SUSTAIN

Spring Activity Week
28th of April – 2nd of May

UKRI AI Centre for Doctoral Training in Sustainable Understandable agri-food Systems Transformed by Artificial Intelligence (SUSTAIN)

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Objectives

1. Reinforce Computation Training for earlier Activity Weeks

2. Build Collaboration within Cohort (Group Activities)

3. Data Management Plan Training

Activity Week Schedule

	Mon	Tue	Wed	Thur	Fri
09:00 - 09:30		Focus Time: Hackathon	Focus Time: Hackathon	Focus Time: Hackathon	Focus Time: Hackathon
09:30 - 10:00					
10:00 - 10:30	Welcome & Hackathon	Hackathon Drop-In Clinic	Student Presentations	Hackathon Drop-In Clinic	Hackathon Conclusion (1
10:30 - 11:00					
11:00 - 11:30		Focus Time: Hackathon		Focus Time: Hackathon	DMP QA
11:30 - 12:00					
12:00 - 12:30	Lunch	Lunch	Lunch	Lunch	Lunch
12:30 - 13:00					
13:00 - 13:30	Hackathon - Group Acitivty	DMP Training	Student Presentations	DMP Task	
13:30 - 14:00					
14:00 - 14:30					
14:30 - 15:00					
15:00 - 15:30					
15:30 - 16:00					

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Hackathon

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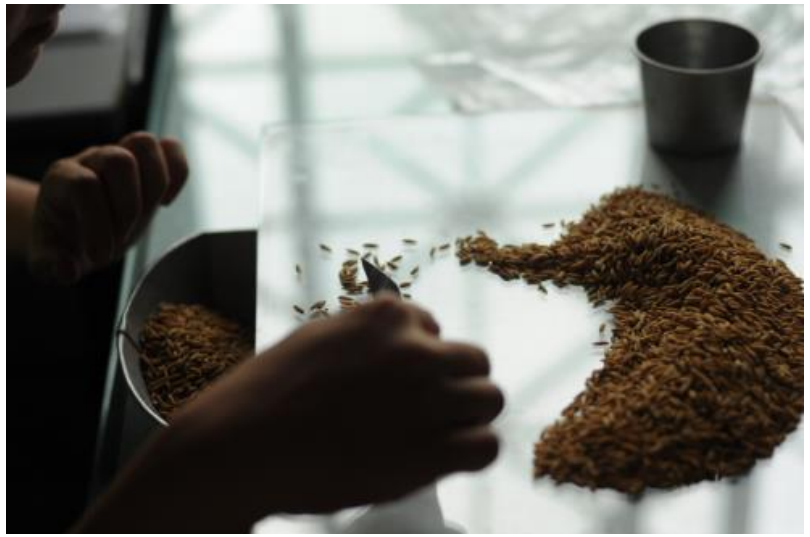
Rice Seeds

- *Vietnam is the world's 3rd largest producer of rice - Annual exports of $2.95 billion from 6.61 million tonnes in 2013.*

Verification Centres inspect rice seed to confirm varietal identity to ensure consistency, quality assurance, improve disease and pest management and comply with export standards

Conventional Inspection

- Manual, labour intensive process
- 1,000’s of species
- Limited sampling; 200 seeds per bag

