A Survey of Resource Allocation in V2V Communications

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Abstract— *In this paper, a comprehensive analysis of resource allocation in vehicle-to-vehicle (V2V) communication systems is presented, which is crucial for enhancing traffic control and improving road safety and driving enjoyment. A variety of resource allocation strategies are classified and examined in this paper, including game theory-based approaches, spectrum allocation, energy allocation, location-based allocation, and machine learning-based procedures. Open research questions and areas that need further study in the field of V2V communication are highlighted for future benefit. This survey helps readers make informed decisions about system design, implementation, and improvement by providing a comprehensive overview of the latest developments in V2V resource allocation. It also indicates areas that need further research and possible directions to enhance the security, flexibility, and scalability of V2V communication networks.*

Keywords— Communication V2V, Resource Allocation, Spectrum Allocation, Game-Theoretic, Power Allocation, ML.

I. INTRODUCTION

With the rapid advancement of vehicular technology and the emergence of connected and autonomous vehicles, Vehicle-to-Vehicle (V2V) communication has become a fundamental building block in shaping the future of transportation systems. V2V communication allows vehicles to exchange critical information directly with nearby vehicles, enabling real-time awareness of their surroundings, and enhancing situational awareness for drivers and automated driving systems alike [1]. By fostering cooperative and collaborative driving behaviors, V2V communication holds the potential to significantly reduce traffic accidents, ease traffic congestion, and optimize overall traffic flow.as the number of connected vehicles on the roads continues to grow, efficient and intelligent resource allocation becomes paramount for the seamless operation of V2V communication systems [2]. Resource allocation refers to the judicious distribution and utilization of limited resources, such as bandwidth, transmission power, and time slots, among vehicles seeking to communicate with each other [3]. However, allocating these resources optimally is a complex challenge due to several inherent characteristics of V2V communication environments.one of the primary challenges in V2V resource allocation is the scarcity of available radio spectrum [4]. The radio frequency spectrum is a finite and shared resource, and as the number of connected vehicles increases, the competition for spectrum resources intensifies [5]. Effectively managing this scarce resource is vital to avoid interference and ensure reliable communication between vehicles, thereby maintaining the integrity and safety of the V2V ecosystem. Moreover, the dynamic nature of V2V networks, with vehicles entering and leaving the communication range frequently, introduces uncertainties in resource allocation. The allocation algorithms must be adaptive and responsive to changing network topologies, varying vehicle densities, and fluctuating channel conditions to provide seamless communication services[6].in this comprehensive survey, we aim to explore and analyze the resource allocation problems in V2V communication. We will delve into the state-of-the-art research and the latest developments in the field, presenting a comprehensive review of existing resource allocation techniques and methodologies. By conducting an in-depth review of the existing literature, the survey will categorize and analyze the different resource allocation techniques proposed to tackle the challenges in V2V communication systems. Furthermore, it will examine the performance metrics used to evaluate these techniques, such as throughput, latency, reliability, and fairness.by gaining a holistic understanding of the state-of-the-art in V2V resource allocation, can make informed decisions in designing, implementing, and optimizing V2V communication systems. Additionally, the survey will identify potential research gaps and highlight opportunities for further advancements in resource allocation strategies, aiming to enhance the scalability, robustness, and security of V2V communication networks

A. Paper Contributions

The motivation for surveying resource allocation problems in V2V (Vehicle-to-Vehicle) communication has its basis in the increasing importance of creating efficient, reliable, and safe communication networks for connected vehicles, following are the major contributions of the paper.

- To study the current V2V communication resource allocation models that aid in system improvement, traffic management, road safety, and the overall driving experience. justice and energy efficiency.

- To show the taxonomy of solutions for different resource allocation schemes taking into account Spectrum Allocation, Power Allocation, Game-Theoretic, Channel Assignment, Location-based Allocation, and ML.
- To highlight various to several unresolved problems and research challenges related to V2V communication for potential future applications

B. Paper Organization

The other part of the paper is set up as follows. A resource allocation taxonomy for several V2V communication resource allocation strategies was described in Section II. In Section III, many research problems and open concerns related to V2V communication are emphasized. The paper is finally concluded in Section IV.

