TUT 3: Tutorial on Theory of Traffic Flow

Time: Sunday 16:00–19:00 Location: HSZ 403

Tutorial TUT 3.1 Sun 16:00 HSZ 403

A General Theory of Traffic Flow — •Dirk Helbing — ETH Zurich, Universitätstr. 41, 8092 Zürich, Switzerland

The multi-disciplinary study of traffic and transport has revealed many interesting observations such as the existence of a large variety of different congested traffic states and counterintuitive effects such as the slower-is-faster effect. At the same time, great theoretical progress has been made, which is reflected by a large number of models aiming at the reproduction of empirical or experimental findings. However, many of these models have been standing side by side, and an integrative view has been missing to a large extent. This has its roots in the fact that traffic constitutes a complex, self-organizing system, and there is no general theory of complex systems, in contrast to many-particle systems close to equilibrium.

This tutorial will present elements of an integrative approach to traffic systems. Starting from simple car-following models, it will be shown how to derive consistent macroscopic, fluid-dynamic-like traffic models. It will be discussed how the linear and non-linear stability properties of these models can be analytically studied, and what kinds of congested traffic states can be derived from the related instability diagram. If time allows, further issues such as effects of multi-class multi-lane traffic will be studied, as well as network effects and elements of traffic signal control.