



APOORBA BIBEKA, P.E. ASSISTANT RESEARCH ENGINEER

YEARS OF QUALIFYING EXPERIENCE: 9



Education

- M.S., Industrial Engineering, Texas A&M University
- M.S., Civil Engineering, Texas A&M University

Background and Qualifications

Mr. Bibeka is an Assistant Research Engineer in the System Reliability Division with over nine years of experience in traffic operations and air quality modeling fields. Mr. Bibeka’s areas of interest are intelligent transportation system (ITS) and connected and autonomous vehicle (CAV) applications, Python-based tool and package development, and data analytics. Mr. Bibeka has worked for several state, local, and federal agencies. He has authored or co-authored six journal articles and several research reports.

Mr. Bibeka’s current research focuses on traveler information systems, queue warning systems, and artificial intelligence-based innovation in roadway asset management. Mr. Bibeka has worked on fusing multiple data sources, such as connected vehicles, roadside sensors, and third-party segment-level data sources, to generate queue warnings and share the information through portable changeable signs (PCMS) or connected vehicle applications. Another of his recent projects focused on developing a proof of concept for lane marking assessment using machine vision (MV) algorithms and artificial intelligence (AI). Additionally, Mr. Bibeka contributes to projects on traveler information and queue warning systems in a freeway work zone using PCMS based on real-time INRIX data.

Mr. Bibeka has extensive experience on probe data-based projects evaluating traffic operations on freeways, intersections, and arterial corridors. Notably, Mr. Bibeka developed a Python-based package to test the usability of the GPS trajectory data to evaluate transit operation at intersections. Additionally, Mr. Bibeka has experience developing frameworks to model cooperative adaptive cruise control (CACC), integrate connected vehicle hardware, signal controller, and traffic simulation, and evaluate high-resolution signal controller data.

Recent Work Experience

Dates	Position(s)	Organization
2021 - Present	Assistant Research Engineer	Texas A&M Transportation Institute
2019 - 2021	Transportation Analyst	Kittelson & Associates, Inc
2015 - 2019	Graduate Research Assistant	Texas A&M Transportation Institute

Professional Affiliation

- Institute of Transportation Engineers
- Professional Engineer # 137286, State of Texas

Relevant Project Level Experience

Key Researcher, Develop Improved Queue Warning System Combining Multiple Data Sources (TxDOT).

This project focused on developing a detailed design of an enhanced queue detection and warning system that combined point-, probe-, and vehicle trajectory data and fine-tuned the design using microsimulation-based testing. The project also included developing a proof of concept, prototype deployment, and field evaluation of the new queue warning system (QWS) design for a freeway segment with recurrent congestion. Mr. Bibeka modeled different queueing scenarios in VISSIM, tested the queue warning system, and helped fine-tune the design. Mr. Bibeka also helped deploy the QWS on Azure using real-time INRIX and roadside sensor data.

Key Developer, Odessa I-20 Corridor Traveler Information and Queue Warning System (TxDOT).

TTI is assisting TxDOT in deploying traveler information and queue warning systems for I-20 corridor reconstruction between Midland and Odessa. The system uses real-time INRIX data to assess existing conditions. It uses a website and PCMS to disseminate appropriate information to the drivers. Mr. Bibeka worked on the interface to

push messages on PCMS using National Transportation Communications for ITS (Intelligent Transportation Systems) Protocol (NTICP) 1203: Object Definitions for Dynamic Message Signs (DMS).

Key Researcher, Developing Geometric/Traffic Operations Guidance for Level 2 Automated Commercial Truck Platooning (TxDOT). This project focused on using simulation-based truck platooning models to develop operational guidance to help TxDOT and other stakeholders prepare for the deployment of truck platooning. This guidance could continue to be applicable as automated driving systems for commercial vehicles evolve into highly and fully automated systems. Mr. Bibeka developed a framework in VISSIM driver model API to model truck platooning (via CACC). He analyzed the operational impact of this technology under different market penetration rates, lane restrictions, and platoon length restrictions. He helped formulate guidelines for truck platooning on Texas roadways.

Key Researcher, Capacity Adjustment Factors for Connected and Automated Vehicles in the Highway Capacity Manual (Pooled Fund Study led by Oregon DOT). This research was sponsored by a pooled fund study led by the Oregon Department of Transportation and guided by a technical advisory committee of state departments of transportation. Mr. Bibeka was the lead traffic simulation modeler conducting sensitivity testing to support the development of capacity adjustment factors for CAVs on arterial roadways for highway capacity manual (HCM). Using simulation tools, Mr. Bibeka modeled different levels of CAV performance and market penetration, analyzed the large data outputs and model results, and identified the recommended capacity adjustment factors for CAVs for different arterial elements, including protected signalized intersections, permitted signalized intersections, two-way stop-controlled intersections, and roundabouts. **Completed with previous employer.*

Data Scientist, Queue Jump Evaluation using Fine-Grained Automatic Vehicle Location (AVL) Data (WMATA). This project developed a Python-based package that allows the Washington Metropolitan Transit Authority (WMATA) to understand the effectiveness of queue jump lanes along different routes and periods. Mr. Bibeka developed a Python-based package to process and provide queue jump-related statistics based on WMATA's fine-grained GPS data for different bus routes. **Completed with previous employer.*

Relevant Publications

- Apoorba Bibeka, Praprut Songchitruksa, and Yunlong Zhang. Assessing environmental impacts of ad-hoc truck platooning on multilane freeways. *Journal of Intelligent Transportation Systems*, 25(3):281–292, 2021. Publisher: Taylor & Francis
- Adekunle Adebisi, Yi Guo, Bastian Schroeder, Jiaqi Ma, Burak Cesme, Apoorba Bibeka, and Abby Morgan. Highway capacity manual capacity adjustment factor development for connected and automated traffic at signalized intersections. *Journal of Transportation Engineering, Part A: Systems*, 148(3):04021121, 2022. Publisher: American Society of Civil Engineers
- Qinhua Jiang, Bastian Schroeder, Jiaqi Ma, Lee Rodegerdts, Burak Cesme, Apoorba Bibeka, and Abby Morgan. Developing highway capacity manual capacity adjustment factors for connected and automated traffic on roundabouts. *Journal of Transportation Engineering, Part A: Systems*, 148(5):04022014, 2022. Publisher: American Society of Civil Engineers
- Subasish Das, Apoorba Bibeka, Xiaoduan Sun, Hongmin “Tracy” Zhou, and Mohammad Jalayer. Elderly pedestrian fatal crash-related contributing factors: applying empirical Bayes geometric mean method. *Transportation research record*, 2673(8):254–263, 2019. Publisher: Sage Publications Sage CA: Los Angeles, CA
- Subasish Das, Anandi Dutta, Mohammad Jalayer, Apoorba Bibeka, and Lingtao Wu. Factors influencing the patterns of wrong-way driving crashes on freeway exit ramps and median crossovers: Exploration using eclat association rules to promote safety. *International Journal of transportation science and technology*, 7(2):114–123, 2018. Publisher: Elsevier