II. RESOURCE ALLOCATION SCHEMES TAXONOMY IN RELATION TO V2V COMMUNICATION

The solution taxonomy of V2V resource allocation systems is shown in this section. It is separated into six categories (Fig. 1), including methods based on ML, Power Allocation, Game Theory, Channel Assignment, Spectrum Allocation, and Location-based Allocation. Below is a thorough explanation of every category.

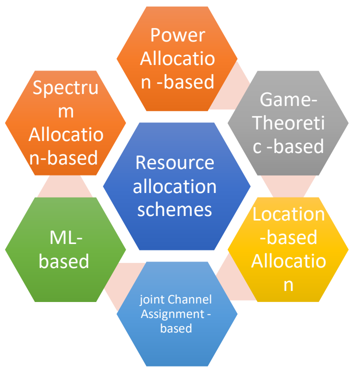

Fig 1. Taxonomy of V2V communication resource allocation systems.

A. Spectrum Allocation-based

In V2V communication, spectrum allocation is a crucial component of resource allocation. Spectrum allocation aims to efficiently and fairly distribute the available spectrum resources among V2V networks while meeting the QoS criteria of the links. Y Hou et al. [7] focuses on resource management for vehicle-to-vehicle (V2V) communications networks. It addresses the allocation of spectrum resources and power regulation. Simulations are used to assess the strategy, showing increased throughput and spectrum usage in V2V telecom networks. Jie Ren et al. then [8]. this research suggests a distributed Vehicle-to-Vehicle (V2V) spectrum allocation and power control method based on Deep Reinforcement Learning (DRL) for 5G communication networks. Due to complexity and dimensionality, resource allocation optimization presents a problem. The suggested technique allows for dispersed allocation while upholding limitations by formulating the latency constraint of V2V connections as a reward function. The technique improves network capacity and V2V connection latency by using a Dueling Double Deep Q-learning (DQN) approach to map observations to optimum resource allocation. Experimental results demonstrate the effectiveness of the method in lowering latency and boosting Vehicle-to-Infrastructure (V2I) network capacity. Then, C Xu et al. [9] an innovative method to spectrum allocation is discussed in this work. Through the use of the 5G network and the multi-agent deep Q-network (MDQN),.it seeks optimizing spectrum allocation to increase spectrum energy efficiency (SEE). By contrasting it with alternative methods, spectrum allocation is assessed. Then [10] addresses the importance of vehicle-to-everything (V2X) communication in enhancing road safety and presents a new way to optimize the distribution of energy resources for device-to-device (D2D) and vehicle-to-vehicle (V2V) communication with load balancing. An integrated power control algorithm is used and resource distribution is selected based on different coverage areas to maximize system efficiency.

TABLE I: A comparative analysis of advanced spectrum allocation-based resource allocation systems for vehicle-to-vehicle communication.

Author	Year, Research Title	Description	Findings
Y Hou et al [7]	2021 Radio Resource Allocation and Power Control Scheme in V2V Communications Network	The paper discusses power control, spectrum allocation, collaboration, and V2V resource management.	Scheme is assessed using V2V network simulations and maximizes throughput while improving spectrum use.
Jie Ren et al [8]	2022 Joint spectrum allocation and power control in vehicular communications based on dueling double DQN	In order to optimize V2V latency, 5G research uses DRL for decentralized spectrum allocation.	DRL spectrum allocation boosts capacity, lowers latency, outperforms alternative methods.
C Xu et al [9]	2023 Intelligent Resource Allocation for V2V Communication with Spectrum–Energy Efficiency Maximization	A novel 5G MDQN spectrum allocation technique is investigated in V2V IOV.	Increasing SEE, latency, and reliability with MDQN-based V2V spectrum distribution.
Jie Be et al [10]	2023 energy-Efficient Resource Allocation for D2D-V2V Communication with Load Balancing	The article introduces a new communication method and joint load balance scheme between traffic vehicles (V2V) and user association under incomplete channel state information.	The simulation results show that proposed strategy effectively reduces delay and improves overall system efficiency for vehicle users

