**Crop Load Estimation**

**Project Goal**

The goal of this project is to develop a system to detect, count, and estimate the size of mature and immature Citrus on trees to produce early-season yield predictions for Citrus orchards.

**Objectives**

The specific objectives of this project are to:

1. Develop a method for detection of citrus on trees at various levels of maturity and varying light conditions.

2. Develop a fruit counting system built on a CNN fruit detector, and a multiple object tracking algorithm in order to count unique fruit detections on images.

3. Evaluate the resulting counting system in the field by measuring the performance on citrus of various canopy depths and varying levels of fruit maturity by comparing estimated yields by the developed algorithm to actual yield measured at harvest.

**Methodology**

**Dataset Collection**

For the mature stage, a set of images of tree fruit canopies will be collected from the PARS orchards. These data will be collected on mature, nearly mature and fully mature citrus. Images will be recorded under both overcast and sunny lighting conditions. The dataset will be largely non-discriminatory in regard to choice of trees to be included; a wide range of cultivars will be included at varying tree sizes with several different tree architectures.

**Fruit Detection**

There are two key challenges in object detection. Each object in an image must be correctly identified, and its boundaries accurately described. To achieve these tasks a convolutional neural network (CNN) is used for identification. For this application, a dataset consists of a set of images, and corresponding annotations which define the position of each apple in the image via a rectangular bounding box.

**Final Product**

Final Product will be an Android mobile app that takes an images as an input and counts the citrus.