

Testing for 2020 US Cooperative Election Study*

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To ensure the ethical and effective deployment of a model trained on the 2020 US Cooperative Election Study, with post-stratification based on a US voter file dataset, several types of tests and evaluations should be put in place regarding the dataset, the model, and its predictions. These tests are designed to address potential biases, validate the model's predictive power across diverse groups, and ensure the model's reliability and fairness.

Tests for the Dataset:

1. **Representativeness Check:** Assess the dataset for representativeness of the broader US electorate, ensuring it includes diverse demographic groups (age, race, gender, geographic location, etc.). This involves statistical analyses to compare the dataset demographics with those of the general population, identifying any underrepresented groups.
2. **Data Quality and Integrity Verification:** Conduct thorough checks for data accuracy, completeness, and consistency. This includes identifying missing values, outliers, and potential errors in voter records, and taking appropriate steps to clean or rectify the data.
3. **Bias Audit:** Perform an audit for potential biases in the dataset, particularly regarding demographic information and voting history. This involves statistical tests to identify any systematic biases in how data was collected or processed.

Tests for the Model:

1. **Performance Evaluation Across Demographics:** Evaluate model performance separately for different demographic groups to identify any disparities. This can involve

*The essay is available at: <https://github.com/leoyliu/STA302-Mini-Essay-MRP>

disaggregated analysis using metrics like accuracy, precision, recall, and F1 score to ensure the model performs equitably across all groups.

2. **Fairness Assessment:** Apply fairness metrics (such as Equality of Opportunity, Demographic Parity, etc.) to assess the model's predictions for bias towards any group. This includes analyzing the model's decision thresholds and their impact on different populations.
3. **Robustness and Stress Testing:** Test the model under various scenarios and conditions to evaluate its robustness. This includes sensitivity analysis to understand how changes in input data or model parameters affect predictions.

Tests for the Predictions:

1. **Real-world Validation:** Compare model predictions with real-world outcomes where possible, to validate the model's predictive power. This could involve using recent election results or conducting field studies to assess the accuracy of turnout predictions.
2. **Impact Assessment:** Assess the potential impact of using the model's predictions in real-world settings, focusing on both positive outcomes (e.g., increased voter engagement) and negative consequences (e.g., potential disenfranchisement of certain groups).
3. **Continuous Monitoring:** Once deployed, continuously monitor the model's predictions against new data and feedback to catch any emerging biases or inaccuracies. This should involve a mechanism for stakeholders to report issues or concerns with the model's predictions.