

# Agrilyze: Soil analysis for agricultural insights

*This project was completed in the fulfillment of the final year mechatronics capstone course.*

## Team

Name	Role
Jonathan McIntyre	Product Owner
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## Project Description

Farmers wish to fertilize their soil to improve yield. However, excess manure at wrong times, such as rainy seasons, leads to environmental pollution. E.g. The pollution of the shared Abbotsford-Sumas aquifer. Regulation attempts to combat the pollution by using blanket restrictions on fertilizer application based on the changing seasons.

- Thus, farmers and authorities need to know the quality of soil for the following reasons:
  1. For farmers to prove to authorities that they adhere to regulations
  2. For farmers to better inform their agricultural activities
- But current soil sampling techniques, require cores to be taken and sent off to labs whose results return months later.

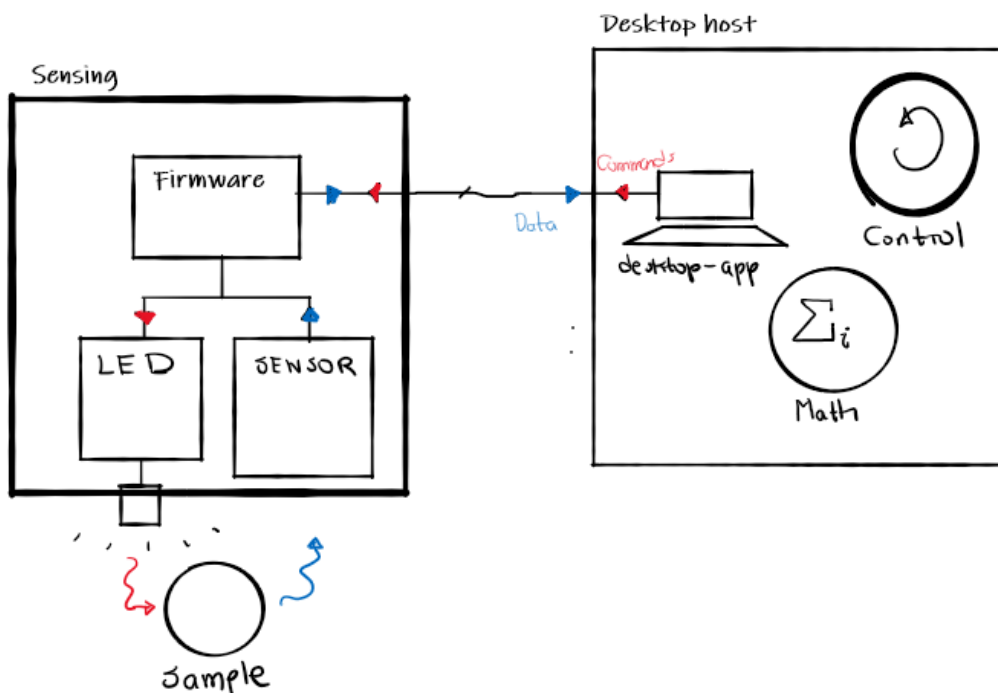
**Our task:** To provide a faster method for a farmer to analyze their soil samples, by themselves.

# Theory

- NPK is found in various quantities in soil
  - Soil and commercially available soil test tablets mix to produce different colors of different intensities according to the amount of each nutrient.
- Spectrometry is a well-known method of optical analysis.
  - Full spectrum light is shone through a colored sample
  - The absorbance profile of the colored sample can be generated by the Beer-Lambert Law because some wavelengths are absorbed more while others are transmitted.
  - Based on empirically calibrated absorbance values for each nutrient, the amount of each nutrient in a soil sample can be estimated with higher levels of speed and accuracy.

# Implementation

## Overview



## Technologies Utilized

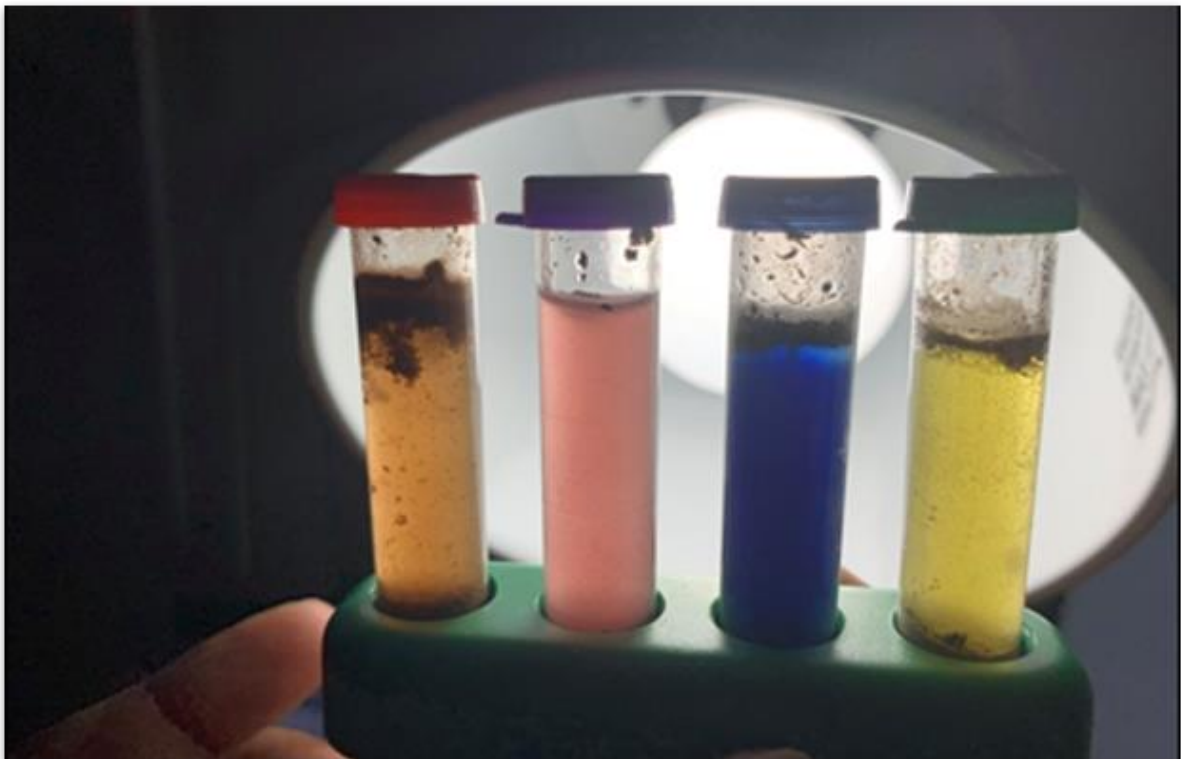
### Electronics:

