ATUL KUMAR VERMA, Department of Mathematics, Indian Institute of Technology Ropar, India-140001.
Modelling of Stochastic Transport Problems using Multi-Channel Exclusion Processes

Many natural systems exhibit complex behavior under stationary state when either driven by some external field or self driven. Such driven diffusive systems reveal very rich nonequilibrium phenomena in physics, chemistry and biology. In order to analyze the collective properties of these driven stochastic transport problems, totally asymmetrically simple exclusion process (TASEP) model is found to be a paradigmatic model to study such problems in the last decade. TASEP is comprised of particles performing biased hopping with a uniform rate in a preferred direction along a 1D lattice. The particles obey certain preassigned rules under hard-core exclusion principle, due to which a lattice site cannot have more than one particle.

In this talk, I will begin with some beautiful theoretical results on single and two-channel exclusion process followed by results on coupled as well as uncoupled systems with or without a nonconserving dynamics known as Langmuir Kinetics. Additionally, to mimic some stochastic transport problems more realistically, we extend two channel system into three- channel systems in the presence of the attachment-detachment process with open boundary conditions. To understand the collective system dynamics, we derive various phase diagrams and density profiles using mean-field theory and singular perturbation technique, for various parameters. Monte-Carlo simulations are carried out for verifying our theoretical findings, which are in good agreement with theoretical findings.