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# Study and development of a hybrid vehicular network for the augmented perception of autonomous vehicles

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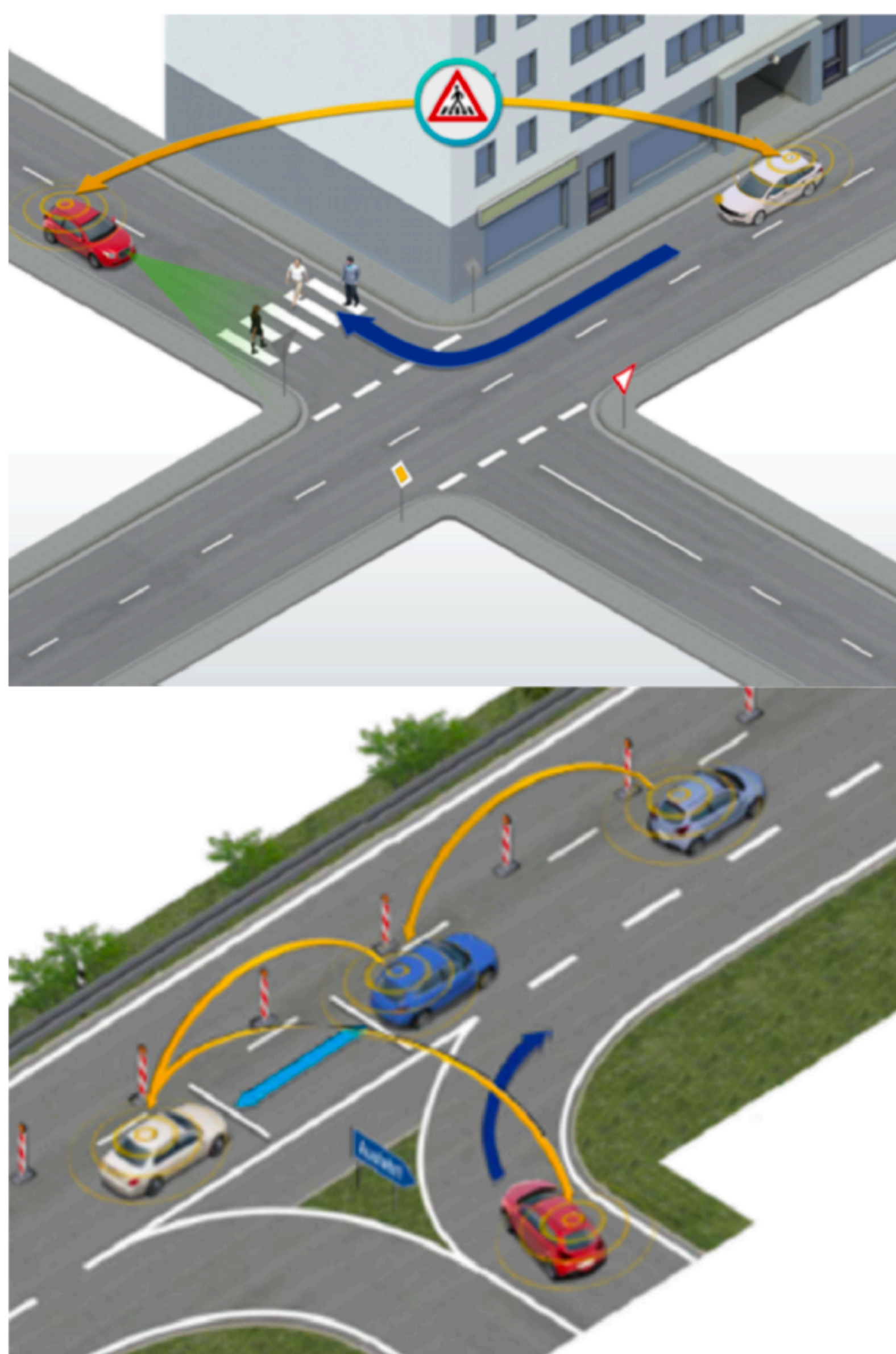
## MOTIVATIONS OBJECTIFS

The motivation behind this study is to implement a machine learning-based architecture to meet the sophisticated demands of modern vehicular internet infrastructures.

The inclination towards robust communications in 5G-enabled networks has made it somewhat difficult to effectively manage network slicing.

## INTRODUCTION

Cooperative perception consists of sharing data or observations acquired by sensors, and advanced environmental information to road users through communication.



