Wednesday the 20 March 2019 at 10:00
Politecnico di Torino, DISMA, Aula Buzano (third floor)

Mattia ZANELLA

Assistant Professor at Politecnico di Torino

Kinetic assessment of automated traffic flow via control methods

Prof. Maria Vallarino introduces the seminar

Abstract

In recent times the challenge of vehicular automation has posed new and exciting questions about traffic management and governance, which in turn boosted broad developments in the technology for intelligent intersections, driver-assist and self-driving vehicles. One of the main goals of such innovation is the enhancement of driver safety through the mitigation of road risk factors.

In this talk, Dr Zanella will present recent results for kinetic-controlled hydrodynamics. In particular, a hierarchical description of controlled multiagent systems will be developed, by means of kinetic-type strategies with applications to traffic dynamics. Feedback controls are designed at the level of agent-to-agent interactions and then upscaled to the global flow via a kinetic approach based on the Boltzmann equation. These models generally lead to highly nonstandard steady states that can be computed through suitable asymptotic procedures. During the talk, the passage to hydrodynamic equations for constrained kinetic models of collective behaviour will be discussed, taking into account several closure methods. As a result, the number of conserved quantities of the system essentially depends both on the constrained binary model and on the adopted closure strategy. Suitable numerical methods are thus necessary to capture the introduced hierarchy in the fluid regime. The introduced kinetic-type description will highlight a feasible bottom-up role played by the automated vehicles in the control of the traffic stream.

1 M. Herty, A. Tosin, G. Visconti, M. Zanella. *Hybrid stochastic kinetic description of two-dimensional traffic dynamics.* SIAM J. Appl. Math., 78(5): 27372762, 2018.

2 A. Tosin, M. Zanella. *Kinetic-controlled hydrodynamics for traffic models with driver-assist vehicles.* Preprint arXiv:1807.11476, 2018.

3 A. Tosin, M. Zanella. *Uncertainty damping in kinetic traffic models by driver-assist controls.* Work in progress.

Biography

Mattia Zanella is currently Assistant Professor at the Department of Mathematical Sciences "G. L. Lagrange", Politecnico di Torino. His research interests are focused on uncertainty quantification for kinetic equations, optimal control methods and kinetic models for collective phenomena. He obtained his PhD in 2017 with a thesis entitled "Boltzmann type and mean-field modeling of social dynamics: numerics, control, uncertainty quantification" under the direction of Prof. Lorenzo Pareschi. He was the recipient of the "Nicolò Copernico Award 2018" for young PhD fellows distinguished for an innovative thesis in science and technologies.

Save the date for the next event: March 27, 2019
More info on www.polito.it/disma-excellence