Pedestrian streams are ubiquitous, but very diverse. Classifying them is critical in practice for crowd management but also for the organization and validation of models. As far as an empirical classification is concerned, a robust method is still lacking. But also in terms of a theoretical description, a large number of models coexist with an ill-defined range of applicability. In this thesis, these problems are addressed in two ways. First, by studying crowds in their one-dimensional limit, namely Single-File motion, which allows for a better understanding of conceptual problems in models. Second, by drawing inspiration from fluid dynamics, where dimensionless numbers such as the Reynolds number help to classify flows.

Single-File motion exhibits interesting collective effects, such as stop-and-go waves, which are validation benchmarks for any agent-based modeling approach of traffic systems. We investigate different classes of models by examining the influence of different parameters, including time-gap, anticipation time, and reaction time - sometimes revealing surprising connections between well-known modeling approaches.

Then the wide range of phenomena encountered in crowds is organized by introducing two dimensionless numbers rooted in psychological and biomechanical considerations: the Intrusion number based on the preservation of personal space and the Avoidance number based on the anticipation of collisions. Using an extensive data set we show that these two numbers delineate regimes in which different variables characterize the crowd's arrangement, namely, Euclidean distances at low Avoidance number and times-to-collision at low Intrusion number. Based on these results, a fairly general perturbative expansion of the individual pedestrian dynamics around the non-interacting state is performed. Simulations confirm that this expansion performs well in its expected regime of applicability. This is also relevant for the larger class of agent-based crowd models as their equations of motion typically depend on variants of the Intrusion number or the Avoidance number. Simulations show that the occurrence of the Intrusion number and Avoidance number in these models limits their range of applicability to specific regimes of crowd motion.