SpaceMonitor
Team: 2B || I2B

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Problem Description:
Farms are trying to make the most efficient use of their resources, but there could be room for improvement. Inefficiencies not only waste water and resources but also contribute to climate change. Therefore, a cheap and accessible method for evaluating efficiency of water usage should be provided to farms in order to help them identify and execute on areas in their crop fields that excessively use water. There does not seem to be any existing solutions that use geospatial remote sensing data to find areas where water use across crop fields is not uniform and water use is relatively high for the specific crop.

Why is it important:
- Inefficient use of water and energy contributes to climate change
- Reduce cost of agriculture
- Minimize the effects of drought and water shortages
- Farms are under pressure to comply with state water regulations, especially in droughts.
- More efficient use of farming yields more crops, helping disadvantaged California communities
- Starting on a small scale of affected farmers, the project leverages machine learning techniques to solve practical problems in agriculture that may be scaled to larger problem instances in the agriculture industry

Current Existing Solutions:
- Efficiency evaluations are typically done by going to the field and manually look for irrigation issues. Groups that do this include field crews and Resource Conservation Districts (RCDs)
- Drones are used to take images of farms and send the data to recommendation engines, where an AI determines how to best improve efficiency on a farm
- Sensors in water tanks detects blockages and leaks and reduces the cost of lost water
- Monitoring manually by farmers: water recycling, soil management, weather apps alerts, newer more efficient equipment (irrigation, piping etc.)
Goals for our project:

- Use geospatial remote sensing data to find areas where water use across field is not uniform and water use is relatively high for the specific crop
- Create a low cost solution using machine learning and data science techniques to improve efficiency of money and resources
- More efficient use of water and energy will combat climate change
- The algorithm should be generic and applicable to any farm
- Output and organize the results in an easy-to-read website format
- Generate an annual report of inefficient resource use

Milestones:

- Sprint 1
  - Analyze the different data layers
  - Research the existing open source tools that we can leverage
  - Design the database
  - Make a mock-up of what the final product should do
  - Use of UML for system requirements modeling and design
- Sprint 2
  - Write down use cases/user stories
  - Begin design phase and build prototype (end-to-end framework)
  - Determine how each different data layer contributes to the project
- Sprint 3
  - Implement the design from sprint 2
  - Successfully test end to end functionality
- Spring 4
  - Finish minimum viable product
    - A basic working webapp
  - Create a UI

Technologies:

- Data Storage: PostgreSQL, Django
- Algorithm Development: QGIS, OpenCV, Pandas, Python
- Front End UI: React, Google Maps API

Strategy

- Daily scrum meetings
- Weekly meetings with mentor (Thomas and Olivier)
- Working demo at the end of every 2 weeks
- Use Trello board to divide up tasks
- Github for code repo and issue tracking