

SUYASH TANDON, Ph.D.

Permanent Resident, Computational Physics - Research Assistant
Contact Information: suyashn@umich.edu | (734) 904-998



SUMMARY

- 5+ years of research experience in computational fluid dynamics (CFD) and numerical methods development with a focus on complex turbulent flows.
- Expertise in parallel & distributed computing with MPI, openMP, parallel I/O, and GPU offloading with CUDA, HIP, Kokkos for large-scale simulations on modern high-performance computing (HPC) systems.
- Collaborated on a data-driven modeling project to develop a novel synthetic inflow generator, which generates turbulent fluctuating fields of desired intensity using kernels that are trained on high-fidelity dataset.

EDUCATION

University of Michigan, Ann Arbor, MI

Ph.D., Mechanical Engineering and Scientific Computing 01/2016 - 05/2020

Thesis: *Large-scale simulations of complex turbulent flows: modulation of turbulent boundary layer separation and optimization of discontinuous Galerkin methods for next-generation HPC platforms*

Advisor: E. Johnsen, Associate Professor of Mechanical Engineering

M.S., Mathematics 09/2019 - 05/2020

M.S.E., Mechanical Engineering 01/2014 - 08/2015

Thesis: *Large-eddy simulations of flow over a backward-facing ramp with vortex generator*

Advisor: E. Johnsen, Associate Professor of Mechanical Engineering

University of Mumbai, Mumbai, India

B.E. Production Engineering 08/2008 - 06/2012

RESEARCH AND WORK EXPERIENCE

Scientific Computing and Flow Physics Lab, University of Michigan, Ann Arbor, MI 01/2014 - 05/2020

Graduate Student Research Assistant

- Performed large-eddy simulation (LES) of turbulent boundary layers near adverse pressure gradients and researched strategies to reduce the size and impact of flow separation region by as much as 50%.
- Development of a parallel and distributed numerical algorithm in modern C++ based on high-order methods to facilitate simulations of complex problems with mixed-precision floating-point arithmetic on HPC clusters.
- Trained a neural network on LES dataset of 3D turbulent flow over a flat-plate to learn probability density functions of velocity fluctuations and generate a synthetic turbulent inflow with desired turbulent intensity.
- Communicated research findings in 5+ conferences and workshops, and published 5+ scientific publications.

Los Alamos National Laboratory, Los Alamos, NM 06/2019 - 08/2019

Computational Sciences Graduate Intern

- Collaborated with diverse team of domain scientists to study core-collapse supernovae by conducting large-scale computations on leadership-class HPC clusters.
- Conducted numerical analysis to improve the accuracy and error-convergence rate of the numerical method to 2nd order, and implemented new physics models to facilitate simulations of core-collapse supernovae problem.
- Refactored a C/C++ scientific code to reduce computational bottlenecks with multi-threading and GPU programming, and demonstrated code/stack portability on 3+ HPC clusters with competitive performance.

SUYASH TANDON



Godrej & Boyce Mfg. Co. Ltd., Mumbai, India

07/2012 - 07/2013

Graduate Engineer Trainee

- Handled end-to-end capital procurement of engineering machinery and equipment for pan-India operations and coordinated with a team of 25+ corporate executives.
- Developed cost models based on historic purchase dataset with annual net savings of more than 10%.
- Increased vendor base by more than 1.5x to decentralize source and improve local vendor support.

Godrej & Boyce Mfg. Co. Ltd., Mumbai, India

11/2011 - 04/2012

B.E. Project Trainee

- Investigated recurring and critical errors in the production pipeline by implementing failure mode and effects analysis (FMEA) to design a resilient process as part of the B.E. Thesis project.
- Coordinated with 2 Line Supervisors and 20+ technicians to design and implement a new process plan, which increased the daily production by more than 40% and reduced lead time to order dispatch by 1.5x.

Siemens, Mumbai, India

06/2010 - 08/2010

Summer Intern

- Designed and developed jigs and fixtures in AutoCAD to improve the speed of quality inspection of parts and components for electrical switchboard by 3x.

CERTIFICATIONS

Udacity

Deep Learning Nanodegree

05/2020

Topics: Neural networks (CNN, RNN, GAN), deep learning frameworks (Keras, TensorFlow)

Machine Learning Nanodegree

12/2019

Topics: Supervised/unsupervised learning, machine learning workflows (AWS SageMaker)

NVIDIA Deep Learning Institute

Fundamentals of Accelerated Computing with CUDA C/C++

01/2019

Topics: Accelerating CPU-only applications on GPUs, CUDA memory optimization, streams and profiling tools

Michigan Institute for Computational Discovery and Engineering (MICDE)

Graduate Certificate in Computational Discovery and Engineering

05/2015

Topics: Interdisciplinary research with focus in scientific computing, parallel programming and visualization

WORKSHOPS

Argonne National Laboratory

Argonne Training Program on Extreme-Scale Computing

08/2020

- Invited to an intensive 2-week workshop on high performance computing

ALCF Computational Performance Workshop

05/2020

- Invited to a 3-day workshop on boosting code performance on parallel computers

Multiple organizers: ANL, NCSA, OLCF, NERSC, TACC

Petascale Computing Institute

08/2019

- Invited to a 1-week workshop on scaling computational codes on leadership-class HPC systems

University of Minnesota, MN, USA

Integrating Machine Learning and Predictive Simulations

11/2017

- Invited to a 1-week workshop on machine learning for uncertainty quantification to digital twins

SUYASH TANDON



Chalmers University, Goteborg, Sweden

Unsteady Simulations for Engineering Flows

11/2016

- Invited to a 1-week workshop on unsteady simulations with LES, URANS, PANS for engineering applications

LEADERSHIP AND VOLUNTEERING

Scientific Computing Student Club

01/2019 - 09/2020

President

- Managed a small team of 5 graduate students and organized 3 series of events on topics including Machine Learning, High-Performance Computing and Scientific Data Visualization.

