

MATH 70098 Ethics in DS and AI: Part I

Checkpoint 2 Questions

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QUESTION SHEET

This checkpoint question sheet is for you to assess your own progress through Ethics Part 1 and to identify any areas that need further clarifications.

It is recommended that you make a written attempt at all questions before solutions are made available to you. If you use code to answer any part of this assessment, this code should be clearly commented in a separate .r or .py file.

This activity is expected to take approximately **90 minutes** of effort. The available marks for each question are indicated in square brackets, with a total of **26 marks** available.

1 Confusion at the bank [26]

A bank has developed two new methods of assessing eligibility for a business loan. The head of operations at the bank wishes to compare two new methods to their current approach. They are also concerned about the fairness of the methods, having heard anecdotal evidence that female applicants were being disadvantaged by their current approach.

You have been hired as a consultant to advise on the assessment of the accuracy and fairness of the bank's loan eligibility methods. To assist you, the bank has provided historical loan outcomes from the last year, along with the predictions made by the current and new eligibility methods. These are supplied in `loan_outcomes_NNN.csv`.

- a) Construct the confusion matrix for the benchmark method and the two new methods. [3]
- b) Calculate the true positive rate and false positive rate for each method. Use these values to recommend which test the bank should use. You should explain the reasoning behind this recommendation. [5]
- c) Disaggregate the data by sex and calculate the TPR and FPR of each test by sex. In a few sentences, interpret these results for the head of operations. You should comment on whether the performance of the current test appears to differ by sex. You should also identify the test with the greatest predictive power for males and for non-males. [5]
- d) Write a short, contextualised description of error parity, equalised odds and equalised opportunity for the head of operations. [6]
- e) Do tests 0, 1 and 2 appear to satisfy error parity by sex? Briefly describe how you might formally assess this. [3]
- f) Describe the practical and statistical issues in assessing fairness through the use of fairness metrics on this data. [4]