

Prediction and Classification of Vehicle Traffic Congestion in Bandung City Using the Random Forest and K-Nearest Neighbour Algorithm

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Abstract

Traffic congestion remains one of the problems that continue to arise, especially in urban areas, one of which is Bandung City, when the causes of the problem are not managed properly. Continuous management of the causes of congestion problems will result in a controlled traffic system for the foreseeable future. This condition can be achieved if there is a congestion classification prediction system available. A reliable prediction and classification system can support the government in formulating data-based traffic management strategies. The Random Forest and K-Nearest Neighbour machine learning classification methods are strengthened with time-based feature expansion to capture traffic behavior in various time frames, so that the objectives can be achieved. The dataset obtained from Area Traffic Control System Bandung includes traffic flow recorded at 15-minute intervals at several intersections. Additional features such as red light duration, road width, and spatial proximity to residential and commercial areas are included to improve model performance. The results show that the Random Forest classifier with time-based feature expansion outperforms K-Nearest Neighbours, achieving the highest performance of 96%. These results show the potential contribution in short-term traffic prediction and its effectiveness in supporting urban traffic planning and congestion mitigation efforts in Bandung.

Keywords: Bandung, Congestion, Traffic, Kriging, Random Forest, K Nearest Neighbours.

I. INTRODUCTION

Traffic congestions are one of the most pressing challenges in urban transportation. This problem often occurs when the volume of vehicles on a particular road surpasses its intended capacity, resulting in a significant reduction in traffic speed, often approaching 0 km/h [1]. Congestions are even more common in major cities, including Bandung of which is among the largest urban areas in Indonesia and experiences high population growth [2]. In the year 2020, the population of Bandung City reached 2,510,103, reflecting an increase of 6,395 people from 2018 when it initially stood at 2,503,708 [3]. As the population continues to rise every year, road usage also escalates, driven by various purposes such as transportation, religious activities,