

ABSTRACT

Railway safety is crucial, especially in urban and suburban areas, where increased frequency, capacity, and speed of trains can amplify operational risks. In light of this, this study aims to analyze the conditions of railway tracks using sensor data, including speed, latitude, longitude, and acceleration, collected from the Bandung commuter line between August 2023 and July 2024. k-means clustering technique was used to categorize the tracks into two groups. Cluster 0 consists of winding, longer tracks with higher speed and acceleration, indicating higher-risk routes. Cluster 1 includes shorter, straighter tracks with lower speed and acceleration, reflecting safer conditions. A comparative analysis with gaussian mixture models (GMM) confirmed the effectiveness of k-means with a silhouette score of 0.480. The results of this study highlight the need for interventions such as more intensive monitoring on high-risk tracks to improve safety.

Keywords—k-means clustering, railway safety, track conditions, train sensor data, train track clustering