**Project Specification Document**

<<Troubleshooters 101>>

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**Table of Contents**

Section Page

[1.](#_gjdgxs) Project Vision and Objectives 1

[1.1](#_30j0zll) Project Scope and Vision 1

[1.2](#_1fob9te) Project Goals and Objectives 2

[2](#_3znysh7) Project Planning 3

[2.1](#_2et92p0) Project Lifecycle 3

[2.2](#_tyjcwt) Project Setup 3

[2.3](#_1t3h5sf) Stakeholders 3

[2.4](#_2s8eyo1) Project Resources 4

[3](#_3rdcrjn) Requirements (User Stories) 5

[3.1](#_26in1rg) Overall Description 5

[3.2](#_lnxbz9) Users and Roles 5

[3.3](#_1ksv4uv) Use Case Diagrams 6

[3.4](#_44sinio) User Stories (Requirements) 6

[3.5](#_2jxsxqh) Constraints and Limitations 13

[Definitions and Acronyms 14](#_z337ya)

# Project Vision and Objectives

Project Scope and Vision

## Agricultural Scientists have been struggling to identify crops using satellite imagery since many years. We intend to solve this problem by identifying different types of crops with minimum resolution of 20m by the end of this semester. Agricultural scientists(Client) will be able to work on the extracted and processed data which this application will provide . Currently we are able to identify diseases in plants using normal imagery and we intend to achieve the same goal using the spectral satellite images in future, which will be a major milestone in satellite image processing as well as agricultural data processing in the given global scenario.

## Project Goals and Objectives

|  |  |
| --- | --- |
| **#** | **Goal or Objective** |
| 1 | Make the system extensible – future updates like epidemic prediction can be done easily |
| 2 | Make the system easy to support – provide good documentation, configuration/build files, administrator’s manual |
| 3 | Make the system reliable and provide better quality cdl outputs. |
| 4 | Have fun working on the project |

# Project Planning

## Project Lifecycle

The team will use an agile approach. Our team will gather requirements and create a high level development plan at the onset of the project and then implement the gathered requirements over ten iterations. The team will follow a SCRUM-like approach with an emphasis on frequent meetings and collaboration.

## Project Setup

|  |  |
| --- | --- |
| **#** | **Decision Description** |
| 1 | Windows 10, python, gdal, keras, tensorflow, thenao, Git,Google Earth Pro , Sentinel,Landsat-5,Landsat-7,Landsat-8, etc. |
| 2 | Image Resolution of at least 20m. |
| 3 | Special access privileges needed for dataset collection. |

## Stakeholders

|  |  |
| --- | --- |
| **Stakeholder** | **Role** |
| Person A | Dr. Kuldeep Chaurasia |
| Person B | Navya Singh |
| Person C | Priyam Ladha |
| Person D | Nishant Phour |
| Person E | Sadaf Shaikh |

## Project Resources

|  |  |  |
| --- | --- | --- |
| **Resource** | **Resource Description** | **Quantity** |
| Exclusive Softwares | Exclusive softwares required for processing satellite imagery. | 2 |
| Capstone Team | Our team of students who will be the primary developers of the project. | 4 |
| Dr. Kuldeep Chaurasia | The mentor who will be able to provide us with technical assistance. | 1 |
| Satellite Data | A set of cdl imagery with satellite data. | 1(set) |
| Working Laptop | A Laptop to be used as test hardware for the GUI(Laptop) version of the software. | 1 |

# Requirements (User Stories)

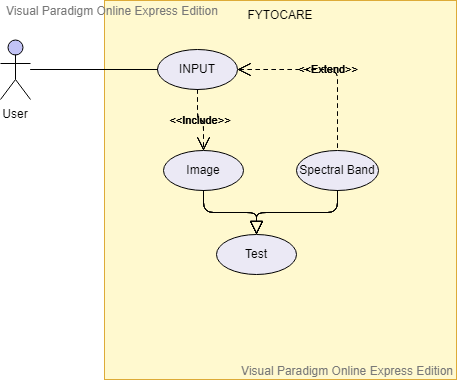
## Overall Description

This project is an attempt to apply data science and machine learning techniques to identify the crop regions and Creation and generation of the labelled and coloured map, for this a gui will be created where at least 6 input images( ideal is 7) will be given for the processing of data wherein the data will be processed.

