Data Mining to Prevent Discrimination and Improve Privacy

Mohammed Isaq Mujawar[1], Dattatreya Choudhari[2]
M.Tech Student[1], Assistant Professor[2]
Department of Computer Science & Engineering
KLS Gogte Institute of Technology, Belgaum, Karnataka, India

Abstract:
Algorithms and automatic decision making on the large database have become integral form in all facets of our everyday life, both online as well as offline, as they are necessary tools in health care, education, individual finances, and the setting up of government policies. This algorithmic bias is present even when there is no intent of discrimination in the mind of algorithm developer. These considerations require the improvement of information mining techniques and methods that are aware of discrimination by design. It is both a much needed and new study area for the data mining community. This work considers a method to deal with the issues like potential discrimination and possible privacy violation. The use of slicing method prevents the potential privacy invasion on the dataset.

Index terms: Direct and indirect Discrimination, Discrimination discovery, Discrimination prevention, Data Privacy, Slicing method.

I. INTRODUCTION

In numerous applications, information systems assist decision-making tasks. Given a collection of data items about a typical client, an automated system determines whether or not the client is to be suggested for a loan. This kind of automated conclusions eases the workload of the personnel of financial institutions such as banks. But there is a possibility that automated decision may include discrimination. Discrimination is described as "the activity of unfairly treating people on the basis of their belonging to a specific group, namely race, ideology, etc". This comprises refusing opportunity to associates of one class that are accessible to associates of other class. We require making use of some anti-discriminatory actions, which are the rules and regulations intended to stop discrimination. Numerous decision-making areas offer themselves to discrimination, such as Financial Institutions, Educational Institutions, Health Insurance and Human Resource Management. The usage of these data systems in information mining technology for automated decision-making has enticed the attention of several individuals. The aim of this field is to develop the discrimination free decisions so as to attain fairness in most of the decision making areas.

II. LITERATURE SURVEY

In the field of information mining which aims to identify potentially valuable and ultimately understandable patterns, many authors have given their contribution. Data processing concept strives to simplify and enhance the information quality, consequently establishing it as more trustworthy. "Data preprocessing" does this by eliminating the unnecessary data and drawing out the important characteristics of the data. This makes pattern discovery simple without ignoring any crucial information. A survey on discrimination prevention methods in data mining exhibits new discrimination prevention method. Various transformations are used for the discovery of discrimination. The procedure measures the discriminative bias

and identifies the categories by decision-making processes. Data models that are discrimination-free can be created from the changed dataset without genuinely harming the information quality. More data can be handled and the system result is dependable. Another study views the recent best in class methodologies for "antidiscrimination" systems and likewise concentrates on "discrimination" discovery and deterrence in" datamining". Furthermore, convey a theoretic suggestion for improving the outcomes of the information quality. And also discusses about the most ideal approach to clean data collection and outsourced informational indexes such that immediate discrimination choice guidelines are changed over to authentic characterization rules. There was a research to build a different pre-processing discriminatory bias deterrence technique together with various "data transformation" techniques which can prevent "direct" discriminatory bias, "indirect" discriminatory bias or together at the similar time. To accomplish this aim, the primary step is to calculate the amount bias then recognizes classes and collections of individuals which may be straightforwardly and indirect victimized in decision making process. The subsequent step is data transformation now is a appropriate approach to expel each one of those discrimination predispositions at long last, data models that are discrimination free can be delivered from the changed data without genuinely harming information quality.

III. PROBLEM DEFINITION

Data Mining is progressively being used in the field of automated decision-making. Automated decision-making involves the abstraction and detection of information concealed in huge volumes of collected data. Several sectors such as Financial Institutions, Educational Institutions, Health Insurance Companies and Human Resource Management make use of automated decisions. But there is a possibility that automated decision may include discrimination. This work considers a

method to deal with the issues like potential discrimination for a loan granting application.

