Remove Discrimination in Data Mining Using Symmetric Uncertainty

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Data mining is an increasingly important technology for extracting useful knowledge hidden in large collections of data. There are, however, negative social perceptions about data mining, among which potential privacy invasion and potential discrimination. The latter consists of unfairly treating people on the basis of their belonging to a specific group. Now a day Data Mining systems are automated .It collect the data from training data set by classification or association mining rules. Training data set make decision from the historical data if this data is biased toward specific person then decision may be discriminatory. For this reason, antidiscrimination techniques including discrimination discovery and prevention have been introduced in data mining. Discrimination can be either direct or indirect. Direct discrimination occurs when decisions are made based on sensitive attributes. Indirect discrimination occurs when decisions are made based on no sensitive attributes which are strongly correlated with biased sensitive ones. In this paper we have proposed new discrimination measurement using symmetric uncertainty

Keywords— discrimination , antidiscrimination, data mining, privacy, cyber crime, symmetric uncertainty.

I. INTRODUCTION

Today's world data is the primary thing for every organization. A large amount of data available in today's market but what about the information? It is very poor. Data mining is tool for mining the information from the large amount of data. The purpose of mining the information is to fetch the knowledge from the large amount of data set. Data mining is also called "Knowledge Mining".

Many people relate data mining to the Knowledge Discovery from Data (KDD).Here are step for KDD.

- DATA CLEANING: IT'S REMOVE THE DATA THAT CONTAINS NOISE OR INCONSISTENCY.
- DATA INTEGRATION: IT COMBINE LARGE MULTIPLE HETEROGENEOUS DATA SET IN TO ONE.
- DATA SELECTION: DATA RELEVANT TO THE ANALYSIS ARE RETRIEVED FROM DATA SET.
- DATA TRANSFORMATION: AT THIS PHASE, DATA IS TRANSFORMED IN TO APPROPRIATE FORMAT FOR MINING.
- DATA MINING: EXTRACT THE KNOWLEDGE FROM THE LARGE SET OF DATA
- PATTERN EVALUATION: THIS PHASE INDENTIFY THE TRULY INTERESTING PATTERN.
- KNOWLEDGE REPRESENTATION: IT IS THE STEP WHERE KNOWLEDGE IS PRESENTED TO USER FOR BETTER UNDERSTANDING.

II. MOTIVATION

Data Mining is increasingly important technology for fetching the knowledge from the data set. Data mining systems are automated and take decision based on association or classification. This automated system may give fair decision but at closer look, one realizes the classification rules are learned by the system from training data. If this data biased for or against a particular community then it shows discriminative activity. So here aim Moto is to remove discrimination

III. SURVEY OF RELATED WORK

The main focus of the literature review is the study about different methods of discrimination prevention in data mining.
There are two types of discrimination possible.

1) Direct discrimination: Direct discrimination explicitly mentions the sensitive attribute. For example female candidate most time rejected in credit applications.
2) Indirect discrimination: Indirect discrimination does not explicitly mention the sensitive attribute, unintentionally generate discriminatory decision. For example urban people most time rejected by bank for approve loan.

There are three approach of antidiscrimination process.

1) Pre-processing: In this approach we us discrimination process on original data set. Here we build an algorithm in such a way that remove discrimination from original data set and produce biased free data set. Along this line,

[3] perform a controlled distortion of the training data from which a classifier is learned by making minimally intrusive modifications leading to an unbiased data set.

2) In-processing: In this approach we have to build data mining algorithm in such a way that also contain the functionality anti-discrimination. Here we need special purpose data Ming algorithm

3) Post-processing: In this approach, we have to work on resultant data. Modify the restyling data in such way that remove the discrimination from the resultant data set. We have two main challenges during this process: one challenge is to consider both direct and indirect discrimination and second is to remove discrimination with good quality. Here in our paper we consider the preprocessing approach because it is most flexible among all.
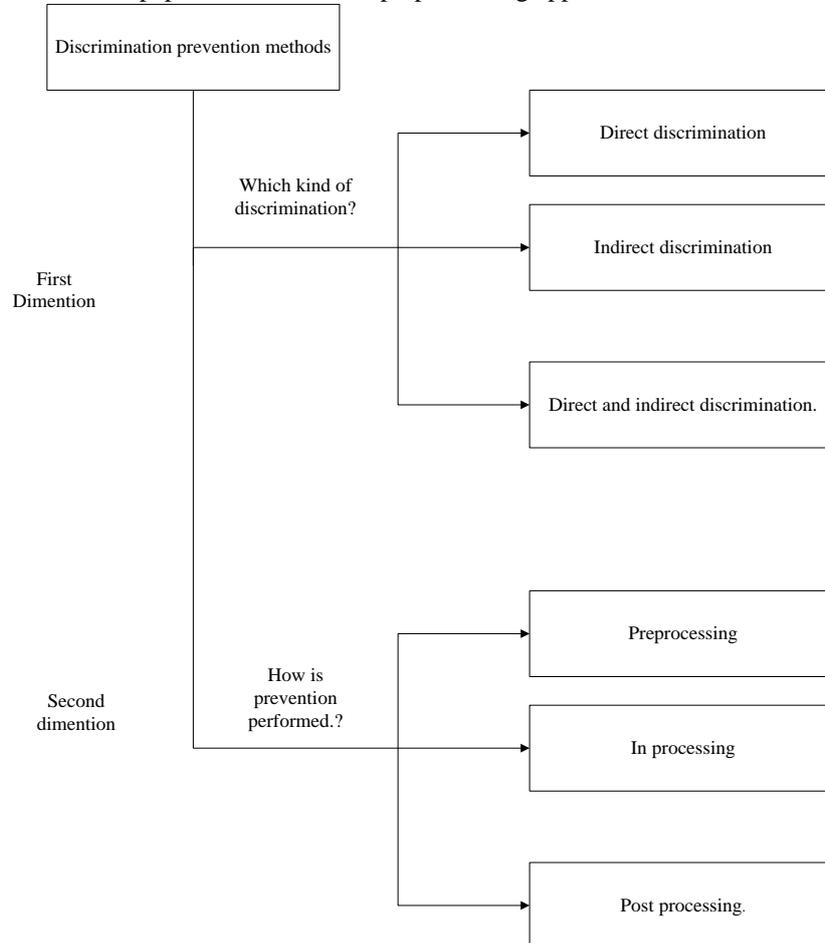

