

Corso di Dottorato in ICT

Doctoral Course in ICT

Research project for a PhD curriculum in ICT – Curriculum: Electronics and Telecommunications

Tutor: Prof. Paolo Falcone

(Possibile) Italian Co-tutor: Laura Giarre (Unimore), Marko Bertogna (Unimore).

(Possibile) Foreign Co-tutor: Jonas Sjöberg (Chalmers)

Proposed Title of the research: Learning and prediction of human road users in traffic scenarios for autonomous driving applications.

Keywords: (3) Machine-learning, Multi-agent systems, Intelligent Transportation Systems

Research objectives: --(max 10 rows)

A self-driving (or autonomous) vehicle plans its motion based on the *a priori* knowledge and the *online* perceived surrounding environment. In particular, the planning problem accounts for the *current* and *predicted positions* of the surrounding objects. While neighbouring autonomous vehicles could, in principle, broadcast their exact planned behaviour, the behaviour of non-cooperating human road users, including pedestrians, cyclists and legacy vehicles, must be inferred from the current traffic scene.

The objective of this Ph. D. research project is to develop data-driven algorithms to learn and predict the motion of human-road users in urban traffic scenes. The theoretical contribution will be validated against experimental data in autonomous path planning and control applications.

Proposed research activity --(max 10 rows)

The problem of learning and predicting humans in traffic has been mainly approached by computer scientists in the computer vision domain. Recently, end-to-end deep learning approaches have been proposed, which output a predicted trajectory starting from an image of the current traffic scene.

In this research project, the Ph. D. candidate will explore the problem of learning the interactions in a multi-agent setting, formulated as the problem of graph learning. That is, the problem of learning interactions (links) between road users and gains (weights) that determine their motions, based on the relative distance w.r.t. the surrounding road users. The developed algorithms will be validated by using real-data collected by cameras and/or cellular phones.

Supporting research projects (and Department)

The research activity will be mainly accomplished at the Department of Engineering “Enzo Ferrari” and is currently not financially supported by specific research projects, it will be supported by research collaborations between the tutor and Ericsson Research and Zenuity AB in Sweden.

Possible connections with research groups, companies, universities.

1) University of California at Berkeley, CA, USA, 2) Chalmers University of Technology, Gothenburg, Sweden.