**Proposal Title: Bankruptcy Prediction System with Fuzzy Logic**

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**Introduction**

Risk assessment is critical because the complicated network of mutual credit obligations can make the actual risk exposure of the entire system invisible at the level of individual institutions. It helps prevent an individual or an organization from committing into something that might cause extreme harm monetary or in any form. Although sophisticated data mining algorithms have been developed to help assess risk in an unprecedented accuracy, in an actual risk assessment process, the discovery of bankruptcy prediction knowledge from experts is still regarded as an important task because experts’ predictions depend on their subjectivity [1]. Finance sector is one of the industry that requires meticulous risk and credibility assessment system. For example, banks are most likely to expose to economic risk scenarios and substantial losses might incur if a shareholder goes bankrupt. The same applies to real-estate industry where banks are required to assess the property buyer on their financial portfolio when they are applying for loans.

**Why is fuzzy logic needed in this project?**

The Law of the Excluded Middle mandates that every statement is either true or false while fuzzy logic subverts this idea by measure the “truthiness” of a statement. To define whether an institute has gone bankruptcy or not, many factors have to be considered carefully before declaring bankruptcy. Many existed methods are quantitative and objective which makes predictions unreliable because defining risks are subjective and this is where fuzzy logic plays a major role.

**Solution**

A fuzzy logic system will be provided to emulate bankruptcy prediction system. The Qualitative\_Brankruptcy dataset will be acquired from the UCI Machine Learning repository. The dataset contains 6 qualitative parameters which are Industry risk, Management risk, Financial flexibility, Credibility, Competitiveness and Operating risk. Also, the dataset contains 250 instances and 2 classes which is Bankruptcy(B) and Non-Bankruptcy(NB).

In this project, the Fuzzy Interactive Dichotomizer3 (FID3) will be employed. FID3 is an effective method to obtain knowledge in uncertain classification related problem. It is based on ID3 and the data representation on ID3 is crisp while for FID3, the data are fuzzy with continuous attributes [2]. A search for most impactful attributes on Bankruptcy will be carried out and sample sets will be partitioned into several intervals to form membership functions. For example, the attribute Financial Flexibility can be partitioned approximately between (-100, 100), as shown in equation 1.

Equation 1. Financial Flexibility.

Then, the fuzzy entropy and information gain can be calculated with the formula portrayed in equation 2 [3]. represents the entropy of the set of training examples in the node. Similarly, equation represents the information gain of attribute . Modulo is the size of the subset . Modulo is the size of set .

Equation 2. Entropy and Information Gain.

Finally, with MATLAB fuzzy toolbox, a Fuzzy Inference System will be built and prediction will be done through defuzzification.

**Reference**

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3. “Applying Fuzzy ID3 Decision Tree for Software Effort Estimation “, Ali Idri and Sanaa Elyassami, International Journal of Computer Science Issues, Vol. 8, Issue 4, No 1, July 2011.