

WATTHANAN JATUVIRIYAPORNCHAI

Research Activities

Areas of Expertise

Applied probability and stochastic processes: modelling and analysis.

Current Interests and Activities

My recent and current research activities involve stochastic processes in the following areas.

1. Theory on stochastic particle systems

This involves rigorous analysis of the large scale dynamics and the critical behaviour of stochastic particle systems using Markov semigroup and generators together with duality functions.

2. Applications of stochastic particle systems in complex systems

Stochastic particle systems are minimal models of complex systems, and rare fluctuations of dynamic quantities such as particle or energy currents in physical systems have recently attracted major research interest in statistical mechanics and beyond. My research focuses on

- **Traffic modelling** in Bangkok using Totally Asymmetric Exclusion Process (TASEP) and Non-Markovian modeling collaborate with EXAT (Expressway Authority of Thailand).
- **Population dynamics** using Inclusion Processes (IP) in Leptospirosis in North-Eastern Thailand collaborate with Tropical Medicine.

3. Population Genetics

Both forward and backward situations in time are considered based on combinatorial stochastic processes, measure-valued processes and coalescent processes.

4. Sequential sampling methods

We are interested in developing simulation methods by sampling from the random trajectories and understanding of ensemble-based methods in the context of stochastic particle systems and related disciplines via theoretical analysis.

5. Mathematical modelling of stem cells differentiation

This involves predicting interactions and stability of the stem cells from the effect of new discovered drug using Gene Regulatory Networks (GRNs).