ATUL TANAJI MOHITE

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EDUCATION

Saarland University *Nov 2023 - Present*
Doctoral researcher

University of Luxembourg *Nov 2020 - Nov 2022*
Doctoral researcher

Ludwig Maximilian University, Munich *Oct 2017 - April 2020*
Master of Science in Physics GPA: 1.3

Indian Institute of Technology, Delhi *Jul 2013 - May 2017*
Bachelor of Technology in Engineering Physics DGPA: 7.913 / 10
Department of Physics

RESEARCH INTERESTS

I am interested in non-linear and non-equilibrium phenomena in physics. This includes many problems in theoretical biophysics and non-equilibrium statistical physics. My main focus is Stochastic Thermodynamics and Coarse-graining and the interplay of phase separation and chemical reactions in a biological context. The research topics I would primarily like to work on are non-linear dynamics, stochastic processes, information theory, soft condensed matter, and non-equilibrium thermodynamics.

PROJECTS

Master's Thesis - Mechanochemical co-operativity and pattern formation
My master's thesis aims to investigate the role of mechanochemical interactions between different protein species and membranes in the context of protein binding co-operativity. This mechanism gives rise to non-linear cytosolic protein recruitment rates which follows Hill curves. Further simulating a reaction-diffusion system for a two-protein species, our model reveals a rich phase diagram with different phases characterising the domination of either protein species or a coexistence regime leading to pattern formation.

Doctoral Project - Optimizing the energetics of the field theories
I developed a generic framework for field theories to optimize the energetic cost (work) associated with finite-time driving. This framework relies on the recent developments on the equivalence of stochastic thermodynamics and optimal transport theory. Further, I formulated a numerical Pareto optimisation problem to simultaneously optimise the mean and variance of the work, revealing a first-order phase transition for Pareto optimization.

Doctoral Project - Thermodynamics of Active Ising Model
I contributed to developing the thermodynamic framework for the Active Ising Model. In particular, our model satisfies the detailed balance condition at the microscopic level ensuring it's thermodynamic consistency. We coarse-grained the microscopic model to find the corrections to the hydrodynamic equation of motions for the Active Ising Model. We found the qualitative and quantitative agreement of thermodynamic quantities at the hydrodynamic and microscopic levels.

PUBLICATIONS

Atul Tanaji Mohite, A. Goychuk and E. Frey, Mechanochemical co-operativity and pattern formation in two protein species (in preparation)
Atul Tanaji Mohite, Optimizing energetics of the field theories (in preparation)

SCHOLASTIC ACHIEVEMENTS

IIT-Joint Entrance Examination 2012-13
Secured All India Rank 1474 in IIT-JEE 2012-13

Indian Physics Olympiad (IPhO)
Selected in the top 300 students in India, 2012-13

Middle-school Aptitude and Maths test, 2007-08
Awarded 17th rank in Maharashtra state of India with a percentile score of 99.99, 2007-08.

WORK EXPERIENCE

University of Luxembourg *Nov 2020 - Nov 2022*
Doctoral researcher in the field of Theoretical Statistical Physics.

Max Planck Institute for Neurobiology, Martiensried *Dec 2018 - Mar 2020*
Contributed to a team of students for maintenance of SyConn. SyConn is aimed to automate synaptic connectivity inference for volume electron microscopy.

SUMMER SCHOOLS

Physics of Life Summer School , Edinburgh: Poster *Apr 2022*
Outstanding Challenges in Nonlinear Dynamics, Les Houches: Poster *Mar 2022*
International Summer School FPSP XV, Brunneck: Poster *Jul 2021*
The Beg Rohu Summer School, Quiborn: Poster *Jun 2021*
Arnold Sommerfeld School - Physics of Life, LMU Munich *Oct 2019*

CONFERENCES

Cell Physics, Saarbruecken *Oct 2023*
Third Infinity conference, Goettingen: Talk *Sept 2022*
DPG, Regensburg: Talk *Sept 2022*
WOST III Workshop, Online: Poster *May 2022*
Journees de Physique Statistique, Paris: Talk *Jan 2022*
Inhomogeneous Random Systems, Paris *Jan 2022*
WOST II Workshop, Online *May 2021*
CeNS/CRC235 Workshop Evolving Nanosciences *Sep 2019*
MECO44, Key Challenges in Statistical Physics, Kloster Seeon *May 2019*

TEACHING EXPERIENCE

Saarland University *Nov 2023 - Feb 2024*
Statistical Physics, Winter semester 2023

University of Luxembourg *Feb 2022 - Jul 2022*
Non-equilibrium soft and active matter, Summer semester 2022

University of Luxembourg *Sep 2021 - Dec 2021*
Calculation methods for Physics and Mathematics, Winter semester 2021

Ludwig Maximilian University, Munich *Nov 2018 - Feb 2019*
Calculation methods for Physics and Mathematics, Winter semester 2018

INTERNSHIPS

Leiden University, Netherlands *May 2016 - Jul 2016*
Implemented experimental setup for a tomography technique of NbN superconducting multiphoton detectors and analyzed data for it.

TIFR-Mumbai *May 2015 - Jul 2015*
Conducted experiments and examined polarization dependence of dielectric metastructures

TECHNICAL SKILLS

Programming Languages	C++, Java, Python, OOP, HPC
Modeling and Analysis	COMSOL, Mathematica
Software & Tools	Latex

LANGUAGES

Marathi	Mother tongue
Hindi	Fluent
English	Fluent
German	Proficiency B1

EXTRA-CURRICULAR INVOLVEMENT

National Service Scheme-IIT Delhi, Volunteered for long term project NSS-Medicine Baba, Born-to-Blossom and Cloth & relief fund collection drives *Jul 2013 - May 2017*

Part of IIT-Delhi Fine Arts & Crafts club *Jul 2013 - May 2017*

HOBBY AND INTERESTS

As a hobby, I like to paint and sketch. I enjoy reading novels and poetry. I like to play strategy board games like Chess. I admire the works of Bhalachandra Nemade and Tukaram.