



Pedestrian crowds exhibit collective phenomena that emerge from local interactions between self-driven individuals. Typical examples include lane formation, stop-and-go waves, and clogging. These patterns arise in distinct density regimes and are governed by qualitatively different interaction mechanisms — from visual anticipation and steering at low densities to body contact and force transmission at high densities.

The second part of the talk compares physics-based (force) and traffic-based (velocity) modelling approaches. These model classes rely on fundamentally different assumptions about motion and interaction: force models incorporate inertia and force transmission, whereas velocity models focus on collision-free motion and speed–distance relations. Because the dominant interaction mechanisms change with density, no single modelling framework can consistently describe crowd dynamics across all regimes.

The talk concludes with an outlook on the ERC Synergy Grant CrowdING, which integrates psychological mechanisms into crowd modelling by enabling agents to switch between different motion models. In this approach, model selection depends on the morphology and interaction regime of the crowd, thereby addressing the limitations of single-model frameworks.