Project: Bias Detection and Mitigation in AI Training Data

Phase 4: Testing Plan

Test Plan Overview

This phase aims to test the bias detection and mitigation code. The testing covers data generation, encoding, bias analysis, mitigation, and result validation.

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1. Dataset Creation (`create_sample_dataset`)

Objective: Ensure the dataset is generated correctly with intentional bias.

Test Cases:

- test_dataset_shape:
  - Assert DataFrame has 1000 rows.
  - Ensure all expected columns are present.
- test_salary_bias:
  - Validate that male salary > female salary (gender bias).
- test_high_salary_split:
  - Confirm `high_salary` contains only 0 or 1.

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2. Categorical Encoding (`encode_categorical_variables`)

Objective: Test that categorical features are correctly encoded.

Test Cases:

- test_encoding_integrity:
  - Encoded columns should be numeric.
- test_encoder_classes:
  - Verify correct mapping of category labels to integers.

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3. Bias Detection (`BiasDetector`)

Objective: Validate the bias detector correctly identifies bias.

Test Case:

- test_bias_detection_output:
  - Ensure output is generated and includes protected attributes.

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4. Bias Mitigation (`BiasMitigator`)

Objective: Ensure the mitigation reduces bias in the dataset.

Test Cases:

- test_bias_reduction:

  - Compare correlation between protected attributes and target before/after mitigation.

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5. End-to-End Testing (`main()` function)

Objective: Validate the complete pipeline runs successfully.

Test Case:

- test_main_execution:

  - Run `main()` and check that it completes without errors.

Tools & Suggestions

- Testing Framework: pytest or unittest

- Mock dependencies if needed (e.g., BiasDetector, BiasMitigator)

- Use assert statements for validations

Status: Ready for implementation and integration into CI pipeline.