Article

Analysis of Access to Emergency Funds in Sub-Saharan Countries– A Human Rights-Based Approach

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1   **Simple Summary:** A Simple summary goes here.

2   **Abstract:** A single paragraph of about 200 words maximum. For research articles, abstracts should
3   give a pertinent overview of the work. We strongly encourage authors to use the following style of
4   structured abstracts, but without headings: 1) Background: Place the question addressed in a broad
5   context and highlight the purpose of the study; 2) Methods: Describe briefly the main methods or
6   treatments applied; 3) Results: Summarize the article's main findings; and 4) Conclusion: Indicate
7   the main conclusions or interpretations. The abstract should be an objective representation of the
8   article, it must not contain results which are not presented and substantiated in the main text and
9   should not exaggerate the main conclusions.

10   **Keywords:** keyword 1; keyword 2; keyword 3 (list three to ten pertinent keywords specific to the
11   article, yet reasonably common within the subject discipline.).

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# test python chunk
# !pip install seaborn
import seaborn as sns
```

12   **1. Version**

13   This Rmd-skeleton uses the mdpi Latex template published 2019/02. However, the official
14   template gets more frequently updated than the 'rticles' package. Therefore, please make sure prior to
15   paper submission, that you're using the most recent .cls, .tex and .bst files (available here).

16   **2. Abstract**

17   Having access to emergency funds is a valuable resource that many people end up needing at
18   least once in their lives. Those who have access to emergency funding and other financial services have
19   the capacity to remain afloat when unexpected predicaments arise, while those who are without this
20   privilege have no choice but to endure crises and simply hope for the best. The purpose of our project
21   is to analyze the access adults have to emergency funds and financial services in Sub-Saharan countries
22   using a 2017 dataset from the Global Findex Database. Additionally, an important goal of our project
23   is to employ a variety of different approaches in an attempt to minimize bias and maximize fairness,
24   particularly when examining the performance for males and females. We also aim to determine how
25   adults in the Sub-Saharan African region access financial services as well as establish the amount of

bias we have within our models using exploratory data analysis, a baseline model, and a variety of fairness metrics. We hope to implement our findings in a Jupyter notebook where this information can be made accessible to a broader undergraduate audience.

3. Introduction

Science is often viewed as a way to offer trustworthy research backed solutions and answers. A lot of that research involves statistical methods performed on data however, what happens when the data and statistical methods aren't as objective and trustworthy as is so often assumed? The conclusions drawn from the data are biased and unfair, most often towards minorities and protected classes of people.To contribute to a human rights based approach to data analysis, we evaluate fairness metrics on a machine learning algorithm to measure bias.We use a Global Findex data set which contains financial information about 35 Sub Saharan countries. Specifically we want to create models to predict access to emergency funds, then analyze the fairness of those models.We focus on group and individual fairness metrics for the protected attributes, sex, age, and race. In addition we investigate the data set itself to understand where potential biases might have been implanted. Data sets and algorithms have real world impacts on real people. The inherent bias in data sets can carry over into machine learning algorithms that are used to profile and categorize people [1,2].Since data set's aren't collected in a vacuum and often represent the discriminatory environments in which they are collected [3], we must find ways to make data sets and statistical methods more equitable. In this study we explore fairness methods that can be used to evaluate machine learning models.The "impossibility theorem" is the idea that not all fairness metrics can be satisfied at the same time[4]. Although fairness is complex and there are multiple approaches to make a model fair [5,6], it's important to continue to question how data and algorithms can be biased and how to mitigate that bias.While there have been previous studies implementing fairness techniques in different contexts[7, Kim and Cho [8]], we implement them in an exploratory context meant to teach how and when to use these techniques thus giving us more freedom to branch beyond a specific question while supporting previous work about the importance of these fairness metrics[9, Barocas *et al.* [3]]. We analyse the data, data collection methods, prediction models, and the fairness metrics to assess how biased our data is and understand how we can de-bias when possible.

4. Materials and Methods

Materials and Methods [10] should be described with sufficient details to allow others to replicate and build on published results. Please note that publication of your manuscript implicates that you must make all materials, data, computer code, and protocols associated with the publication available to readers. Please disclose at the submission stage any restrictions on the availability of materials or information. New methods and protocols should be described in detail while well-established methods can be briefly described and appropriately cited.[5]

Research manuscripts reporting large datasets that are deposited in a publicly available database should specify where the data have been deposited and provide the relevant accession numbers. If the accession numbers have not yet been obtained at the time of submission, please state that they will be provided during review. They must be provided prior to publication.[11]

Interventionary studies involving animals or humans, and other studies require ethical approval must list the authority that provided approval and the corresponding ethical approval code.

5. Results

This section may be divided by subheadings. It should provide a concise and precise description of the experimental results, their interpretation as well as the experimental conclusions that can be drawn.[3]

5.1. Subsection Heading Here

Subsection text here.

5.1.1. Subsubsection Heading Here

Bulleted lists look like this:

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- Second bullet
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Numbered lists can be added as follows:

1. First item
2. Second item
3. Third item

The text continues here.

All figures and tables should be cited in the main text as Figure 1, Table 1, etc.

Figure 1. This is a figure, Schemes follow the same formatting. If there are multiple panels, they should be listed as: (**a**) Description of what is contained in the first panel. (**b**) Description of what is contained in the second panel. Figures should be placed in the main text near to the first time they are cited. A caption on a single line should be centered.

Table 1. This is a table caption. Tables should be placed in the main text near to the first time they are cited.

Title 1	Title 2	Title 3
entry 1	data	data
entry 2	data	data

This is an example of an equation:

$$\mathbb{S} \tag{1}$$

Example of a theorem:

Theorem 1. *Example text of a theorem.*

The text continues here. Proofs must be formatted as follows:

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Proof of Theorem 1. Text of the proof. Note that the phrase 'of Theorem 1' is optional if it is clear which theorem is being referred to. □

The text continues here.

6. Discussion

Authors should discuss the results and how they can be interpreted in perspective of previous studies and of the working hypotheses. The findings and their implications should be discussed in the broadest context possible. Future research directions may also be highlighted.

7. Conclusion

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8. Patents

This section is not mandatory, but may be added if there are patents resulting from the work reported in this manuscript.

Author Contributions: For research articles with several authors, a short paragraph specifying their individual contributions must be provided. The following statements should be used "X.X. and Y.Y. conceive and designed the experiments; X.X. performed the experiments; X.X. and Y.Y. analyzed the data; W.W. contributed reagents/materials/analysis tools; Y.Y. wrote the paper.'' Authorship must be limited to those who have contributed substantially to the work reported.

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Abbreviations

The following abbreviations are used in this manuscript:

MDPI	Multidisciplinary Digital Publishing Institute
DOAJ	Directory of open access journals
TLA	Three letter acronym
LD	linear dichroism

Appendix A

Appendix A.1

The appendix is an optional section that can contain details and data supplemental to the main text. For example, explanations of experimental details that would disrupt the flow of the main text, but nonetheless remain crucial to understanding and reproducing the research shown; figures of replicates for experiments of which representative data is shown in the main text can be added here if brief, or as Supplementary data. Mathematical proofs of results not central to the paper can be added as an appendix.

Appendix B

All appendix sections must be cited in the main text. In the appendixes, Figures, Tables, etc. should be labeled starting with 'A', e.g., Figure A1, Figure A2, etc.

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Sample Availability: Samples of the compounds . . . . . . are available from the authors.