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Traffic Anomaly Detection and Analysis for 5G Enabled Autonomous Vehicle Systems

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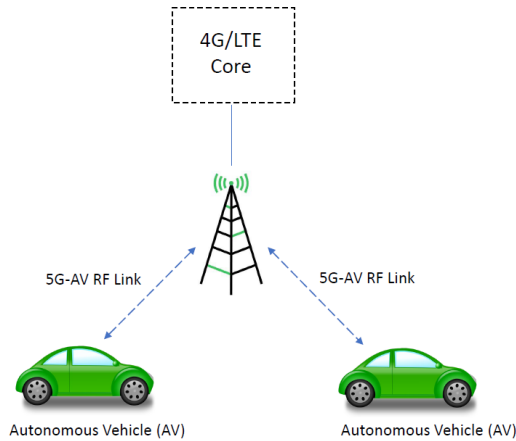


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Traffic Anomaly Detection and Analysis for 5G Enabled Autonomous Vehicle Systems



Block diagram that shows the communications between autonomous vehicles to a 5G tower. The 5G tower is anchored to the 4G/LTE core, as defined in the 5G NSA architecture

Problem Statement

- Develop ML based anomaly detection systems for the wireless communications link between an autonomous vehicle (AV) and 5G NSA small cell tower for MCAS Miramar use case.
- Approach:
 - Assess current state of the art in ML techniques for 5G enabled vehicular environments. Survey current AV systems in commercial settings. Include discussions with Miramar end users to determine requirements and needs.
 - Determine possible ML based IDS approaches for 5G enabled autonomous vehicle networks. Candidate solution: Autoencoder neural networks.
 - Simulate the performance of the most potent ML techniques in a small 5G-AV network. Matlab and TensorFlow will be employed to model the system and 5G RF environment. Use open source, public vehicular datasets for ML training.

Impact

- Future of autonomous networks is grounded in the use of ML and AI, as outlined in DoN IAS strategy document. 5G enables these technologies to ensure low latency and bandwidth efficient connectivity.
- Deployment of 5G for autonomous systems requires a piece meal approach.
- MCAS Miramar's 5G NSA network provides a suitable environment to test 5G technology and security in a small unmanned use case that benefits base users.
- This can lead to further understanding on how ML and AI can be leveraged (via 5G) to enact secure autonomous communications.

Transition

- The PI is currently funded through ONR on complementary projects studying anomaly detection for resilient 5G energy networks at MCAS Miramar.
- MCAS Miramar, with the support of NIWC-PAC, is aggressively looking at integrating 5G and next generation wireless protocols to enhance connectivity of their autonomous assets.
- CRUSER seed funding will allow us to showcase the potential feasibility of ML based IDS for the Miramar AV use case.
- Preliminary models and results from this proposed work will be used to obtain follow on funding through our current sponsor, ONR NextStep.