Reek Majumder, Ph.D.

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Summary — Ph.D. candidate in Civil Engineering with a focus on transportation cyber-physical systems and a concurrent M.S. in Computer Science specializing in Data Science, graduating in May 2025. Leveraging over 3 years of professional experience as a software developer and a strong foundation in connected vehicle technologies, intelligent transportation systems, and deep learning applications. Proven ability to innovate at the intersection of transportation and technology, with demonstrated success in research, software development, and real-world system demonstrations. Excited to apply technical expertise to advance intelligent and sustainable mobility solutions.

Skills

Languages Python, C/C++, Java, JavaScript, R-language, HTML/CSS, LaTeX
Libraries Pytorch, Pennylane, Qiskit, OpenAI-Gym, Adversarial Robustness Toolbox(ART), AdverTorch
Tools Git/GitHub, VS Code, Tableau, Orange Civil3D, ArcGIS,
Amazon AWS Kinesis, Lambda, DynamoDB, Sagemaker, API Gateway
ITS Framework ARC-IT, RAD-IT, and SET-IT
Communication Dedicated Short-Range Communications (DSRC), and Cellular Vehicle-to-Everything (C-V2X)

Projects

Quantum Machine Learning (QML) | *Python, Pytorch, Pennylane, Optuna*| *GitHub Repo* *Nov. 2023*
– Leveraged PennyLane for QML in traffic sign detection, rigorously testing against adversarial attacks. Incorporated transfer learning on image data to input gate-based quantum computers, achieving a performance boost of 85% for hybrid classical-quantum models.

Deep Learning Projects | *Python, Pytorch*| *GitHub Repo* *Dec 2021*
– Executed a Generative Adversarial Network (GAN) [hw3], training a discriminator/generator pair on the CIFAR10 dataset with techniques from DCGAN, Wasserstein GANs, WGAN-GP, and ACGAN.
– Assembled a Video Caption Generation system using S2VT [hw2], creating a Sequence to Sequence – Video to Text model with GRU. Trained the model using provided video and caption files, evaluating its performance with a BLEU Score (best model BLEU score = 0.705).

Neuroimaging-Based Autism Group Classification | *Python, Scikit-learn, Nilearn*| *GitHub Repo* *May 2020*
– We used the Autism Brain Imaging Data Exchange (ABIDE) Dataset to extract subject-specific time-series data to construct functional connectomes and predict Autism groups using Ridge and Support Vector Classifiers, achieving an accuracy of 83%.

Soccer Data Visualization | *D3.js, Python* *Dec 2020*
– Analyzed team rankings in the English Premier League and La Liga during the 2017-2018 season, creating interactive visualizations to illustrate score performance trends throughout the tournament and achieved a Net Promoter Score (NPS) of 72% from the instructor and classmates for the quality and clarity of the visualizations.

Cloud-Powered Autonomous Mobility Enhancement | *Python, Amazon AWS services, Synchro* *Dec 2022*
– Utilized Amazon AWS services (DynamoDB, Kinesis, Lambda) to develop a cloud-based speed advisory system for autonomous vehicles, integrating data from Synchro micro traffic flow simulation software to calculate advisable speeds and deliver real-time feedback for optimal vehicle performance.

Experience

Clemson University | ***Center for Connected Multimodal Mobility*** **Jan 2021 – Present**
Graduate Research and Teaching Assistant
– Coordinated and led student demonstrations for diverse audiences, including federal agencies, high schools, and industry representatives, showcasing innovations such as software-defined networking, vision-based collision alerts, IoT-based pedestrian warning systems, and cybersecurity solutions, such as adversarial attack detection in traffic sign classification.
– Proficiency in both DSRC and C-V2X technologies. Designed and executed vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication solutions to enhance vehicle safety.
– Integrated APIs and socket programming to facilitate seamless communication in transportation cyber-physical systems.
– Designed and assessed graph-based machine learning models for drone intrusion detection, achieving a performance improvement of 3%-35% for different Denial of Service (DoS) attacks compared to baseline LSTM models.
– Developed an AI model based on ensemble learning for real-time methane detection and intensity prediction, using a pipeline combining classification and regression ensembles, leveraging distributed meteorological data for efficient large-scale monitoring, and achieving improved R^2 values of up to 85%.