B. Power Allocation -based

The process of distributing the entire transmit power of the vehicles among the many V2V lines is known as power allocation in vehicle-to-vehicle communication. To optimize the throughput, dependability, and energy efficiency of the V2V network is the aim of power allocation in V2V communication. Power distribution is a difficult and complex issue, yet it is crucial to the design of any V2V communication system. The system's performance may be markedly enhanced by properly planning the power allocation method. Then, Md Z Alam et al. [11] The discusses the challenging problem of energy allocation in multi-hop vehicular relay communications by presenting a model that integrates V2V and C2C cooperation using the SDP-IGD algorithm, Xin Hu, et al [3] proposed a new radio resource allocation, concentrating on deep reinforcement learning-based power allocation for 5G V2V communications. Then, Hanan Hussein et al. [12] used the DFST algorithm to address challenges in power allocation within vehicular communication networks, through efficient use of network resources. Addressing power distribution problems in VEC Qiong Then, Wu et al. [13] DDPG method is used to solve problems in continuous work space based on V2I and V2V communications. Then D Han et al. [14] addresses the topic of energy-efficient resource allocation in vehicle-to-vehicle (V2V) communications using Deep Q-Network (DQN) technology. To improve the efficiency of using wireless resources in a V2V communication network, which includes allocating communication channels and transmission power to vehicles in order to improve communication speed and reduce power consumption and communication delay.

TABLE II: A comparative analysis of cutting-edge power allocation-based resource allocation systems for vehicle-to-vehicle (V2V) communication.

Author	Year, Research Title	Description	Findings
Md Z Alam, et al [11]	2020 SDP-IGD: An Iterative Power Allocation Technique for Cluster-Based Multi hop Vehicular Communication	Research addresses power distribution in vehicle relaying and provides a comprehensive fix.	By enhancing V2V and C2C collaboration, the global channel model addresses power distribution issues.
Xin Hu, et al [3]	2021, A Joint Power and Bandwidth Allocation Method Based on Deep Reinforcement Learning for V2V Communications in 5G	In order to optimize V2V latency, 5G research uses DRL for decentralized spectrum allocation	DRL spectrum allocation boosts capacity, lowers latency, outperforms alternative methods.
Hanan Hussein et al [12]	2021 Depth-first-search-tree based D2D power allocation algorithms for V2I/V2V shared 5G network resources	The DFST algorithm increases capacity and reliability by optimizing vehicular power distribution.	Study introduces MAX and OPT mechanisms for vehicular power allocation control.
Qiong Wu et al [13]	2023 A Power Allocation Scheme for MIMO-NOMA and D2D Vehicular Edge Computing Based on Decentralized DRL	The paper discusses power distribution in VEC, including judgments about offloading in the face of channel and task uncertainty as well as V2I and V2V.	The paper presents the DDPG approach for continuity with DRL-based power allocation.
D Han et al [14]	2023 Energy-Efficient Resource Allocation Based on Deep Q-Network in V2V Communications.	Deep Q-Network (DQN) is used to achieve optimal allocation of communication channels and transmission power for vehicles, improving communication speed and reducing power consumption and communication delay in V2V links.	Simulation results show that the proposed model achieves significant reduction in energy consumption of V2V links compared with the traditional resource allocation scheme based on reinforcement learning (RL)

C. Game-Theoretic -based

This section describes several game theory-based resource allocation systems for V2V communications. Zemin Sun et al. [15] They discussed applications of game theory to current vehicular network challenges as well as to the integration of 5G technologies. key research challenges, and possible solutions are presented. Then, Rathi et al. [16] radio resource allocation scheme based on Stackelberg games for heterogeneous cellular networks is proposed. They adopted D2D users as followers and mobile users as leaders. The utility function of a cellular user is defined as the product of his throughput and the additional cost. However, for D2D users, it is determined by deducting the additional cost from its own throughput. Then,Ali et al. [17] presented a D2D resource allocation strategy based on a binary log-linear learning technique in a multi-cell scenario. By assigning 5% of each to bounded and Gaussian noise, the system's efficacy was assessed relative to the system sum rate.Then Sumit Kumar et al. [18]. They presented the proposed approach using pure snapper game as a solution to this problem, and an implementation algorithm was designed that uses this approach to achieve pure equilibrium in the system. The performance of the proposed algorithm was evaluated through simulation. Later, Changsen Xia et al. [19] A platform based on game theory is proposed that takes into account users' movement and the cost resulting from task shifting and routing. Simulation results indicate that the proposed system improves network performance and increases system efficiency.

