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Unlocking Insights into Crop Growth and Nutrient Distribution: A Geospatial Analysis Approach Using Satellite Imagery and Soil Data

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Unlocking Insights into Crop Growth and Nutrient Distribution: A Geospatial Analysis Approach Using Satellite Imagery and Soil Data

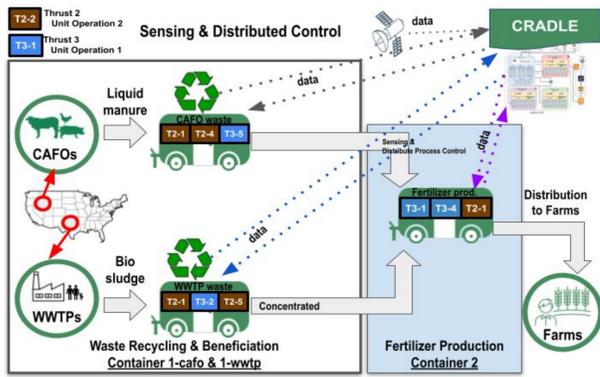
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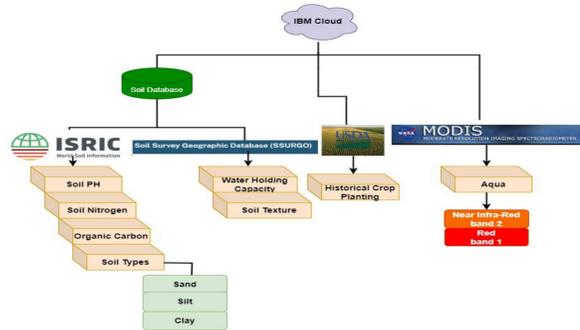


Introduction

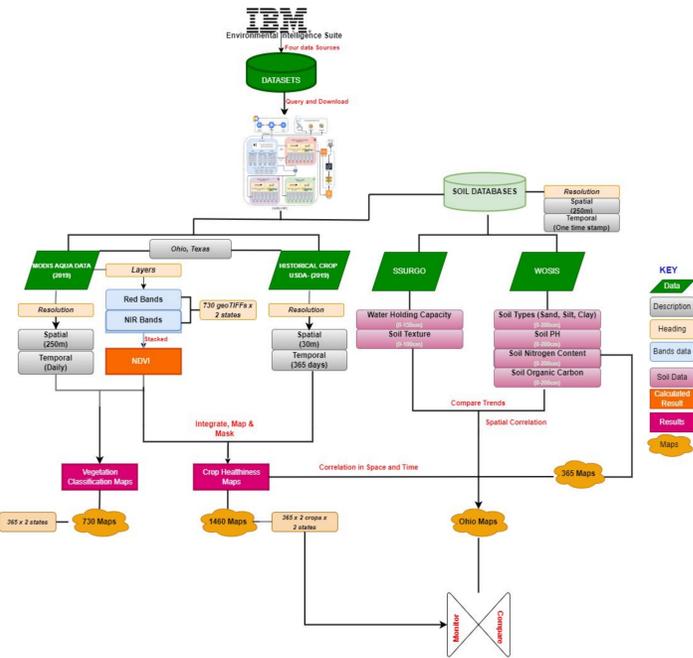


- Aiming to resolve the problem of land application and proper crop planting among farmers
- Mitigate continual runoff from CAFOs/WWTPs into streams.
- Geospatially locate where to position CASFER trailers

