**Raven Charles Roy P. Jacinto**          **Assignment 5.1 - Perceptron  Applications**

**CPE019 - CPE32S3**

**1st Scientific Paper:**

**Title:** Multi-layer Perceptron Neural Network with Feature Selection for Software Defect Prediction

**Author/s:** J. Mary Catherine & S. Djodilatchoumy

**Date of conference:** 28-30 April 2021

**Title of publication or conference proceeding:** 2nd International Conference on Intelligent

Engineering and Management (ICIEM)

**What is the problem being solved in the research?**
The problem being solved in this research is identifying whether there are defects in software modules or not (results must be that the module is "clean" or "buggy"). Since software development challenges and constraints rise, unexpected effects like failure and error decrease the consistency of software and user loyalty, which may also lead to user's frustration.

**What is the proposed solution of the author/s?**

Authors proposed to develop and analyze the use of Multi-Layer Perceptron Neural Network (MLP-NN) for the efficient prediction of defects in software modules. The authors have also executed the MLP-NN with a subset of features selected using popular feature selection methods. Then their model was evaluated on 5 datasets coming from the AEEEM dataset. Then the authors compared the results to other common classifiers like Logistic Regression, MLP-NN, and Random Tree.

**How did the author/s solve the problem/s? Provide a summary of the methodology**

They used three phases for their methodology and those are selection of dataset, preprocessing of data, implementation of various classification methods and analysis of the results. **Firstly**, they considered the creation of target/output class dependent attributes and the rest of the attributes are called independent attributes. With a purpose that they can assign the factors that affect the result and the result itself depending on independent factors. **Secondly**, they operate in two dimensions, with the first dimension having only the pre-processing stage feature selection function and the second dimension, along with the feature selection function, a class balancing technique included. Authors claimed that the class balance technique allows them to analyze the effects of unbalanced datasets on the performance of the proposed classification structure. **Thirdly**, they performed an experimental setup, which the authors' proposed model obtained by slightly modifying the existing MLP-NN model. Their model consists of two hidden

layers, with 20 neurons in each layer. They claimed that they tried different activation functions in each iteration and chose the one which gave the highest accuracy.

**Provide a summary of the results**

The authors claimed that it is evident that the MLP-NN is able to classify the data more accurately and that their proposed model which combines feature selection with MLP-NN (MLP+FS) is able to achieve a similar accuracy rate.They provided heat maps that shows their results that shows selecting a subset of features based on correlation will not only reduce the dimensions of the input but also improve the accuracy of the classification whether the software module is buggy or clean.

**What is the conclusion of the author/s and provide your own recommendations on the paper**

The authors conclusion is that the MLP model combined with feature selection offers a better solution for predicting errors in software modules. They concluded that the research provided a multi-filter feature selection-based classification framework for software defect prediction. They also made sure that for defect prediction, the structure uses a synthetic neural network (MLP). They concluded that the use of oversampling technique is also used in the structure to analyze the effect of the class inequality problem on classification performance

**2nd Scientific Paper:**

**Title:** Cataract Detection Using Single Layer Perceptron Based on Smartphone

**Author/s:** Riyanto Sigit, Elvi Triyana, & Mochammad Rochmad

**Date of conference:** 29-30 October 2019
**Title of publication or conference proceeding:** 3rd International Conference on Informatics and Computational Sciences (ICICoS)

**What is the problem being solved in the research?**

The problem being solved is identification of cataract disease to humans. Since cataracts are a leading cause of visual impairment and blindness in Indonesia and even in the world. In addition, Early detection of cataracts is known as the main setting in resisting the increase in the amount of blindness caused by cataracts.

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**What is the proposed solution of the author/s?**

The author/s proposed that they will detect a cataract using a smartphone that is equipped with a single layer perceptron method that was then used to determine the classification results in the form of normal eyes, immature cataract eyes and mature cataract eyes. Based on the results of research conducted, this cataract detection system has an accuracy of 85%.

**How did the author/s solve the problem/s? Provide a summary of the methodology**

They begin with image capture using a camera or gallery from a smartphone and preprocess it and crop in the pupil area to perform a median filter in order to get a circular shape on the pupil of the eye. They used the segmentation stage to determine the location of the pupil of the eye Via loop detection that implements a canny edge detection, followed by cropping the image on the circle using Hough circle transform, then use the feature extraction stage to obtain the features of the pupil which they can use to identify the mean intensity and uniformity. Lastly, is the classification using Single Perceptron. Wherein cataract classification will use the Neural Network Single Layer Perceptron method, with 3 eye conditions that will be detected. Which gives three types of cataracts in the eye: Normal, Immature, and Mature.

**Provide a summary of the results**

As a result, they finally identify whether the person has a cataract that is either mature, immature, or normal. They presented data which gives 8/8 success rate in determining normal eyes, 6/7 success rate in determining immature cataract in the eye, and 3/5 success rate in determining the mature cataract in the eye of the patient. They tested it successfully on 20 patients. However, they claim that failure in detection is due to eye capturing, since some of the patients are having difficulty following the instructions to open the eyes appropriately so that the pupils look clear and intact so that the pupils are not wide open and closed by the eyelid. Also, they claim that the light factor will also affect the results of detection.

**What is the conclusion of the author/s and provide your own recommendations on the paper**

The authors of this paper and project, conclude that they have successfully developed a cataract detection device using a single layer perceptron. They claim that they were right in the preprocessing techniques they implemented to the images. They conclude that the segmentation that they have done in this project is a complete success in terms of performance. In addition to that, feature extraction and classification stages are also right and give a successful result, providing 85% in accuracy.