

# Muhammad Adil

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## EDUCATION

<b>Ph.D. Candidate in Computer Science</b> Jan 2023 – Present	<b>Vermont Artificial Intelligence Lab(VaiL), Department of Computer Science, University of Vermont, Burlington, VT, USA</b> <b>Advisor:</b> <a href="#">Dr. Safwan WShah</a> <b>Dissertation:</b> Geospatial Understanding for Environmental Monitoring Using Remote Sensing and Advanced Deep Learning Models
<b>MS Computer Science</b> Sep 2017 - July 2020	<b>School of Computer Science and Technology, Nanjing University of Science and Technology, Nanjing, China</b> <b>Advisor:</b> <a href="#">Zhichao Lian</a> <b>Thesis:</b> Multi Scale Adaptive Super Resolution Person Re-Identification

## SKILLS

<b>Research Skills</b>	Machine Learning, Computer Vision, Remote Sensing, Forecasting and Time Series Analysis, Spatio-Temporal Modeling, Change Detection, Generative Modeling, Multi Model Learning
<b>Frameworks</b>	PyTorch, TensorFlow, MATLAB
<b>Programming</b>	Python
<b>Miscellaneous</b>	Anaconda, PyCharm, Visual Studio, Git/Git Bash, Microsoft Office, L <sup>A</sup> T <sub>E</sub> X

## RESEARCH EXPERIENCE

**VaiL Lab, University of Vermont**  
Jan 2023 – Present



### **Cyanobacterial Harmful Algal Blooms Forecasting - Article Under Review**

- Developed first intensity-based CyanoHAB forecasting system using only remote sensing data, eliminating costly ground sensors while providing five-level classifications for environmental management.
- Pioneered multi-segment spatial analysis across three Lake Champlain regions, revealing segment-specific dynamics and demonstrating localized water quality modeling approaches.
- Advanced remote sensing environmental monitoring by providing satellite-only data achieves operational accuracy, transforming the water quality agency's harmful algal bloom response.
- Enhanced climate adaptation research by developing proactive management tools for frequent CyanoHAB events, directly impacting public health and ecosystem protection.
- Established extended-horizon forecasting benchmarks with consistent 14-day predictions, significantly extending agency warning time for seasonal-scale systems.

### **Trees Canopy Change Detection - In Progress**

- Developed a high-resolution framework to detect subtle canopy changes like tree removal and regrowth.
- Tackled extreme class imbalance to improve sensitivity to minor ecological changes in urban and forested areas.
- Revealed limitations of standard models, promoting specialized tools for urban forestry and land management.

### **Maximum Chlorophyll Index and Maximum Peak Height Forecasting - In Progress**

- Leading an in-progress effort to develop a deep learning-based forecasting model for MCI and MPH using multisource satellite data, with planned integration of in-situ and meteorological inputs for enhanced accuracy.

- Address temporal data gaps caused by cloud contamination, enabling consistent chlorophyll prediction across dynamic weather conditions.
- Demonstrating the viability of satellite fusion to track aquatic ecological patterns and seasonal productivity in large freshwater bodies.
- Contributing to scalable, remote-sensing-based frameworks for global freshwater health and ecosystem forecasting.

#### **Co-Author: Conditional Satellite Image Generation - Article Ready for Submission**

- Co-authored a generative modeling study to improve satellite image availability using multi-source conditional data.
- Contributed to the development of WeatherSAT, a diffusion-based model addressing missing, cloud-covered, and low-frequency imagery.
- Helped construct a large multimodal dataset combining weather, satellite, and elevation data for model training and evaluation.
- Supported model validation for applications in image interpolation, reconstruction, and synthetic scenario generation.

**School of Computer Science and Technology, Nanjing University of Science and Technology**  
**Sep 2019 – July 2020**



#### **Super Resolution Person Re-Identification - [Article Link](#)**

- Addressed resolution mismatching in person re-identification caused by low-quality surveillance images.
- Reduced complexity and memory usage by replacing multi-branch GANs with a unified architecture.
- Resolved noise artifact issues in GAN-based image reconstruction on compressed JPEG inputs.
- Enabled arbitrary input handling with a novel scale-adaptive module for real-world surveillance use.



#### **WORK EXPERIENCE**

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**TenX, Lahore, Pakistan**  
**May 2022 - December 2022**



##### **Data Scientist**

- Developed a deep learning solution for breast cancer detection in collaboration with Shaukat Khanum Hospital, Lahore.
- Built a tumor segmentation model capable of distinguishing solid masses and fine-grained calcifications across mammogram images.
- Addressed the clinical need for multi-scale tumor localization, enabling more accurate and interpretable radiological assessments.
- Supported clinical deployment by contributing to one of the final model iterations before transitioning to academic research.



#### **PROJECTS**

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##### **Brain Tumor Segmentation using Deep Learning - Class Project**

- Built a 3D U-Net model for glioma segmentation using multi-modal MRI scans (T1, T2, FLAIR) from the BraTS dataset.
- Preprocessed volumetric data with skull stripping, z-score normalization, and patch-based training for memory efficiency.
- Evaluated the model with Dice similarity coefficient and visualized outputs using overlaid segmentation masks.

##### **Lung Nodule Detection in CT Scans using 3D CNNs - Class Project**

- Developed a 3D convolutional neural network to detect pulmonary nodules using the publicly available LUNA16 CT scan dataset.

- Preprocessed volumetric data by applying Hounsfield Unit normalization, resampling, and extracting centered 3D voxel patches.
- Achieved high sensitivity in identifying nodules while reducing false positives through a second-stage refinement classifier.

#### Self-attention Bidirectional LSTM (SA-BiLSTM) - Research Project

- Collaborated in the development of a sentiment analysis approach for Roman Urdu by utilizing the "Self-attention Bidirectional LSTM (SA-BiLSTM)" network
- Implemented the BiLSTM to extract the context representations to tackle the lexical variation of attended embedding in preceding and succeeding directions
- Fair comparison was carried out by preprocessing and normalizing the Roman Urdu

#### Re-ranking in Person Re-Identification - Research Project

- Co-developed a re-ranking model that improved person re-identification performance using joint learning of local and global features.
- Enhanced retrieval accuracy by incorporating mutual feature refinement and metric-based similarity adjustments.

#### CERTIFICATIONS

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| • <b>Neural Networks and Deep Learning</b><br><a href="#">Coursera</a>   <a href="#">DeepLearning.AI</a> , 2021  | • <b>Python 3 Programming</b><br><a href="#">Coursera</a>   <a href="#">University of Michigan</a> , 2022 |
| • <b>Machine Learning</b><br><a href="#">Coursera</a>   <a href="#">Stanford</a>   <a href="#">Online</a> , 2022 | • <b>MATLAB Onramp</b><br><a href="#">Matlab</a>   <a href="#">Matlabacademy</a> , 2021                   |

#### REFERENCES

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##### Dr. Asim Zia

Professor of Public Policy & Computer Science,  
Department of Community Development and  
Applied Economics (primary) &  
Department of Computer Science (secondary)  
Associate Dean of Research & Postgraduate Educa-  
tion, College of Agriculture and Life Sciences  
Director: Sustainable Development Policy, Eco-  
nomics & Governance Ph.D. Program  
Director: Institute for Environmental Diplomacy  
and Security  
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