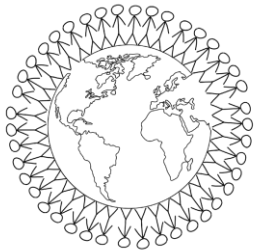
FALE: Fairness-Aware ALE plots for Auditing Bias in Subgroups

Athena Research Center



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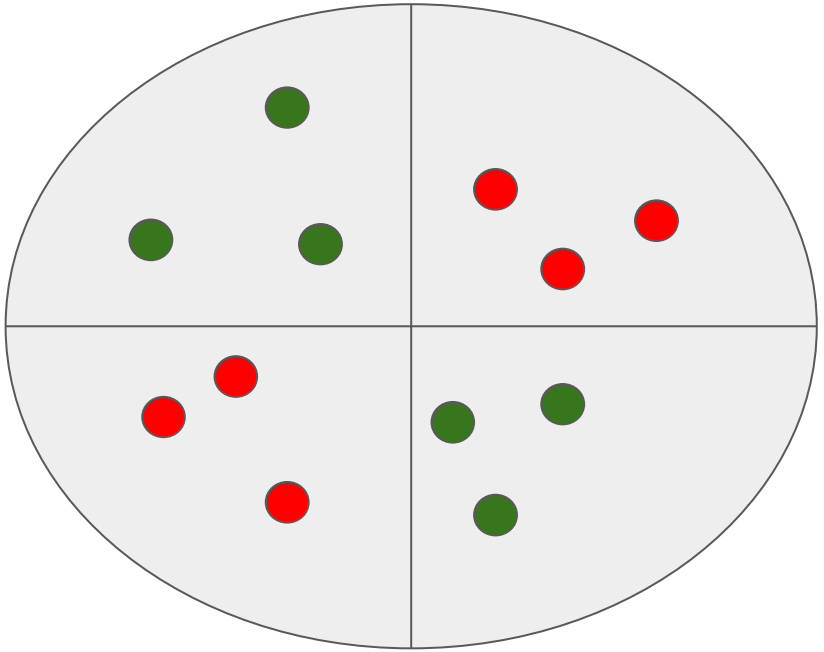
Algorithmic Fairness

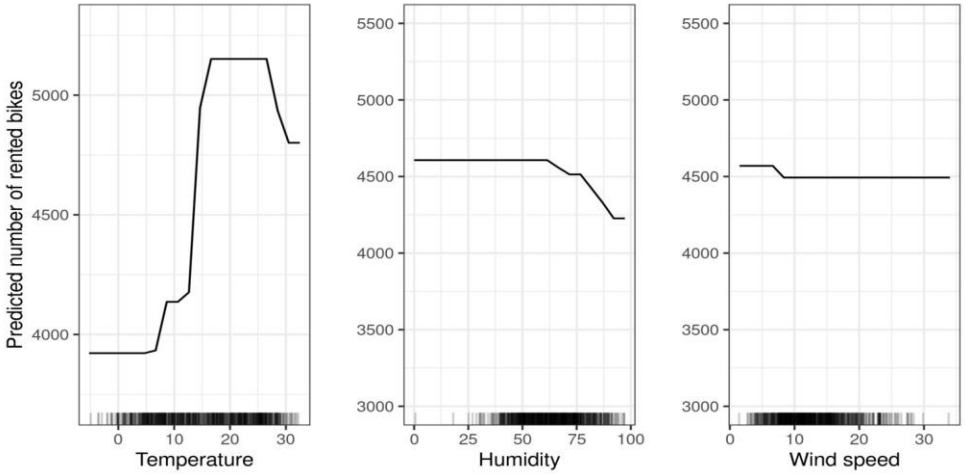
- The model should not **discriminate against a sensitive attribute** like gender.
- **Statistical parity**: Males and females should have equal probability of being assigned to the positive outcome by the classifier.
- However, **biases** may be **present** or **enhanced in more fine grained subgroups of males and females.**

Subgroup fairness



ALE plots

- Provide **insight** into the **relationship** between a **feature** and the **target variable**
- **Visualize** the **marginal effect** that a feature has on the predicted outcome



Our method-FALE plots

Observation: Instances with **same** feature values define **subgroups.**

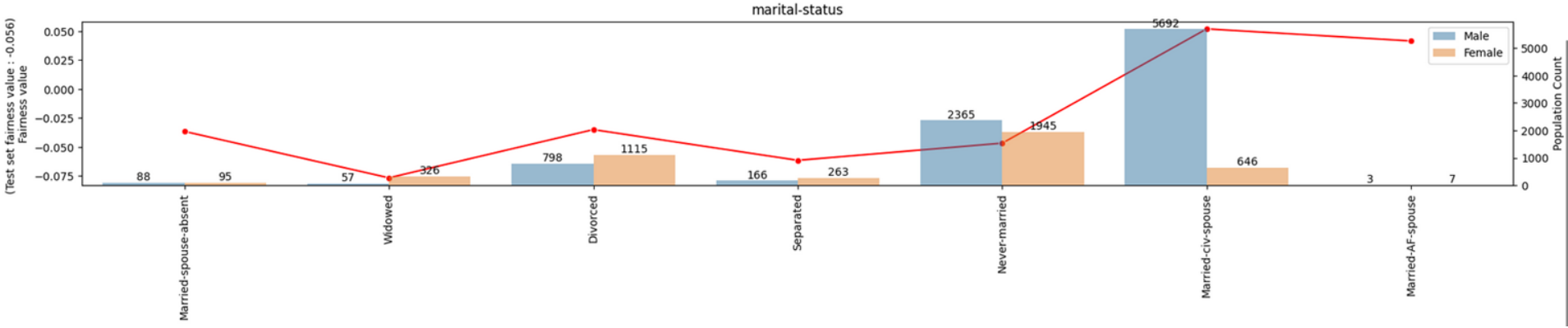
ALE plots visualize the **marginal effect** of **subgroups** to the **predicted outcome**

