**Stage 3**

**Project Report**

**Proposed Title**: Classification of New Mexico Chile pepper plant disease using Multilayer Neural Network model.

The severity of diseases caused by pathogens varies from mild symptoms to decline of the infected plants, depending on the aggressiveness of the pathogen, host resistance, environmental conditions, duration of infection and other factors. Plant disease symptoms vary with the infecting pathogen and the infected part and can include leaf spots, leaf blights, root rots, fruit rots, fruit spots, wilt, dieback and decline.

Worldwide, per capita availability of food is projected to increase around 7 percent between 1993 and 2020, from about 2,700 calories per person per day in 1993 to about 2,900 calories. This is gradually becoming a mere dream because of plant disease which reduces yields. This implies plant disease have both direct and indirect impact on health, food security and economic growth of every nation. Since plant diseases are strongly influenced by environmental factors, it will be unrealistic to talk about all plants and all diseases (they are heterogenous). Chile is one of the most popular and promising grown plant in New Mexico.

New Mexico is the nation’s largest Chile pepper grower, followed by California, Arizona and Texas. It is obvious that Chile farm and produces are insufficient as about 80 percent of the Chile peppers consumed in the United States are imported, largely due to lower hand labour costs, lack of adequate funds and disease control.

**Machine learning as a tool for plant disease(s) detection**

Accurate and early identification is essential in tracking plant disease. Initially, the identification of plant diseases solely relies on visual examination. The process is not efficient and is also prone to human error. For a trained computer with classifier algorithms, diagnosing plant disease becomes easy and efficient. Machine learning algorithms recognize plant disease type, severity, and so on by sorting through hundreds to thousands of photos of diseased plants (Samuel, 2017).

The main

**Solution**: The goal of this project is to build a robust model and application using machine and deep learning approach for image classification. This will be achieved using keras package with python (by Francois Chollet and J.J. Allaire, 2018) with TensorFlow (by google, 2015 and updated January 2018) as backend.

**Objectives**: observe different machine learning techniques which can help to reduce overfitting and train a robust model. This will be done by considering data augmentation, regularization, with different iterations. The data will be splitted into three namely Training, Test and Validation.

**Society Impact:** Automatic detection will help in bringing cost of detecting plant disease to the beariest minimum for adequate preventive measures and control.

**Methods**

**Data set Description.**

The considered pathogenic disease affect Chile plant stem and thereby block both water and nutrient intake for leaves. This study recognizes area base effect on intensity values of images, thereby uses images peculiar to the area of New Mexico state. 3002 images were collected between May and August of the year 2018 and 2019. The images with two class labels namely “Disease” and “Normal” were analyzed with CNN using python 3.6 software. Images were resized to 50 x 50 pixels and model normalization; optimization and predictions were performed on these downscaled plant images. The dataset was analyzed with three color channels options. Throughout the modelling process, Epoch values of 15 and 30 were considered.