Objective

Learn about data preparation by examining the feature engineering process, as well as the data transformation that precedes the model training and outputs. Think about bias, variance, and fairness issues as they pertain to a simplified version of a real-world application, then discuss such issues in a small group.

Clarification

You should not need to re-run anything in this notebook, though you are welcome to do so. Be careful in that I have not provided the full machinery for the debiasing step, so if you run into errors doing modifications, you might want to talk to the teaching team before investing debugging time.

Recipe Ingredients

For reference the code presented in this lab is analogous to that found in this paperLinks to an external site.. You can find the original posting about this dataset from ProPublica hereLinks to an external site., if you want to learn more about any features.

1. Notebook for Data Preparation and ValidationDownload Notebook for Data Preparation and Validation
2. Some tabular recidivism data: compas-scores-two-years.csvDownload compas-scores-two-years.csv
3. Form small groups (suggest 2-3) to discuss the "Team" elements of the task list below (Feel free to also discuss anything else that is related to this lab+assignment). Note that we will be doing 1 more lab on the next steps of this data processing pipeline.
4. You should then create a shared document that everyone can work on together. Please clearly indicate group members on your single submission so we can appropriately credit everyone. For a question marked "Team", you should have one block of text from the whole team, while for a question marked "Each", each team member should identify themselves and provide their own block, following a format like the following:

Task 2A

<team answer here>

Task 2B

...

Task 4B

Task 4C Alice

<Alice's answer here>

Task 4C Bob

<Bob's answer here>

Task 4C Carol

<Carol's answer here>

Your Tasks

1. Pre-task, *Data Preparation*: Follow the pre-task to understand how we prepare the data for loading and preprocessing.
    A. **[Each, TURN THIS IN, 5 points]** First, read the assignment specification and ***estimate how long you think it will take you*** and write it down.
    B. **[Each, TURN THIS IN, 10 points]** Before beginning this assignment, briefly characterize in writing your position on using this kind of technology for this kind of problem domain.
2. Task 2, *Exploration in Feature Engineering*: Please examine Feature Categorization and investigation on fairness to answer the following questions
    A. **[Team, TURN THIS IN, 5 points]** Pick a feature that we dropped from the model in the cell titled "Feature Categorization" to re-incorporate. The original set is in the cell previous. You may want to briefly consult this paper by Grgic-HlacaLinks to an external site.. The original spreadsheet (compas-scores-two-years) might also help you interpret what the semantics of the features are.
    B. **[Team, TURN THIS IN, 10 points]** Why did you pick the chosen feature?
    C. **[Team, TURN THIS IN, 10 points]** How might including the chosen feature help and/or harm a future model in terms of accuracy, fairness, etc?
3. Task 3, *Understanding the Feature Coefficients*: Run the code in cell titled **Feature Coefficient** in Task 2 and answer the following
    A. **[Team, TURN THIS IN, 10 points]** Inspect the feature coefficients of this model found in the cell titled "Feature Coefficients" in the preparation notebook. Which features are predictive of which outcomes and how strongly?
4. Task 4, *Investigating the Debiasing Data Transformation*:
    A. **[Team, TURN THIS IN, 5 points]** Clearly describe ONE modification to the distortion function in Task 4's cell (you can search "getDistortion") that you think might help the a future model to achieve higher accuracy or "better" fairness (your modification may be very simple).

    B. **[Team, TURN THIS IN, 5 points]** Why do you think this modification might help as described?
    C. **[Each, TURN THIS IN, 5 points]** In what ways and to what extent do you think this dataset is biased?
    D. **[Each, TURN THIS IN, 10 points]** Which pieces of evidence do you find most compelling in reaching the judgment you did in the previous question?
    E. **[Each, TURN THIS IN, 10 points]** Why are those pieces of evidence the most compelling to you?
5. Task 5: *Model Construction and Validation***:**
    A. **[Team, TURN THIS IN, 10 points]** In the code starting at task 5, we examined 5x test-train splits throughout. Describe what this accomplishes, why that might be important, and what you see in these outputs.
6. **[Each, TURN THIS IN, 5 points]** Upon completing the lab, determine how long you actually spent on the lab, and report that timeframe in addition to your estimate beforehand.

Submit

One readable file per team should be fine, but be sure to indicate ALL team members on the submission.