Examples of use cases of cooperative perception using communication

## CHALLENGES

- How to resolve perspective differences between the communicating cars?
- How to minimize the communication bandwidth and latency for shared data ?
- Distributed data in VNs pose new challenges for ML
- Decision making for network forming/deforming has not received sufficient attention from research communities.
- ML methods used in various recommendation systems can be applied to learn individual node behavior and network traffic loads to match suitable networks

## RÉFÉRENCES

[1] Hussain, S. M., Yusof, K. M., Asuncion, R., Hussain, S. (2021). Artificial intelligence based handover decision and network selection in heterogeneous internet of vehicles. *Indones. J. Electr. Eng. Comput. Sci.* 22, 1124-1134.

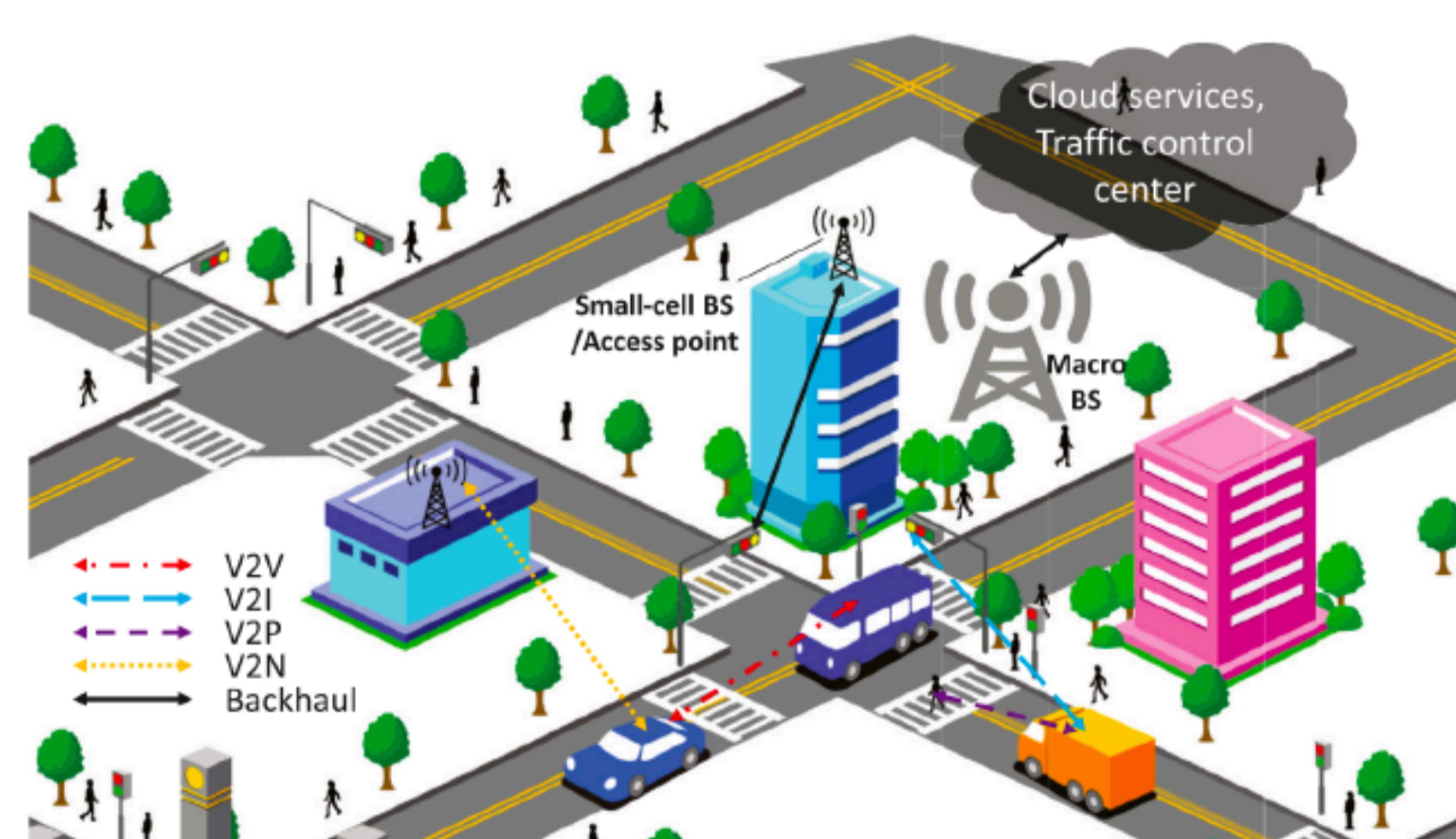
## RELATED WORK

After a detailed study of the previous works related to IoV, vertical handover, 5G, and their integration, the synopsis of the carried out literature survey is formatted in a tabular format, as shown in Table. This table provides an overview of the existing efforts to improve the integration process of IoV, vertical handover, and 5G for better performance and seamless connectivity. The performance of the discussed techniques is evaluated based on some important parameters such as throughput, delay, QoS, and PDR.