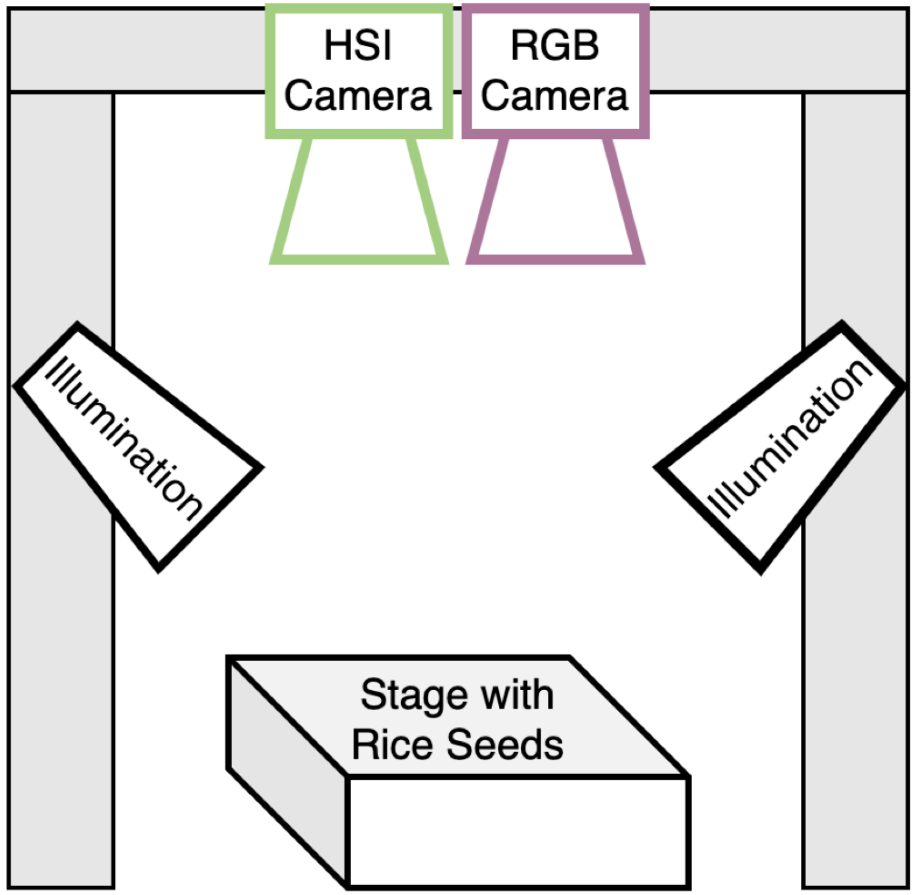


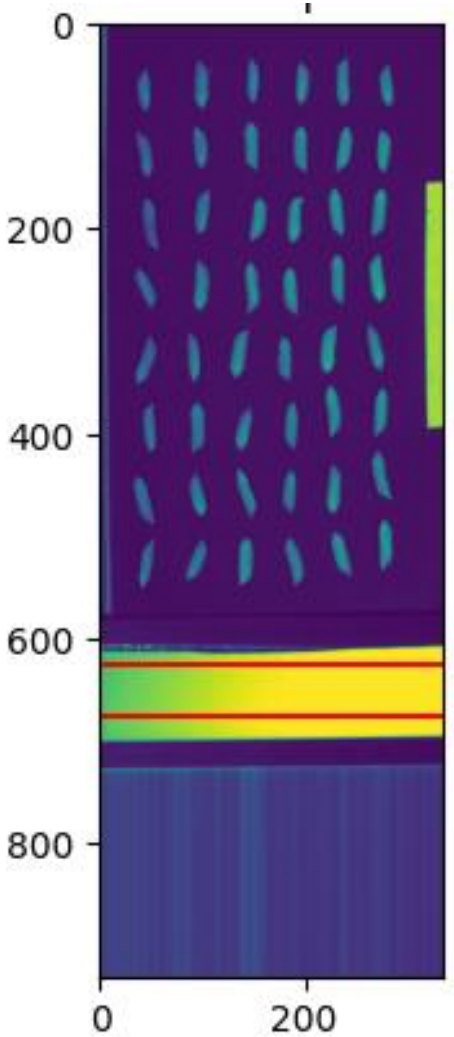
Dataset

- 8,640 rice seed kernels: 90 rice seed species and 96 kernels per
- Imaging systems:
  - Visible - Near Infrared (VIS/NIR) Hyperspectral Imaging Device System (~385nm - ~1000nm) consisting of a Specim V10E Imaging Spectrograph and Hamamatsu ORCA-05G CCD camera.
  - RGB - Fujifilm X-M1 with a 35mm/F2.0, ISO 400.

https://doi.org/10.5281/zenodo.3241922
Dataset already on Maxwell; see repository for full path
Partial Dataset (~1GB): https://tinyurl.com/hsi-partial
Research Article: https://doi.org/10.1109/ACCESS.2020.2969847

Automatic Inspection (Computer Vision)





Spectrum

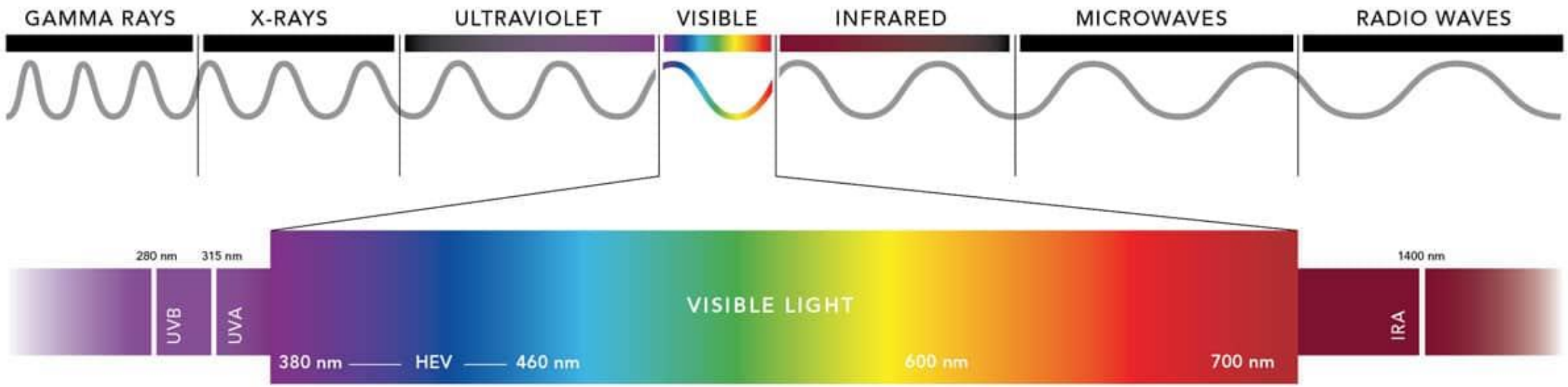


Figure 2-1. High-energy visible (HEV) blue light ranges from 380 to 500 nm. The blue light rays that border UV (at 380 nm) have the highest energy.

