INSAN ARAFAT JAHAN

insanarafat.jahan@ucf.edu | 321-460-2878 | linkedin.com/in/insanarafat | Oviedo, FL, 32765

EDUCATION

University of Central Florida, Orlando, FL **GPA 3.75/4.00**
Master's in Civil Engineering (Smart Cities Track – due in May 2026) *August 2024 – May 2026*

Ph.D. (ongoing), Dept. of Civil, Environmental and Construction Engineering *August 2024 – July 2027*
Research Focus: Radar perception, sensor fusion, and deep learning for intelligent transportation systems.
Advisor: Dr. Mohamed Abdel-Aty, P.E., F.ASCE, F.ITE, ASEMFL

Islamic University of Technology, Gazipur **GPA: 3.4/4.00**
B.S., Electrical Engineering *January 2018 – May 2022*
Thesis: Demand-based Electricity Price Management for a Deregulated Market Scenario.
Advisor: Dr. Fahim Abid

RESEARCH AND WORK EXPERIENCE

University of Central Florida, Orlando, FL
Graduate Research Assistant *August 2024 – Present*

Sensor Fusion Project (*Funded by FDOT, PI: Dr. Mohamed Abdel-Aty*)

- Developed a radar-only object detection pipeline for full 2D bounding box prediction using drone-supervised learning
- Designed a radar-camera fusion framework with range-adaptive strategies to improve detection accuracy
- Analyzed radar data to derive reliable object-level detections suitable for integration with camera data.
- Advanced real-time sensor fusion methods to support smart intersection monitoring and traffic safety applications
- Applied deep learning architectures (Transformers, CNNs, MLPs) for spatial-temporal modeling of radar clusters.
- Conducted deployment and integration of roadside radar and CCTV sensors at urban intersections.
- Processed multi-modal datasets and ensured spatiotemporal synchronization for supervised training.
- Submitted findings at TRB Annual Meeting and prepared manuscripts for IEEE journals.
- Delivered multiple annual reports to the Federal Highway Administration (FHWA) and FDOT.

Digital Twin Project (*Funded by FDOT, PI: Dr. Mohamed Abdel-Aty*

- Simulated multi-sensor configurations under varying deployment scenarios to identify optimal sensor placement strategies.
- Analyzed performance differences across sensor heights and setups to compare and evaluate deployment conditions.

Accident Research Institute, BUET, Bangladesh *June 2020 – July 2024*
Research Assistant

- Conducted traffic safety analysis using **sensor data and machine learning** techniques to identify hazardous driving conditions.
- Co-developed *RoadSense*, a low-cost IoT-based road condition monitoring framework integrating accelerometer, gyroscope, GPS, and cloud connectivity.
- Designed and implemented machine learning pipelines (tree-based ensemble models) for detection and prediction of **potholes, speed breakers, and hard braking events** in real time.
- Applied advanced data preprocessing and imbalance handling (SMOTE-ENN) to improve reliability of traffic safety models.
- Supported government-led safety initiatives by providing data-driven insights for **infrastructure maintenance and road safety policies.**

Arthor Limited, Dhaka *June 2020 – March 2023*

Embedded Systems Engineer

- Development and performance tuning of the company's flagship "BlackBox" road safety project.
- Development and integration of IoT-based devices for the Factory Next project (Factory Automation).
- PCB design using Proteus, PCB fabrication, circuit design and testing.
- Signal conditioning circuitry (measurement of machine status – speed, different fault conditions)
- Calibration and testing of IoT devices.
- Firmware development for data collection from devices.

PUBLICATIONS

Peer reviewed journal publications

- **I. A. Jahan**, M. Abdel-Aty and Z. Islam, "Drone-Supervised Multi-Modal Sensor Fusion for Infrastructure-Based Vehicle Detection in Bird's Eye View," in ***IEEE Internet of Things Journal***, doi: 10.1109/JIOT.2026.3656347.
- **I. A. Jahan,** A. S. Huq, M. K. Mahadi, I. A. Jamil and M. Z. Shahriar, "RoadSense: A Framework for Road Condition Monitoring using Sensors and Machine Learning," in ***IEEE Transactions on Intelligent Vehicles***, doi: 10.1109/TIV.2024.3486020.

