## **Project title:** Traffic modelling and network infrastructures planning in the era of EVs and CAVs

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| **Helpful existing knowledge:** | Applied Mathematics, Scientific Computing and Simulation |
| **Funding status:** | No funding |

**Project Description:**

During the last decade, Electric Vehicles (EVs) and Connected Automated Vehicles (CAVs) capability has consistently advanced, notably in terms of technological performance and safety features as well as on the operational and regulatory front. Thanks to their communication features, CAVs provide the opportunities to control traffic flow and optimise network performance while reducing fuel consumption and improving road safety. However, the gradual deployment of CAVs introduces a transition phase of mixed traffic flow containing both CAVs and legacy vehicles. On the other hand, the acceptance of EVs required improved perception, access, and appropriate distribution of charging infrastructures with stable energy supply through renewable sources. To leverage the potential of EVs/CAVs alongside smart road technology to enhance mobility via network level traffic management requires a systemic approach, which integrates technological, socio-economic and environmental opportunities and constraints, to formulate long-term trade-off solutions. A sound understanding of the dynamics of mixed traffic on road networks as well as a timely and optimal deployment of the required infrastructures will play a significant role to harness the capability of CAVs to improve the efficiency of transport systems.

The aims of this project are

- to develop new traffic modelling framework during the transition from legacy vehicle to EVs and CAVs
- to assess the economic and environmental impact of the automation and electrification
- to investigate the energy requirement and propose scenarios for optimal infrastructure planning to facilitate this transition.

**Useful references**


1. Talebpour A and Mahmassani HS (2016) Influence of connected and autonomous vehicles on traffic flow stability and throughput. Transp. Res. C, Emerg. Technol., 71:143-163.
2. Wu C et al. (2018) Stabilizing traffic with autonomous vehicles. Proc. IEEE Int. Conf. Robot. Autom. (ICRA), pp. 1–7.
3. Vinitsky E et al. (2018) Lagrangian control through deep-RL: Applications to bottleneck decongestion. Proc. 21st Int. Conf. Intell. Transp. Syst. (ITSC), pp. 759–765.
4. Zhou et al. (2022) Location optimization of electric vehicle charging stations: Based on cost model and genetic algorithm. Energy 247, p. 123437.
5. Zhang M (2018). Location planning of electric vehicle charging station. IOP Conf. Series: Materials Science and Engineering 39478042126.