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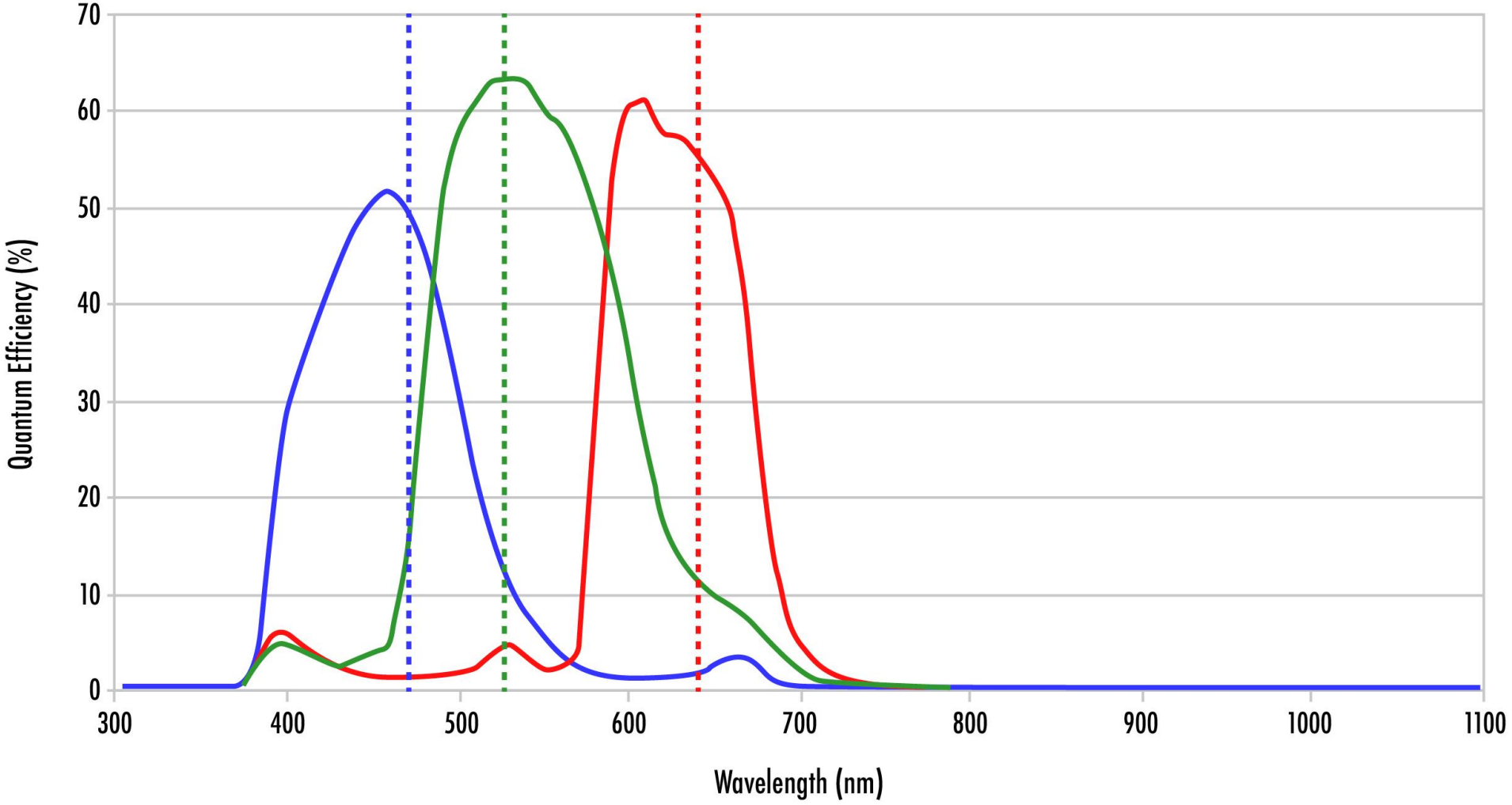