IV. PROPOSED WORK

The main idea of this work is to get the "discrimination free association rules for the Loan Granting Application. To achieve this aim, the initial step is to assess discrimination and determine categories and class of people that have been discriminated during the automated decision-making; the second step is to generate the discriminatory rules and the final step is to transform these rules to non-discriminatory rules.

I. System Architecture
To use the discrimination free dataset, the data must go through various modules, after which we get the "discrimination free association rules. The system design architecture consists of three main modules that are:
A. Frequent Item Set Module.
B. Discrimination Discovery Module.
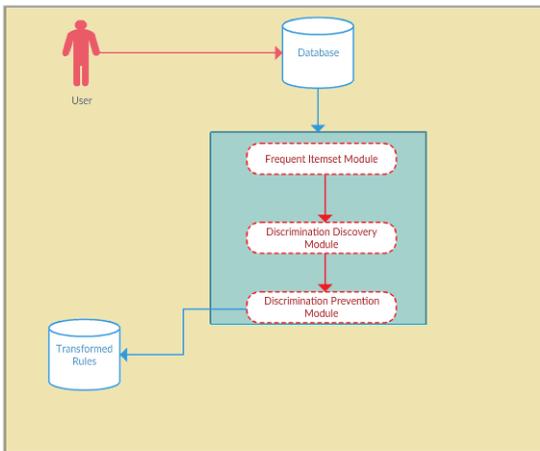**C.** Discrimination Prevention Module.

Figure.1. Block Diagram of System Architecture

II. Frequent Item Set Module
The main aim of this module is to generate the Frequent Itemsets (FI). Frequent Itemsets are the itemsets that have a support above "minsup" threshold. The Apriori algorithm is used to obtain the FI. The Apriori algorithm works in two steps:
1. Generate all FI: A FI is an itemset that has transaction support above "minsup".
2. Generate all confident association rules from the frequent itemsets: A rule with confidence above minimum-confidence "minconf" is confident association rule. The number of items in an itemset is called its size, and an itemset of size k a k-itemset.

Algorithm1: Find Frequent Itemset

III. Discrimination Discovery Module
The aim of this module is to obtain from the frequent itemsets all the rules that have a high confidence. The figure below shows the discrimination discovery process.
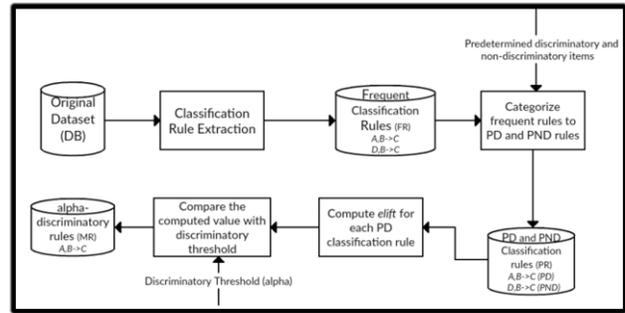

Figure.2. Discrimination discovery process

IV. Discrimination Prevention Module
In this module Discrimination Transformation of dataset is done. We transmute the genuine dataset D in such a manner to eliminate direct and indirect discriminatory biases, with least effect on the data and on authentic decision rules, so that no prejudicial decision rule can be mined from the database. The suggested solution to intercept and stop direct discriminatory bias is built on the point that the dataset of decision rules could be without direct discriminatory bias if it only consisted Potential Discriminatory (PD) rules that are alpha-protective or are occurrences of utmost one non-redlining Potentially Non-Discriminatory (PND) rule. Therefore, a appropriate"data transformation with least data damage must be used in such a manner that each alpha-discriminatory rule also turn out to be alpha-protective or an occurrence of a non-redlining"PND rule. We use the (DRP) Direct Rule Protection Algorithm.
666yy

Step 1: Inputs: DB, FR, MR, α, DIs

Step 2: Output: DB0 (transformed data set)