	Author	Technique/ algorithm	Throughput	Delay	QoS	PDR (packet delivery ratio)
1	Shaik Mazhar Hussain, et al. [1]	Dynamic Q learning algorithm, fuzzy rules, jellyfish optimization algorithm	✓	✓	x	✓
2	Gita Mahardhika, et al.[2]	Multicriteria Vertical Handover Decision Algorithm	x	x	✓	x
3	Khalid Mahmood Awan, et al.[3]	Cluster based technologies , Edge computing	✓	x	x	✓
4	Sanchezborra, Ramon, et al. [5]	Distributed MultiAccess Edge Computing and cloud computing architecture	x	✓	✓	x
5	Lan Wu, et al. [6]	Coherent beamforming (CB) technology	x	x	x	x
6	Siti Sabariah Salihin, et al.[7]	New optimal HO decision model	✓		✓	✓
7	U. Kumara n, R. S. Shaji[8]	HO decision algorithm	✓	✓	x	✓
8	Emna Bouzid Smida, et al.[9]	Predictive HO mechanism	x	x	x	x
9	Mohammed Balfaqih, et al. [10]	Analytical expression, HO initiate process, DMM	✓	✓	x	✓

## PROPOSED SYSTEM

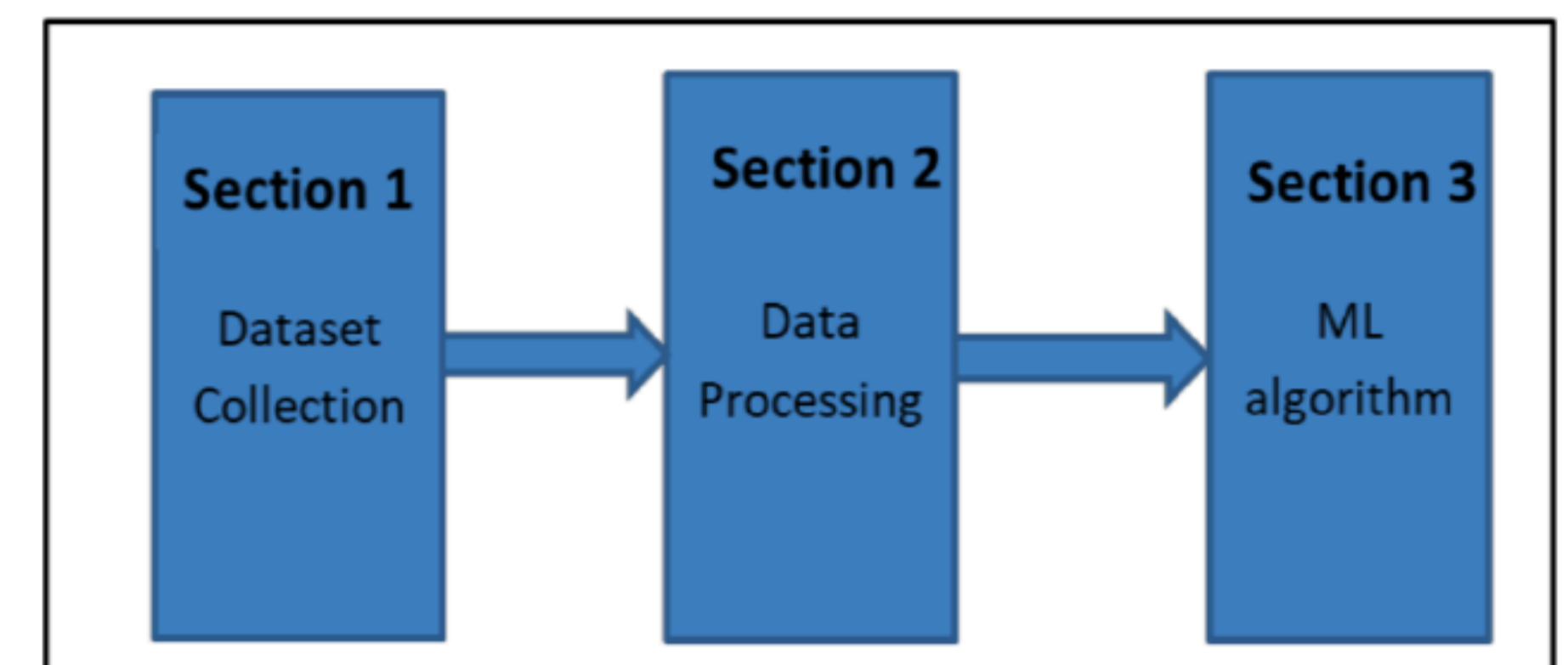
Intelligent mobility management would be an important requirement for future communication systems. In this research, we will propose a learning-based forwarding optimization for the Internet of Vehicles that would facilitate the smooth transition of device and communication connections between networks.



