# Interactions induce correlations in driven diffusive systems

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Many non-equilibrium biological processes such as intracellular transport, cellular organization, cellular motility, etc are supported by the enzymatic molecules called molecular motors or motor proteins. For performing the mechanical work, they convert the chemical energy derived from the hydrolysis of ATP. Experiments suggest that they behave in a cooperative manner and interact locally among them [1, 2]. Driven diffusive systems, in particular, totally asymmetric simple exclusion process (TASEP), provide a fruitful framework for studying the statistical properties of such non equilibrium realistic processes.

In the talk, we examine the collective behavior of interacting particles using a variant of TASEP that consolidates the interactions in the thermodynamically consistent procedure. We show that the analysis of the system using the mean-field approximation that ignores correlations produces the unphysical results. We compute the steady-state properties of the system using the two cluster mean-field analysis and validate the results with Monte Carlo simulations. The fundamental diagram of particle current versus density exhibits particle-hole symmetry. Interestingly, the particle current-density relation is unimodal for the attractions while for sufficiently strong repulsive interaction energy it shows the bimodal behavior. We also obtain the steady-state phase diagram for the open boundary conditions using the maximal and minimal current principles.

## References

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