Step 3: for each r0 : A, B → C ∈ M R do

Step 4: F R ← F R − r0

Step 5: DBc ← All records completely supporting : + AB → + C

Step 6: for each dbc ⬜DBc do

Step 7: Compute impact(dbc =| ra ⬜F R | dbc) support the premise of ra

Step 8: end for

Step 9: Sort DBc by ascending impact

Step 10: while conf (r0) ≥ α. conf (B → C) do

Step 11: Select first record in DBc

Step 12: Modify discriminatory item set of dbc from + A to A in DB

Step 13: Recompute conf(r')

Step 14: end while

Step 15: end for

Step 16: Output: DB0 = DB

Algorithm 2: Direct Rule Protection Algorithm

V. RESULTS

This section shows the snapshots and results obtained by using proposed algorithms for discrimination prevention.
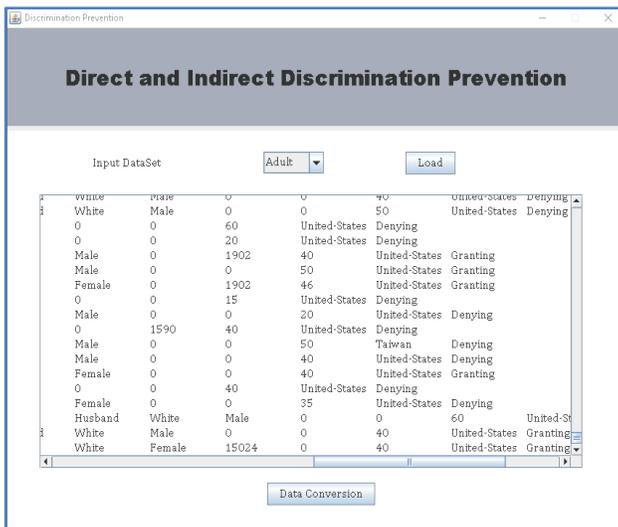
Figure.3. Load Dataset.

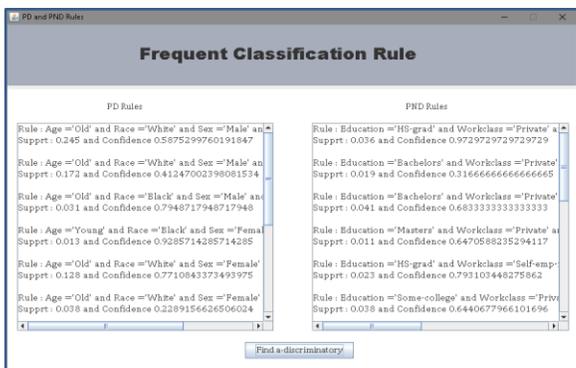**Figure. 4. Select Predetermined Discriminatory Itemsets.**
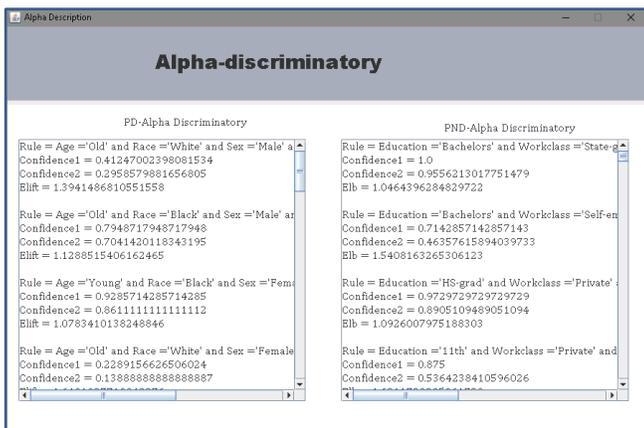