Fig 1. The taxonomy of discrimination prevention methods [7]

In [1], Sara Hajian, josep Domingo-ferre et al, have proposed the methodology for removing both direct and indirect discrimination.

Approach for direct and indirect discrimination prevention can be described in two phases:

• Discrimination measurement: In which they have first measure the discrimination weather it is direct or indirect discrimination .

• Data Transformation: In which they have proposed the mechanism for transform the original data set DB in such a way that it produce fair result and remove discrimination.

Authors have proposed solution for data transformation for direct and indirect discrimination.

Direct rule protection: Here convert the discriminatory rule in to non-discriminatory rules. In order to covert this rule they proposed two methods DTM1 in which change the sensitive attribute(e.g. change the gender from male to female with granted credit) and DTM2 in which change the class attribute in some record(e.g., change grant credit to deny credit with male gender)

Direct rule generalization: It another method in which they have more generalize the rule so the decision will be fair.

In, [2],D. Pedreschi,S.Ruggieri, and F.Turiniet al, have introduced similar concept but they concentrated on identifying the discriminatory rules that are present in a dataset rather than on learning a classifier with independency constraint for future predictions.

Author has proposed two solution to learn classifier.[6]

1) Massaging: In Massaging, we want to remove the dependency between B and the class attribute from the dataset. In order to do this, we will change the labels of some objects x with x(B) = b from '−' to '+', and the same number of objects with x(B) _= b is changed from '+' to '−'.[6].then we use ranking approach for ranking the positive class in ascending order.

2) Reweighting: In this approach they have weight object according to specification. If class B=b and it has + class then it should be high weighted and if has negative class then it should be low weighted. Then we resample the original dataset according to weight.

In[2], this paper authors have proposed discrimination classification rule. Discriminatory rules are either PD rules or PND rule. PD stands for potentially discriminated rule and PND stands for potentially non discriminated rule.
PD rule: suppose we have two attribute A,B in which A is discriminatory item set then A,B -> C could be PD rule. PND rule: If D and B is non discriminatory item set then D,B-> C is PND rule.
Author has also proposed a mechanism for measure the discrimination from the data set. For that we have to calculate elift of PD rule.

$$Elift(A,B\text{->}C) = Conf(A,B\text{->}C)/Conf(B\text{->}C).$$

After we define one threshold value α .If elift(A,B->C)< α, then it is non discriminatory otherwise it is discriminatory rule.
Here they also consider PND rule .PND rule has no potential for discrimination but if we check the back ground the it could possible that PND rule may have discriminatory behaviour. As an example, assume that loan application from area that has pin code 390087 has been rejected by bank most. If we check more in detail then we find that people live in area 390087 is from urban area. Here indirect discrimination found by the background knowledge.Here Purpose of author is to define discriminatory rules and discover discrimination from the data set.

IV.   PROPOSED SYSTEM.

Limitation of existing system:
The solutions will discrimination proportional to the predetermined discrimination items in DB. When these items are missing or not sufficient, it cannot identify more discrimination. The ability to populate the predetermined discrimination items in DB depends on the ability of the user.