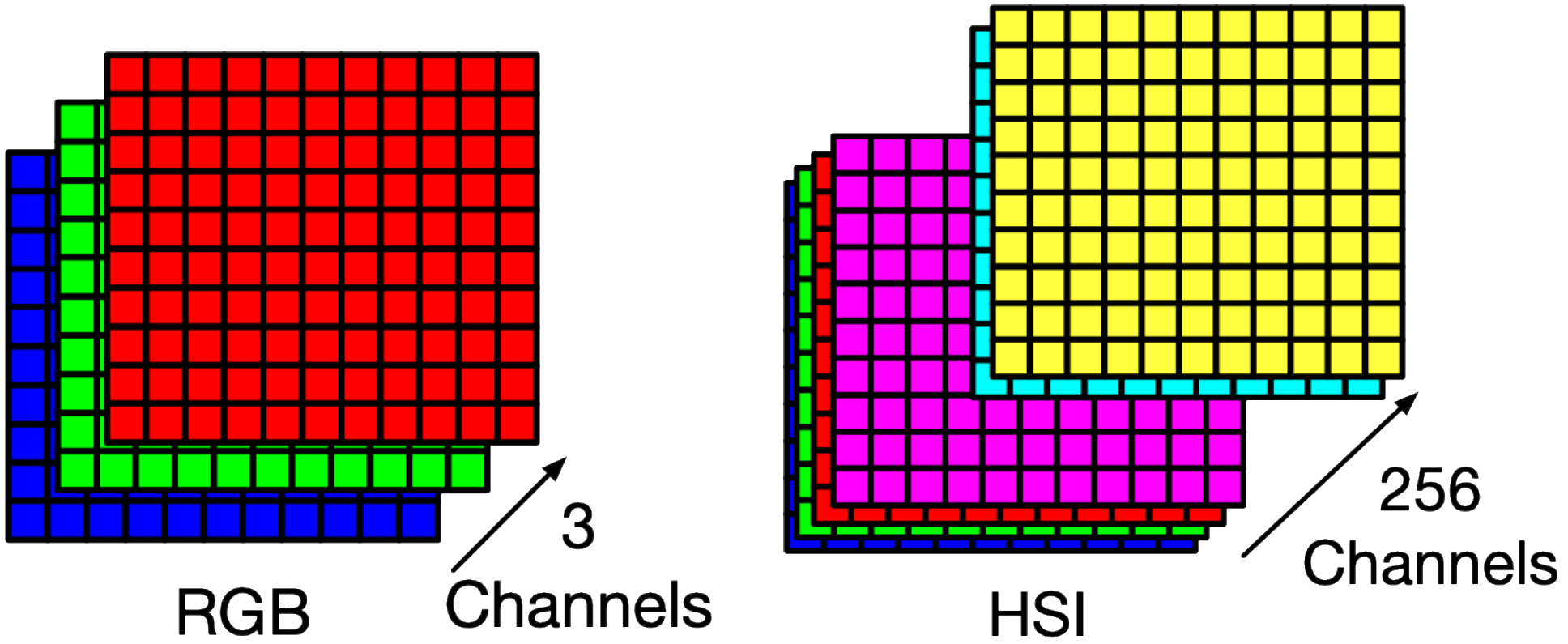
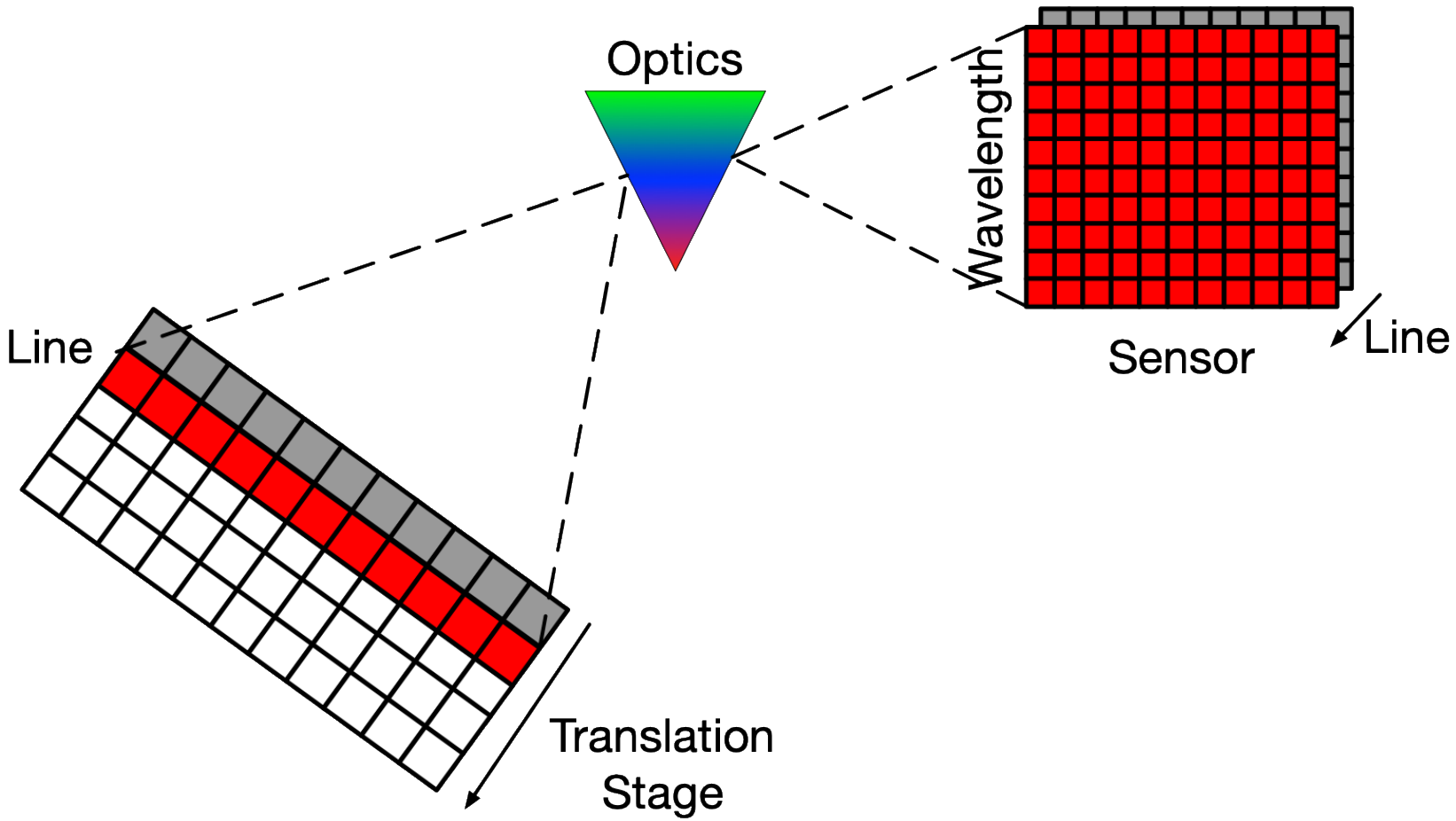
RGB


