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Sommario

In this thesis we propose a model to describe traffic flows on network by the theory of measure-based equations. We first apply our approach to the initial/boundary-value problem for the measure-valued linear transport equation on a bounded interval, which is the prototype of an arc of the network. This simple case is the first step to build the solution of the respective linear problem on networks: we construct the global solution by gluing all the measure-valued solutions on the arcs by means of appropriate distribution rules at the vertices. The linear case is adopted to show the well-posedness for the transport equation on networks in case of nonlocal velocity fields, i.e. which depends not only on the state variable, but also on the solution itself. It is also studied a representation formula in terms of the push-forward of the initial and boundary data along the network along the admissible trajectories, weighted by a properly dened measure on curves space. Moreover, we discuss an example of nonlocal velocity eld tting our framework and show the related model features with numerical simulations. In the last part, we focus on a class of optimal control problems for measure-valued nonlinear transport equations describing traffic ow problems on networks. The objective is to optimize macroscopic quantities, such as traffic volume, average speed, pollution or average time in a fixed area, by

	controlling only few agents, for example smart traffic lights or automated cars. The measure-based approach allows to study in the same setting local and nonlocal drivers interactions and to consider the control variables as additional measures interacting with the drivers distribution. To complete our analysis, we propose a gradient descent adjoint-based optimization method and some numerical experiments in the case of smart traffic lights for a 2-1 junction.
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