

# M. Alfi Hasan (PhD)

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## SUMMARY

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Experienced professional in geospatial and numerical modeling for over 10 years in multiple domains, i.e. agriculture, climatology, hydrology, and epidemiology. Currently, working as a spatial data scientist at the Research and Development division of Bayer Crop Science. Extensive experience in the area of computer vision and remote sensing in a corporate setting. Developed industry-focused drone ( Unmanned Aerial Vehicle- UAV ) and satellite processing pipeline for agriculture domain. Lead and supported the collaborative efforts in modeling using artificial intelligence and deep learning on geospatially referenced remote sensing collection. Doctoral research was to predict the epidemic cycle of infectious disease using satellite and climatological information. Proven efficiency and experience in the scaleable AI platform like SageMaker, Google Bigquery, and cloud-based services like AWS instances with various UNIX-based operating systems. Cutting edge domain knowledge and applied experience on the latest machine learning/deep learning architectures like LSTM, Transformer, world model, and GANs. In the process to become an author for several patent applications in the remote sensing domain. Passionate programmer with professional working knowledge of five programming languages. Currently interested in advancing the data scientist career to the next level in the geospatial and remote sensing domain.

## PROFESSIONAL HIGHLIGHTS

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### Key Strengths:

- *AI-based model development*: Extensive experience in the development of various AI-based models like Unet, GANs, World model or LSTM for the company. The introduction of these approaches in various remote sensing applications opened cost-saving opportunities for the industry. Got awards for the deployment of the projects.
- *Scalable deep learning model platform*: Have experience not only in the development but also in the deployment process of resource-intensive deep learning models. The scalability of such models is challenging thus, successfully adopted models in the platforms like SageMaker. Have great flexibility working in various Unix platforms.
- *Computer vision*: Have experience in computer vision algorithms like Res-Net or RCNN for solving agriculture-specific problems.
- *Geospatial expertise*: Over 10+ years of experience in various geospatial platforms, concepts, programming languages, and deployment. Expertise in open-source tools like GDAL ( python ) and QGIS. Extensively used in spatial mapping, spatial data processing, and other geospatial analysis. Utilized ArcGIS python for the automation of forecasting the weather patterns.
- *Epidemic modeling*: Developed and proposed a model for forecasting epidemics of rotavirus and cholera. Have peer-reviewed articles in the reputed journals. Conducted research on epidemic models like susceptible-exposed-infected-resistant(SIER) model, SIR model. The research contributed to the disease management of the developing countries through GATES foundation.
- *Python*: Used in cross-platform satellite image processing and implementation of deep learning framework in crop yield detection. Also used in time-series analysis, pattern reorganization, and data visualization. Libraries like keras, tensorflow, gdal, geopandas, shaply, rasterio
- *R* : Extensively used in various applications like, Rswirl, R-markdown, R-server, etc. Utilized in machine learning framework, data visualization, GIS analysis, stochastic modeling, biostatistics, and regression methods. Currently developing two R packages.
- *Leadership and organization initiatives*: Organized UAV pipeline process deployment initiatives for corporate partners. Also, have experience in mentoring junior colleagues and interns for various projects.

### Publications:

Have 9 journal papers and 20 conference papers. Have more than 200 citations. Presented two talks and 9 posters in various conferences. Dissertations and research report also cited by various scholarly institutes. Full list of publications can be found : <https://scholar.google.com/citations?user=mi0w3fgAAAAJ&hl=en>

## EXPERIENCE

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### **Spatial Data Scientist**

*Mar 2020 - present*

Research and Development Breeding, Bayer Crop Science, St. Louis, MO, USA

- *Production deployment of digital remote sensing pipeline:* Scalable UAV and satellite platform is a challenge for large-scale operation for the global footprint. A production-ready remote sensing pipeline can save tremendous amounts of money by avoiding manual field operation. Developed successfully several components of, both UAV and satellite platform, and the project won the breeding excellence awards for 2021.
- *UAV soy maturity pipeline:* Orchestrated innovative solution for large-scale soy maturity operation using UAV. The project was submitted as a patent, and I got the opportunity to become an author of the application. Developed part of the code base that enables large-scale traits assessment for the soybean around the globe.
- *UAV cotton maturity assessment:* Lead UAV-driven cotton maturity solution for almost 3 years for enabling large-scale maturity trait collection. Developed both computer vision and deep learning-based models ( attention-based UNet) to enable production-ready automation for the company.
- *UAV canola assessment:* Organized cross-department collaboration for Canola/OSR UAV innovation initiatives. Developed canola/OSR flowering detection algorithm for scalable deployment for thousands of plots.
- *Satellite-based crop health monitoring project:* With the effort to save millions of operational costs, introduced and developed a satellite-based health monitoring system for the company. Have domain expertise and negotiation experience with the most cutting-edge satellite acquisition available in the market. Filled patent for the innovative architecture of a deep learning model and is a lead author of the patent.
- *Global clustering of remote sensing data:* Developed and participated in a collaborative effort for remote sensing clustering that helps the research decision-making for the company.
- *Mentoring with University research:* Successfully mentored individuals from academics through research collaboration. Conduct various projects related to remote sensing and in particular satellite.
- Involved in the recruitment process on the relevant procedures of HR.