70
60
50
40
30
20
10
0
Quantum Efficiency (%)
300
400
500
600
700
800
900
1000
1100
Wavelength (nm)

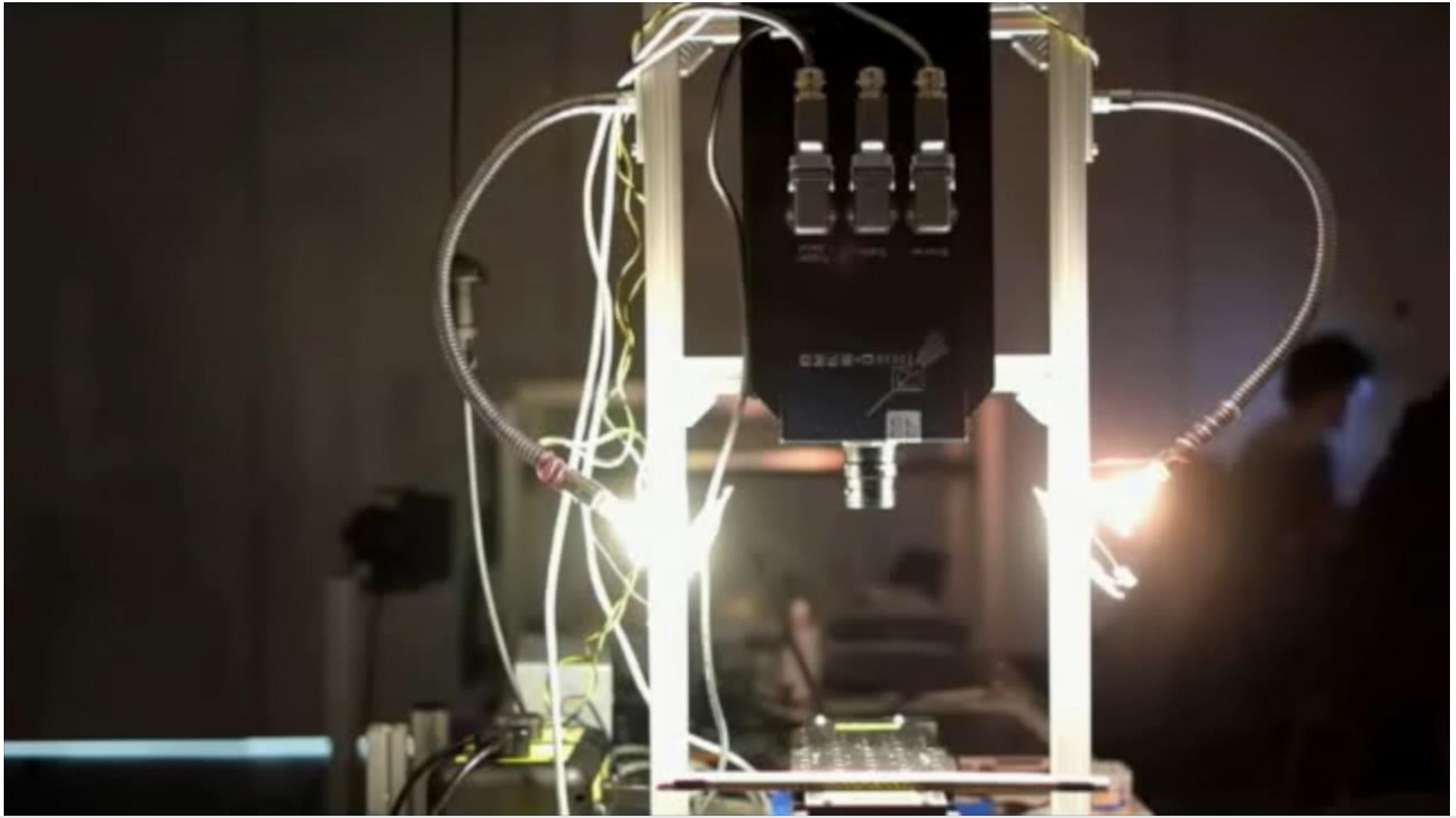
RGB vs HSI



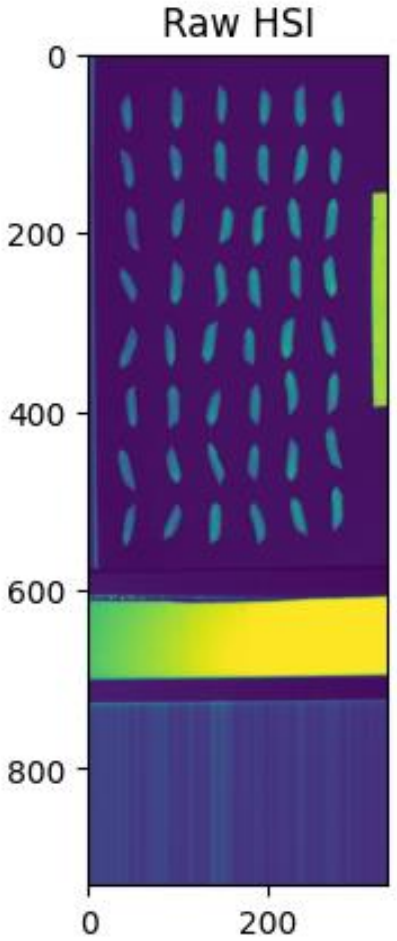
Push Broom Camera



Automatic Inspection

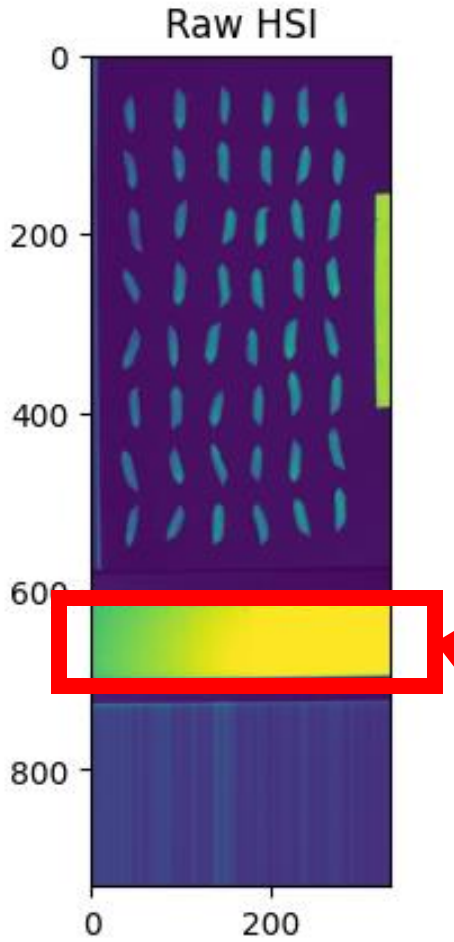