Table III: Describes the relative comparison of various state of-the-art game theoretic-based resource allocation schemes for D2D users.

Author	Year, Research Title	Description	Findings
Z sun et al [15]	2021 Applications of Game Theory in Vehicular Networks	They discuss applications of game theory in vehicular networks and review recent developments in this field also background related to 5G vehicular networks.	Game theory is used to balance and improve overall vehicular network performance.
Rathi et al [16]	2020 Device-to-Device Communication with the Application of Stackelberg Game Theory	effective resource allocation for D2D communication using the Stackelberg game	The utility function was examined by the authors to ensure correct allocation.
Ali et al [17]	2020 Dispersed Learning for Resource Allocation in D2D Networks Using Noisy-Potential Games	Binary log-linear learning approach for D2D communication resource allocation	Improved normalized sum rate
S kumar et al [18]	2022 A Game-Theoretic Approach for Increasing Resource Utilization in Edge Computing	present, a game theory-based approach to maximizing resource, utilization in distributed computing in edge-based IoT, using pure snapper game to achieve pure equilibrium in, resource allocation.	Minimum cost and maximum resource utilization are achieved thanks to distributed computing at the edges.

	Enabled Internet of Things		
C Xia et al [19]	2023 Mobility-Aware Offloading and Resource Allocation Strategies in MEC Network Based on Game Theory	It addresses the problem of providing massive connectivity in a mobile edge computing (MEC) network in the framework of the Industrial Internet of Things (IIoT). A system based on game theory is proposed to optimize computing resource utilization and task routing.	Simulation results show that the proposed system improves network performance and increases system efficiency.

D. Location-based Allocation

Modern location-based resource allocation strategies for vehicle-to-vehicle (V2V) communication are covered in this section. Farhan K and others.[20] proposing k-shortest route routing along with Q-learning for location-based data forwarding using roadside sensors. In order to determine which sensors. have larger queuing waits during peak hours and which experience relatively lower delays, the study uses Q-learning for sensor exploration. This research uses Q-learning particularly for sensor exploration to obtain quicker convergence, in contrast to conventional methods that use naïve Q-learning for shortest path routing. Then, Seong-Jung Kimal. [21] It addressed the problem of inter-cell interference in ultra-dense networks, where the user's device receives signals from multiple small base stations. Multipoint cooperation technology was used to mitigate interference between these stations. A location-bound allocation method using a clustering algorithm has been implemented to improve the data transfer rate and reduce interference between clusters Then, K Kim et al. [22] He introduced a method to allocate resources for C-V2X mode 3 called Maximum Reuse Distance (MRD) scheduling. By optimizing the distance between vehicles using the same resources simultaneously, MRD scheduling attempts to improve the spatial reuse of resources. The goal of this optimization is to raise the Quality of Service (QoS) for each vehicle. Then, Adhikary A, et al. [23] They presented an approach to location- and task-based resource allocation for the holographic beamforming process. Increasing channel capacity for users is achieved by activating the required number of gratings from the holographic grating array based on the user's location and task priority. A Transformer technique-based approach is proposed to solve the holographic optimization problem. Then, Jie Huang et al. [24] They discuss the use of 6G wireless network technology with smart radio and network severing technology to support various communication services under limited spectrum resources. They propose a new approach to allocating resources based on the opportunity capacity of the shared communication channel.

Table IV: Explains how different cutting-edge location-based resource allocation techniques for vehicle-to-vehicle communication are compared.

Author	Year, Research Title	Description	Findings
Farhan K et al [20]	2020 Location-based data delivery between vehicles and infrastructure	The paper focuses on using Q-learning and roadside sensors to transmit position data.	Improve the road condition monitoring during peak hours by using the right sensors.
Seong J et al [21]	2021 Location-Based Resource Allocation in Ultra-Dense Network with Clustering	Addressed the problem of inter-cell interference in ultra-dense networks. A method for allocating resources based on the location of base stations using clustering technique.	The results showed that the proposed method achieved a higher aggregate rate than other previously used methods for resource allocation.
K Kim et al [22]	2022 Location-Based Maximum Reuse Distance Resource Scheduling for LTE Cellular-V2X Side link Mode 3	examines the distribution of LTE C-V2X resources with an emphasis on V2V communication.	Results show that location-based MRD scheduling improves QoS measures.
Adhikary et al [23]	2023 Location-Dependent and Task-Oriented Resource Allocation for Holographic Beamforming Using Transformer	A Transformer technique-based approach is proposed to solve the holographic optimization problem.	Simulation results show that the location- and task-dependent Transformer-based approach effectively allocates energy to serving users in holographic beamforming.
Jie Huang et al [24]	2023 Opportunistic capacity based resource allocation for 6G wireless systems with network slicing	They proposed a new approach to allocating resources based on the opportunity capacity of the common communication channel.	A conflict graph model of the resource allocation process is built and an advanced algorithm is developed to achieve conflict-free node set.

