Muhammad Adil

(802) 355 9980 | muhammad.adil@uvm.edu | Google Scholar

🎓 EDUCATION

Ph.D. Candidate in Computer Science
Jan 2023 – Present

Vermont Artificial Intelligence Lab(VaiL), Department of Computer Science, University of Vermont, Burlington, VT, USA
Advisor: Dr. Safwan WShah
Dissertation: Geospatial Understanding for Environmental Monitoring Using Remote Sensing and Advanced Deep Learning Models

MS Computer Science
Sep 2017 - July 2020

School of Computer Science and Technology, Nanjing University of Science and Technology, Nanjing, China
Advisor: Zhichao Lian
Thesis: Multi Scale Adaptive Super Resolution Person Re-Identification

⚙️ SKILLS

Research Skills	Machine Learning, Computer Vision, Remote Sensing, Forecasting and Time Series Analysis, Spatio-Temporal Modeling, Change Detection, Generative Modeling, Multi Model Learning
Frameworks	PyTorch, TensorFlow, MATLAB
Programming	Python
Miscellaneous	Anaconda, PyCharm, Visual Studio, Git/Git Bash, Microsoft Office, LaTeX

📖 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

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

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 overlayed 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 BiLASTM 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

- **Neural Networks and Deep Learning**
  Coursera | DeepLearning.AI, 2021

- **Machine Learning**
  Coursera | Stanford|Online, 2022

- **Python 3 Programming**
  Coursera | University of Michigan, 2022

- **MATLAB Onramp**
  Matlab | Matlabacademy, 2021

REFERENCES

Dr. Safwan WShah
Associate Professor
Department of Computer Science
University of Vermont
Office: Innovation E415
Safwan.Wshah@uvm.edu

Dr. Donna M. Rizzo
Professor and Dorothean Endowed Chair
Department of Civil & Environmental Engineering
University of Vermont, Burlington VT 05401
drizzo@uvm.edu

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 Education, College of Agriculture and Life Sciences
Director: Sustainable Development Policy, Economics & Governance Ph.D. Program
Director: Institute for Environmental Diplomacy and Security
University of Vermont
Asim.Zia@uvm.edu