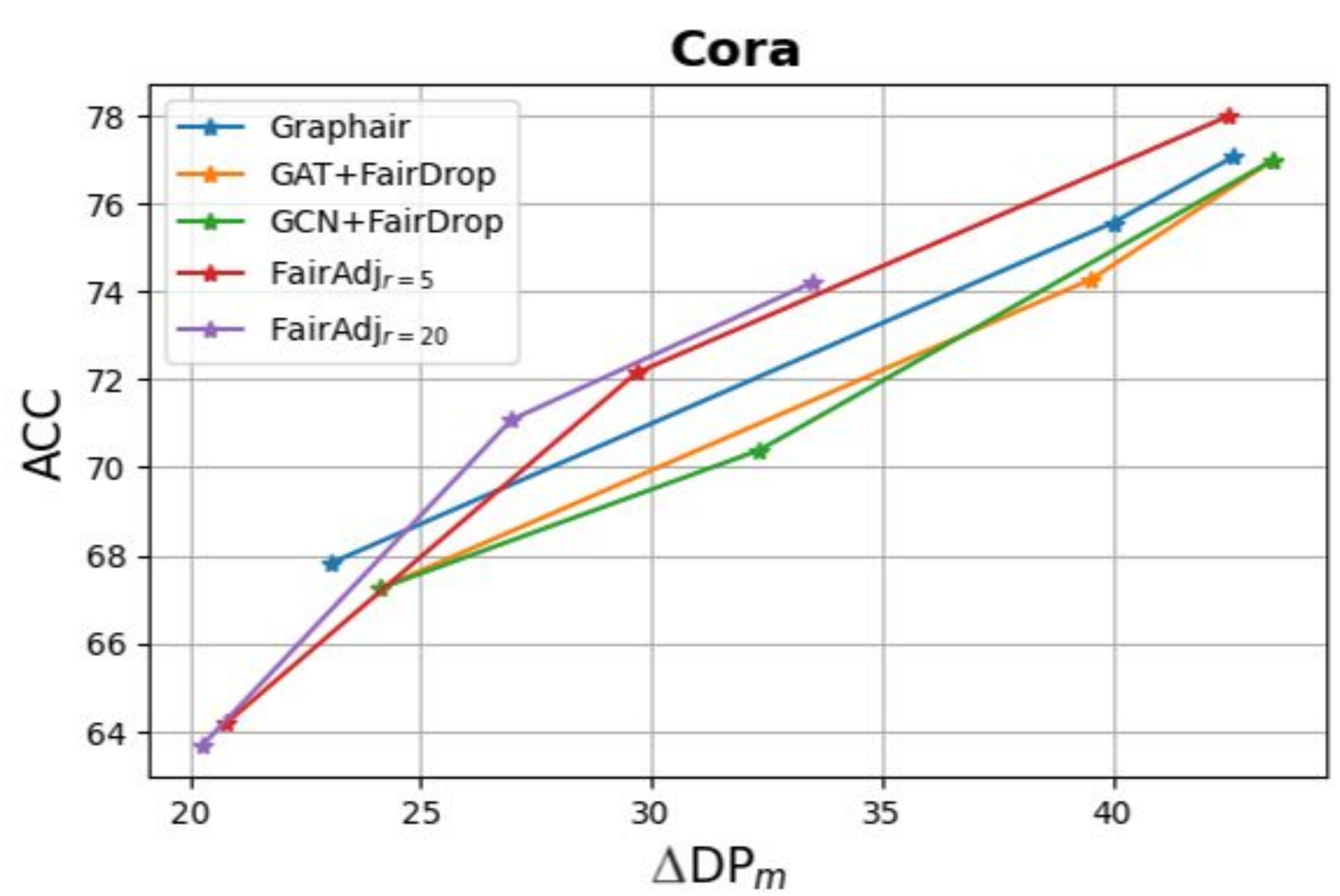


Figure 2. Different Fairness Metrics [1]

