SURAJ KUMAR SAHU

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EDUCATION

University of California Merced **Jan 2021 – Present**
PhD Candidate, Physics | Advisor: ***Prof. Ajay Gopinathan*** *GPA: 3.84/4.00*

National Institute of Technology Rourkela **Aug 2017 – May 2019**
Master of Science in Physics

D.R. Nayapalli College, Utkal University **Jul 2014 – Jun 2017**
Bachelor of Science (Honors in Physics)

SKILLS

- **Computational Modeling:** Agent-Based Modeling, Numerical Simulations, Particle-Based Simulations, Reaction-Diffusion Systems, Network Analysis, HPC
- **AI & Agentic Tools:** Context Engineering, Prompt Design, Custom Agents, MCP Servers, Agentic Workflows, LLM Integration (Claude API), Image Analysis Pipelines
- **Data Science & Visualization:** Data Analysis, Statistical Modeling, Scientific Visualization, NumPy, SciPy, NetworkX
- **Bioinformatics & Image Analysis:** Cellpose, ReaDDy, Cell Segmentation, 2D/3D Image Restoration
- **Programming Languages:** Python, Julia, LaTeX
- **Tools & Software:** Git, GitHub, VS Code, Cursor, Copilot, HPC Cluster Workflows

PUBLICATIONS

Sahu, S., M. Biswas, **"Modeling protein association from homogeneous to mixed environments: A reaction-diffusion dynamics approach."**, *Journal of Molecular Graphics and Modeling*, vol. 107, pp. 107936 (2021).

PROFESSIONAL EXPERIENCE

Graduate Research Assistant | Gopinathan Group, UC Merced *Jan 2021 – Present*

- Cell Junction Mechanics: Active gel model of cell-cell contact formation and adhesion strength, actin dynamics, cadherin pattern formation; Cell junction stability and rupture kinetics. ****In preparation.***
- Computational model of collagen matrix compaction by contractile fibroblast networks; identified percolation transition in multicellular network as driver of phase-transition-like compaction behavior. In collaboration with **Dasbiswas Lab**. *In preparation.*
- Agent-based model of Vascular network formation capturing cell migration, cell junction formation and multicellular network formation and remodeling; Quantified network functionality, resilience and adaptability. Collaboration with **Sindi Lab** & **McCloskey Lab**. *Continuing...*
- Built **Cellpose-MCP** (Jan 2026): MCP server enabling AI assistants (Claude, Cursor) to perform cell segmentation via 13+ tools — 2D/3D segmentation, batch processing, image restoration (denoising, deblurring, upsampling), custom model training, and Napari visualization.

Graduate Teaching Assistant | Department of Physics, UC Merced *Jan 2021 – Present*

- Led experimental labs and discussions for introductory physics courses; teaching assistant for upper-division course.

Graduate Student Researcher | Computational Biophysics Group, NIT Rourkela *Aug 2017 – May 2019*

- Coarse-grained reaction-diffusion (ReaDDy) modeling of macromolecular crowding effects on protein association; showed crowder size dominates over shape in stabilizing products; characterized additivity rules in mixed-crowder systems. Published in *J. Mol. Graph. Model.* (2021).
- Nonlinear dynamical modeling of language competition among endangered scheduled Indian languages (Kashmiri, Tamil, Dogri, Assamese); predicted missing demographic data.

CONFERENCES & WORKSHOPS

Organizer & Instructor | Workshop on AI Tools for Research and Data Analysis, UC Merced *Spring 2025*

- Designed materials for AI-Aided Research Workflow Workshop (Spring 2025, UC Merced): context engineering, custom agents, MCP server development, and agentic workflows applied to scientific data analysis and image analysis pipelines; attended by physics and life science graduate students.

- Led research project and instructed graduate trainees during the Center for Engineering and Mechanobiology annual bootcamp; participated in CEMB Academic Career Search Workshop.

Selected Oral Presentations:

- ***BPS 2026***, San Francisco — "Collective Cell Motility of Fibroblasts Driven by Contractile Multicellular Network Formation" (Feb 2026)
- ***APS March Meeting 2025***, Los Angeles — "Stability of Cell-Cell Junctions: Balancing Cortical Tension and Cadherin Aggregation" (Mar 2025)
- ***Cell Bio 2024, ASCB|EMBO***, San Diego — "Balancing Cortical Tension and Adhesive Force for Stable Cell Junctions" (Dec 2024)
- ***APS March Meeting 2024***, Minneapolis — "Modeling Cell-Cell Junction Mechanics in Vascular Networks" (Mar 2024)
- ***APS March Meeting 2023***, Las Vegas — "Assembly and Mechanical Remodeling of Vascular Networks" (Mar 2023)
- ***APS March Meeting 2022***, Chicago — "Agent-Based Simulation of Vasculogenesis" (Mar 2022)

AWARDS & ACHIEVEMENTS

- **2025: CEMB** Summer Research Fellowship; **CCBM** Travel Award; Physics Graduate Group Travel Fellowship
- **2024:** GradExcel Peer Mentor Award; Physics Graduate Group Travel Fellowship
- **2023: CCBM** Outreach Fellowship; CCBM Travel Fellowship; Physics Graduate Group Travel Fellowship
- **2022: Bobcat Summer STEM Academy** Fellowship; Physics Graduate Group Travel Fellowship

LEADERSHIP, OUTREACH & COMMUNITY ENGAGEMENT

Trainee Leadership Council | Center for Engineering Mechanobiology (CEMB) *Aug 2023 – Aug 2025*

- Planned and organized tutorials, research presentations, and professional development workshops for CEMB graduate trainees across multiple institutions.

President | Graduate Biophysics Club, UC Merced *Jun 2021 – Jun 2023*

- Led biophysics journal club, organized science outreach events and workshops, and coordinated professional development and networking opportunities for graduate students.

GradExcel Peer Mentor | UC Merced Graduate Division *Aug 2024 – Aug 2025*

- Mentored incoming graduate students on personal well-being, academic success, and professional development; recognized with GradExcel Peer Mentor Award (2024).

Science Outreach Highlights:

- **Bahujan Scholars Network, Panelist** (Sept 2024): Graduate school application guidance and program application series.
- **Digital Nalanda, Presenter & Organizer** (Jan 2024, Nov 2022): Hands-on Foldscope activities (Tiny Wonders of the Living World); talk on graduate school applications and career development.
- **CEMB Science Outreach Presenter** (Aug 2023): Demonstrated mechanobiology outreach tools for high school teachers.
- **Bobcat Summer STEM Academy, Instructor** (Jul 2022): Hands-on electrical circuits activities for middle school students.
- **The Franklin Institute, Philadelphia** (Aug 2022): Contributed to planning a mobile museum exhibit on mechanobiology (with Dr. Jayatri Das).
- **CCBM Science Outreach, Organizer** (Jul 2023, Jun 2022): CellPaint coronavirus science outreach for schools; Foldscope microorganism exploration events.
- **Mother/Daughter Science Camp, Volunteer** (Fall 2021): AAUW science camp, UC Merced.

REFERENCES

Prof. Ajay Gopinathan ✉
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