Armstrong Aboah, Ph.D.

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Google Scholar Citation: 78

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

- **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, Arcpy
- **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

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

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

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

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

- 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

- **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

- **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)