I. INTRODUCTION

In the current era, the term Autonomous Vehicle (AV) or also known as self-driving, driverless or robotic is already familiar [1]. An AV or self-driving vehicle is a technology that will replace driving tasks performed by humans. This technology uses a wide variety of systems such as pattern recognition, sensor technology, recommended/optimized routes, etc. [2].

AV is projected to grow every year. This is evidenced by the projected data on the number of AVs from Statista which states that, until 2021, the number of AVs globally has reached 39.06 million units. This number is an increase of 7.66 million from 2019 [14]. This is due to AVs have many advantages over conventional vehicles, such as reduce pollution, reduce fuel consumption, reducing congestion, and reducing parking occupancy rates. Besides that, AVs can also help disabled passengers who have the limitation to drive.

Meanwhile, Indonesia has similar problems, for example traffic jams. According to a survey conducted by the UK congestion monitoring agency TomTom throughout 2019, Jakarta reached 53% congestion rate and placed in top 10 of the world most high level of congestion [15]. In addition, pollution caused by motorized vehicles reached 92 AQI US, 6.4 times more than WHO standards [16]. Indonesia does not yet have AVs, but preparations are already underway to welcome AVs which will be predicted in about five years [17].

Based on this data, as an alternative solution, the adoption of AV and ride-sharing concept can be implemented. Ride-sharing is a system that is used in several online taxi applications to serve several passengers simultaneously to reduce the impact of transportation on the environment such as congestion, gasoline costs, etc. Ride-sharing can also reduce fleet vehicle usage and fleet vehicle operating costs [3]. In this context the route recommendation aspect of the ride-sharing AV plays an important role in the implementation. The route recommendation system implemented within the ride-sharing AV helps the AV to find the best route to pick up the passengers and decide the efficient way to deliver the passengers to their destination point [4]. With ride-sharing AV the congestion can also be reduced.

There are existing research related to ride-sharing AV, such as a research by Ahmed B. T. Sherif that explains ride sharing can happen with a scheme that will preserve the privacy of the trip data [10]. The scheme can organize ride sharing without the need to disclose private information [10]. There's also research that focused on performing multidisciplinary research on car riding systems that takes consideration of personalized user mobility behavior by providing a system that predicts user next direction and also a recommendation based on rider's personalized information [11]. This study focuses on analyzing the potential benefits of taxi sharing using agent-based modeling. New York City taxis are examined as a case study to evaluate advantages and disadvantages of ride sharing using traditional taxis and shared AV [12].

In context of route recommendation for ride sharing, there are also several existing research that has been conducted. In [13], research by Chak Fai Yuen and others, they propose a question *"Is the shortest path the optimal path for ride sharing?"*. To answer this question, they develop a route recommendation algorithm called SHARE. By using this algorithm, they reduce failure rate in ride sharing up to 40% and also improve waiting time for customers by 20%. However, there's limited research that study the algorithm that used for route recommendation in the context of ride-sharing AV.

That's why, in this study we investigate algorithms that can be used to support the ride-sharing AV. The approach that is used is a comparative study involving the two most widely adopted algorithms for route recommendation, that is A* and Dijkstra. A* is an algorithm that specialized in finding the shortest route/path. It uses the heuristic function of $F = G + H$ to find the optimal route. Dijkstra is an algorithm that uses a graph to determine which route is the fastest by finding the lowest weight. To identify the best algorithm, in this study, we used three measurement variables: (1) processing time; (2) memory usage; (3) completion time.

This paper is organized as follows. Section 2 describes the related work of this research. Section 3 describes the method this research uses to reach the goal. Section 4 describes the results and discussion of the research. Finally, the conclusion of this research is described in Section 5.