

Combining the Deep Neural Network with the K-Means for Traffic Accident Prediction

Authors : Celso L. Fernando, Toshio Yoshii, Takahiro Tsubota

Abstract : Understanding the causes of a road accident and predicting their occurrence is key to preventing deaths and serious injuries from road accident events. Traditional statistical methods such as the Poisson and the Logistics regressions have been used to find the association of the traffic environmental factors with the accident occurred; recently, an artificial neural network, ANN, a computational technique that learns from historical data to make a more accurate prediction, has emerged. Although the ability to make accurate predictions, the ANN has difficulty dealing with highly unbalanced attribute patterns distribution in the training dataset; in such circumstances, the ANN treats the minority group as noise. However, in the real world data, the minority group is often the group of interest; e.g., in the road traffic accident data, the events of the accident are the group of interest. This study proposes a combination of the k-means with the ANN to improve the predictive ability of the neural network model by alleviating the effect of the unbalanced distribution of the attribute patterns in the training dataset. The results show that the proposed method improves the ability of the neural network to make a prediction on a highly unbalanced distributed attribute patterns dataset; however, on an even distributed attribute patterns dataset, the proposed method performs almost like a standard neural network.

Keywords : accident risks estimation, artificial neural network, deep learning, k-mean, road safety

Conference Title : ICTLE 2022 : International Conference on Transportation and Logistics Engineering

Conference Location : Istanbul, Türkiye

Conference Dates : July 28-29, 2022