E. Joint Channel Assignment -based

The most recent findings in cooperative resource allocation strategies for D2D communication are highlighted in this section. For example, , X Lyu et al. [25] proposed a collaborative resource allocation for D2D users that is based on mobility. They broke the formulated problem down into three smaller issues and used the Dinkelbach technique to resolve them. With varying mobility values, they were able to obtain spectral efficiency that was energy-efficient. Later, Y Du et al. [26] proposed a plan for sharing resources in a multi-user cell situation using the underlying D2D communication channel. In order to attain the highest possible spectral efficiency, they compared their method to the established ones using a matrix channel technique. Later, K Lai et al. [27] offered a state-of-the-art scheme for cooperative resource management and power control for D2D users who are linked to many service providers. They have developed a radio access network in order to regulate the power and resources needed for direct-to-device connections. As per their strategy, the service provider might supply certain resources in order to prevent interference. They were able to verify their approach by monitoring resource access ratio, network speed, and energy efficiency. Next, Saied and associates [28] Given a shared channel, power, and resource allocation scheme supporting heterogeneous networks with multiple base stations (BSs), for D2D users. They aim to achieve high sum rates and network throughput with QoS. The effectiveness of the proposed approach was achieved with different SINRs, numbers of cellular users, and numbers of D2D users. Than, Wenhao Fan et al [29] Propose a task distribution and joint resource allocation system to improve the task processing time of vehicles in a roadside enhanced computing (VEC) system in the context of Internet of Vehicles. Task diversity, vehicle classification and task processing flexibility are considered in the proposed system.

Table V: Explains how several cutting-edge joint Channel Assignment resource allocation techniques in D2D communication are compared to one another.

Author	Year, Research Title	Description	Findings
X Lyu et al [25]	2020 Joint Power and Allocation Using Interest-Aware D2D Cache and Mobility in Het Nets	Dinkel collaborative resource allocation technique based on batching for optimal outcomes	Result evaluation using energy spectral efficiency
Y Du et al [26]	2021 Allocation of joint power and channel for multi-user cellular networks with D2D overlay	created a matrix channel method for communication in D2D underlay mode.	Evaluated the spectrum efficiency of D2D and mobile users
K Lai et al [27]	2021 Cooperative Resource and Power Management for D2D Transmission Among Several Service Providers	Combined optimal power resource management using radio access networks for D2D users	Measured the effectiveness of their plan in terms of throughput and energy use.
Saied et al [28]	2022 An Effective Allocation of Resources for D2D Communications Underlaying in Het Nets	offered a cooperative power management and resource distribution scheme to D2D users.	System performance and resource access rate were considered
W Fan et al [29]	2023 Joint Task Offloading and Resource Allocation for Vehicular Edge Computing Based on V2I and V2V Modes	Propose a task distribution and joint resource allocation system to improve the task processing time of vehicles in a roadside enhanced computing (VEC) system in the context of Internet of Vehicles.	The system was simulated in six different scenarios, and the results showed many advantages of the proposed system compared to four other systems.