HSI Calibration



- Imbalanced illumination
- Correct sensor effects

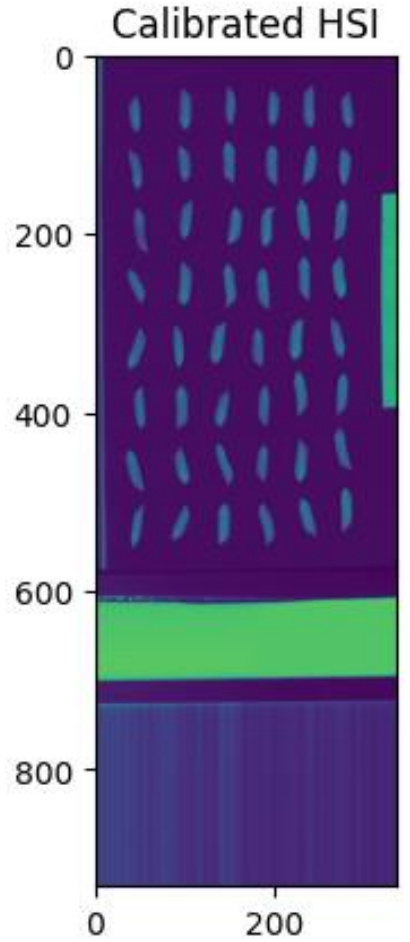
HSI Calibration



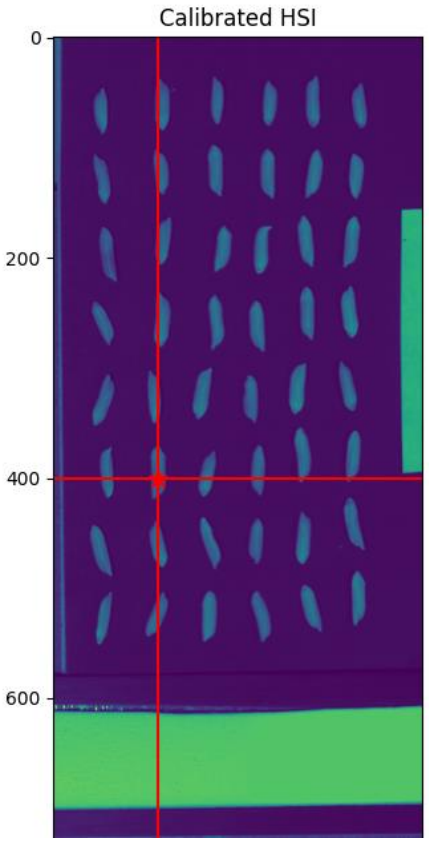
$$I_{\text{norm}} = \frac{I - I_{\text{dark}}}{I_{\text{white}} - I_{\text{dark}}}$$

