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Welfare Classification of Muslim Majority Communities using Decision Tree Algorithm

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Abstract— Community welfare is a benchmark of various conditions that can represent a quality community life. It is undeniable that welfare in a comprehensive sense can be realized if certain economic conditions can be achieved, one of which is prosperity. Economic freedom is a framework in which principles compatible with the ideals of prosperity are implemented in economic institutions and processes. Important components in economic freedom such as size of government, legal system and property rights, sound money, freedom to trade internationally, and regulation have a significant influence on the welfare of the people of a country. This study aims to examine the effect of economic freedom on the welfare of the people in several countries with the Muslim majority population. By using unsupervised learning methods and decision tree algorithms in the classification, the experiment result found that 35% of countries with a majority Muslim population in the world were classified as Moderately Free.

Keywords-decision tree algorithm; muslim communities; welfare classification

I. INTRODUCTION

Welfare is a benchmark of various conditions that can represent a quality life [1], [2]. It cannot be denied that welfare in a comprehensive sense can be realized if economic conditions such as prosperity can be achieved. Therefore, implementing economic principles that are compatible with the ideals of prosperity will never lack its relevance in every effort to realize the general welfare.

Economic freedom is a framework in which principles compatible with the ideals of prosperity are implemented in economic institutions and processes [3]–[5]. Within the framework of economic freedom, there are a few principles imbued with the spirit of independence for every citizen within a country to carry out various kinds of economic activities to increase the level of personal well-being as well as that of the environment.

Around 85% of people worldwide identify as religious. Christianity is the most common religion globally, with an estimated 2.38 billion followers. The second most popular religion is Islam, which is followed by 1.91 billion people [6].

But according to population experts, by 2050 Islam will have almost caught up to Christianity. Muslims are present in every country in the world, with the majority of them residing in Southeast Asia, the Middle East, and northern and central Africa. In many of these nations, including Egypt, Afghanistan, Syria, Pakistan, Turkey, and Iran. Indonesia, with an estimated 231 million Muslims, is the nation with the greatest overall number of Muslims. This represents almost 13% of all Muslims worldwide and 86.7% of the population of Indonesia [7].

However, are these countries with majority Muslim prosperous? This study aims to reveal the welfare of Muslim-majority countries through evaluating economic freedom by utilizing machine learning technology.

II. Related Works

In the development of machine learning technology, this research utilizes supervised learning approach of machine learning to classify the economic freedom on the welfare of the people in several countries with Muslim majority populations. This research use Decision Tree algorithm which is many used in classification research with welfare or economic studies, such as: (1) creation of socio-economic system predictive models using decision trees with multivariate response [8]; (2) use of a decision tree algorithm based on clustering and level division using the entropy method for the selection of regional economic indicators [9]; (3) creating a model to predict corporate bankruptcy in the Republic of Serbia using decision trees [10]; (4) application of decision tree algorithms for measuring the financial performance of Indian manufacturing companies [11]; and (5) a categorization and regression tree analysis of adverse childhood events and their associations with complex health profiles among adolescents involved in child welfare [12].

III. Methodology/ Reseach Methods

The activities of this research begin with problem identification, literature study, data collecting, modeling, evaluate the model, and provide classification result. In the problem identification and literature study activity, this research found that one indicator of welfare is the economic factor. The level of economic freedom of a country can be grouped into four types, such as repressed, mostly unfree, mostly free, and moderately free.

The dataset used in this study is "Economic Freedom & Top 11 Factors" data from Faraz Rahman [13]. The dataset is Economic Freedom data compiled from the results of an analysis conducted by the Fraser Institute. We have also compared the data with the data available on the Fraser Institute official website (https://www.fraserinstitute.org/). The dataset contains country data along with value index data for 5 board areas, namely size of government, legal system and property rights, sound money, freedom to trade internationally, and regulations.

This research use Decision Tree algorithm to classify economic freedom of Muslim majority country. The non-parametric supervised learning approach used for classification and regression applications is the Decision Tree [14]–[16]. The most effective and popular tool for categorization and prediction is the Decision Tree. A decision tree is a tree structure that looks like a flowchart, with each internal node representing a test on an attribute, each branch representing a test result, and each leaf node (terminal node) representing a class label.

A tree can be "trained" by separating the source set into subgroups depending on an attribute value test. To repeat this action on each derived subset is known as recursive partitioning. The recursion ends when the split no longer improves predictions or when the subset at a node has the same value for the target variable. Because it does not require parameter setting or domain knowledge, decision tree classifier construction is appropriate for exploratory knowledge discovery. Decision trees can handle high-dimensional data. Decision tree classifiers are frequently correct. Decision tree induction is a prominent inductive method for learning classification information.

IV. Result and Discussion

This study prepared for the dataset, including changing data types, changing column names, deleting countries with a low percentage of Muslims and in the form of strings, adding the Economic Freedom criteria label, integrating data, between the Economic Freedom dataset [13]and the Muslim by Country dataset [7].