### **Research Data Scientist (Geo-Spatial)**

*Sep 2018 - Mar 2020*

Bayer Crop Science (Contract: Colaberry Inc), St. Louis, MO, USA

- Deployment of a satellite-based deep learning model for yield and lodging prediction : Develop a model that can predict lodging and disease of a crop from UAV images using deep learning models like UNet, SSD and ResNet. The model was utilized to facilitate the business decisions of the company.
- Crop Disease prediction : Worked in a team to develop a machine learning model to predict crop disease from high-resolution satellite platform DOVE.
- Development of UAV imaging platform : Orchestrated UAV processing pipeline that saved the operation cost of the company by reducing manual labor. The pipeline can handle 3, 4 or 5 band images from various sensors.

### **Remote Sensing Data Scientist (Summer intern)**

*Jun 2018 - Aug 2018*

Monsanto (Contract: Colaberry Inc), St. Louis, MO, USA

- Update workflow Pipeline: Updated workflow from raw drone images to plot matrix using python and AWS.
- Open Drone Map: Extensively worked on Open Drone Map (ODM)

### **Graduate Research and Teaching Assistant**

*Jan 2015 - May 2018*

University of Rhode Island, Kingston, RI 02881, USA

- Project on Epidemiology: Actively working in the project "Control of Endemic Cholera in Bangladesh", funded by the Bill & Melinda Gates Foundation.
- Summer Projects with The International Maize and Wheat Improvement Center(CIMMYT):
  - Year 2015: Developed an atmospheric correction tool using FORTRAN, Python and R (see. publication no. )
  - Year 2016: Developed an integration tool ("PANI") for irrigation scheduling.
  - Year 2017: Developed an R packages for Agro-stress analysis.

- Research Fellow in RI-Water Resources Center.
- Teaching Assistant: Environmental Engineering Lab and Waste Water Management.

### **Research Associate**

*Jul 2011 - Dec 2014*

Institute of Water and Flood Management (IWFM), Dhaka-1000, Bangladesh

- International Research Projects:
  - High End Climate Impact and Extremes (HELIX), collaborative research project by the Institute of Water and Flood Management (IWFM), Exeter University and the Met office, UK, funded by the EU (under FP7 call)
  - Production and Service of Agro-meteorological Information for the Adaptation to Climate Change in Bangladesh, conducted by the Institute of Water and Flood Management (IWFM) and the Bangladesh Agricultural Research Council (BARC))
  - High-resolution Regional Climate Change Information for Bangladesh to inform Impacts assessments, Vulnerability indicators and Adaptation policies, conducted by the Institute of Water and Flood Management (IWFM) and Met Office UK; funded by Department of International Development (DFID)
  - Review of Climatic Disaster Warning System for Bangladesh, conducted by IWFM, Institute of Water and Flood Management, BUET and funded by the Government of Bangladesh
  - Environmental Impact assessment of Dhaka and Mongla power plant; funded by Orion Group

### **Visiting Scientist**

*Jul 2012 - Sep 2012*

Met Office, Hadley Center, FitzRoy Road, Exeter, Ex1 3PB, United Kingdom

### **Lecturer (Summer intern)**

*Jun 2011 - Apr 2012*

World University of Bangladesh, 3A, Road No 4, Dhaka 1205, Bangladesh

## **EDUCATION**

### **Ph.D. in Civil and Environmental Engineering**

University of Rhode Island, Kingston, RI 02881, USA

*Aug 2018*

### **Master of Science in Water Resources Development**

Bangladesh University of Engineering and Technology (BUET), Dhaka-1000, Bangladesh

*Dec 2014*

### **Bachelor of Science in Water Resources Engineering**

Bangladesh University of Engineering and Technology (BUET), Dhaka-1000, Bangladesh

*Feb 2011*

## **AWARDS, TRAINING WORKSHOPS, AND INTERNSHIPS**

- Won Breeding excellence award at 2021 as a team for developing remote sensing pipeline.
- Graduate Fellowship: Nominated as a research fellow of Rhode Island Water Resources Center (RI-WRC) for Fall 2017 & Fall 2018.
- Travel Grants from CUAHSI: Awarded Travel Grants from CUAHSI for attending WRF-Hydro workshop.
- WRF & WRF-Hydro Workshop by NOAA: Completed the training workshop organized by National Center for Atmospheric Research (NCAR) on Workshop on WRF-Hydro, June - October, 2017.
- Intern at IWM: Conducted Internship at Institute of Water Modelling (IWM), House no. 496, Road no. 32, New DOHS, Mohakhali Dhaka, April 2010 to May 2010.

## **EXTRA-CURRICULAR ACTIVITIES & LEADERSHIP**

- President of Blood Donation Organization, Badhon: Nominated as President of Badhon-Suhrawardi Hall Unit, BUET (Badhon is a voluntary blood donating organization) for 2008 and 2009
- Organizer of Vaccination Program : Team Leader and Organizer of three consecutive Hepatitis B+ Vaccination program, organized by Badhon and Sanofi Aventis in 2009.
- Mentored Intern for the Bayer Crop Science.

**References can be provided as per request.**