Rahul Sundar

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PRINCIPAL INTERESTS

Interested in generative AI, AI for science, applied machine learning, and high performance scientific computing. Experienced in embedding inductive biases of any given physical system to train data efficient, cost effective and interpretable deep learning models. Interested in exploring agents for research and scientific applications.

EXPERIENCE

Scientist II - AI/ML, April 2024 - present
Verisk Catastrophe and Risk solutions, Hyderabad, India
Building the next generation of climate models for the insurance and re-insurance industry. Expertise in generative multi-modal diffusion models, computer vision techniques, and atmospheric aerodynamics.

Pro-Bono Project Lead, SARAL AI May 2025 - Present
Saral AI (IIIT hyderabad), Hyderabad,India
Project lead, and solutions architect for SARAL AI which is a generative AI assisted research dissemination and diffusion platform. Over the course of 6-8 months, Saral AI has seen national scale adoption with over 5000 unique users.

Founder November 2023 - present
Dhyuti Frontiers - Community initiative in AI for Science and Engineering
A community initiative to enable capacity building & knowledge dissemination in AI for Science and Engineering. Dhyuti enables knowledge sharing through various interactive seminar formats and encourages open source contributions from budding SciML researchers through https://github.com/DhyutiLABS.

Organiser December 2025 - present
GDG AI for Science - India Chapter
A community initiative to enable capacity building & knowledge dissemination of Google technologies and enable research in AI for Science.

Mentor January 2024 - present
AIGurukul
An online gurukul to build a collaborative, personalised and experiential learning ecosystem for emerging AI technologies targeting undergraduate and postgraduate students.

Project Mentor - LLM Interface, InnoGuide project July 2023 - present
iBOT Club, Centre for Innovation, IIT Madras
Objective: To develop a guide Robot embedded with a LLM based conversational interface, that physically navigates and guides the visitor through exhibits. As part of this role,

- Formulated an effective product development strategy - from PoC, MVP to the final well rounded product to be executed in an AGILE and LEAN way.
- Interaction on a regular basis with the design, navigation and hardware module to stay up to date on their requirements while building the end-end ML pipeline.
- Currently working with the LLM interface team to get the text2speech, LLM, and speech2text models to work with low latency on a NVIDIA Jetson.

EDUCATION

M.S. /Ph.D. *(Aerospace Engineering, CGPA: 9.31)* 2018-Present (Thesis submitted)
Indian Institute of Technology Madras, Chennai, India

- Guided by Prof. Sunetra Sarkar. **Dissertation title:** Accelerated computing and deep learning enablers for surrogate modeling of unsteady flow past moving bodies.
  - Successfully ported an in-house Immersed boundary method based unsteady flow solver to GPU using OpenACC and obtained a speedup of the order $O(10^2)$.
  - Standardising and automating the end-to-end CFD+PINNs workflow to reduce CFD runs by $\approx 2\times$, improve memory efficiency by $\approx 10\times$, and obtain efficient unsteady flow surrogates for real time inference/query applications.

B.E. *(Mechanical Engineering, CGPA: 8.71* 2017
Birla Institute of Technology and Science Pilani, Rajasthan, India

High School and Higher Secondary
(10 GPA and 94.6%, respectively), CBSE 2011 and 2013

RECENT PUBLICATIONS

3. **Sundar, Rahul, Didier Lucor, and Sunetra Sarkar.** *Sequential learning based PINNs to overcome temporal domain complexities in unsteady flow past flapping wings.* Journal of Fluids and Structures 139 (2025): 104421.
2. **Rahul Sundar, Nishant Parashar, Antoine Blanchard, and Boyko Dodov**. *TAUDiff: Improving statistical downscaling for extreme-event simulation using generative diffusion models.* https://www.climatechange.ai/papers/neurips2024/60. Spotlight paper at the **NeurIPS 2024** Workshop on Tackling Climate Change with Machine Learning
1. **Rahul Sundar**, Dipanjan Majumdar, Didier Lucor, Sunetra Sarkar. *Physics-informed neural networks modeling for systems with moving immersed boundaries: application to an unsteady flow past a plunging foil*, Journal of Fluids and Structures 125 (2024): 104066.

RELEVANT CONFERENCE CONTRIBUTIONS

3. **Rahul Sundar**, Dipanjan Majumdar, Didier Lucor, Sunetra Sarkar. *Data-driven physics-informed and immersed boundary aware surrogate modeling of unsteady flows past moving bodies* , IACM Computational Fluids Conference, 2023, Cannes, France. (Accepted for oral presentation.)
2. **Rahul Sundar**, Sunetra Sarkar. *Model order reduction of unsteady flows past flapping wings using physics driven deep learning*, Mechanistic Machine Learning and Digital Twins for Computational Science, Engineering and Technology (online), (2021).
1. **Rahul Sundar**, Sunetra Sarkar. *Probing into the efficacy of Autoencoder based models for nonlinear latent space embeddings of unsteady flow past flapping wings*, Eastern European Machine Learning Summer School on Deep Learning and Reinforcement Learning, (2021).

SKILLS	**Programming Languages:** Python, C/C++ **Parallel Computing:** OpenMP, OpenACC **Packages and frameworks:** Tensorflow, PyTorch, JAX, plotly, dash, streamlit, MATLAB, OpenFOAM **MLOps:** AWS - lambda, EC2, sagemaker, wandb, Tensorboard **Others:** Git, AGILE, SCRUM
HACKATHONS AND WORKSHOPS	**Advanced course** - Winter School on Deep Learning (**WSDL 2023** - ISI Kolkata), **OpenFOAM ML** Hackathon 2022 & 2023, **EEML** 2021 (Online),CDAC-AI fo Science bootcamp, 2021, **CDAC GPU hackathon, 2020**, ACM winter school on **High Performace Computing**, 2019 (IIT Kanpur), **DAML 2019** (IISER Tirupati)