Blessing Agyei Kyem

PhD Student

blessing.agyeikyem@ndsu.edu 701-491-2101 Fargo, North Dakota

https://blessing-agyei-kyem.github.io/ Google Scholar ResearchGate Linkedin

Education

PhD in Civil Engineering, GPA 4.0/4.0, *North Dakota State University* 06/2024 – present
Expected 2028 Fargo, United States
Advisor: Arsmstrong Aboah

- Concentration in Computer Vision, Machine Learning, Deep Learning with applications in Pavement Asset Management and Transportation Engineering

Kwame Nkrumah University of Science and Technology, GPA 3.9/4.0 09/2019 – 11/2023
Advisor: Kenneth Adomako Tutu Kumasi, Ghana

- Concentration in Transportation and Pavement Engineering
- **Thesis Title:** Detection of Pavement Distress on Asphalt roads in Ghana using Computer Vision

Research Interests

- Pavement Asset Management
- Computer Vision, Machine Learning, Deep Learning
- Multi-modal AI applications in Transportation and Pavement Engineering
- Intelligent Transportation Systems
- Agentic AI

Research Experience

North Dakota State University, SMART Lab
Advisor: Armstrong Aboah
My research focuses on multi-modal AI in computer vision for transportation and pavement engineering, combining advanced deep learning architectures with robust multi-modal data fusion to tackle real-world infrastructure monitoring challenges.
Selected Research Work and Projects:

- Introduced **PaveCap**: the first multimodal framework for comprehensive pavement condition assessment with dense captioning and Pavement Condition Index (PCI) estimation. PaveCap comprises of a Single-Shot PCI Estimation Network and a Dense Captioning Network. The PCI Estimation Network uses YOLOv8 with Segment Anything Model (SAM) to predict the PCI of a pavement while the Dense Captioning framework generates detailed textual descriptions describing the condition of the pavement.

- Developed a **workzone safety system** aimed at improving vehicle detection and tracking in construction areas. The system accurately estimates the speed of vehicles in real-time as they approach the workzone. To enhance safety, it includes an automatic sound-alert feature that warns drivers to reduce their speed. Additionally, the system estimates vehicle sizes to gather comprehensive traffic information. Cameras installed at the workzones capture vehicle data, which is then processed using embedded devices such as the Nvidia Jetson Nano. This combination allows for effective, real-time monitoring and quick response to safety concerns.

Selected Journal Publications

Blessing Agyei Kyem, Joshua Kofi Asamoah, Eugene Denteh, Andrews Danyo and Armstrong Aboah. *Self-Supervised Multi-Scale Transformer with Attention-Guided Fusion for Efficient Crack Detection*. **Automation in Construction**, 2025.

Joshua Kofi Asamoah, **Blessing Agyei Kyem**, Nathan David Obeng-Amoako, and Armstrong Aboah. *Saam-reflectnet: Sign-aware attention-based multitasking framework for integrated traffic sign detection and retroreflectivity estimation.* **Expert Systems with Applications**, 286:128003, 2025.

Blessing Agyei Kyem, Joshua Kofi Asamoah, and Armstrong Aboah. *Context-cracknet: A context-aware framework for precise segmentation of tiny cracks in pavement images*. **Construction and Building Materials**, 484:141583, 2025

Blessing Agyei Kyem, Joshua Kofi Asamoah, Ying Huang, and Armstrong Aboah. *Weather-adaptive synthetic data generation for enhanced power line inspection using stargan*. **IEEE Access**, 12:193882–193901, 2024.

Selected Conference Papers

Eugene Kofi Okrah Denteh, Andrews Danyo, Joshua Kofi Asamoah, **Blessing Agyei Kyem**, and Armstrong Aboah, "*Demographics-Informed Neural Network for Multi-Modal Spatiotemporal Forecasting*," *in* **NeurIPS 2025 Workshop on UrbanAI: Harnessing Artificial Intelligence for Smart Cities**, 2025. [Online]. Available: https://openreview.net/forum?id=EhaRCVSE60

Neema Jakisa Owor, Joshua Kofi Asamoah, Tanner Muturi, Jakisa Anneliese Owor, **Blessing Agyei Kyem**, Andrews Danyo, Yaw Adu-Gyamfi, and Armstrong Aboah. *A unified detection pipeline for robust object detection in fisheye-based traffic surveillance*. In The IEEE **International Conference on Computer Vision (ICCV)** Workshops, 2025.

Blessing Agyei Kyem, Jakisa Neema Owor, Andrews Danyo, Joshua Kofi Asamoah, Eugene Denteh, Tanner Muturi, Anthony Dontoh, Yaw Adu-Gyamfi, and Armstrong Aboah. *Task-specific dual-model framework for comprehensive traffic safety video description and analysis*. In The IEEE **International Conference on Computer Vision (ICCV)** Workshops, 2025.

Tanner Muturi, **Blessing Agyei Kyem**, Joshua Kofi Asamoah, Jakisa Neema Owor, Richard Dyzinela, Andrews Danyo, Yaw Adu-Gyamfi, and Armstrong Aboah. *Prompt-guided spatial understanding with rgb-d transformers for fine-grained object relation reasoning*. In The IEEE **International Conference on Computer Vision (ICCV)** Workshops, 2025.

Manuscripts under Peer-Review

7 manuscripts under peer-review.

Grants

- **Sponsor:** EDRF Technology Acceleration Program
  RCA Title: “Development of an IoT-Based Sensor for Advancing Safety Monitoring and Intervention at Work Zone Areas”
  Amount: $153,889
  Contribution: Proposal Writer
  Award Number: FAR0037938
  Duration: Jun 2024 – May 2025

Awards

1st Runner-up in the 2nd International Data Science for Pavements Symposium Competition 2023, *Missouri Center for Transportation Innovation(MCTI), U.S Department of Transportation(Federal Highway Administration), University of New Hamsphire* 03/02/2023

- I led my Team in a data competition to build a Computer Vision model using YOLOv5 with 74.3% accuracy to detect distresses in pavements. My Team ranked 2nd and had the opportunity to make a presentation at the Symposium.

Provost's Award for Excellent Students 2020/2021, College of Engineering, KNUST College of Engineering, 06/20/2021
Ing. Prof. Mark Adom-Asamoah

- This award is given to students who have demonstrated exceptional and sustained commitment and diligence in their studies, clearly manifesting in their EXCELLENT ACADEMIC ACHIEVEMENT in the Academic Year.

Professional Activities

American Society of Civil Engineers (ASCE), *Member* 06/2025 – present

IEEE, *Member* 09/2024 – present

Reviewer Activities

I have reviewed over 50+ manuscripts for the following journals and conferences.

IEEE Acess, Journal of Transportation Engineering: Part B Pavements, KDD Conference, TRB Conference,

Technical Skills

- **Programming**

Python, MATLAB, R, SQL, JavaScript, Latex

References

Armstrong Aboah, *Assistant Professor,* North Dakota State University
armstrong.aboah@ndsu.edu, +1 (931) 284-7657

Jack Banahene Osei, *Assistant Professor,* Kwame Nkrumah University of Science and Technology
jobanahene.coe@knust.edu.gh, +233 (248) 657-887