Shreyas Sunil Gaikwad

(+1)925-336-5931 shreyas.gaikwad@utexas.edu linkedin.com/in/shreyasg911 Shreyas911

EDUCATION

University of Texas at Austin — **Austin, Texas**
Ph.D. in Computational Science, Engineering, and Mathematics, GPA: 4.0/4.0 — *2020-2025*
M.S. in Computational Science, Engineering, and Mathematics, GPA: 4.0/4.0 — *2019-2021*

Indian Institute of Technology (IIT) Bombay — **Mumbai, India**
B.Tech with Honors in Mechanical Engineering (Minor in Computer Science), GPA: 9.32/10.0 — *2015-2019*

EXPERIENCE

- **Machine Learning Intern, Ansys Inc.** *Summer 2024*
  - Developed **unified Neural Radiance Field (NeRF)** to implicitly represent multiple, diverse object geometries.
  - Built scalable **GenAI** pipeline in **PyTorch** with **106 million parameters** using unified NeRF and **3D-aware diffusion models** to enable novel 3D object generation from single camera views of object geometries.
  - Achieved **3D object generation time of 5 minutes** for novel, user-provided single camera-view images.
- **Graduate Research Assistant, UT Austin** *2020-Present*
  - Developed Bayesian inversion framework for ice sheet model SICOPOLIS by leveraging open-source **Automatic Differentiation (AD)** tools to perform back-propagation in a **Fortran**-based numerical model. [I][4]
  - Achieved **7,500x speed-up** over traditional finite difference-based ensemble methods for sensitivity analysis.
  - Developed novel feature importance method for neural networks using **eXplainable-AI (XAI)** method Layerwise Relevance Propagation in **Keras** to validate deep learning insights against physics mechanisms. [2]
- **Visiting Scholar, Argonne National Laboratory** *Summer 2022*
  - Developed **first-ever open-source** AD-based, **MPI**-parallel Bayesian inversion framework for ocean circulation model MITgcm, an **alternative to proprietary software that costs ~$14,000 per year**. [II][1][3]

RESEARCH PROJECTS

- **Machine Learning Applications in Geophysics** *Spring 2021*
  - Developed CNNs, U-Nets in **Keras** for earthquake (**96%** accuracy) and seismic faults (**97%** accuracy) detection.
  - Utilized Variational Autoencoders in Keras for clustering by reducing dimensionality into the latent space.
- **Physics-Informed Machine Learning** *Spring 2021*
  - Trained a Deep Neural Network in **PyTorch** to emulate and assimilate a partial differential equation (PDE) based glacier model by leveraging **higher-order derivatives of the PyTorch computational graph**.
- **Laplacian 2D Finite Difference (FD) Solver Application** *Fall 2020*
  - Features: OOP (**C++**), Solver (gauss, jacobi, PETSc), tests (bats, Travis CI, docker), **98% code coverage** (lcov), **0% memory errors** (valgrind), build (autotools), HPC env (SLURM), parser & logger (GRVY).

OPEN-SOURCE CONTRIBUTIONS

I **SICOPOLIS-AD v2**, open-source data assimilation framework for the ice sheet model SICOPOLIS.
II **MITgcm-AD v2**, open-source data assimilation framework for the general ocean circulation model MITgcm.

TECHNICAL SKILLS

Languages	Python (PyTorch, Keras, Tensorflow), Julia, C/C++, Fortran-77/90, MATLAB
HPC toolkit	OpenMP, MPI, CUDA, SLURM, git, docker, shell scripts, CI, autotools, valgrind, lcov, GRVY

HONORS AND AWARDS

- Reviewer for Journal of Open Source Software (JOSS) and Journal of Mountain Science (JMS). *2023-Present*
- Invited talk at SIAM TX-LA: **Computational Science to enable Digital Twins of the Oceans**. *2023*
- Recipient of Peter O'Donnell Graduate **fellowship worth $24,000**. *2019*
- Ranked 509/1,500,000 (**99.97 percentile**) in nationwide university entrance exams, India. *2015*

SELECT COURSEWORK

Data Science	Machine Learning, ML applications in Geophysics, Engineering Data Mining
Algorithms	Differential Equations, Linear Algebra, HPC, Functional Analysis, Data Structures & Algorithms
Modeling	Uncertainty Quantification in Modeling, Mathematical Modeling, Quantum & Statistical Mechanics

SELECT JOURNAL AND CONFERENCE ARTICLES

1. L Hascoët, JL Bouchot, **SS Gaikwad** et. al "Profiling checkpointing schedules in adjoint ST-AD", *Preprint on arXiv, submitted to 8th International Conference on Algorithmic Differentiation (2024).*
2. H Pillar, **SS Gaikwad** et. al "Pairing Neural Networks with Adjoints for Flexible Investigation and Robust Attribution of Ocean Variability", *In preparation for submission to Geophysical Research Letters (2024).*
3. **SS Gaikwad** et. al "MITgcm-AD v2: tangent linear and adjoint modeling framework for the oceans and atmosphere enabled by the Automatic Differentiation tool Tapenade", *Future Generation Computer Systems (2024).*
4. **SS Gaikwad** et. al "SICOPOLIS-AD v2: tangent linear and adjoint modeling framework for ice sheet modeling enabled by Automatic Differentiation tool Tapenade", *Journal of Open Source Software 8, no. 83 (2023): 4679.*