Severity Analysis of Plant Diseases Using Deep Learning And Understanding Patterns Using GradCAM

## Problem

The Irish Famine 1845/46 was primarily caused due to a potato plant disease named Potato Late Blight. Our understanding and knowledge of nature was questioned when single plant disease caused millions of damage and killed approximately one in every eight irish people alive at that time. Despite all the existing modern agricultural technologies present, the world is still facing huge amounts of losses due to plant diseases and insect infestation. It might be thought that a lot of Plant Protection Products (PPPs) can be used to tackle this problem, where PPPs include herbicides, fungicides and insecticides. Depending upon the amount of PPPs used for agriculture, it can cause serious health effects for the individual consuming those vegetables. Since the time of spreading PPPs doesn't remain fixed, farmers have to continuously monitor his farm and each plant individually as well which is a very tiresome task. So farmers of today's world needs a smart monitoring system which should also include computer vision based plant health monitoring system which can be additionally integrated to mobile phones or drones for efficiently monitoring crops and plants

## Solution

A lot of remote sensing based solutions exist where we have to put a grid of sensors in our farm land to monitor soil contents, data collected from which reflects partial plants health based on soil analysis. Coming to plant leaves pathologies, there are several ways to do so. Many of the plant diseases show early characteristics in the visible spectrum, So farmers either examine them manually with naked eyes or capture images in mobile devices and send them to plant disease pathologists for advanced examination, which is a costly, time taking and cumbersome process. Mostly existing plant diseased leaf classification softwares uses traditional image processing methods. Very few deep learning based systems exist in the market which are using traditional outdated models like AlexNET and VGGNets and they perform better as compared to image processing based models.

## Value Proposition

Image Processing based methods are very slow and are highly susceptible to environmental conditions, and existing solutions are using outdated deep learning models thus there is a great scope of improvement lies in their performance and accuracy. Additionally, to train new plant pathologists deep learning can be very useful. Using GradCAM or Lime activation maps pattern of any new images can be viewed which will not just help in classification but can also explain the reason for classification using activation maps, thus bringing in the much needed explainability of CNN model. I have planned to develop and test my models on the PlantVILLAGE dataset consisting of approx 54,000 images of different plant varieties, thus the model will be very well generalised as well.