

INSALATE DI MATEMATICA



Nonlocal and Steady Wins the Race: Interaction of Nonlocal and Local Conservation Laws in Traffic Modelling

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IN THIS TALK

Macroscopic traffic modelling is intimately related to conservation laws: cars are described by a density and the flux is typically given by the density times a speed depending on traffic conditions. But what happens when the road is shared by two very different kinds of drivers?

Autonomous vehicles (AVs) perceive traffic far ahead, and recent studies suggest they could act as traffic stabilisers, damping stop-and-go waves and reducing fuel consumption and emissions. Their speed is therefore naturally modelled as depending on a weighted average of the density in the surroundings, which gives a nonlocal conservation law. Human drivers, instead, react only to what is right in front of them, leading to classical local models.

In this talk we couple the two descriptions into a mixed nonlocal-local system. After a gentle introduction to conservation laws and to why nonlocal and local equations behave so differently, we show that the coupled model is well posed. Its solutions exist, are unique and depend continuously on the initial traffic configuration. Numerical simulations will illustrate how AVs and human drivers interact on the road.

This is joint work with Rinaldo M. Colombo and Mauro Garavello.

 **words: Macroscopic Traffic Models, Mixed Nonlocal-Local PDEs, AVs-Bulk Traffic Interactions**