This study used the available modules and libraries to classify the Decision Tree. Among them we use DecisionTreeClassifier to create the Decision Tree model, accuracy_score to get the entropy value and export_graphviz to generate the GraphViz representation. Figure 2 shows the result of decision tree model.

Decision trees categorize instances by organizing them in a tree from the root to the leaf node, which offers the categorization of the instance. To categorize an instance, as shown in the figure above, one examines the attribute provided by the root node of the tree before proceeding along the branch of the tree that corresponds to the attribute's value. The same approach is then applied to the subtree rooted at the new node. Figure 1 illustrate the decision tree representation.

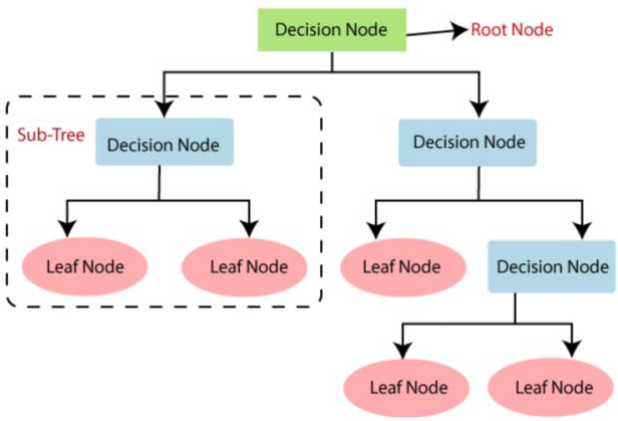

Fig 1. Illustration of decision tree representation (https://www.javatpoint.com/machine-learning-decision-tree-classification-algorithm)

The algorithm in a decision tree starts at the root node and works its way up to forecast the category of the given dataset. By comparing the values of the root attribute with those of the record (actual dataset) attribute, this algorithm tracks the branch and moves to the next node. Before proceeding, the algorithm double-checks the attribute value with the other sub-nodes for the next node. It continues in this manner until it reaches the tree's leaf node. The following method can assist you in understanding the complete procedure [17]:

- Step 1: Begin the tree at the root node, which contains the complete dataset, according to S.
- Step 2: Use the Attribute Selection Measure (ASM) to determine the top attribute in the dataset.
- Step 3: Subset the S so that prospective values for the best attributes are included.
- Step 4: In step four, create the decision tree node with the best attribute.
- Step 5: Iteratively create new decision trees using the dataset selections generated in step 3. Continue along this path until you can no longer categorize the nodes and refer to the final node as a leaf node.

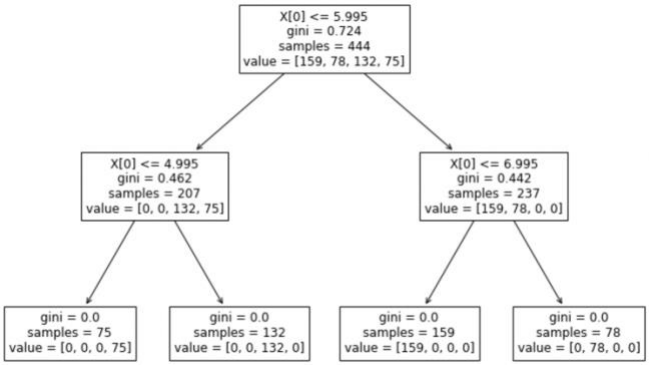

Fig 2. Decision Tree result of Economic Freedom of Muslim Majority

Based on Figure 2, it is found that by classifying the decision tree algorithm on countries with a majority Muslim population, it is proven that these countries can be classified according to the economic freedom criteria with the result that 159 countries are declared Moderately Free; 78 countries declared Mostly Free; 132 countries declared Mostly Unfree; Based on 444 countries with a Muslim population, 75 countries were declared repressed on the results of data integration, between the Economic Freedom dataset and the Islam by Country dataset.

In Figure 2 it is also stated that the classification is influenced by the value X[0] or the value "Economic_Freedom" and the array value is based on the value "Condition" from the Economic Freedom dataset. The value of X[0] here is the Economic Freedom value of a country based on a sample of 444 Muslim-majority countries. Based on the value of X[0] it is found that a country belongs to the criterion of economic freedom in which X[0] with value ≤ 4.995 means repressed category, 4.995 ≤ 5.995 means mostly unfree, 5.995 ≤ 6.995 means mostly free, and ≥ 6.995 classified to moderately free.

V. Conclusion

This study found a classification model using the Decision Tree algorithm and found that countries with a majority Muslim population with 35% of 444 countries are classified as Moderately Free criteria and as much as 16.89% are still classified as Repressed. With 16.89% of Muslim-majority countries classified as Repressed, it can be said that the quantity of Muslims in a country does not really affect the country's welfare value, especially in the field of economic freedom. However, in this study it was also found that 35% of countries with a majority Muslim population are classified as Moderately Free which have quite high values of economic freedom as well. Future research can use factors other than economic freedom to find the level of welfare of Muslim countries. Apart from that, it can also use other machine learning algorithms, such as the Naive Bayes Classifier, Artificial Neural Networks, and even Deep learning.

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