Simulation User Guide - September 18th, 2023

Currently, there are six simulation code files:

Simulation_1.R: This deals with natural imbalance and uses the correct model. Both the training and testing data show that the minority has higher hiring potential than Asian and White.

Simulation_2.R: This also handles natural imbalance but uses an incorrect model. Like Simulation_1, it indicates that the minority has higher hiring potential than Asian and White in both training and testing.

Simulation_3.R: This simulation features sample imbalance. While the racial proportions in training are set at 0.09, 0.04, 0.57, and 0.30, the test round gradually adjusts to 0.25 for each group. The hiring quality for the minority group is established higher than the dominant group, consistent in both training and testing.

Simulation_4.R: Sample imbalance is observed here as well. Training proportions are 0.09, 0.04, 0.57, and 0.30, but the test round shifts to 0.25 for every racial group over time. The hiring quality of the minority in the training set is slightly higher than the dominant group. However, in the testing set, the difference in hiring quality between the minority and dominant group is much more pronounced.

For **Simulation_1.R to Simulation_4.R**, the code is written to compare a static SL on a randomly chosen test round to the last round of non-static models. This method of comparison was later identified as potentially unfair. Also, the plots in these simulations need refinement.

Simulation_5.R: This contains sample imbalance with training proportions of 0.09, 0.04, 0.57, and 0.30. The test round is adjusted to attain a 0.25 ratio for each racial group over time, paced by a rate of composition convergence. The hiring quality for Asian/White is made superior to Black/Hispanic in the training set. In contrast, this order is reversed in the testing set. A consistent baseline hiring potential probability is maintained for each racial group.

Simulation_6.R: Here, sample imbalance is also present with the same training proportions as Simulation_5.R. The test round proportions again transition to 0.25 for each racial group over time, guided by a composition convergence rate. The training set places Asian/White hiring quality over Black/Hispanic, but the testing set does the opposite. The baseline hiring potential probability is varied, determined by a beta distribution for each racial group.

Simulation_5.R and **Simulation_6.R** provide a data generation process that more

accurately mirrors real-world data compared to the earlier simulations. These simulations also include enhanced plotting capabilities for a thorough model performance assessment and effective debugging.