- Arduino
- AMS AS726x Spectral sensor
- Super white LED

### Interface:

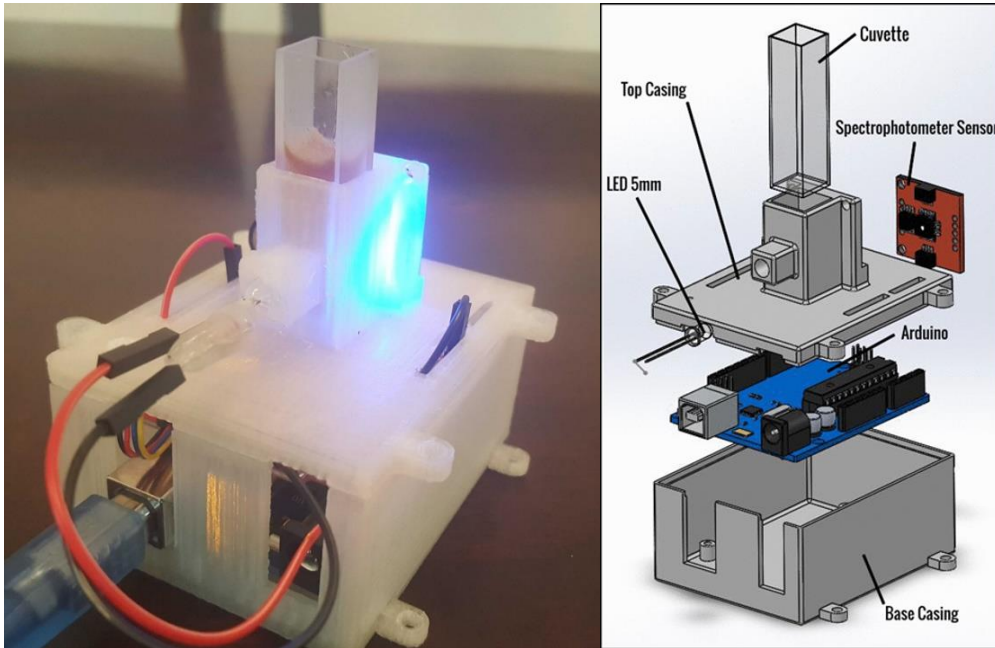
- Python3
- PyQT5
- Pyserial
- Matplotlib

## Sample Preparation



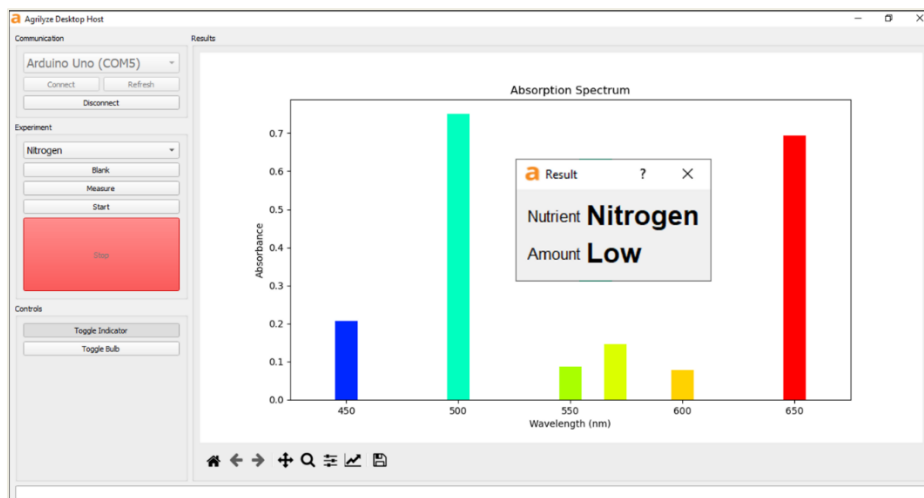
- A soil test kit mixes with the same sample to produce different colors based on the nutrient being tested
- Blue – Nitrogen, Purple – Phosphorus, Orange - Potassium

## Physical setup



- Structure to pass light directly from the source through the sample and into the sensor.
- Sends spectral data over the serial port.

## Software interface



- Orchestrates the program execution
- Receives spectral data from the sensor and estimates the nutrient amount