Fair Play for Individuals, Foul Play for Groups? Auditing Anonymization's Impact on ML Fairness

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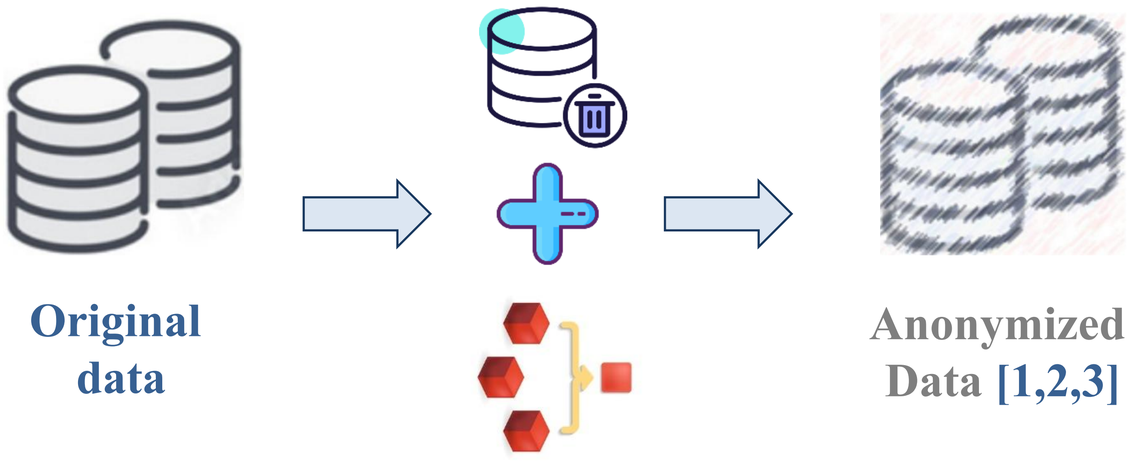
Paper Code

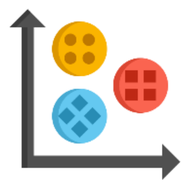
1. FROM ANONYMIZATION TO DATA DISTORTION

Record suppression



YES!

"Safe in the crowd"



BUT...

Alters data distributions

Distorted data may bias ML fairness…?

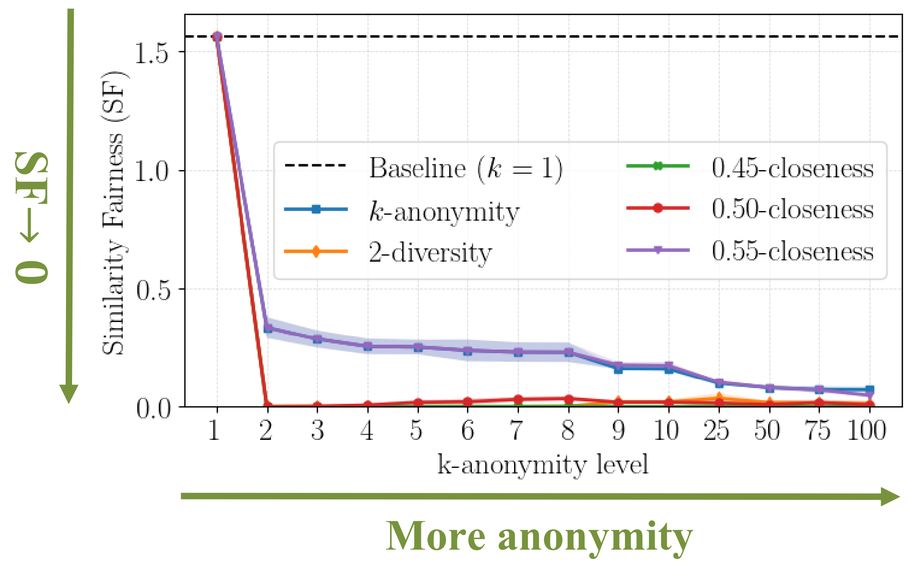
2. FAIRNESS EFFECTS VARY BY LEVEL OF ANALYSIS

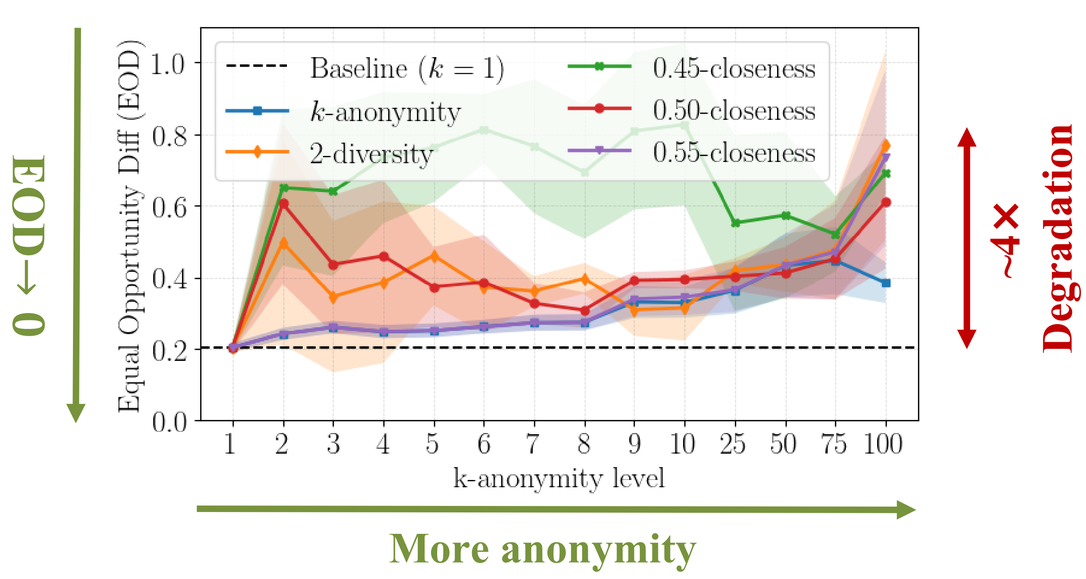
Individual fairness [4]
"Similar individuals → similar predictions"
(measures local consistency of model outputs)

VS

Group fairness [5]
"Equal outcomes across demographic groups"
(measures parity between protected groups)

Anonymization tends to ***smooth predictions*** (↑ **individual fairness**)
but to ***amplify group disparities*** (↓ **group fairness**)





3. ROBUSTNESS AND GENERALIZATION

✅ **Consistent results across**

- **Datasets** → Adult, Compas, ACSIncome
- **Protected attributes** → Gender, Race
- **Models** → XGBoost, RF, LGBM, MLP
- **Metrics** → Utility & individual and group fairness

🔍 **Further research questions**

- **Record suppression** → minorities **most affected?**
- **Target distribution variation** → **fairness varies?**
- **Data size variation** → **reduces stability?**

4. KEY TAKEAWAYS & PERSPECTIVES

🟩 **Individual fairness ↑**

→ homogeneous data… "**fairness washing**" [6] ⚠

🟥 **Group fairness ↓**

→ up to 4× disparity

⚖ **Utility ↓ slightly**

🔮 **Future work**

- **Fairness-aware anonymization**
- Joint optimization of **privacy-fairness-utility**
- Extend to **multiclass classification**, **regression**

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