Sanjan Muchandimath

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EDUCATION

University of Michigan — Ann Arbor, MI
Ph.D. in Aerospace Engineering (GPA: 3.9/4.0) — *Exp. 2027*
M.S.E. in Aerospace Engineering (GPA: 4.0/4.0) — *May 2023*
- **Focus:** Multi-fidelity Bayesian Inference, Scientific Machine Learning, Closure Modeling, CFD Optimization under Uncertainty.
- **Key Coursework:** Inference, Estimation & Learning, Data-driven Modeling, Parallel Computing, Science for Predictive Modeling.

Indian Institute of Technology, Madras (IITM) — Chennai, India
B.Tech with Honours in Aerospace Engineering (Rank: **2/50**) — *May 2020*
- **Key Coursework:** Advanced CFD with LES, Numerical Methods and Scientific Computing, Finite Volume Methods for PDE's.

SKILLS

Languages: Python (PyTorch, TensorFlow, Pandas, NumPy, Scikit-Learn), C++, Fortran 90, MATLAB, Java, LaTeX
HPC & Software: MPI, OpenMP, CUDA, Git, GitHub (Actions/CI/CD), Docker, Linux (Slurm/Bash),
Simulation/CAD: OpenFOAM, Star-CCM+, ANSYS, ADflow (Maintainer), XFoil, SolidWorks, NX, CATIA V5, Inventor

EXPERIENCE

Odys Aviation, Inc. (e-VTOL Startup) — Long Beach, CA
Aerodynamics Engineer (Intern → Full-time) | Manager: Fabio Ciampoli — *May 2022 – Sep 2023*
Stints: Intern (May–Aug 2022); Intern (Jan–May 2023); Full-time (May–Sep 2023)
- Automated CFD workflows for large-scale aero databases using *Java/Python* in *StarCCM+*, eliminating manual setup.
- Built a *Python/XFoil* pipeline to calibrate propeller models; improving BEMT-to-test accuracy by **10%** via tip-loss modeling.
- Increased multi-element wing efficiency (L/T) by **9%** by implementing an Adjoint-based MDO workflow in *StarCCM+*.

Computational Autonomy Group & MDO Lab (University of Michigan) — Ann Arbor, MI
Graduate Research Assistant (Ph.D.) | Advisors: Alex Gorodetsky & Joaquim Martins — *Jan 2024 – Present*
- *"SYNCE" algorithm:* Developed a novel coupling algorithm for Multilevel Markov chain Monte Carlo that reduces variance in uncertainty quantification; won **Best Student Paper Award** at USNCCM, Chicago, 2025 (Paper under review, JCP).
- *Generative modeling for CFD:* Extended SYNCE with transport maps to calibrate RANS turbulence models on the NACA0012 airfoil, achieving **50% cost reduction** (Paper under review, AIAA Journal).
- *Multi-fidelity Surrogates:* Engineered a novel multi-fidelity framework for coupled multidisciplinary systems using AMISC, POD, and Manifold Alignment; accelerated aero-structural uncertainty quantification (Manuscript prep).
- *Scalable Physics-ML Framework:* Developed a Neural SDE approach to rapidly learn closures in a compressed latent space, validated on the turbulent Burgers' equation (Manuscript prep).

Transport: Modeling, Numerics & Theory Laboratory (TMNT), Purdue University — Purdue, IN
Summer Intern – Purdue Undergraduate Research Experience (PURE) | Advisor: Ivan Christov — *May 2019–Aug 2019*
- Selected as one of 12 interns from a pool of 100+ applicants for a competitive summer research program at Purdue University.
- Developed a mathematical model using first-order shear-deformation theory of pre-tensioned plates, and the lubrication approximation for Newtonian fluid flow at low Reynolds number and validated with *ANSYS FLUENT* (JAM).

PROJECTS

Parallel Tensor-Train Decomposition — *Course: Parallel Computing*
- Developed parallel algorithms for tensor decomposition using *OpenMPI* and *cuSOLVER*, achieving linear weak scaling.
- Implemented a memory-efficient *PSTT* algorithm that distributes subtensors across nodes to handle large data.
- Optimized performance ($\mathbf{50}\times$) by replacing full SVDs with randomized sketching and GPU-accelerated matrix operations.

Randomized Linear Solvers for CFD — *Course: Randomized Numerical Linear Algebra*
- Adapting the *Sketched GMRES* framework to accelerate Newton-Krylov solvers for large-scale CFD problems.
- Validating theoretical complexity bounds against classical GMRES to benchmark performance improvements in ADflow.

Neural Networks for Airfoil Performance Prediction — *Course: Data Driven Modeling*
- Trained a deep neural network to predict aerodynamic coefficients from airfoil coordinates using *TensorFlow*.
- Enhanced prediction speed and robustness by compressing geometric inputs using *POD*, *Q-DEIM*, and *Auto-Encoders*.

Raftar Formula Racing, IIT Madras — *Formula Student Team*
- Spearheaded the frame/cockpit design, winning **Best Engineering Design Award** at *Formula Bharat* (2019, 2020).
- Innovated a wooden-honeycomb composite alternative for panels, winning **2nd Place** at the *FabHeads Competition* (2019).
- Won **1st Place** (Overall), *Formula Bharat* 2020; set an event milestone as the first team to cross 800 points.