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Mohammad Saif

About me:

I am a Ph.D. candidate in Imaging Science, dedicated to applying advanced imaging techniques to solve complex scientific problems. My research focuses on developing innovative imaging spectroscopy and structural algorithms, in this case using unmanned aerial systems (UAS) to collect data for agriculture as a proxy application area.

Education

Ph.D. in **Imaging Science** / Rochester Institute of Technology, *Rochester, NY* | ***AUG 2020 – MAY 2025***
Advisor: Dr. Jan van Aardt | *CGPA:* 3.87/4

Research focus: **Advancing the Utility of Unmanned Aerial Systems-Based (UAS) Imaging Techniques in Broadacre Agriculture: A Multimodal Case Study on Table Beets.**
This study explored the utility of LiDAR, multispectral and hyperspectral imaging technologies to predict table beet root yield, plant population and assess disease severity, and thus the potential of UAS technology in enhancing crop management practices.

Bachelor of Science in **Electrical and Electronic Engineering** / Bangladesh University of Engineering and Technology, *Dhaka, Bangladesh* | ***FEB 2013 – SEP 2017***
CGPA: 3.31/4

Notable projects: Detection of Anemia from Anterior Conjunctiva of the eye by image processing and thresholding.
Thesis: Modelling of Performance Parameters of Single Photon Avalanche Detector Incorporating Dead Space Effects and History Dependent Ionization Coefficient.

Research Experience

Graduate Research Assistant/Rochester Institute of Technology, *Rochester, NY* | ***JUNE 2021 - PRESENT***

- Conducted research on the use of Unmanned Aerial Systems (UAS) to predict agricultural parameters in a project funded by the National Science Foundation (NSF), Love Beets USA, the New York Farm Viability Institute (NYFVI), and the United States Department of Agriculture (USDA)
- Planned UAS flights, collected multispectral and hyperspectral images in addition to LiDAR data, and processed them using tools such as Envi, QGIS, LAStools, and Pix4D.
- Identified spectral indices from hyperspectral images predictive of harvest root yield [PP4].
- Utilized machine learning solution to assess *Cercospora* leaf spot disease severity in table beets [PP2].
- Developed a growth stage independent harvest root yield model using multispectral, hyperspectral and LiDAR sensors [PP1].

- Compare model performance across multiple imaging systems for diverse agricultural monitoring applications [PP3].

Undergraduate Research/
Bangladesh University of Engineering and Technology, *Dhaka, Bangladesh* | ***JUNE 2016 - SEP 2017***

- Anemia Detection from RGB imagery. [PP5]
    - Developed a non-invasive, smartphone-based method for the preliminary detection of anemia by analyzing the anterior conjunctival pallor of the eye.
    - The dataset was self-collected from 19 individuals with known hemoglobin levels, achieving a classification accuracy of 78.9%.
    - The study demonstrates potential for automation in basic healthcare diagnostics, particularly in underdeveloped regions

- Single Photon Avalanche Detector performance parameter modelling. [PP6]
    - Simulated the performance of a SPAD device using MATLAB by incorporating dead space effects and history-dependent ionization coefficients.
    - The model analyzed electric field, ionization profiles, and breakdown characteristics, assessing the impact of multiplication region width on photon detection efficiency (PDE) and dark count rate (DCR).
    - Generated PDE vs. overbias and PDE vs. DCR curves to guide device design.

Publications

[PP1] **Saif, M.S**., Chancia, P., Murphy, S.P., Pethybridge, S. and van Aardt, J., "Comparison of UAS LiDAR, Hyperspectral and Multispectral Images for the multisession estimation of Table Beet Root Yield." *(Manuscript under preparation)*.

[PP2] **Saif, M.S**., Chancia, R., Sharma, P., Murphy, S.P., Pethybridge, S. and van Aardt, J., "Estimation of *Cercospora* Leaf Spot Disease Severity in Table Beets from UAS Multispectral Images." *(Under review, second round in Computer and Electronics in Agriculture, available as preprint in https://doi.org/10.31219/osf.io/sp2u9_v1)*.

[PP3] **Saif, M.S.**, Chancia, P., Murphy, S.P., Pethybridge, S. and van Aardt, J., "Exploring UAS imaging modalities for precision agriculture: predicting table beet root yield and disease severity estimation using multispectral, hyperspectral, and LiDAR." *Algorithms, Technologies, and Applications for Multispectral and Hyperspectral Imaging*, SPIE, Apr 2025.

[PP4] **Saif, M.S**., Chancia, R., Pethybridge, S., Murphy, S.P., Hassanzadeh, A. and van Aardt, J., "Forecasting Table Beet Root Yield Using Spectral and Textural Features from Hyperspectral UAS Imagery." *Remote Sensing*, *15*(3), p.794, Jan 2023.

[PP5] Tamir, A., Jahan, C.S., **Saif, M.S**., Zaman, S.U., Islam, M.M., Khan, A.I., Fattah, S.A. and Shahnaz, C., "Detection of anemia from image of the anterior conjunctiva of the eye by image processing and thresholding." *2017 IEEE Region 10 Humanitarian Technology Conference (R10-HTC)* (pp. 697-701). Dec 2017.

[PP6] Tamir, A. and **Saif, M.S.**, "Modelling of Performance Parameters of Single Photon Avalanche Detector Incorporating Dead Space Effects and History Dependent Ionization Coefficient." *SEU Journal of Science and Engineering*, Vol. 13, No. 1, June 2018.

