

(MCUB) technique. This is a new initiative that has not been considered in the literature to handle multi class imbalanced problem by employing PNN.

The results obtained demonstrate that the proposed MCUB technique is capable of handling multi class imbalanced problem. Therefore, the PNN with the proposed ensemble technique can be used effectively in data classification. As a further study, other classification tools can be used to investigate the performance of the proposed MCUB technique in solving class imbalanced problems.

## 1. Introduction

In the literature, many classification learning algorithms have been developed and applied to real world problems. Most of the classification algorithms assume balanced distribution among classes which is not valid in many real world applications [1-5].

A data set is imbalanced when the training examples are unevenly distributed among classes and there are many more instances of some classes than other classes in an imbalanced data set [1-3, 5-7]. When classifying an imbalanced data set, classifiers encompass a major difficulty of being bias towards majority classes and tend to misclassify test samples belong to small classes more often than those of prevalent classes [5, 8-11].

When classifying real world binary imbalanced data sets using existing classification algorithms, the problem of misclassifying minority class observations habitually is often present where the minority class has the utmost interest [2, 3, 6, 7, 12]. Many researches can be found relating to handling binary class imbalanced problem in the literature [2, 3, 6, 13, 14]. Classifications related to modern applications are usually not limited to two classes and hence, researchers focused on handling multi class imbalanced problems [1, 2, 15-22].

Ensemble techniques use multiple models and then combine them to produce results which lead to produce more accurate solutions than a single model. Ensembles tend to yield better results when there is a significant