Peer reviewed conference proceedings

- **I. A. Jahan**, I. Arafat Jamil, M. S. Hossain Fahim, A. Sabiha Huq, F. Faisal and M. M. Nishat, "Accident Detection and Road Condition Monitoring Using Blackbox Module," 2022 Thirteenth International Conference on Ubiquitous and Future Networks (ICUFN), 2022, pp. 247-252, doi: 10.1109/ICUFN55119.2022.9829589.
- N. H. Sonet, S. S. Rahman, **I. A. Jahan**, A. Subhana and F. Abid, "Prospect of Demand-based Electricity Pricing in a Deregulated Market Scenario in Bangladesh," 2022 International Conference on Innovations in Science, Engineering and Technology (ICISET), 2022, pp. 379-384, doi: 10.1109/ICISET54810.2022.9775905.
- Radar-Camera Fusion for Infrastructure-Based Smart 3 Intersection Monitoring: A Drone-Supervised Approach - TRB Annual Meeting 2026

Journal manuscripts under-review

- **I. A. Jahan,** Abdel-Aty, and Z.Islam,"Radar-based object bounding box prediction via supervised learning on drone-annotated ground truth," IEEE Open Journal of Intelligent Transportation Systems, 2025, submitted for publication
- **I. A. Jahan,** Abdel-Aty, and Z.Islam, "Velocity Error Propagation to Surrogate Safety Metrics: A Comparative Study Between Camera and Sensor Fusion" IEEE Transactions on Intelligent Transportation Systems, 2026, submitted for publication.

CONFERENCES ATTENDED

- Transportation Research Board (TRB) Annual Meeting (2026)
- Transportation Research Board (TRB) Annual Meeting (2025)
- IRF Global R2T Conference & Exhibition (2024)
- Institute of Transportation Engineers (ITE) Student Leadership Summit (SLS) (2026)
- Institute of Transportation Engineers (ITE) Student Leadership Summit (SLS) (2025)
- Thirteenth International Conference on Ubiquitous and Future Networks (ICUFN) (2022).

REFEREE SERVICE

- 105th Annual meeting of the Transportation Research Board, January 2025, Washington DC
- IEEE Transactions on Intelligent Transportation Systems.

TECHNICAL SKILLS

- **Programming & Data Science**
  - Python (Advanced): NumPy, Pandas, OpenCV, Matplotlib, Seaborn, SciPy
  - Computer Vision: YOLOv8, Pytorch, Tensorflow: object detection/tracking, homography transformations, video processing
  - Machine Learning: PyTorch, neural networks, model training/deployment
  - Statistical Analysis: Correlation analysis, time series analysis, multi-modal data fusion
  - Other Programming Languages: R, C, C++, C#, Arduino, MATLAB, VHDL
- **Specialized Technologies**
  - Radar Signal Processing: Raw radar data processing, Doppler velocity analysis, SNR filtering
  - GPS/Coordinate Systems: Geodetic calculations, coordinate transformations, spatial analysis
  - Sensor Fusion: Multi-modal correspondence matching, temporal alignment algorithms
- **Data Engineering & Visualization**
  - Data Pipeline Development: ETL processes, large-scale data processing, CSV/temporal data handling
  - Visualization: Complex multi-panel plots, trajectory analysis, statistical dashboards
  - Video Analytics: Frame-by-frame processing, overlay generation, temporal synchronization
- **Domain Expertise**
  - Autonomous Systems: Multi-sensor validation, ground truth establishment, tracking algorithms
  - Transportation Analytics: Speed measurement validation, vehicle tracking, traffic analysis
- **Simulation Tools:** Simulink, Proteus, PSpice, ModelSim, emu8086
- **Communication Protocols:** UART, SPI, I2C

NOTABLE PROJECTS

Immersive VR Reconstruction of Real-World Traffic Scenarios from CCTV Data – *December 2025*

- Developed a VR framework to reconstruct and visualize real-world traffic trajectories derived from CCTV footage.
- Transformed image-based vehicle detections into spatially accurate ground-plane motion aligned with roadway geometry.
- Enabled immersive, multi-perspective analysis of traffic flow and vehicle interactions using Meta Quest 2.

HONORS AND AWARDS

- ORCGS Doctoral Fellowship – University of Central Florida (August 2024 to July 2025)
- UCF Graduate Presentation Fellowship 2025
- Completion of Industrial Training on Power Infrastructure under Bangladesh Power Management Institute.
- Completion of Industrial Training on Communications Infrastructure under Robi Axiata Limited.

LEADERSHIP AND INVOLVEMENT

- **Institute of Transportation Engineers (ITE) student chapter** — *UCF*
- *Outreach Coordinator* — *August 2025 – Present*

- Lead outreach and external communications for the ITE UCF Student Chapter, strengthening engagement with students, faculty, industry professionals, and regional ITE sections
- Play a key organizing role in the **ITE Florida–Puerto Rico Student Leadership Summit 2026**, a large-scale, multi-institution leadership conference for transportation students
- Coordinate speaker outreach and industry engagement, supporting panel sessions and interactive discussions with senior transportation professionals
- Manage event promotion and student engagement strategies, contributing to increased visibility and participation across universities in Florida and Puerto Rico
- Collaborate with a cross-functional student leadership team on logistics, programming, and sponsorship coordination for a multi-day professional summit