**Project Progress Report**

**Title: AI in credit scoring Noorul Hussain Shaik  
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**Problem statement:**

Credit rating models form the core of the methods used to denote people’s financial capacity. However, those credit scoring models that reflect conventional credit scoring models rely on historical data and are retained and reused to provide credit scoring results that are unfair and punitive towards demographic groups. To sum up, the first and one of the most profound tasks is the creation of AI-based credit risk models that will yield high predictive power and compliance with the principles of the fair treatment of customers regardless of their background. This includes the process of identifying and minimizing bias in the information used and addressing bias in the system selected, using algorithms that are both explainable and highly transparent, and regularly revising the system to address newly implying biases. It is to establish a credit scoring system that should help ensure that people with impaired credit history can get credit and making credit scoring more fair so that those consumers who take credit would use the credit responsibly and follow regulations and policies.

**Motivation:**

AI-based credit scoring models must eliminate the existing bias in scoring systems that created the current disparity in credit access for minori In this case, it brings fairness when extended to customers secures fair credit access as the ultimate aspect of people’s financial liberation and as a means to minimize financial imbalance. Since the regulation has become more stringent, it has become notable that regulatory bodies want fairness and transparency in AI systems, especially including financial institutions, as seen in the case of ECOA and GDPR laws to prevent legal consequences and gain the trust of consumers. Moreover bringing focus to AI ethical issues involved in this project can contribute to enhancing technical progress in this area to produce significantly more precise and fair models. Understanding these issues, this project strives to shape a more financial context and establish new benchmarks for responsible AI in credit scoring.

**Literature Review:**

* **"Fairness in Credit Scoring: Assessment, Implementation, and Profit Implications"** by Nikita Kozodoi, Johannes Jacob, and Stefan Lessmann (2022) [(Research Paper 1)](https://econpapers.repec.org/RePEc:eee:ejores:v:297:y:2022:i:3:p:1083-1094): This is one of the papers that I will be using for my literature review. This paper is part of the papers that I’ll be reviewing in this literature review Here the authors review several scenarios of measuring fairness in credit scoring and guide methods for enhancing fairness in compass algorithmic solutions; the overall notion of profitability is kept intact.
* "A Distributionally Robust Optimization Approach to Fair Credit Scoring [(Research Paper 2)](https://arxiv.org/abs/2402.01811): I agree with Magnani et al., (2020) on the following paper that I should review in this context, addresses the potential ability of DRO to enhance fairness in the credit scoring dataset by reducing risk concerning sensitive features. Although it puts forward a new concept, the way the solution is provided at large-scale business environment may remain ambiguous with its operating model or mechanism requiring further action research.
* **"Algorithmic Fairness in Credit Scoring"** published in the Oxford Review of Economic Policy [(Research Paper 3)](https://academic.oup.com/oxrep/article-abstract/37/3/585/6374682): They are also relevant to the paper since they explain the theoretical concept of performance parity and separation in credit scoring, among other statistical fairness concepts. It is very informative indeed but looking at it one can spot a rather significant drawback of the given paper – the complete lack of similar case studies that would demonstrate how these measures of fairness can be applied in practice.

**Progress:**

In this progress report, I would like to summarize the key steps taken in our credit scoring project. Our goal is to develop an accurate and fair credit scoring model using the dataset, that I have taken from Kaggle. Below, I outlined the progress made in three critical areas:

1. **Data Collection and Preprocessing**
2. **Bias Detection and Mitigation**
3. **Advanced Bias Mitigation Techniques**

### 1. Data Collection and Preprocessing

#### Data Overview

We started by collecting a credit scoring dataset containing various features related to creditworthiness, financial metrics, and customer characteristics. The dataset includes information such as income, savings, debt, expenditures, and credit utilization.

#### Preprocessing Steps

1. **Handling Missing Values**:
   * We addressed missing values by imputing them with the median value for each feature.
   * Ensuring data completeness is crucial for accurate model training.
2. **Feature Engineering**:
   * I created new features, such as the debt-to-income ratio, which provides additional context for creditworthiness.
   * Feature engineering enhances the model’s ability to capture relevant patterns.
3. **Categorical Encoding**:
   * Categorical features (e.g., credit card usage, mortgage status) were encoded using one-hot encoding.
   * This ensures compatibility with machine learning algorithms.

### 2. Bias Detection and Mitigation

#### Fairness Considerations

1. **Sensitive Attributes**:
   * I tired to identify potential sensitive attributes, such as gender or race, that might introduce bias.
   * Fairness assessment requires careful handling of these attributes.
2. **Fairness Metrics**:
   * I evaluated fairness using metrics like disparate impact
   * These metrics help us understand how different groups are treated by the model.

### 3. Advanced Bias Mitigation Techniques

#### Ongoing Exploration

* As I move forward, I will explore more advanced approaches and aim to strike the right balance between accuracy and fairness.

**Timetable:**

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| --- | --- | --- |
| Week | Task Description | Milestones |
| 1st | Data Collection and Preprocessing | Gather divers and representative credit data. Clean and preprocess data. Engineer features to address initial biases. |
| 2nd | Bias Detection and Mitigation | Identify biases using statistical tool. Apply pre-processing. Begin in-processing techniques. |
| 3rd | Advanced Bias Mitigation Techniques | Implement in-processing techniques during model training. Apply post-processing techniques to adjust model outputs for fairness. Evaluate the effectiveness of bias mitigation techniques and refine as necessary. |
| 4th | Model Development | Develop the credit scoring model using selected machine learning algorithms. Perform initial evaluations using traditional performance metrics. Adjust the model based on initial evaluation results. |
| 5th | Model Evaluation and Transparency | Evaluate the model using fairness metrics. Document the evaluation results and interpretability insights, preparing for stakeholder review. |
| 6th | Continuous Monitoring, Compliance, and Presentation Preparation | Conduct regular fairness audits to ensure ongoing compliance with fairness criteria. Ensure the model complied with regulatory standards. Prepare and finalize the project presentation for stakeholders. |