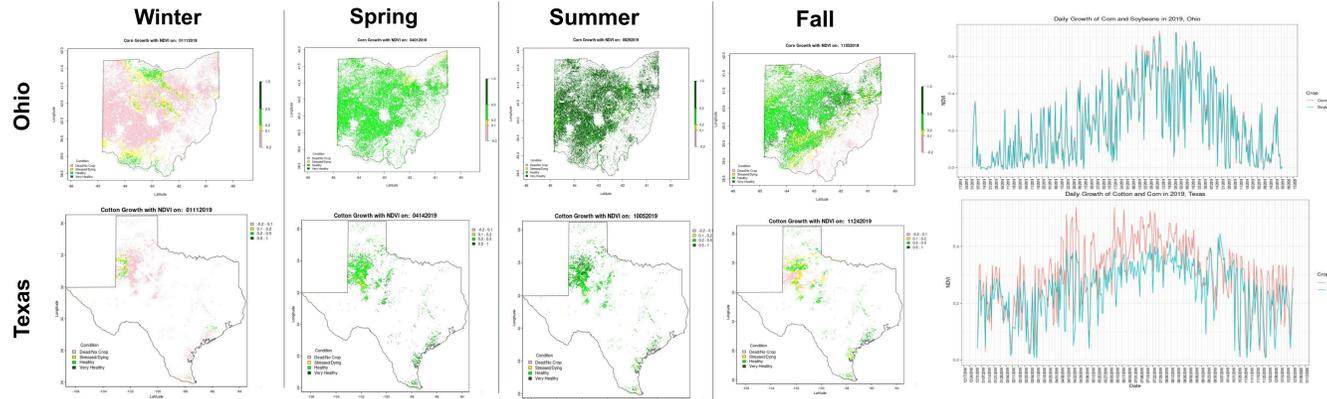
Datasets



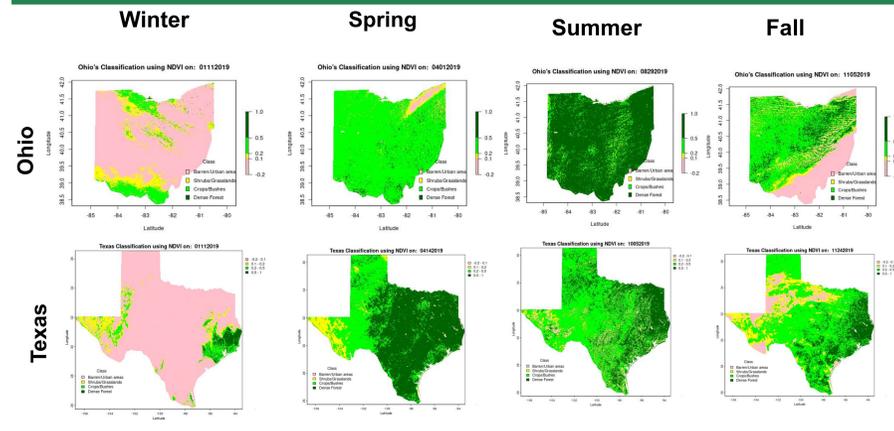
Methodology



Daily Crop Healthiness



Daily Vegetation Classification



Vegetation Index

- MODIS Aqua (red and NIR bands) were used to classify Ohio and Texas
- Classification is done with the calculated NDVI.

Normalized Difference Vegetation Index

$$NDVI = \frac{NIR - Red}{NIR + Red}$$

- Ohio: Corn and Soybeans
- Texas: Cotton and Corn
- The greenness of the crops vary with seasons, location and crop type.

Takeaways

- **Gains**
 - Recommendation for farmers on crops planting and getting the locations where crops are planted.
 - Monitoring metrics is needed in land application in pursuit of the nitrogen circular economy
 - More nitrogen accumulation/contamination in known areas (help to know where to position CASFER trailers)
 - Soil Nutrient Distribution:
 - Useful on when land application is appropriate
 - Knowing right crop, best soil and time to plant
 - Soil properties correlate with nutrient flow
- **Next**
 - Integrate weather, CAFOs, water and elevation data
 - Predictive models for Nitrogen-Based Fertilizers (NBF).
 - Explore other soil properties

Interdisciplinary Approach & EWD/DCI

Predictive models with allow to track, estimate and predict N and P flows in watersheds and

- Estimate how CASFER technologies with impact the migration of nutrients to water

Therefore this project is strongly connected to CASFER mission and it involves thrust 1, thrust 2 and thrust 3

- ACS Seed Program for low income high school students
- Undergraduate Students
 - Mentoring of high school students by Graduate students
 - Training, onboarding and integration
- Training and development of educational material for students from other universities/thrusts
- Data Science Bootcamps

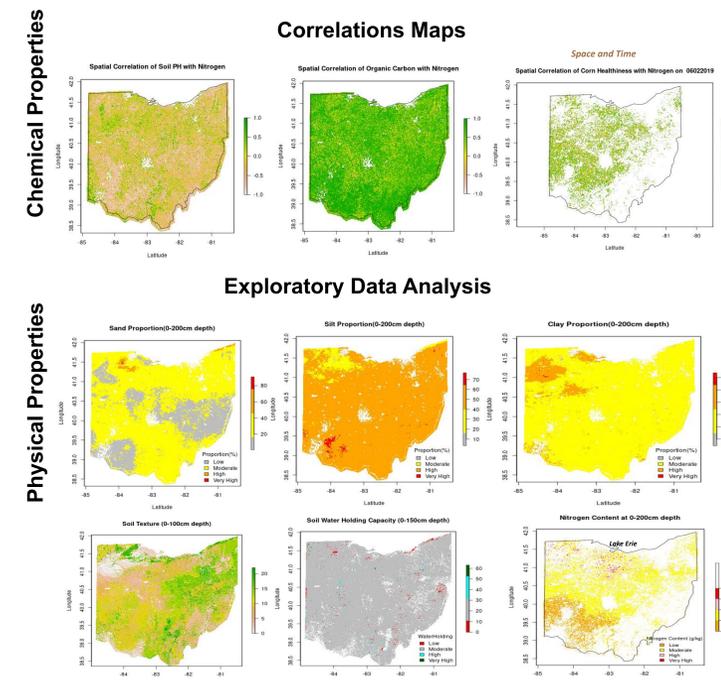
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Nutrient Distribution



Discoveries

- PH has negative correlation with Organic carbon, Crop Healthiness and Nitrogen
- Maximum Silt and Clay towards the Maumee Watershed
- More Nitrogen accumulation towards Lake Erie and Maumee Watersheds

Nutrients Flow

- Relatively low texture towards Lake Erie correlates with silt and clay available in that area
- Moderate Holding of water/nutrient across the state
- High Nitrogen accumulation in low elevation area

Thrust Interactions