F. Machine Learning-based

Several ML-based resource allocation strategies are covered in this subsection to decrease interference and boost the overall sum rate in a D2D environment. w Lee et al. [30] For device-to-device (D2D) communications over several channels, we suggest a hybrid resource allocation system. For a given set of Quality of Service (QoS) restrictions, our proposed approach regulates the transmit power of D2D user equipment (DUE) allotted to each channel in order to optimize the cumulative rate of the DUEs. Next, Jagdeep Singhet al. [31] They discussed resource allocation technology for fog computing environments using software-defined networking (SDN) and collaborative machine learning (CML). Fog computing aims to bring computing resources closer to end users, addressing limitations such as network bandwidth and latency that cloud computing faces.Than Tongke Cui et al. [32] They address content distribution resource allocation strategy in computing environments in Internet of Things (IoT), edge, and cloud using deep reinforcement learning. The strategy aims to reduce network delay by providing optimal allocation of computation, caching, and communication. This was achieved by applying queuing theory to achieve the lowest level of delay. The deep reinforcement learning model then runs at each network node to achieve optimal caching and routing of requests based on request history and network state. Yang X et al. [33]. They describe the cellular HetNet model with IoCT communications in the uplink and the resource allocation problem is formulated using mixed numerical nonlinear programming (MINLP) to achieve long-term energy efficiency according to URLLC requirements. Later, Nien Fang Cheng et al. [34] They propose an advanced solution to allocate network resources to network slices in O-RAN using Reinforcement Learning (RL). A simplified RL-compatible simulator was developed that contains three main components: User Equipment (UE), Edge O-Cloud, and Regional O-Cloud.

Table VI: Explains the comparative analysis of many cutting-edge machine learning-based resource allocation techniques in a distributed network setting.

Author	Year, Research Title	Description	Findings
Lee et al [30]	2021 Resource Allocation Plan for Deep Neural Network-Based QoS Guarantee in D2D Communications	The authors suggest utilizing hybrid resource allocation to optimize transmit power in D2D communications.	Considered the total rate, the likelihood of the constraint, and the calculation time
J Singh et al [31]	2023 An Efficient Machine Learning-Based Resource Allocation Scheme for SDN-Enabled Fog Computing Environment	The proposed technique integrates the CML model with resource allocation in an SDN-enabled fog computing environment. The FogBus and iFogSim frameworks are used to evaluate the performance of the proposed technique,	The results indicate that the proposed scheme reduces processing time by 19.35%, response time by 18.14%, and delay time by 25.29%. Reduces execution time by 21%, network usage by 9%, and power consumption by 7%.
T Cui et al [32]	2023 Deep Reinforcement learning based resource allocation for content distributed in IOT-Edge cloud computing Environments	They address content distribution resource allocation strategy in computing environments in Internet of Things (IoT), edge, and cloud using deep reinforcement learning	the proposed deep reinforcement learning model can adapt to network state changes and user requirements and achieve fast convergence.
Yang X et al [33]	2023 Underpinning Networks for D2D Communication Through Machine Learning-Based Resource Optimization	An autonomous MADRL algorithm with partially autonomous centralized decision making (dec-POMDP) and a mixed centralized-autonomous (MCD) framework are used to solve the problem.	The proposed algorithm significantly outperforms traditional resource allocation methods and various client communication mechanisms in terms of achieving maximum energy efficiency.
Nien Fang et al [34]	2023 Deep Reinforcement learning based resource allocation for network slices in O-RAN	This simulator was used to discover how to improve the throughput of target network slices by allocating unused bandwidth from other slices	he results show that the RL model can deliver eMBB traffic with high peak rate and shorter transfer time for URLLC compared with balanced reference and eMBB-focused reference.

III. RESEARCH AND OPEN PROBLAMS APPLICATIONS ,USE CASES, AND CHALLENGES AND BENEFITS

This section outlines some unresolved problems and unmet research needs in V2V networks.

1 Applications and Use Cases

V2V communication provides various applications, as shown in Figure 2.

