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Neural Network Model for Improving Vulnerable Road User Safety

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Abstract

Automating and integrating V2X communication infrastructure, connected vehicles, and Vulnerable Road Users (VRU) is critical to enhancing the interaction process to detect, categorize, and predict patterns and behaviors to decrease fatal accidents for VRUs. Multiple challenges are unsolved to address efficiencies in understanding potential risky behaviors from VRUs and connected vehicles. Ample possibilities to expand research exist in different domains, under the data perspective, modeling behaviors, increasing accuracy during all the interactions, and considering other exogenous variables, such as crime rate or environmental conditions. Despite technological advances, recent literature highlights rising traffic casualties related to vulnerable road users (VRU), such as pedestrians, cyclists, motorcycles, and animals. Therefore, designing a robust, resilient, and reliable system for end-to-end VRU protection is critical. Unsupervised and Deep Learning were combined as techniques to predict VRU injury risk levels. A proposed framework and the "V2X-VRU Dashboard" App Visualization are developed. Our project considered data gathered from multiple sources in real-time. There were two primary sources: 1) New York City DOT and 2) the NYC Open Data for Motor Vehicle Collisions – Person gathered during 2021. Our study shows a combined methodology of neural network-based PCA to ingest real-time data (offline), process, and classify the risk levels of fatalities. It is an empirical and straightforward method to define the principal components of neural network-based PCA.

Keywords
Principal Components Analysis, Vulnerable Road Use, V2X, Deep Learning

Biography
Carlos A. Marino is a Ph.D. in Industrial & Systems Engineering from Mississippi State University, USA. In addition, he has obtained the titles of Master in Data Science at Harvard Extension School, Master of Transportation & Logistics Management from the American Military University, and Master of Science Engineering Management from the California State University in the USA. Likewise, he has a Master's degree in Administration with a major in Finance from the Universidad del Pacífico in Peru and Industrial Engineering from the University of Lima in the same country. Complementing his training, he obtained the Data Science and Big Data Analytics Certification from the Massachusetts Institute of Technology, Data Science Certification from the Harvard Extension School of Harvard University, Stanford Certified Project Manager from Stanford University, and a Graduate Certificate in Theoretical Statistics at California State University, USA.