Figure.5. Frequent Classification Rules

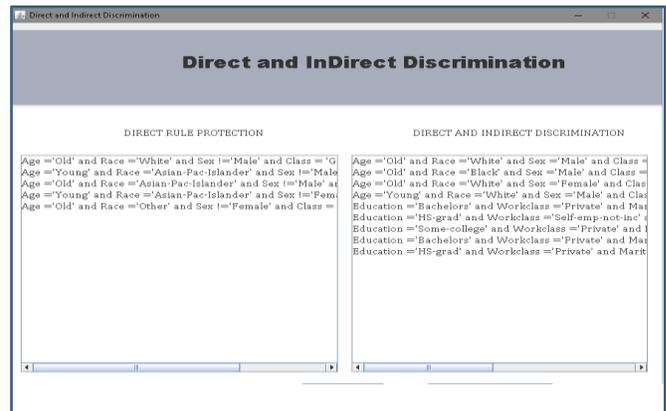**Figure .6. Alpha-Discriminatory Rules.**

Figure .7. Direct and Indirect Discrimination.

Figure.8. No. Of Rules

VI. CONCLUSION

Discrimination prevention is a major issue in data mining. It is studied that approaches based on pre-processing methods are flexible to use than the other two methods in-processing and post processing since; preprocessing involves transforming dataset so as to remove discriminatory biases from it. The study of direct discrimination removal include the discrimination detection, rule generalization and discrimination prevention. This work considers a method to deal with the issues like potential discrimination and possible privacy violation.

VII. REFERENCES

[1].Shruti A. Vagare, P.D. Thakare, "A Survey on Discrimination Prevention Methods in Data Mining," International Journal of Scientific & Engineering Research, Volume 7, Issue 2, 2016.

[2].Rupanjali T.Dive, Anagha P. Khedkar, "An Approach for Discrimination Prevention in Data Mining," International Journal of Application or Innovation in Engineering & Management, Volume 3, Issue 6, 2014.

[3]. Anjali P S, Renji S, "Discrimination Prevention in Data mining with Privacy Preservation," International Journal of Science and Research (IJSR),Volume 4,Issue 3,2015.

[4]. P.Yuvasri, S.Boopathy, "A Method for Preventing Discrimination in Data Mining," International Journal of

Advanced Research in Computer Engineering & Technology (IJARCET) Volume 3, Issue 4, 2014.

[5]. Manoj Ashok Wakchaure, Prof. Dr. Shirish Sane, "Discrimination Prevention by Different Measures in Direct Rule Protection Algorithm," International Journal of Emerging Technology and Advanced Engineering, Volume 5, Issue 9, 2015.

[6].Supriya M Manglekar, V K Bhusari, "Data mining for Discrimination Prevention," International Journal of Advanced Research in Computer Science and Software Engineering, Volume 4, Issue 11, 2014.

[7].P Baskaran and Arulanandam, "A Novel Fast and Accurate Method for Preventing Discrimination in Data Mining," World Engineering & Applied Sciences Journal, Volume 7, Issue 1, 2016.

[8].Bhagyesh P. Asatkar, Asst. Prof. Pushpanjali M. Chouragade, "Preventing Discrimination In Data Mining," International Journal of Scientific & Engineering Research, Volume 7, Issue 2, 2016.

[9].Ms Nikhita B Ugale, Prof S D Deshpande, "Prevention for Direct and Indirect Discrimination in Data Mining," International Journal of Computer Science and Information Technologies, Volume 7, Issue 2, 2016.

[10]. Jagriti Singh, Prof. Dr. S. S. Sane, "Pre-processing Technique for Discrimination Prevention in Data Mining," The International Journal of Engineering and Science (IJES), Volume 3, Issue 6, 2014.

VIII. AUTHOR INFORMATION

Mohammed Isaq Mujawar, Student, Department of Computer Science and Engineering, KLS Gogte Institute of Technology, Belagavi.

Dattatreya Choudhari, Professor, Department of Computer Science and Engineering, KLS Gogte Institute of Technology, Belagavi.