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Saravanan Rajendran

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Education

- 2017-present **Ph.D., Physics**, *Indian Institute of Technology Mandi*, India.
- 2015-2017 **M.Sc., Physics**, *Indian Institute of Technology Mandi*, India.
- 2015 **B.Sc., Physics**, *The American College*, Madurai, India.

Research Interests

molecular reactions in condensed phases, reaction-diffusion systems, multi-state problems in quantum and statistical physics, mathematical and numerical method development

Phase transition in NP-problems, Quantitative finance, stochastic processes.

Publications

- 2019 **Reaction-diffusion system: Fate of a Gaussian probability distribution on flat potential**, *R. Saravanan**, *A. Chakraborty*, *Physica A*, 120989 (2019)[link](#).
- 2019 **Exact diffusion dynamics of a Gaussian distribution transiting between two flat states**, *R. Saravanan**, *A. Chakraborty*, *Chem. Phys. Lett.*, 731, 136567 (2019)[link](#).
- 2020 **Some exact time-domain results related to reversible reaction-diffusion systems**, *R. Saravanan**, *A. Chakraborty*, *Chemical Physics*, 539, 110955.
[link](#)
- 2020 **Diffusion dynamics in the presence of two competing sinks: Analytical solution for Oster-Nishijima's model**, *R. Saravanan**, *A. Chakraborty*, *Physica A*, 12537.
[link](#)

*-corresponding author

All preprints can be made available on request

Awaited publications:

5. **A general method to solve diffusion in piece-wise linear potentials in the time-domain**, *R. Saravanan**, *A. Chakraborty*, Chemical Physics, (under revision).
[link](#)
6. **Exact time-domain solution of the Schrödinger equation for a new scattering model**, *R. Saravanan**, *A. Chakraborty*, (under revision).
[link](#)
7. **An exact analytical scheme using a new potential to solve one-dimensional quantum systems**, *R. Saravanan**, *D. Kumar*, *A. Chakraborty*, Physica E, under review.
[link](#)
8. **Diffusion-reaction scenario for a Gaussian distribution in harmonic potential and a time-dependent sink**, *R. Saravanan**, *A. Chakraborty*, Chemical Physics, (under review).
9. **Exact quantum properties of a dimple-harmonic trap decorated by a delta-potential: transient insights into Bose-Einstein condensation**, *R. Saravanan**, *A. Chakraborty*, (preparation).
10. **Transient insights into Bose-Einstein condensates using a dimple $|x|$ -potential decorated by a delta-potential**, *R. Saravanan**, *A. Chakraborty*, (preparation).
11. **Exact wave packet dynamics of a Gaussian in two flat energy states coupled at a point**, *R. Saravanan**, *A. Chakraborty*, (to be submitted).
[link](#)

PhD Thesis

Jul 2016-2019 Time domain analytical methods to solve the multi-state problems in quantum & statistical physics

Supervisor Dr. Aniruddha chakraborty

Summary Multi-state models are ubiquitous in science and they explain complex systems ranging from molecular processes to systems in biology, finance. The theory of such systems are often governed by coupled Smoluchowski/coupled Schrödinger equations. In specific to molecular processes, the process may proceed either through curve crossing between Born-Oppenheimer potential surfaces of the molecule (diabatic representation of the problem), or by crossing an activation barrier (adiabatic). Very few analytically solvable cases have been reported in both the representations and even the existing solutions are in the Laplace domain. In the thesis, we developed mathematical methods to solve the models analytically in time-domain. In the end, our time-domain work presented time-dependent population profiles of such molecular processes as a function of the system and molecular parameters.

Computing

Computational techniques Langevin dynamics (research level), Molecular dynamics (course-level)
Programming Python, C
Documentation L^AT_EX
Other softwares [Wolfram Mathematica](#), Matlab, HyperChem
OS Linux and Windows

Recent talks/Posters

13, August, 2020 Delivered an open seminar on "**Theory of Reversible Reaction-Diffusion Systems using a simple Two-State Model**" in Google meet, participants: 11
04, August, 2020 Delivered an open seminar on "**Theory of Electron Transfer: Microscopic descriptions, Methods and Open problems**" in Google meet, participants: 15 (IIT inmates)+11 (outsiders)
04, July, 2019 Delivered an invited talk on "**Developing Mathematical Methods to Solve Problems of Quantum and Statistical Physics**" in The American College, Madurai, India. Participants: 33+1 (outsider).
21, February, 2018 Presented a poster entitled "**Analytical solutions for multistate problems in time domain**" at the Spring College on the Physics of Complex Systems, ICTP, Trieste, Italy

Awards/Honors

Reviewer Invited reviewer in the journal 'Catalysis today' published by Elsevier.
Topper in physics Einstein Awards for securing top grade in the examinations (B.Sc- all 6 semesters)
Topper in physics M A Thangaraj Awards for securing the top grade in the examinations (B.Sc- all 6 semesters)

Topper in Hindi Vanchinathan Awards for securing first marks in Hindi language (B.Sc- all 4 semesters)

Teaching experiences

2017 (fall) Teaching Assistance in Computational Chemistry, IIT Mandi
2018 (spring) T.A in Group theory and Spectroscopy, IIT Mandi
2018 (fall) T.A in Mechanics of waves and particles, IIT Mandi
2019(spring) T.A in Physics Practicum, IIT Mandi
2019 (fall) T.A in Computational Chemistry, IIT Mandi
2020 (spring) T.A in reaction dynamics, kinetics and catalysis, IIT Mandi

Other experiences

Characterization UV-Visible absorption spectrophotometry, X-ray Photoelectron spectroscopy
Characterization X-ray Diffractometer (powder), Raman spectroscopy, Interferometers, PPMS
Plotting Origin

International conferences/workshops

19 Feb-16 Mar, 2018 Attended a workshop entitled "Spring College in the physics of complex systems" held at Abdus Salam ICTP, Trieste, Italy

References

- Dr. Aniruddha Chakraborty
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**Additional references available on request*