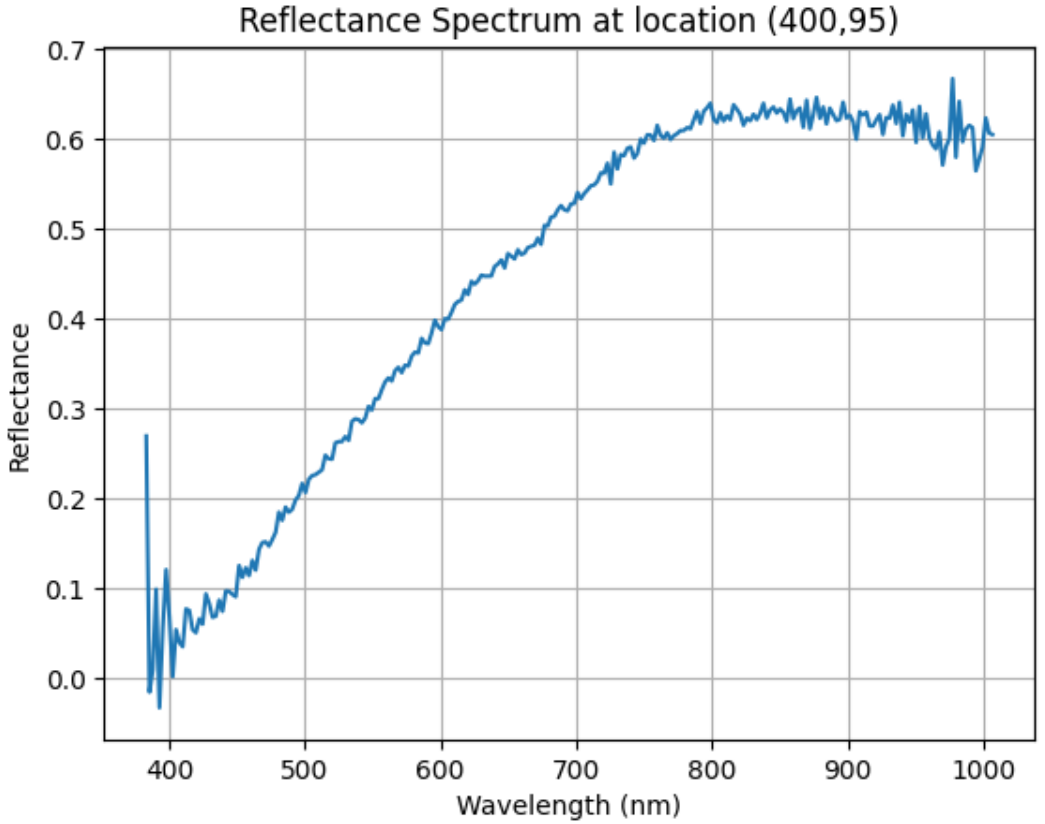
100% reflective Spectralon tile

Lens cap applied for black

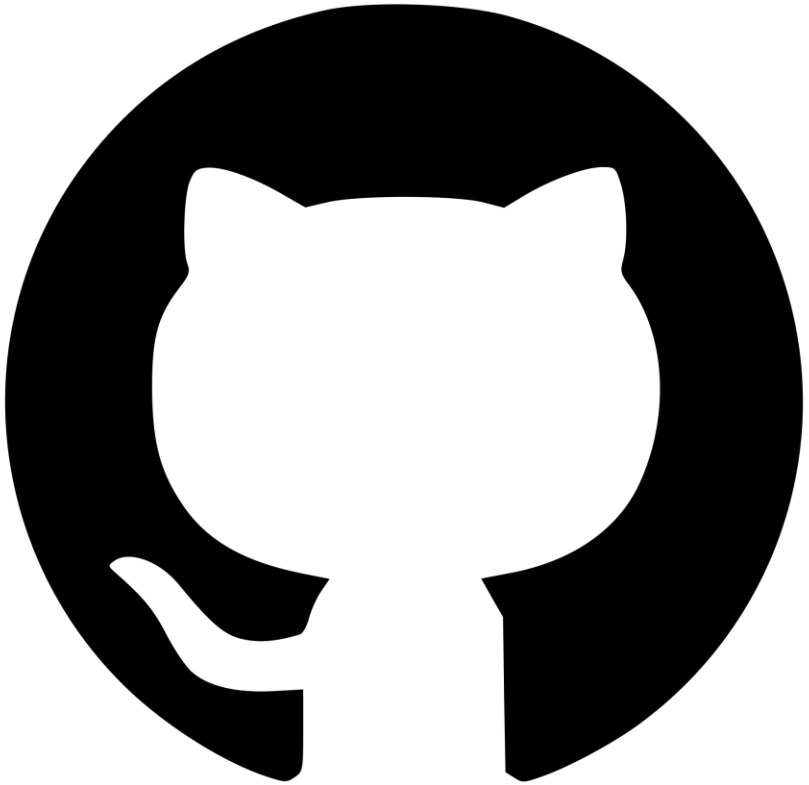


Example Spectra





Dataset and Simple Notebook



https://github.com/SUSTAIN-CDT/rice-hsi-hackathon-2025

Partial Dataset (~1GB):
https://tinyurl.com/hsi-partial

Teams

Team A:

