1. Introduction

The problem of traffic density is a complex problem in the world of land transportation, especially in urban areas, including Bandung City (Nugroho Julianto, 2010). Congestion generally occurs at road intersections, especially during rush hour, namely in the morning when employees go to work, or children go to school and in the evening when they come home (Triwibisono & Aurachman, 2020). With rapid population growth, data from 2020 shows that there were 1.2 million two-wheeled vehicles in Bandung City and 536 thousand four-wheeled vehicles (Dewi, Badruzzaman, Fajar, Suhaedi, & Harahap, 2020). The problem of congestion has become a major challenge for the quality of life of citizens, not only disrupting travel delays, but also increasing the risk of traffic accidents, damaging air quality due to vehicle emissions, and disrupting community productivity.

Traffic flow characteristic types are generally categorized into three models, namely Macroscopic, Microscopic, and Mesoscopic (van Wageningen-Kessels, van Lint, Vuik, & Hoogendoorn, 2015). The macroscopic model views traffic as a continuous fluid flow and analyzes variables such as speed, density, and traffic flow. Then, the Microscopic model is a model that observes individual vehicle behavior and interactions between vehicles, which focuses more on analyzing acceleration, deceleration, and distance between vehicles. Then, the Mesoscopic model is a model that combines the Macroscopic and Microscopic approaches (J. Popping, 2013).

Buah Batu Road is 13 meters wide and 1.70 kilometres long, connecting Bandung City and Bandung Regency. It is located near several important locations, such as toll roads, food places, and other entertainment centres (Duddy Studyana et al., 2020), and make this road frequently passed. With the high volume of existing vehicles, Buah Batu Road also faces a tough challenge in maintaining smooth traffic and avoiding congestion that has the potential to harm mobility on Buah Batu Road (Fadriani & Pirmansyah, 2022).

***Fig 1**.Illustration of the observation area*

An illustration of traffic congestion can be seen in Fig. 1. This journal will observe the relationship between speed and traffic flow density. The speed function depends on the speed of the vehicle. Therefore, the second-order polynomial regression function approximates the speed function from the observed data. The speed function is obtained from the relationship between the average velocity of vehicles (v) and density (ρ) in traffic flow.

This study analyses and simulates a traffic flow model based on the velocity-density function obtained from observation data. The structure of this journal is arranged as follows, *Introduction* introduces the research topic, *Methods* discusses the macroscopic model of traffic flow and the application of Second Order Polynomial Regression, *Results and Discussion* presents the results and discussion of the methods used, and finally *Conclusion* presents the conclusions of this study.