WHO WILL ADOPT ELECTRIC VEHICLE IN THE NEAR FUTURE?

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Abstract

Electric vehicle (EV) is a promising and sustainable transportation option, contributing to reducing greenhouse gas (GHG) emissions and building eco-friendly livable environment. The objective of this study is to characterize EV adopters utilizing the 2022 Halifax Travel Activity (HaliTRAC) survey data. It incorporates three different machine learning-based clustering techniques, such as, K-prototype Clustering, Agglomerative Hierarchical Clustering (AHC), and Density-Based Spatial Clustering of Application with Noise (DBSCAN) to classify the people having immense interest to adopt electric vehicle (EV) based on their socio-demographic characteristics. Following different evaluation criteria, such as, Silhouette-Score, Calinski-Harabasz, and Davies-Bouldin; the best clustering approach is reflected, and optimum number of clusters are defined by Elbow-method. This study develops four clusters with the proportion of 16%, 39%, 15% and 30% of survey respondents. Cluster 1 (16%) identifies respondents who are likely a student, have low vehicle ownership, homeownership, and low annual household income, but portray a high willingness to adopt EV. Cluster 2 is the biggest group (39%) and represents individuals who are employed full-time, have a higher level of education, a substantial annual household income, and have high levels of vehicle ownership. Cluster 3 has the smallest share (15%) and consists of individuals who work full or part-time, have small families, have low vehicle and home ownership, and fall into the medium-income range. Cluster 4 (30%) represents respondents over 60 years old who are retired, have a high vehicle ownership rate, and possess moderate levels of homeownership and annual household income. Among these four clusters, cluster 2 demonstrates the highest level of intention to adopt EV, whereas cluster 4 exhibits the lowest. This research also investigates their travel patterns including mode share, travel duration, travel companions, trip purposes, and travel start time of a day for each individual belonging to various clusters. It also identifies key obstacles, such as high purchase price, lack of charging station, insufficient driving range and so on, to electric vehicle (EV), identified by the respondents of HaliTRAC survey. Moreover, the findings of this paper could be valuable for shaping policies and strategies targeted at encouraging higher adoption of electric vehicles within particular socio-demographic groups of Halifax residents.

Key words: Clustering, K-prototype Clustering, Agglomerative Hierarchical Clustering (AHC), and Density-Based Spatial Clustering of Application with Noise (DBSCAN), Elbow-method, Halifax

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