scenario of the heterogeneous vehicular network

### VHO decision architecture

The architecture is related to VHO decision making using ML techniques that consist of 3 sections as we can see in figure



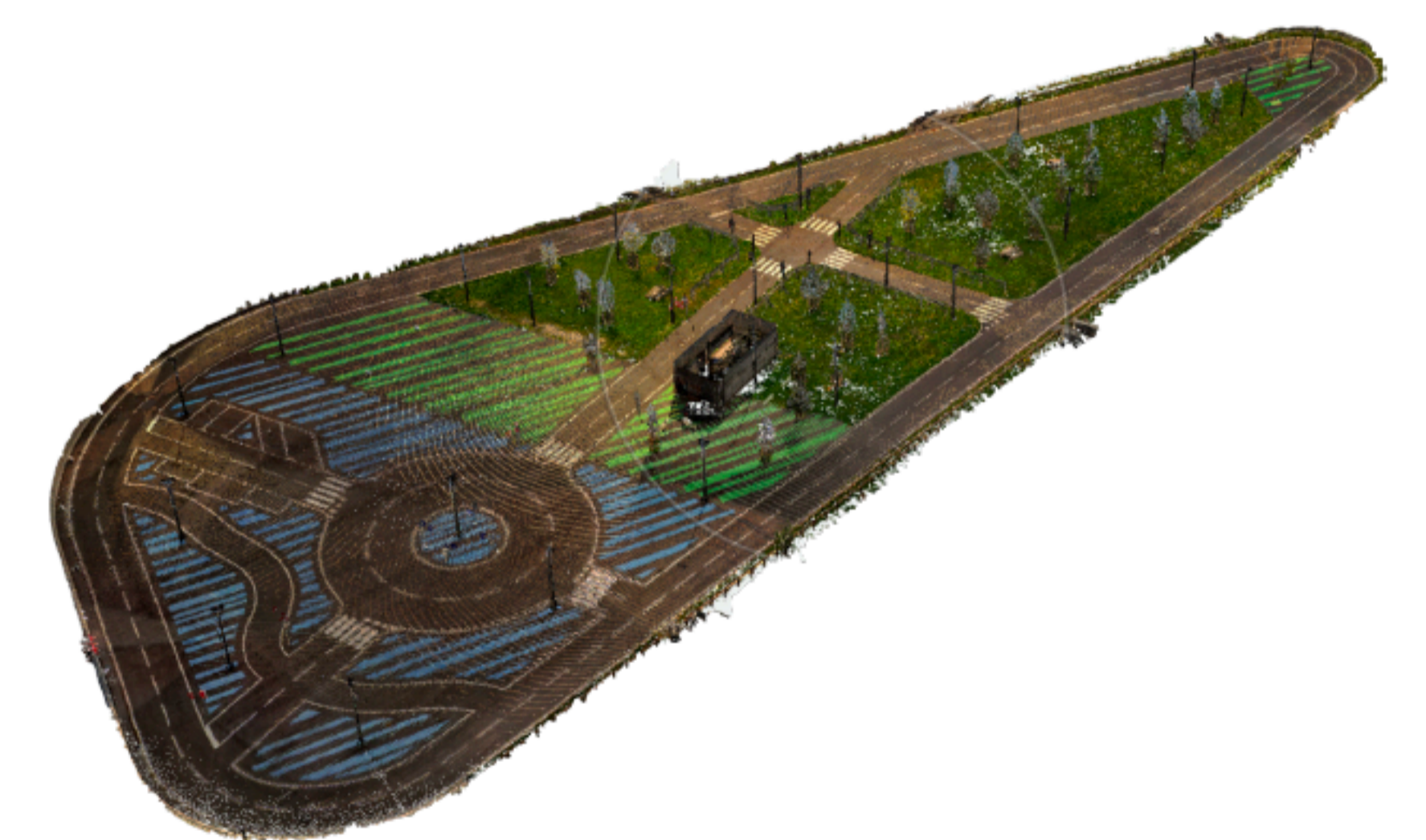
VHO decision making module

- Section 1: Dataset file collection: In this step, numerous data measures are gathered and recorded in a dataset that is kept by the platoon commander.
- Section 2: Before passing the data to the following submodule, this Section is in charge of cleaning and processing the dataset.
- Section 3: Machine learning processing: Decisions regarding handover are made in this section by running the ML algorithm.

## WORKBENCH



Syfra vehicles



3D static map created with point cloud

## CONCLUSION

In order to have an intelligent transport system in smart cities, a well-advanced network infrastructure is needed. There is 5G in the field, which plays a crucial role in this process. Though there is an advanced network infrastructure, it is important to have the best handover mechanism for the fast-moving vehicles to shift from one network to another. In this poster, the principles behind various handover algorithms have been analyzed. In accordance with the review of literature works, a new idea by which the IoV, vertical handover, and 5G can be integrated