

# Armstrong Aboah, Ph.D.

Portfolio: <https://aboah1994.github.io/>

Github: [github.com/aboah1994](https://github.com/aboah1994)

Email: [aboah1994@gmail.com](mailto:aboah1994@gmail.com)

Mobile: +1-931-284-7657

Google Scholar Citation: 85

## EDUCATION

- University of Missouri** Columbia, USA  
• *Doctor of Philosophy (Ph.D.)* January 2020 - December 2022  
*Research Areas:* Naturalistic Driving, Transportation Safety, Anomaly Detection, Internet of Network, NLP, Autonomous Vehicle
- Tennessee Technological University** Tennessee, USA  
• *Master of Science (MSc)* August 2018 - December 2019  
*Research Areas:* Transportation Planning, Transportation Safety, Ridesharing, Demand Modelling
- Kwame Nkrumah University of Science and Technology** Kumasi, Ghana  
• *Bachelor of Science (BSc.)* September 2013 - July 2017  
*Research Areas:* Structure Health Monitoring, Structure Design and Failure, Earthquake Analysis, Self-Compacting Concrete

## RESEARCH INTEREST

- **Computer Vision:**
- **Anomaly Detection:**
- **Machine Learning:**
- **Natural Language Processing:**

## SKILLS SUMMARY

- **Languages:** Python, ReactJs, R, SQL, Matlab
- **Frameworks:** Scikit, NLTK, SpaCy, Pytorch, TensorFlow, Keras, Django, Flask, NodeJS, LAMP
- **Tools:** Kubernetes, Docker, GIT, PostgreSQL, MySQL, SQLite
- **Platforms:** Linux, Web, Windows, Arduino, Raspberry, AWS, GCP
- **Soft Skills:** Leadership, Event Management, Writing, Public Speaking, Time Management

## ACADEMIC AND TEACHING EXPERIENCE

- **Postdoctoral Fellow (01/2023-Present): Northwestern University:** Biomedical image segmentation
- **Graduate Research Assistant (01/2020-12/2022): University of Missouri-Columbia:** Conducted research in Naturalistic Driving Studies - developed algorithms necessary to extract driving events from gyroscope readings; improving vehicle perception-developed object segmentations models to segment vehicles, pedestrians, roadway, trees, etc.; improving pavement maintenance - led a team in developing deep learning framework to predict road roughness index; pavement detection and quantification - led a team in designing a multi-task deep learning framework for detecting and quantifying pavement distress; Traffic monitoring - led a team in developing a deep learning frame for real-time anomaly detections of vehicles on the road
- **Graduate Teaching Assistant (01/2020-12/2022): University of Missouri-Columbia:** Lectured in tutorial classes, demonstrated laboratory experiments, and marked assignment copies
- **Graduate Research Assistant (08/2018-12/2019): Tennessee Technological University:** Conducted research in Transportation Network Companies (TNC)-undertook a descriptive analysis of TNC users using data collected in the most recent US National Household Travel Survey (NHTS) conducted in 2017 to develop a national profile of TNC users; investigated alternative statistical models in their ability to predict how often a person uses TNC Apps daily.
- **Graduate Teaching Assistant (08/2018-12/2019): Tennessee Technological University:** Lectured in tutorial classes, demonstrated laboratory experiments, and marked assignment copies
- **Graduate Teaching Assistant (08/2017-08/2018): Kwame Nkrumah University of Science and Technology:** Lectured in tutorial classes, demonstrated laboratory experiments, and marked assignment copies.

## INDUSTRIAL WORK EXPERIENCE

- HDR Inc.** In-person  
• *ITS/Data Scientist (Internship)* May 2022 - August 2022
  - **Grant Writing:** Helped with grant and proposal writing.
  - **Computer Vision Application:** Developed an automated pipeline for segmenting satellite images for the installation of fiber optics using UNET as my base architecture model.
  - **Utility Pipes Project:** Developed a machine learning model to predict the state of a utility pipe whether it is going to be dirty or not.
- Felucca AI** Remote  
• *Research Scientist (Freelancer)* Dec 2021 - June 2022
  - **Data Annotation:** Developed an end-to-end pipeline for data annotation.
  - **Problem Formulation:** Formulate research problems with regards to data collection for autonomous vehicles.
  - **Model Building:** Training state-of-art object detection models on custom datasets.

## RESEARCH PROJECTS

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- **Vehicle Detection & Tracking (Computer Vision):** Developed a vehicle detection model using YOLO v5 and Deepsort for tracking. Tech: Python, Pytorch, Pandas
- **Anomaly Detection (Computer Vision):** Developed a traffic anomaly detection model using deep learning powered with decision tree. Tech: Python, YOLO v5, Pytorch, & OpenCV.
- **Next Word Prediction (Natural Language Processing):** Used transformers models to predict the next word or a masked word in a sentence. Tech: Python, Pytorch, Transformer
- **Speech & Emotion Recognition (NLP, Computer Vision):** Developed a CNN model to class various speech files into different emotions. Tech: Python, Pytorch, CNN
- **CamVid Project(Computer Vision, Naturalistic Studies):** Developed a deep learning model using Unet architecture for multiclass semantic segmentation. Tech: Python, Pytorch, CNN, Unet
- **3D Image Reconstruction(Computer Vision):** Performed a 3D reconstruction Google Street View images for direct distance measuring. Tech: Python, Pytorch
- **Bus Routing Problem:** Used ArcGIS pro and arcpy to develop a bus routing system for St. Louis City. Tech: ArcGIS, Ar-cpy
- **Covid-19 Sentiment Analysis (NLP):** Used transformers to develop covid-19 tweet classification system
- **Text Generation (NLP):** Built a Markov chains function that creates a dictionary for text generation.
- **DeepInsight (NDS):** Developed an algorithm called Energy Maximization Algorithm (EMA) to extract driving events from naturalistic driving videos
- **Eye Detection (NDS and Computer Vision):** Developed a deep learning model to detect the eye positioning of drivers while driving in a naturalistic driving environment using Yolov5 for detection and deepsort for tracking.
- **Weather Prediction:** Developed an LSTM model to perform a multiclass classification of weather.
- **Accident Analysis:** Developed a machine learning model to understand the various causes of vehicle crash.
- **Road Incident Detection:** Developed a deep learning model to detect various road incidents in Missouri

