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# Assignment 3.1 Exercise

In this assignment, you will explore the impact of fairness metrics after applying the Disparate Impact Remover (DIR), retrain a Light GBM model with the adjusted data, and compare its metrics (listed below) against the original and reweighted models from the lab tutorial. Afterward, respond to the reflection questions.

## Part 1: Experimentation with the DIR

* Modify the levels array for the Disparate Impact Remover to include finer and coarser granularity. (See example in lab/assignment notebook.)
* Identify the best repair level and the Disparate Impact at the best repair level.
* Retrain a Light GBM model on the modified data from the DIR and compute both the performance and fairness metrics.

### 1.1a Code Output for Finer Granularity

Paste your screenshot here. (This can be a very lengthy output)

Attach a screenshot or output of your code here:

### 1.1b. Code Output for Coarser Granularity

Paste your screenshot here.

### 1.2. Code Output for Best Repair Level and Disparate Impact at Best Repair Level

Paste your screenshot here. (Choose the single best out of all repair levels for finer/coarser. This will be the DI closest to 1.0.)

### 1.3. Code Output for Light GBM Performance Metrics and Fairness Metrics

Paste your screenshot(s) here.

**\*Comparison of Performance Metrics from the Original and Reweighted Models (for your convenience from the lab)**

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**\*Comparison of Fairness Metrics from the Original and Reweighted Models (for your convenience from the lab)**

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## Part 2: Short-Response Questions

### Question:

#### 2.1. How does the Disparate Impact (DI) change with finer granularity? Coarser granularity?

Your response:

### Question:

#### 2.2. Based on your findings, which model would you recommend (Original, Reweighted, or DIR)? Justify your choice by balancing performance and fairness.

Your response:

### Question:

#### 2.3. Consider a scenario where you are responsible for deploying a machine learning model that shows a fairness-accuracy trade-off.

How would you approach deciding whether to prioritize fairness or accuracy? Which factors (organizational values, societal impact, or application context) would guide your decision? Reflect on how ethical dilemmas in machine learning require balancing competing values and their implications.

Your response: