Space Plant Bioinformatics Aggregation and Visualization Matrix:

Public Engagement Application

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Quick Background

Ph.D. Student, Aerospace Sciences, Space Studies, UND

- **M.S. Biology, Clemson University**
- **Mission Science Specialist; Magnitude.io**
- **Astrobotany Research Program Coordinator and Biology Teacher; Osaka Prefecture Suito Kokusai Senior School, Japan**
- **AIRI, Program Director**
- **NASA Genelab Plant Analysis Working Group**

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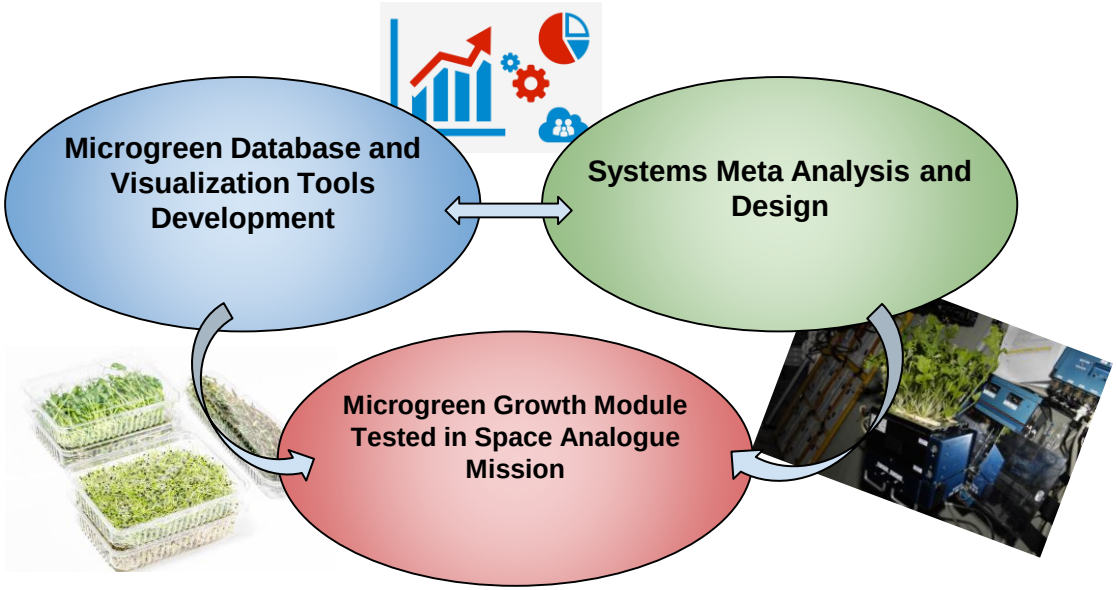
Ph.D. Research Focus

Plant Integration into bioregenerative life-support systems in space habitats

- **Particularly Microgreens**
- **Novel Growth Module**
- **Targeted Phenotypes**



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Space Plant Bioinformatics Aggregation and Visualization Matrix

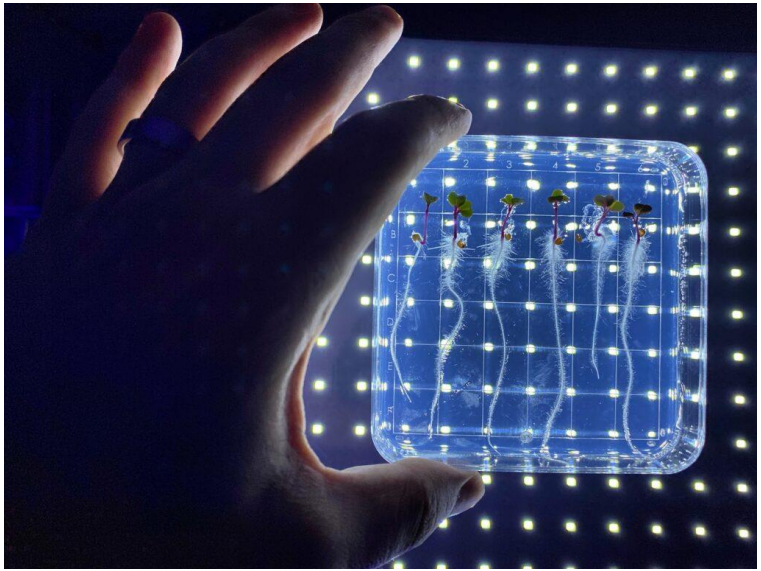
Objective:

Development of an open-source baseline bioinformatics database and visualization pipeline designed to identify ideal cultivars and methods through the analysis of the following criteria:

-Biomass potential based on targeted light treatments

-Root architectural morphological variation

-Phenomic developmental gravitropic variability induced by simulated microgravity cultivation



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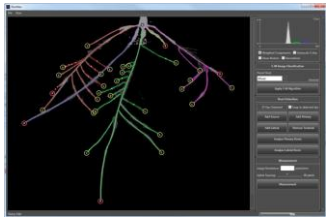
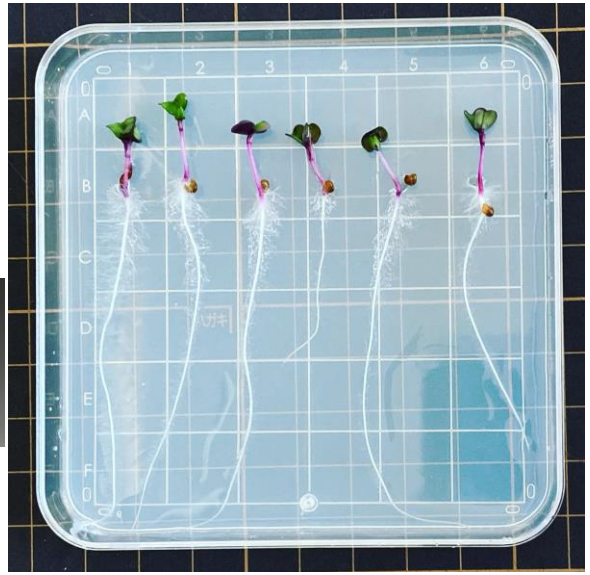
Step 1: Standardized Protocols

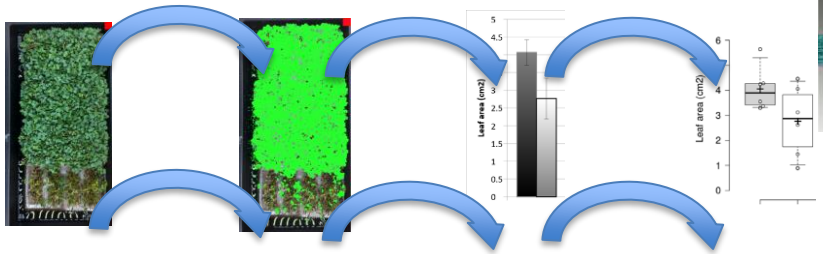
Protocols were developed and standardized in order to produce replicable investigations.

Stage 1: Biomass

Stage 2: Root Architectural Variation

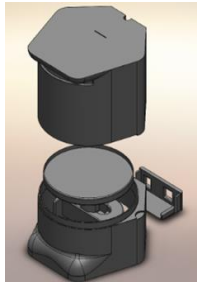


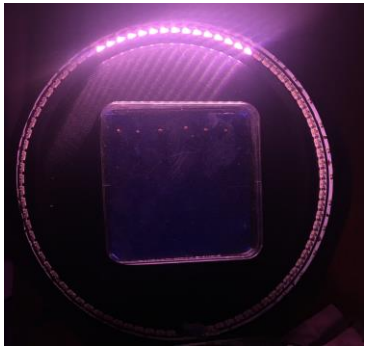




Step 1: Standardized Protocols

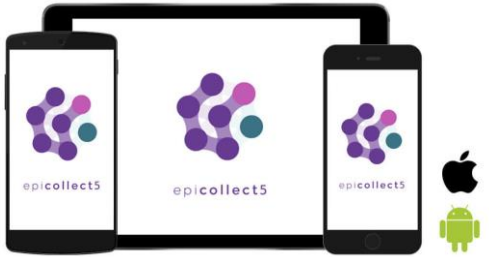
Stage 3: Targeted Microgravity Cultivation

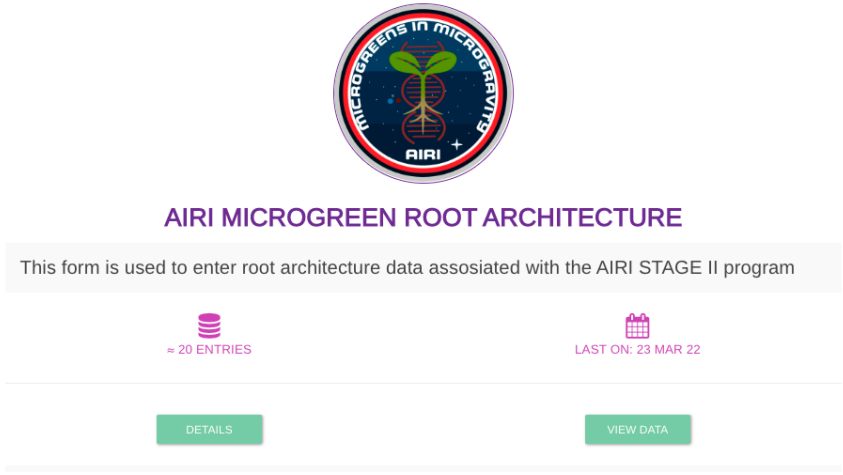


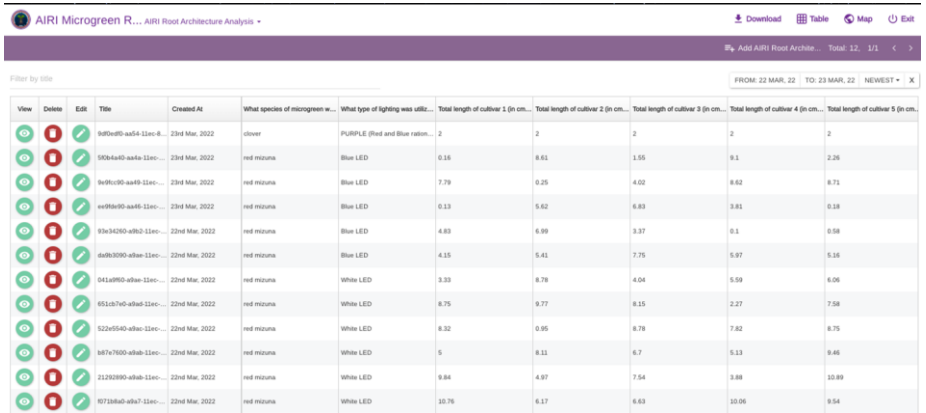


Step 2: Aggregation

A set of open-source, web-based data collecting forms were developed using epicollect5 associated with each protocol.



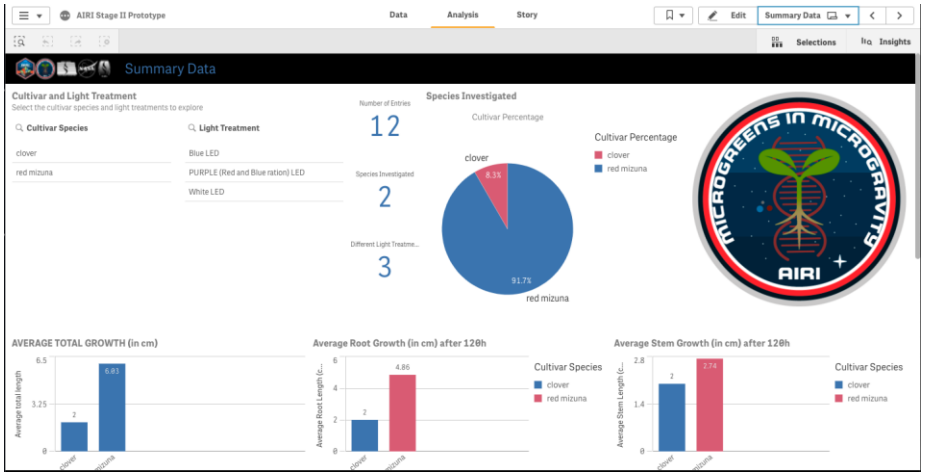




Step 3: Visualization

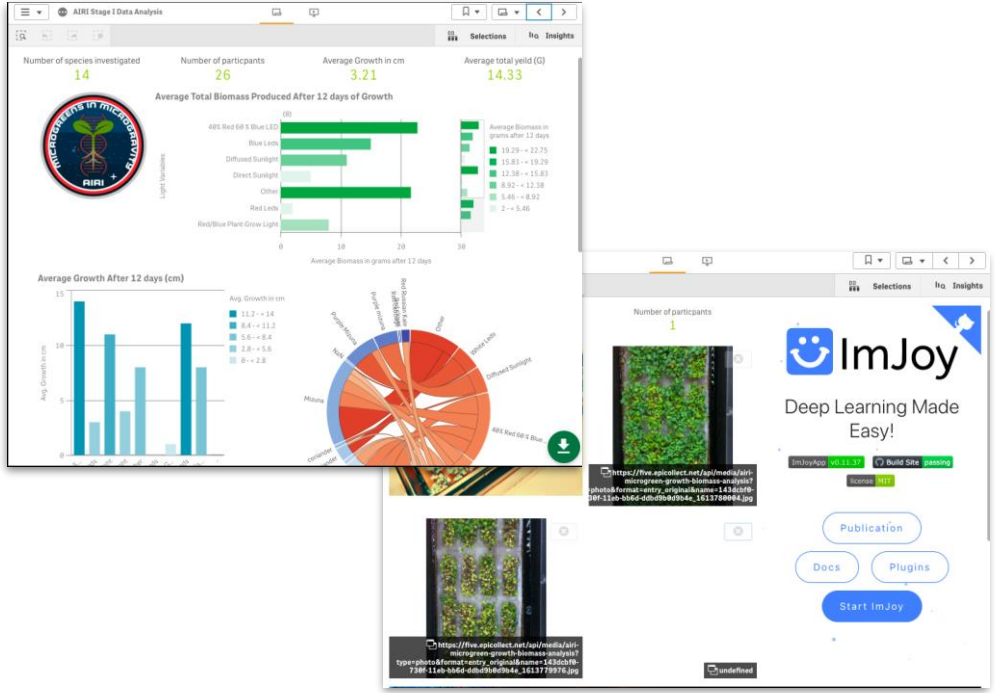
An interactive data analysis and visualization interface was developed using Qlik

- Variables in the data sets are able to isolated in order to identify possible trends associated with the investigative data sets.
- All data sets and visualizations are able to downloaded and shared.



Step 3: Visualization

- First step in machine learning pipeline able to identify various phenotypic variables autonomously through the association of data sets and images



AIRI: Astrobotany International Research Initiative

Open source astrobotany research platform that seeks to support ongoing space plant biology research through an interactive, collaborative space.

- **AIRI aims to engage researchers, academics, citizen scientists, university students, and K-12 educators and students in authentic astrobiology research**

www.astrobotany.com/AIRI

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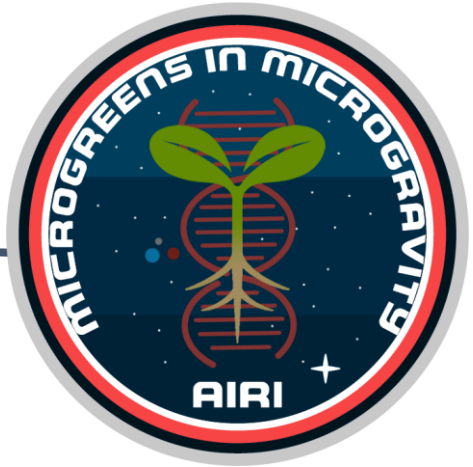
It all came together!



The program will go live in early summer 2022!

Next Steps

- **User Experience Trials utilizing the NASA TLX (Late April)**
- **Live launch online**
- **Publish**
- **Outreach**
- **Integration into future ILMAH missions at UND**

★ **<u>STEM Curriculum Development</u>**

Open Source Ethos

Goal for this program was to develop a tool to make space plant biology research…

- Accessible
- Applicable
- Scalable

Acknowledgments:

Thank you to
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