Sreejith Santhosh

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Research Interests

Theoretical Biophysics, Dynamical Systems, Morphogenesis, Active Matter

Education

PhD in Physics (Biophysics). GPA **3.971/4.0** 2021 - 2026
Advisor : Prof. Mattia Serra
University of California San Diego, La Jolla, CA.

B.Tech. in Engineering Physics. CGPA **8.45/10.0** 2016 - 2020
Physics GPA **8.82/10.0**
Indian Institute of Technology Madras, Chennai, India

Publications

- **Sreejith Santhosh**, Mehrana R. Nejad, Amin Doostmohammadi, Julia M. Yeomans, and Sumesh P. Thampi; *"Activity induced nematic order in isotropic liquid crystals"* Journal of Statistical Physics (2020)
- **Sreejith Santhosh** and Mattia Serra. *"Optimal Locomotion for Limbless Crawlers"* Physical Review E (2022)
- **Sreejith Santhosh**, Haodong Qin, Bjoern F. Klose, Gustaaf B. Jacobs, Jerome Vetel, Mattia Serra; *"Spike formation in 3d flow separation"* J. Fluid Mechanics (2023)
- Mattia Serra,.., **Sreejith Santhosh**,.., L. Mahadevan; "*A mechanochemical model recapitulates distinct vertebrate gastrulation modes*"Sci. Advances (2023)
- Merlin Lange,.., **Sreejith Santhosh**,..,Mattia Serra,.., Loïc A. Royer; "*Zebrahub-Multimodal Zebrafish Developmental Atlas Reveals the State Transition Dynamics of Late Vertebrate Pluripotent Axial Progenitors*" Cell (2024)
- **Sreejith Santhosh** , Cuncheng Zhu, Blaise Fencil and Mattia Serra; *"Coherent Structures in Active Flows on Dynamic Surfaces"* biorXiv (2025)
- Sierra Schwabach*,**Sreejith Santhosh***, Audrey Miller Williams, Maureen Cetera, Mattia Serra, Sally Horne-Badovinac *"Tissue geometry and mechanochemical feedback initiate rotational migration in Drosophila"* biorXiv (2025)
- Enrico Maiorino, **Sreejith Santhosh**, Julian Dukes, Mattia Serra; "*Integrating local and global cues for optimal source finding without gradients*"(pre-print)
- **Sreejith Santhosh**, Mattia Serra; *"Odd elasticity in achiral epithelia focuses stress-strain at defects"* (pre-print)

* : These authors contributed equally

Conferences and Workshops

- "*Genes, geometry and mechanics govern vertebrate gastrulation*", April 2021, 11th Annual Southern California Systems Biology Symposium, UCLA (Los Angeles, USA)
- "*Lagrangian folding of material surfaces and the theory of material spike formation in 3D flow separation*", April 2022, 15th Southern California Fluids Symposium, UCLA (Los Angeles, USA)
- "*Mechanics and a Turing Mechanism pattern the early chick embryo*", Feb 2023, Biophysics of Organoids, Princeton University (Princeton, USA)
- "*Spike formation theory in 3d flow separation*", Southern California Fluids Symposium, SDSU (April 2023, San Diego, USA), APS DFD (Nov 2024, Salt Lake City, USA)
- KITP summer school on "*Synthetic Morphogenesis*", Jul-Aug 2023, KITP (Santa Barbara, USA)
- *"Patterning mechanisms in pre-gastrulation chick embryo"*, March 2024, APS March Meeting (Minneapolis,USA)
- *"Coherent Structures in Active Flows on Dynamic Surfaces"*, March 2025, APS March Meeting (Anaheim,USA)

Research Experiences

Graduate Student Researcher, Serra Group April 2021 - present
PI: Prof. Mattia Serra, UC San Diego

- Working on problems in Dynamical systems, Morphogenesis and biophysics using theoretical and computational methods.

Stochastic Formulation of Chemotaxis in E.Coli 2019 - 2020
PI: Prof. Manoj Gopalakrishnan, IIT Madras *B.Tech Thesis Project*

- Modelled the chemotactic signalling network of E.Coli as a stochastic processes and investigated the dependence of drift velocity in different environments.

Mathematical Modelling of Hydrogels May 2019 - June 2019
PI: Prof. Dmitry Chigrin, RWTH Aachen *Summer Internship*

- Investigated theoretical non-equilibrium models of hydro-gels and worked with the numerical implementations of these models.

Activity induced order in Isotropic Liquid Crystals May 2018 - Dec' 2019
PI: Prof. Sumesh Thampi, IIT Madras

- Theoretically demonstrated activity induced nematic order in liquid crystals from an disordered state using the Q-tensor formulation of active nematics.

Teaching Experience

- Teaching Assistant, (Mechanics I) UCSD Fall 2020
- Teaching Assistant, (Quantum Mechanics II) UCSD Winter 2020
- Teaching Assistant, (Mechanics II) UCSD Winter 2023, 2024, 2025
- Teaching Assistant, (Waves, Fluids and Thermodynamics) UCSD Winter 2024

Awards/Honors

- Recipient of the Kishore Vaigyanik Protsahan Yojana (KVPY) scholarship by the Govt. of India.
- Recipient of the Physics Excellence Fellowship by UC San Diego in recognition of academic achievement in undergraduate studies.
- University of California president's Lindau Nobel Laureate Meetings Fellow 2024

Extra-Curricular Activities

Organizer: Coffee Room Seminar Series 2022 -

- Manages logistics for a student-run quantitative biology (q-bio) seminar series.
- Organizes events to create an inclusive and collaborative environment among graduate students, post-docs & faculty doing q-bio research at UCSD.

Tensors Student Coordinator, IIT Madras 2016 -2017

- Organized workshops and seminars for high school engineering aspirants from underprivileged backgrounds in the state of Kerala, India.
- Managed a team of 15 volunteers to conduct a mock engineering entrance examinations for over 2000 high school students.

Co-founded a physics undergraduate journal club at IIT Madras 2019-2020
Volunteer for the National Service Scheme, IIT Madras. 2017-2018

Journals refereed

Science Advances (2024)

Students mentored

- Julian Dukes (Physics undergraduate UCSD, 2023). After: PhD (Physics) UCSD
- Blaise Fencil (Maths undergraduate UCSD, 2024)
- Kelly Ortiz Franco (ENLACE summer program 2024)
- Isabela Cifuentes Enriquez (ENLACE summer program 2024)
- Aravind Ramakrishnan (CS masters student UToronto, 2024). After: PhD (Physics) UCSD 2025