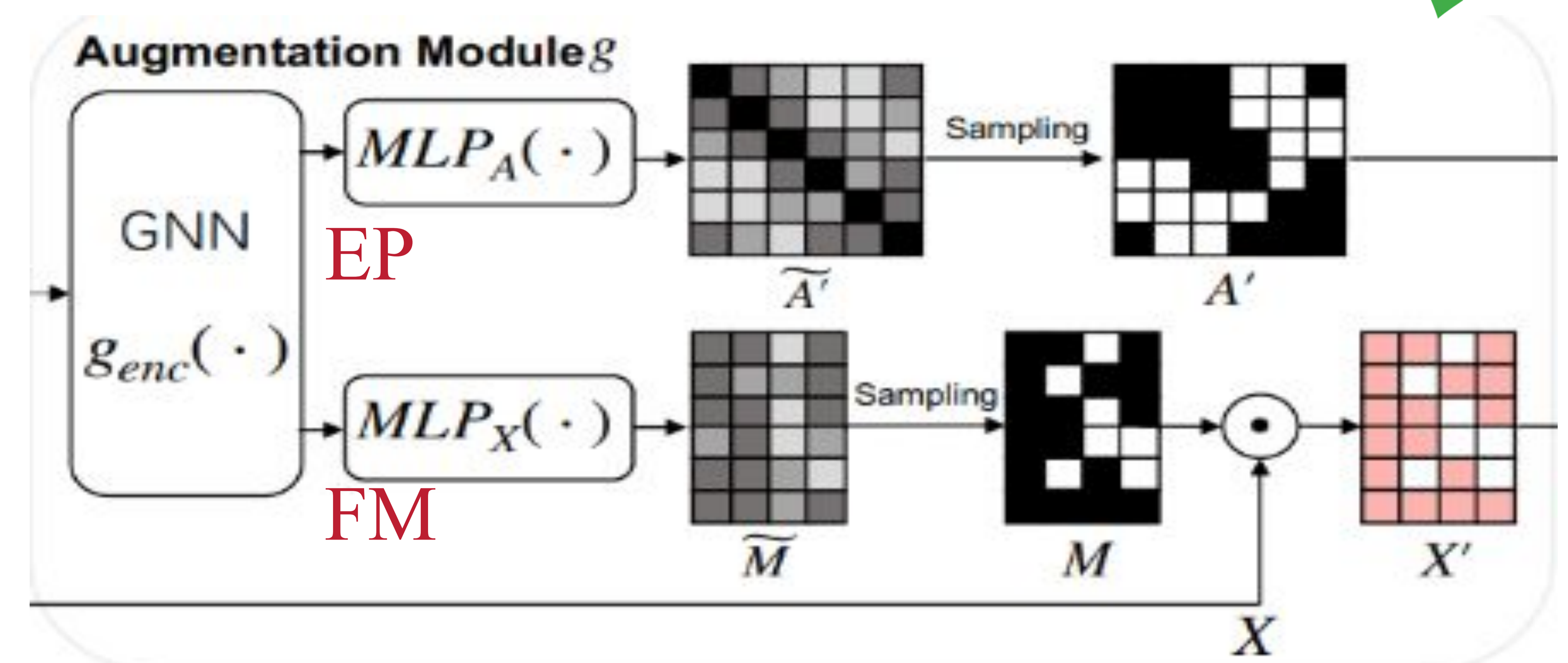
Outperforms baselines on subgroup dyadic