- Aura
- Lauren
- Alisa
- Jack

Team B:

- Athinoulla
- Dominik
- James
- Villanelle

Could you please come up with a name for your team?

Objectives

- Explore the Dataset: Investigate the hyperspectral data to identify interesting patterns
- Develop a Model: Create an innovative approach to analyze or classify the rice seed varieties
- Visualize Results: Generate some visualizations that demonstrate your findings
- Prepare a Presentation: Document your methodology and results for Friday's presentation

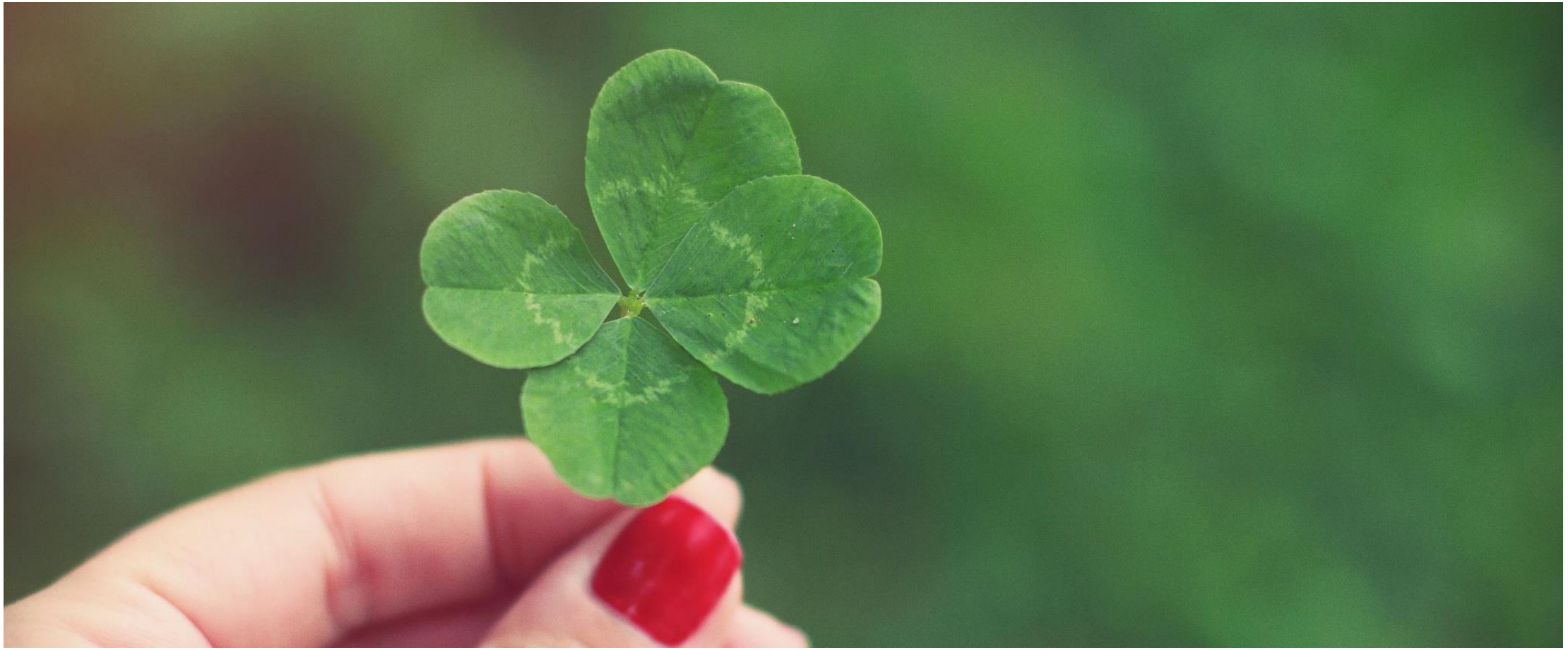
Submission Requirements

- Code Repository: Well-documented code for your analysis and models
- Results Summary: Key findings and visualizations
- Presentation: A 15-minute presentation explaining your approach and discoveries
- Technical Documentation: Methods, challenges, and potential applications

Evaluation Criteria

- Innovation: Originality of approach and techniques
- Technical Merit: Effectiveness and sophistication of models/algorithms
- Insights: Quality and relevance of discoveries from the data
- Presentation: Clarity and engagement of the final presentation

Good Luck



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