Teaching and Mentorship

Graduate Teaching Assistant/Rochester Institute of Technology, *Rochester, NY*

- Course: Advanced Environmental Applications in Remote Sensing. | ***FALL 2023 & SPRING 2025***
  - Topics: Spectral image analysis techniques, UAS hyperspectral image processing
  - Activities: Lecturer, Tutor
- Course: Image processing for Computer Vision. | ***SPRING 2021***
  - Topics: ISP, CFA demosaicing, automatic Image Registration, color balancing, image reconstruction, image and video compression, and morphological operations.
  - Activities: Grader, Tutor

Mentoring/Tutoring, *Dhaka, Bangladesh* | ***FEB 2012 – MAR 2018***

- Provided one-on-one tutoring in mathematics, physics, and chemistry to 12 high school students, focusing on conceptual understanding and problem-solving skills.

Professional Experience:

Assistant Engineer/Energypac Engineering Ltd., *Gazipur, Bangladesh* | ***FEB 2018 – DEC 2020***

- Performed routine and special tests, in compliance with IEC/ANSI standards, on factory and onsite inoperative transformers (rated up to 150 MVA), which includes handling equipment capable of generating up to 16 million volts.
- Automated transformer testing report generation.
- Pioneered the establishment of the calibration laboratory and maintained the calibration status of all the equipment in the factory.

Skills & Coursework

Remote Sensing: Radiative transfer modeling, atmospheric compensation (ELM, AARR), geometric correction, minimum noise fraction denoising, SMILE and keystone characterization of hyperspectral imagers

Camera ISP: Demosaicing, white balance correction, color correction, gamma correction

Software and Tools: QGIS, ENVI, Cloud Compare, LAStools, Pix4D

Programming Languages: Python, Matlab, IDL, R, VBA

Python Libraries: PyTorch, numPy, seaborn, scikit-learn, openCV, scipy, geopandas, rasterio, rioxarray, GDAL, spectral python.

Image Processing: Image stitching, corner detection, homographies, automatic image registration, camera ISP

Machine learning: Random forest, xgboost, SVM, gaussian process, CNN, transfer learning, generative adversarial network

Coursework:

- Radiometry (IMGS 619)
- Fourier methods in imaging (IMGS 616)
- Image Processing and Computer Vision (IMGS 682)
- Deep Learning for Vision (IMGS 684)
- Advanced Environmental Applications in Remote Sensing (IMGS 632)
- Spectral Image Analysis (IMGS 723)
- Probability, noise and system modeling (IMGS 613)

Presentations/Talks

- **Saif, M.S.**, Chancia, P., Murphy, S.P., Pethybridge, S. and van Aardt, J., "Exploring UAS imaging modalities for precision agriculture: predicting table beet root yield and disease severity estimation using multispectral, hyperspectral, and LiDAR." *SPIE Defense + Commercial Sensing 2025*, Apr 2025.

- **Saif, M.S.**, Chancia, P., Murphy, S.P., Pethybridge, S. and van Aardt, J., "Assessing Multiseason Table Beet Root Yield from Unmanned Aerial Systems." *AGU24*, Dec 2024.

- **Saif, M.S.**, "Utilizing UAS-based imaging systems to streamline agricultural crop management: A case study on table beets.", *Fall 2024 Industrial Associates Symposium,* Oct 2024

- **Saif, M.S**., Chancia, R., Sharma, P., Murphy, S.P., Pethybridge, S. and van Aardt, J., "Agricultural Disease Management: Estimation of *Cercospora* Leaf Spot Severity in Table Beets using UAS." *Stratus conference 2024*, May 2024

- **Saif, M.S**., "Measuring what's above from below." *3 Minute Thesis 2024,* Apr 2024

- **Saif, M.S**., Chancia, R., Pethybridge, S., Murphy, S.P., Hassanzadeh, A. and van Aardt, J., 2023, May. "Predicting Table Beet Root Yield via UAS-based Hyperspectral Imagery." *Stratus conference 2023,* May 2023

- **Saif, M.S.**, Chancia, P., Murphy, S.P., Pethybridge, S. and van Aardt, J., "Evaluating UAS Imaging Technologies for Precision Agriculture: Yield Prediction and Disease Assessment in Table Beets" *Spring 2025 Industrial Associates Symposium*, Apr 2025. **(Poster Presentation)**

- **Saif, M.S.**, Chancia, P., Murphy, S.P., Pethybridge, S. and van Aardt, J., "Assessing Multi-season Table Beet Root Yield from Unmanned Aerial Systems.", *Fall 2024 Industrial Associates Symposium,* Oct 2024 **(Poster Presentation)**

- **Saif, M.S**., Chancia, R., Sharma, P., Murphy, S.P., Pethybridge, S. and van Aardt, J., "UAS-Enabled Monitoring for Cercospora Leaf Spot Disease in Table Beets.", *RIT Graduate Student Showcase*, Apr 2024 **(Poster Presentation)**

Service & Volunteering

Peer Review

- AGU24 OSPA presentation review

Tiger Tales Toastmasters, *Rochester, NY*

- Treasurer | ***JAN 2025 – JUN 2025***
- Secretary | ***JUL 2024 – DEC 2024***

Orion EEE Day 2017, *Dhaka, Bangladesh*

- Treasurer | ***FEB 2017 – JUN 2017***

IEEE Industrial Application Society, *Dhaka, Bangladesh*

- Publication Secretary | ***FEB 2017 – JUN 2017***

Affiliations

- Toastmasters Internationals. (Pathway: Presentation Mastery Level 3) | ***JAN 2024 – PRESENT***
- SPIE Student member | ***FEB 2025 – PRESENT***
- IEEE Student member | ***AUG 2015 – SEP 2017***

Hobbies & Interests

- Travel: Visited 7 countries (excluding US and Bangladesh)
- Triathlon: Completed Ironman Maryland in 2023, along with 3 other half-iron distances.
- Toastmasters: 8 Speeches, 10+ evaluations and counting, performed all the meeting roles several times.