Users and Roles

|  |  |
| --- | --- |
| **User** | **Description** |
| Developer | A capstone team member or mentor who is tasked with managing the test data, creating initial machine learning models, and ultimately generating a firm process for applying these techniques to future user data. This is used for sub-stories and task needed to fulfill the true end user use cases. |
| Program Manager | A manager who is working on developing the model application who will be making design decisions based on the data analysis and showing the output (i.e. creation of GUI). |
| End User | An end user of the product who will be generating the data used and reaping the potential efficiency benefits from the data analysis when designing the application. |

## Use Case Diagrams



## User Stories (Requirements)

|  |  |  |
| --- | --- | --- |
| **ID** | **Feature name** | **Story points** |
| 5 | Input at least 6 or max 11 band images into the GUI to be processed | 2 |
| 4 | Crops regions and types of crops should be identified and the model should learn accordingly. | 8 |
| 10 | Generating and analysing the output images. | 4 |
| 17 | Creation and generation of the labelled and coloured map | 6 |

**SPRINT 1**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **ID** | **Added** | **Description** | **Status** | **Story Points** | **Actual Equivalent Story Points** | | **% Completed** |
| 100 | Onset | ***As a*** *system,*  ***I want*** *to be able to preprocess satellite imagery ,and feed it into my model through a GUI and process it*  **S*o* that** *I can feed the data into the model and extract useful information from that.* | **C** | **2** | **3** | | **100%** |
| **Acceptance Criteria** | | | **Verification** | | | | |
| 110 | A user has to submit at least 6 spectral bands and max 11 bands in the form of images to be fed into the system so that it can be processed | | Create a test case to verify the image has at least 6 or max 11 bands. | | | | |
| 111 | The images should be in “.tif” format | | Create test case to verify images are in “.tif” format | | | | |
| 112 | The images should have at least 20m resolution in terms of satellite imagery . | | Create test case to verify to check if image resolution is less than or equal to 20m | | | | |
| 113 | The image must not be pixelated or cloudy for it to be processed properly and should be ideally in the size of (2^n X 2^m : height and weight ::optional can also have an RGB Band) | | Create test cases to verify that image is in the size of 2^n X 2^m : height and weight ::optional can also have an RGB Band. | | | | |
| **ID** | **Tasks** | | | | | **Resource** | |
| 1 | preprocessing of data ( resizing , stacking the images and making a list of one : i.e. actually merging all the input images into one ) so that it can be fed into the model for processing and extraction of data . Improving the accuracy of the model by using different networks and tuning them so that the CDL(ground truth) can be generated for the generation of coloured and labelled map for viewing | | | | | Navya Singh | |
| 2 | Reading the images through gdal and processing large dimensional images into smaller and multiple images. Creation of dataset. | | | | | Priyam Ladha | |
| 3 | Feeding the image to the model by providing user interface to the user. | | | | | Nishant Phour | |
| 4 | Fine tuning all the models and preprocessing and stacking of data. Creation of dataset. | | | | | Sadaf shaikh | |

## Constraints and Limitations

|  |  |
| --- | --- |
| **Constraint** | **ID** |
| Team will not provide alternate data-bands for processing.( There has to be atleast 6 bands for processing the data as an input from the user.) | 100 |
| Generated ground truth will not be 100% accurate but it will be very close to generating actual ground truths. | 101 |
| Team will use python(GDAL,keras ,tensorflow/theano etc.) for preprocessing , model creation and data extraction of the images. | 120 |

# Definitions and Acronyms

|  |  |
| --- | --- |
| **Term** | **Definition** |
| GDAL | The Geospatial Data Abstraction Library is a computer software library for reading and writing raster and vector geospatial data formats, and is released under the permissive X/MIT style free software license by the Open Source Geospatial Foundation. |
| CDL | Crop Dataland Layer Data describing the cultivated area, the crops grown and yield in the different regions in satellite imagery |
| Microsoft Azure | Microsoft’s cloud computing platform that houses modules such as Azure ML (Machine Learning) and Azure HDInsights (Hadoop). |