Cognizant Technology Solutions **Jan 2016 – June 2019**
Associate Engineer-1

- Devised and constructed ADPART (Activity Diagram-based Path analysis and regression testing) to enhance test-case generation efficiency through regression path analysis on activity diagrams, resulting in a 7% performance improvement. Utilized Tools: Eclipse Rich Client Platform (RCP), SWT, Core Java.
- Engineered a streamlined reverse engineering workflow for generating activity diagrams directly from existing textual test cases in Excel, improving the efficiency of visual representation processes and enhancing team productivity by 70% within six months.
- Designed and implemented Quality Insight Bots with a dashboard in HTML, jQuery, CSS3, and core Java. Showcased AI model performance in assigning client issues, improving client issue allocation to teams by 30% and providing an option to view similar issues previously solved by the respective team.

Education

Clemson University
M.S in Computer Science *Aug 2021*
Specialization: Data Science

Ph.D. in Civil Engineering *May 2025*
Specialization: Transportation Cyber-Physical Systems
Dissertation: Integrating AI for Environmental and Cybersecurity Challenges: Methane Detection and Secure Autonomous Systems

Kalinga Institute of Industrial Technology
B.Tech in Computer Science *June 2015*
Specialization: Software Development

Publications

- **Majumder, Reek** et al. "Hybrid classical-quantum deep learning models for autonomous vehicle traffic image classification under adversarial attack." arXiv preprint arXiv:2108.01125 (2021).
- **Majumder, Reek** et al. "Development and Evaluation of Ensemble Learning-based Environmental Methane Detection and Intensity Prediction Models." Environmental Health Insights 18 (2024): 11786302241227307.
- **Majumder, Reek** et al. "Graph-Powered Defense: Controller Area Network Intrusion Detection for Unmanned Aerial Vehicles." arXiv preprint arXiv:2412.02539 (2024).

Presentation

- Poster Presentation Runner-up at **5th Annual C^{2}M^2 Virtual Fall Conference (October 15th,2021)**

Technical Demonstration

Demonstration of transportation cyber-physical system applications includes examples like quantum computing-supported traffic sign detection and mitigation techniques against real-time cyberattacks, Lossy video-compression-based pedestrian detection with IoT-based pedestrian warning at crosswalk, Vision and CV2-X based collision alerts. We presented it to

- FMCSA and FHWA guests during their visit at CU-ICAR, Greenville,SC- student coordinator (May 9, 2024)
- TraCR Annual Conference 2024 at CU-ICAR, Greenville,SC- as a student coordinator (May 7, 2024)
- SCDOT officials visit to Clemson University, Clemson,SC- lead student coordinator (March 27, 2023).
- C^{2}M^2 6th Annual Conference, Clemson University, as a demonstration designer (November 3,2022).
- The 7th Annual UTC Conference, Boca Raton, FL- as lead student demonstrator.(March 24, 2022).

Leadership and Community Service

- Vice-president, IEEE ITSS Clemson University Student Chapter (2023-2024).
- Secretary, IEEE ITSS Clemson University Student Chapter (2022-2023).
- Coordinator, for South Asian Food on International Food Festival (Spring 2022).
- Tresurer, ITE Clemson University Student Chapter (2022-2023).
- Volunteered in campus clean-up service as a part of IEEE ITSS Clemson University Student Chapter (Fall 2021).
- Volunteered in Saucer Magnolia plantation drive on Arbor Day Tree Plantation Ceremony (Fall 2021).
- Co-founder, Head of Logistics, The TiffinWala (2014-2015)
- Co-founder, Sales, Plebians Marketing (2014-2015)