## REFEREED JOURNAL PUBLICATIONS

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- J-4. **Aboah, A.**, Adu-Gyamfi Yaw, Anuj Sharma et al. (2022): “Driver Maneuver Detection and Analysis using Time Series Segmentation and Classification”, ASCE Journal of Transportation Research Part A.  
Impact Factor: 2.19
- J-3. **Aboah, A.**, & Adu-Gyamfi, Y. (2020). Smartphone-Based Pavement Roughness Estimation Using Deep Learning with Entity Embedding. Advances in Data Science and Adaptive Analysis, 12(03n04), 2050007.  
Impact Factor: 0.8
- J-2. **Aboah, Armstrong**, Michael Boeding, Yaw Adu-Gyamfi (2022). Mobile Sensing for Multipurpose Applications in Transportation. Journal of Big Data Analytics in Transportation.  
Impact Factor: 1.23
- J-1. Shoman, M., **Aboah, A.**, & Adu-Gyamfi, Y. (2020). Deep learning framework for predicting bus delays on multiple routes using heterogenous datasets. Journal of Big Data Analytics in Transportation, 2(3), 275-290.  
Impact Factor: 1.23

## REFEREED CONFERENCE PUBLICATIONS

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- C-2. **Aboah, A.**(2021): Vision-based system for traffic anomaly detection using deep learning and decision trees. In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (pp. 4207-4212).  
Impact Factor: 45.17
- C-1. **Aboah, A.**, Shoman, M., Morehead, A., Duan, Y., Daud, A., & Adu-Gyamfi, Y. (2022). A Region-Based Deep Learning Approach to Automated Retail Checkout. In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (pp. 3210-3215).  
Impact Factor: 45.17

## PAPERS UNDER REVIEW

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- R-3. Shoman, M., **Aboah, A.**, Daud, A., Adu-Gyamfi Yaw (2022): “GC-GRU-N for Traffic Prediction using Loop Detector Data”, IEEE Transactions on Intelligent Transportation System.  
Impact Factor: 6.49
- R-2. **Aboah, Armstrong**, Michael Boeding, Yaw Adu-Gyamfi (2022). Mobile Sensing for Multipurpose Applications in Transportation. Journal of Big Data Analytics in Transportation.  
Impact Factor: 1.23
- R-1. Ashkan Behzadian, Tanner Wambui Muturi, **Aboah, Armstrong**, Yaw Adu-Gyamfi (2022). The 1st Data Science for Pavements Challenge.

## FUNDED RESEARCH GRANTS

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G-1. Sponsor: Federal Highway Administration

Title: “MIMIC – Multidisciplinary Initiative on Methods to Integrate and Create Artificial Realistic Data”

Amount:\$1,073,255

Contribution: 2%

Duration: 2020 - 2022

## HONORS AND AWARDS

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- Won first place in the ITS Heartland Annual Conference poster competition 2022 - January, 2022.  
Amount : \$800.00
- Won first place in the ITS Heartland Annual Conference poster competition 2021 - November, 2021.  
Amount : \$800.00
- Led a team that placed 4th in the 2022 AI city challenge organized by IEEE.
- Led a team that placed 5th in the 2021 AI city challenge organized by IEEE.
- Won second place in CMITE Students poster presentation.
- Best Teaching Assistant - Ghana Engineering Student Association Awards (2017/2018 Academic Year)
- Outstanding Departmental President - Ghana Engineering Student Association Awards (2016/2017 Academic Year)
- Excellent Student Award - College of Engineering Provost Award (2016/2017 Academic Year)
- Excellent Student Award - College of Engineering Provost Award (2015/2016 Academic Year).
- Excellent Student Award - College of Engineering Provost Award (2014/2015 Academic Year).

## VOLUNTEER EXPERIENCE

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- **Computer Vision Tutorials** Columbia, USA  
*Organized a free computer vision tutorials for everyone interested in the summer.* Jun 2021 - August 2021
- **Mentoring High School Students for National Science and Math Quiz** Accra, Ghana  
*Mentor, teach and prepare High School Students for the National Math and Science Quiz* Jun 2013 - Present

## JOURNAL REVIEWS

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- **TRB:** Artificial Intelligence Committee (10 reviews)
- **IET Image Processing:** Jan 2021 - Present (3 reviews)
- **ASCE Journal of Transportation Research Part: System:** Jan 2022 - Present (2 reviews)