Similar performance on mixed dyadic

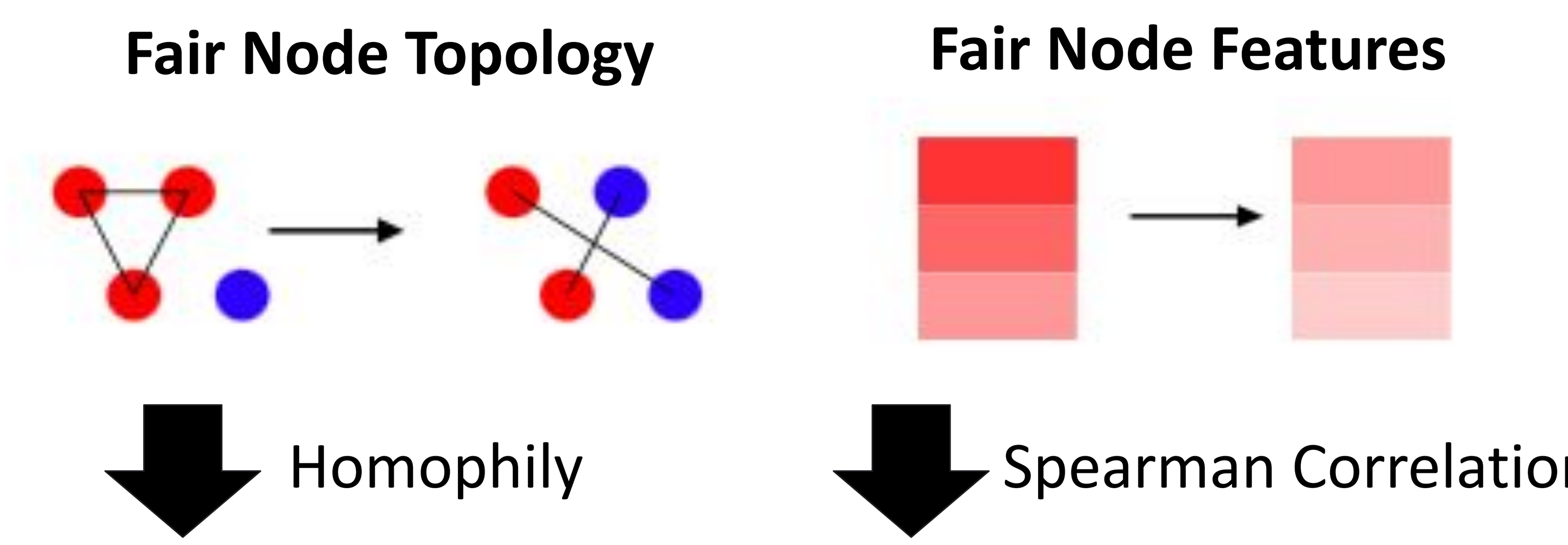


Claim 2: Ablation of Components



Conclusion: Both FM and EP are necessary for fairness graph generation

Claim 3: Fairness Generated Graph



Conclusion: Automatically Generated Graphs are Fair

Discussion & Comments on Reproducibility

- Claim 1 is partially reproducible
- Claim 2 and 3 are fully reproducible
- Outperforms baselines on subgroup dyadic-level fairness metric
- The code is part of a library and is well-documented
- The paper and code provide a straightforward way to reproduce results

1. Spinelli, S. Scardapane, A. Hussain, and A. Uncini, "Fairdrop: Biased edge dropout for enhancing fairness in graph representation learning," IEEE Transactions on Artificial Intelligence, 2021.
2. E. Dai and S. Wang, "Say no to the discrimination: Learning fair graph neural networks with limited sensitive attribute information," in Proceedings of the 14th ACM International Conference on Web Search and Data Mining, pp. 680–688, 2021.
3.H. Ling, Z. Jiang, Y. Luo, S. Ji, and N. Zou, "Learning fair graph representations via automated data augmentations," in The Eleventh International Conference on Learning Representations, 2022.

$$\Delta_{DP} = |\mathbb{P}(\hat{Y} = 1|S = 0) - \mathbb{P}(\hat{Y} = 1|S = 1)|$$

$$\Delta_{EO} = |\mathbb{P}(\hat{Y} = 1|S = 0, Y = 1) - \mathbb{P}(\hat{Y} = 1|S = 1, Y = 1)|$$