Mechanical Engineering Graduate Council

01/2017 - 05/2020

Workshop Co-Chair

- Managed a team of 3 within the Mechanical Engineering Graduate Council and responsible conducting 2-3 technical events per academic semester.
- Organize workshops to teach 100+ early graduate students skills including MATLAB, Python, LaTeX, etc.

Engineering Graduate Symposium

04/2018 - 01/2019

Co-Chair

- Managed and organized a day-long event to showcase the research conducted by 150+ graduate students in the College of Engineering and engage students, staff, faculty and alumni.

University of Michigan Solar Car

02/2014 - 09/2014

Aerodynamics Team Member

- Performed CFD tests in SolidWorks to analyze and improve aerodynamic performance of the new solar car design.

HONORS AND AWARDS

- Michigan Institute for Computational Discovery & Engineering (MICDE) Fellowship 09/2019 - 09/2020
- Graduate Fellowship, Curadve Pharma Pvt. Ltd. 01/2016 - 01/2019
- Engineering Graduate Symposium Best Poster Award (3rd place), University of Michigan 10/2017
- Shri N. V. Shekhara Varier Scholarship, University of Mumbai 02/2011
- Rohit Kapoor Memorial Prize, University of Mumbai 02/2011
- Academic Achievement Award, University of Mumbai 02/2011
- Academic Achievement Award, University of Mumbai 02/2010

SKILLS

- Fluid dynamics, finite volume, finite element methods, numerical modeling and error analysis, linear algebra, turbulence modeling, mesh generation
- OpenFOAM, ANSYS, Pointwise, TecPlot, Paraview
- Algorithms, data structures, software development, unit tests, debug, tuning, performance analysis
- Distributed/multi-threaded/GPU programming, Intel Parallel Studio, MPI, OpenMP, CUDA, Kokkos, HIP
- Machine learning, data analytics, model training, PyTorch, TensorFlow
- C/C++, Linux/Unix environment, Python, MATLAB, bash, shell scripting, CMake, Make
- LaTeX, technical documentation and communication, Git, Jira, containers, Docker



PUBLICATIONS

S. Tandon, K. Maki and E. Johnsen, **The structure of turbulent kinetic energy in modulated flow over a backward-facing ramp with wall-mounted cubes**, *Journal of Fluid Mechanics*, (in preparation)

S. Tandon, I. Marincic, H. Hoffmann and E. Johnsen, **Power and performance balance of Recovery-assisted discontinuous Galerkin schemes for large-scale computations**, *International Journal of High Performance Computing Applications* (submitted, 2020)

CONFERENCE PROCEEDINGS

AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS (AIAA)

S. Tandon, I. Marincic, H. Hoffmann and E. Johnsen, **Enabling power-performance balance with transprecision calculations for extreme-scale computations of turbulent flows**, in *AIAA Aviation 2020 Forum*, June 2020, USA.

S. Tandon, E. Johnsen and K. Maki, **Characteristics of flow modulation on a backward-facing ramp by a line array of wall-mounted cubes**, in *AIAA Aviation 2020 Forum*, June 2020, USA.

S. Tandon, E. Johnsen and K. Maki, **Understanding the dependence of turbulent flow modulation on the spacing between adjacent cubes on a backward-facing ramp**, in *24th AIAA Computational Fluid Dynamics Conference*, June 2019, Dallas, Texas, USA.

S. Tandon, S. Shinde, E. Johnsen and K. Maki, **Near-wake flow modulation by a cube on a backward-facing ramp**, in *AIAA Flow Control Conference*, June 2018, Atlanta, Georgia, USA.

S. Tandon, S. Shinde, K. Maki and E. Johnsen, **Flow control using passive vortex generators**, in *47th AIAA Fluid Dynamics Conference*, June 2017, Denver, Colorado, USA.

S. Shinde, S. Tandon, K. Maki and E. Johnsen, **Flow separation over a backward-facing ramp with and without a vortex generator**, in *46th AIAA Fluid Dynamics Conference*, June 2016, Washington D.C., USA.

POSTER PRESENTATIONS

S. Tandon et al., **The arithmetic intensity of high-order discontinuous Galerkin methods for hyperbolic systems** in *International Conference for High Performance Computing, Networking, Storage and Analysis (SC20)*, Nov 2020.

S. Tandon, N. Stegmeier, et al., **Enabling code portability of a parallel and distributed smooth-particle hydrodynamics application, FleCSPH**, in *International Conference for High Performance Computing, Networking, Storage and Analysis (SC19)*, Nov 2019, Denver, Colorado, USA.

S. Tandon, E. Johnsen and K. Maki, **Flow control using passive vortex generators**, in *University of Michigan Engineering Graduate Symposium (EGS)*, Nov 2017, Ann Arbor, Michigan, USA.

S. Tandon, S. Shinde, E. Johnsen and K. Maki, **Separation control of flow over a backward-facing ramp**, in *University of Michigan Engineering Graduate Symposium (EGS)*, Nov 2016, Ann Arbor, Michigan, USA.