Replace the **model function** with a **statistical fairness definition**=>FALE

Example

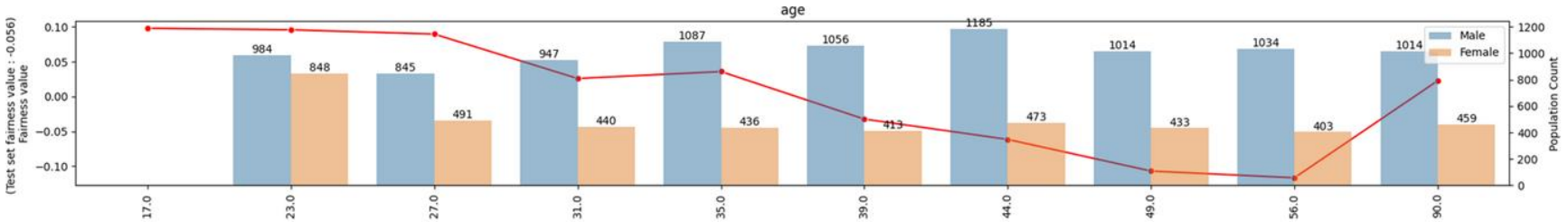
- We evaluated **statistical parity for gender** in the adult dataset
- We have found a value of **-0.056** that suggests that there is **bias against females**
- We want to see **how subgroups affect this value.**

Subgroups of Marital-status



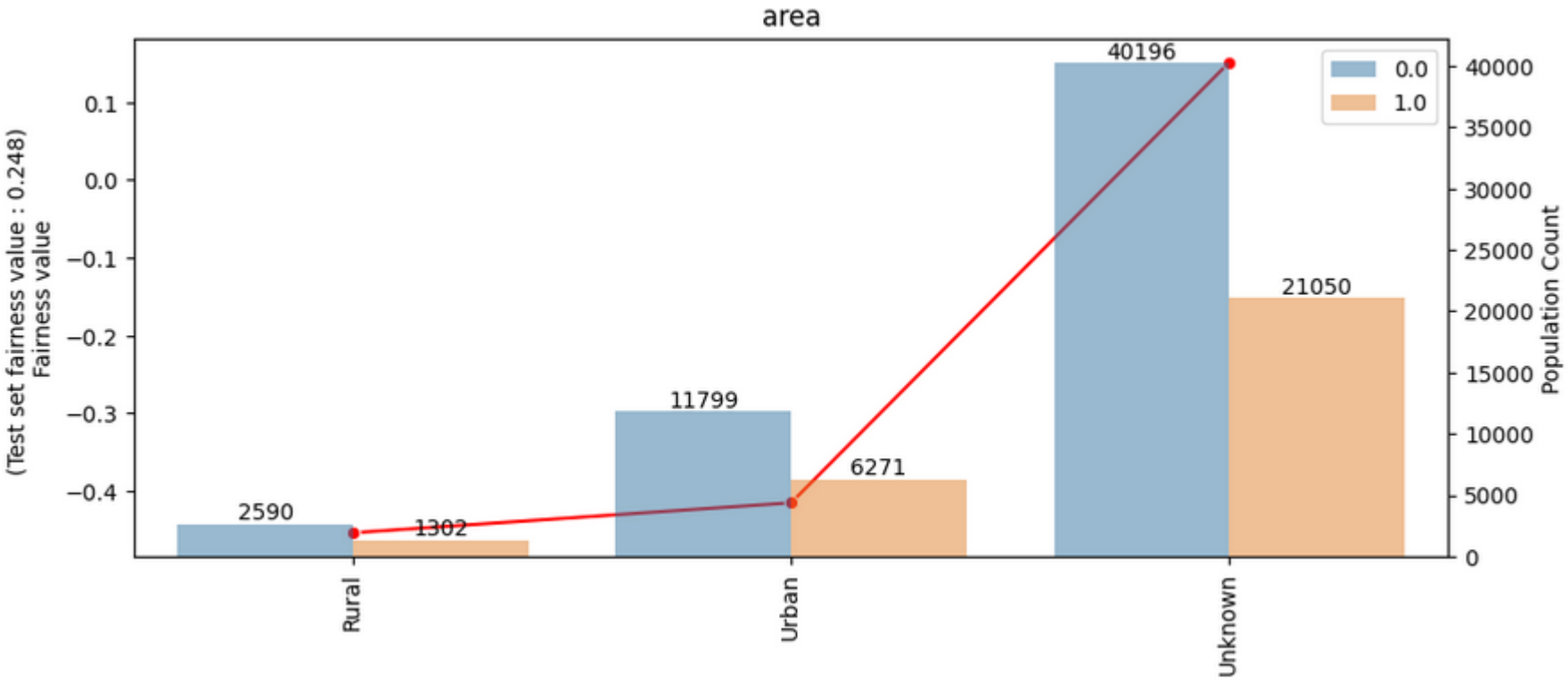
- **Zero** here is the reference value (-0.056)
- **Negative values**: **Widowed, separated , divorced, never married females** are treated with more bias.
- **Positive values**: **Married females** are treated with less bias.

Subgroups of Age



Middle aged females are treated with additional bias.

Advertising dataset-Subgroups of Area



Results

- Identify unfairness in subgroups even if the model is fair on the group level.
- Identify additional bias in subgroups for unfair models
- Visualize the unfairness=> Easily understood by non-experts

Future work

- Results on other datasets
- Implement 2D FALE
- Compare with other visual explainability methods in terms of fairness auditing