Post-doc, PhD and Research Engineer positions in Digital Twins and V2X for Connected and Automated Mobility

Job description

The UWICORE laboratory at the Universidad Miguel Hernández de Elche (Spain) offers 1 post-doc, 1 PhD and 1 Research Engineer positions to develop cognitive 5G/AI-powered Digital Twins for Automated Mobility utilizing cooperative perception. Cooperative perception will enable the exchange of sensed information among connected automated vehicles (and infrastructure nodes) to enhance their perception of the driving environment. Designing an effective and efficient cooperative perception is a complex task since it involves efficient and low latency V2X communications, realistic driving environments and sensor fusion algorithms to fuse locally sensed data with data exchange over V2X.

In this context, the project will design and implement a software/simulation platform for the generation of digital twins of the driving environment based on cooperative perception for connected automated driving. The SW platform will bundle networking, driving and ADAS/sensor emulation capabilities leveraging and evolving existing high-fidelity open 3D simulation engines (e.g. CARLA), autonomous driving open software stacks (e.g. Autoware or Apollo) and V2X communication capabilities to connect the different simulated agents (vehicles and infrastructure nodes) using and extending the models/tools developed at our lab.

Using the implemented SW platform, research will be conducted to address fundamental questions related to cooperative perception and other cooperative AD functions (e.g. maneuver coordination), such as when and how sensed data should be exchanged, as well as design and evaluate novel AI-powered connectivity solutions for connected and automated mobility (including the generation of the necessary datasets using the SW platform budling networking, driving and ADAS/sensor functionalities. These AI-based communications and networking solutions should target resilient, scalable and self-adaptable V2X networks capable to predict the evolution of V2X communications and the driving context to improve the operation of cooperative perception and other V2X-enabled connected and automated driving functions (e.g. maneuver coordination).

The specific tasks to be conducted by the Research Engineer for Autonomous Driving (**Profile 1**) include:

- Implement SW components for autonomous driving (AD) stack of the platform to enable cooperative perception, including modules for data format transformation and new ROS nodes for sensor fusion.
- Implementation/evolution of other AD agents and road infrastructure nodes in the high-fidelity 3D simulation engine of the platform with (simplified) cooperative perception capabilities.
- Evolve existing ROS bridges between the high-fidelity 3D simulation engine and the autonomous driving software stack of the platform to enable cooperative perception.
- Implementation of new high-fidelity 3D driving scenarios.
- Implementation of the necessary V2X components for the connection of different simulated agents leveraging existing models/tools provided by UWICORE.
- Generation of datasets using the implemented scenarios to train and validate AI-based solutions that will be studied in the framework of the project.

The specific tasks to be conducted by the Post-doc and PhD on V2X for AD (**Profile 2**) include:

- Design new V2X solutions for a scalable operation of cooperative perception through the context- and value-aware adaptation of the sensed data that is V2X-exchanged, that could include congestion control and redundancy control techniques.
- Design novel cognitive AI-powered connectivity and networking solutions for guaranteeing the scalability of the V2X network, that could include the prediction of the evolution of V2X communications and the driving context to improve the operation of cooperative perception, as well proactive mechanisms to estimate the optimum (time and content) generation of cooperative perception messages.
- Contribute to the development of the software platform as needed for the research and generation of datasets using the implemented scenarios to train and validate AI-based solutions that will be studied in the framework of the project.

Candidates profile

Research engineer candidates (Profile 1) should have a Master (preferably) or Bachelor in Computer Engineering, Telecommunications, or Electrical (or closely related disciplines). Desired technical skills include ROS, C++ and Python programming languages, GitHub and Docker, as well as Linux and Bash environments. Interest or experience in connected and automated driving are also valuable. The candidate should have good programming skills. Publications in journals and conferences are valuable, but not required. Simulation, prototyping and experimentation experience will be positively considered (but not required). Good written and spoken communication skills in English are required, as well as team working skills, self-motivation and a strong desire to utilize technology for improving society.

PhD/Post-doc candidates (Profile 2) should have a Master (for PhD position) or PhD (for Post-doc position) in Telecommunications, Electrical, or Computer Engineering (or closely related disciplines). Postdoc candidates should have a proven track record of publications in relevant journals and conferences, and the candidate should have done the PhD or have experience in one of the following research topics: V2X networks, cooperative perception, congestion control, MAC and radio resource management, IoT/5G. PhD candidates are not required to have publications in journals and conferences, but are valuable. Simulation, prototyping and experimentation experience will be positively considered in both cases (but not required) as well as strong theoretical foundations, analytical capabilities and critical thinking. Good written and spoken communication skills in English are required, as well as team working skills, self-motivation and a strong desire to utilize technology for improving society.

Conditions

- Competitive annual salary based on knowledge, qualifications and/or years of work experience of the candidate. No previous work experience is necessary to apply for the position for the PhD/research engineer positions, we like training young researchers.
- Full time dedication with flexible working conditions.
- Application deadline: continuous evaluation until the position is filled.
- Contract duration: depending on the profile between 20 and 36 months.
- Starting date: ASAP from March/April 2023.
- Non EU-candidates should have preferably an EU working permit.

Location/Who we are/About the Uwicore lab

The UWICORE (Ubiquitous Wireless Communications Research) laboratory is part of the Communications Engineering Department of the Universidad Miguel Hernández de Elche (Spain). The laboratory has strong expertise and research record on the design of wireless technologies to verticals, in particular in the areas of connected and automated vehicles as well as Industry 4.0. The lab actively participates in European research programs and closely works with national and international companies and research institutions. The laboratory also actively participates in standardization groups (e.g., ETSI) to transfer its research output. The candidates will join a very dynamic research lab with international collaborations and possibilities to develop their research profile and promote their career.

Application

Interested candidates should send their application by email. Candidates must indicate in their email if they are opting for Profile 1 or Profile 2 positions. Candidates should send their Curriculum Vitae and their Academic Certificate and transcript of records to Prof. Javier Gozalvez (j.gozalvez@umh.es), Dr. Miguel Sepulcre (msepulcre@umh.es) and Dr. Baldomero Coll (bcoll@umh.es). The subject of the email should be "Positions in DiGiT - Candidate name". Applications will be continuously evaluated upon reception, and online interviews will be organized with the selected candidates until the positions are filled.