Overview of Proposed System:
We propose a new solution which will solve the problem in the base paper solution to rely on the human expert to fill the predetermined discrimination items. We calculate a statistical parameter called Symmetric Uncertainty (SU).
The symmetric uncertainty (SU(X,Y)) is derived from the mutual information by normalizing it to the entropies of feature values or feature values and target classes, and has been used to evaluate the goodness of features for classification by a number of researchers. Entropy represent the Uncertainty of the random variable, let X be a random variable then, its entropy define as

$$H(X)= - \sum_i p(x) \log_2(p(x))$$

In which p(x) is prior probability of random variable x. H(x) is greater then entropy is greater so variable is more uncertain.Symmetric uncertainty is extending of the above equation and gives more accuracy in measuring; here is the equation of measuring the symmetric uncertainty.

$$SU(X,Y)=2*[I(X,Y) / (H(X)+H(Y))].$$

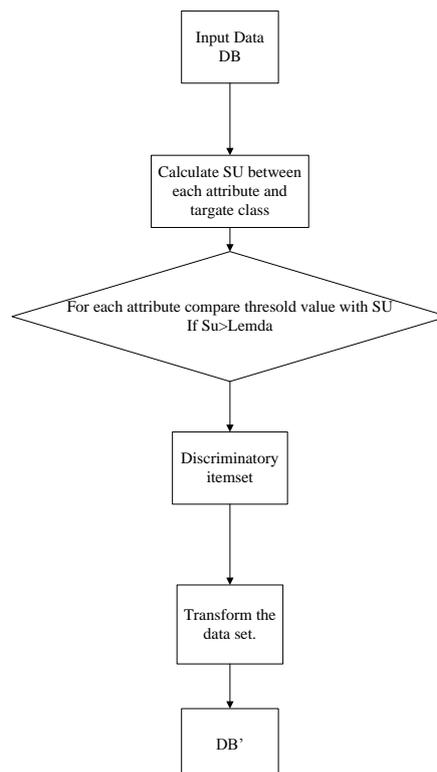

Fig 2. Propose flow chart.

SU is always in range of [0, 1].1 shows that variable are most dependent and 0 shows variables are mutually independent. Here we have more concern about the independent variable .cause i variable id dependent then it shows discriminatory behaviour. Based on calculating the SU, we can find the association between the attribute value and the class value.Once after knowing this, we will try to normalize the attribute values to move in a generic way from specific i.e. we do selective data transformation, so that discrimination is removed.

Result Analysis:

As existing system relay on the user expertise here our propose system remove more discrimination .our proposed system does not rely on user expertise and it is entropy based transformation system which help to remove more discrimination with minimum information loss. in below figure we can see the comparison of existing and proposed system.

Table 1.1

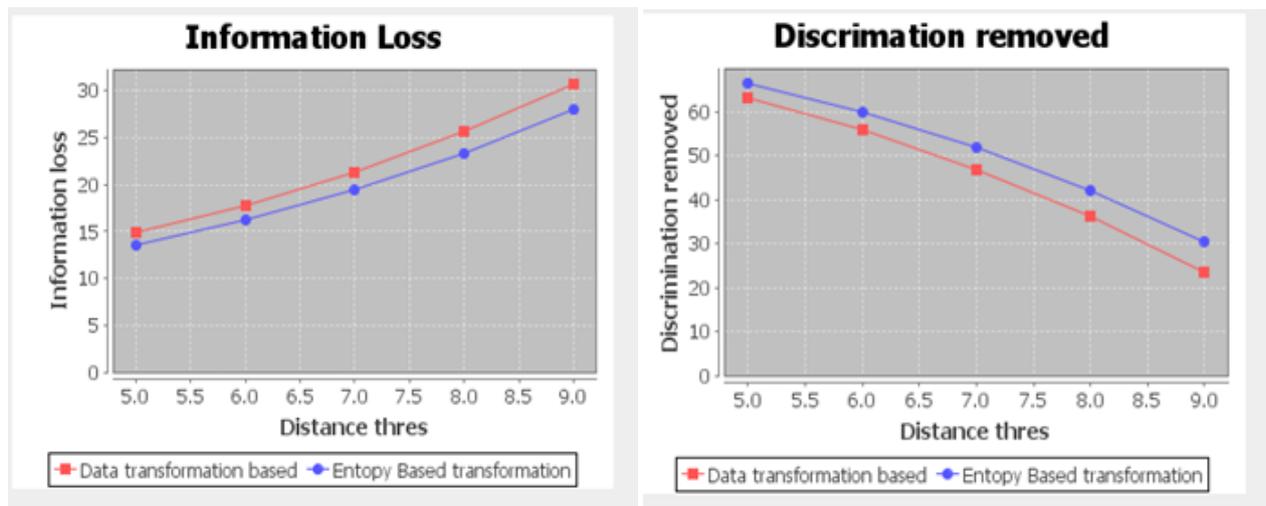|	Discrimination removal	Information loss
Existing system	Less	More
Proposed system	More	Less

Fig 3.Comparison of existing and proposed system

V. CONCLUSION

Discrimination is very important issue when considering the legal and ethical aspects of data mining. It is more than obvious that most people do not want to be discriminating because of their gender, religion, age. The existing discrimination prevention system is select predetermine discriminatory dataset that totally rely on user expertise if there is wrong information or missing value then it will cause less discrimination removal.

Proposed system is entropy based which is measure symmetric uncertainty between individual attribute and class attribute. Proposed system helps to remove more discrimination as it is overcome the drawback of an existing system which is relay on user expertise. Here my aim is to remove more discrimination with minimum information loss. In future further more enhancements can be done in discrimination measure.

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