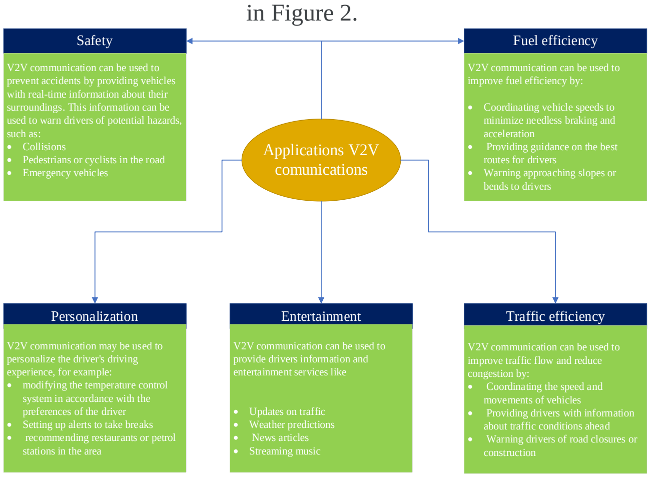

Figure 2. Potential Applications and Use Cases V2V Communications

More applications and use cases for V2V communications technology are likely to emerge as it develops. The safety, effectiveness, and simplicity of transportation might all be revolutionized via V2V communications. For instance, "Forward Collision Warning," "Lane Departure Warning," "Pedestrian Warning," and "Traffic Sign Priority."

2 Benefits of vehicle-to-vehicle(V2V) communication

Vehicle-to-vehicle (V2V) communication is an important technology because it has many benefits for improving road safety and efficiency of vehicle-to-vehicle communications. There are also many benefits of vehicle-to-vehicle (V2V) communication listed in Table VII.

Categories	**Benefits**
Benefits related to V2V interoperability [35]:	• Enabling real time information exchange and information update among vehicles • Improve mobility • Improving system throughput and reliability • Enhance routing protocol • Provide direction and route optimization • Fast association and low communication latency between communicating vehicles
Improving traffic management	• Reliable traffic monitoring • Reduce traffic congestion • Reduce travel time • Reduce average delay • Reduce waiting time at the intersections
Benefits related to safety [36]	• Notify driver about road conditions • Path history and path prediction • Collision avoidance and detection • Improve driver decisions • Extending driver vision • Reduce the risk of secondary crashes
Benefits related to sophisticated security system	• Reduce risks to data privacy • Enable the security data access control policy • Provide messages encryption • Provide authentication • Messages confidentiality and integrity

Table VII: Categories of benefits of V2V communication system

3 Challenges of V2V resource allocation

1. **Dynamic environment**: Vehicles continually move and shift places in the extremely dynamic V2V communication environment. Because of this, it is challenging to anticipate resource demand and to timely deploy resources [37].
2. **Limited resources:** Spectrum and bandwidth are often scarce resources in V2V communication systems. This makes it challenging to distribute resources to all V2V couples that require them, particularly in busy locations**.**
3. **Security:** Systems used for V2V resource allocation must be secure to guard against malicious users tampering with the network. Given that V2V communication systems are normally accessible to all cars, this is a difficult challenge

There are also several vehicle-to-vehicle (V2V) communication challenges mentioned in Figure 3.

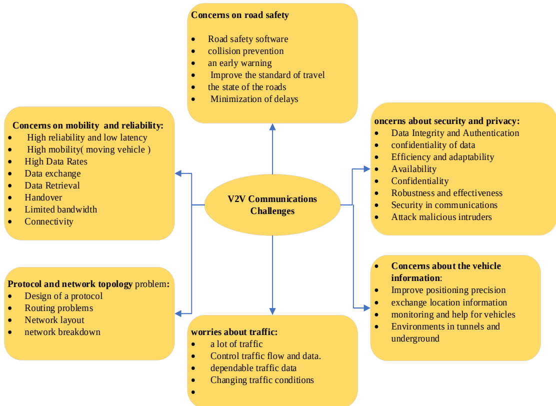

Fig 3. Categories of challenges related to V2V communication systems

IV. CONCLUSION

V2V communication in D2D networks is a common solution to meet the exponential surge in demand for high data speeds, energy efficiency, spectrum efficiency, and throughput. But when network efficiency rises, the heightened interference impact worsens aggregate rate and overall system security. The literature has several answers, however there aren't any articles that compile resource allocation in one area. Not every approach listed is included in all of these surveys. Therefore, in this work, we give a brief review of resource allocation in V2V communications. For V2V communications in D2D networks, we have previously suggested in earlier studies a distributed resource allocation approach based on ant colony optimization and MapReduce. The suggested method takes into account a number of network factors, including interference, distance, and data rates, in order to optimize resource allocation. Our analysis of the suggested technique made use of network datasets. The performance has significantly improved, according to the simulation findings. Additionally, because of how pheromones behave, the suggested approach has a reduced runtime complexity. minimizes the area to be searched for the ideal answer.

The anticipated time to arrive at the ideal answer is therefore greatly reduced.

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