

Arpit Agarwal

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EDUCATION

University of Wisconsin – Madison

Sep '15 - present

Ph.D. in Mechanical Engineering & Graduate Minor in Computer Science
Fields: Computational Methods, Multi-Phase, Turbulent, & Compressible Flows
GPA: 3.82/4.00

Indian Institute of Technology Bombay

Jul '10 - Aug '15

B.Tech & M.Tech in Mechanical Engineering
M.Tech Specialization: Thermal & Fluids Engineering
Cumulative Performance Index: 7.91/10.00

DOCTORAL RESEARCH

Liquid Jet Atomization

Sep '15 - present

Principal Investigator: Professor Mario Trujillo

Assessment of Dominant Atomization Models

- Theoretically analyzed dominant atomization models & established the extent of their validity
- Proved that the most pivotal assumptions in the modeling theory are not valid for realistic conditions; this explains the failure of the models' predictive capabilities
- Generated boundary fitted grids for real injector geometries for high-fidelity simulations
Accepted for presentation at SAE World Congress in April 2018
In progress: Journal paper titled 'The Case Against Linear Stability Theory Based Spray Modeling' for Fuel

Identification of Universal Atomization Regimes

- Identified three breakup regimes in 3D atomizing liquid jets over a wide operating range
- Customized OpenFOAM based solvers for post-processing data
In progress: Journal paper titled 'Liquid-Gas Momentum Coupling in an Atomizing Liquid Jet' for International Journal of Multiphase Flow

Analysis of Two-Phase CFD solvers

- Evaluating the performance of the two-phase compressibleInterFoam solver
- Conducted weak/strong scaling tests for the interFoam solver (up to 80M cells, 960 processors)
- Examined a mass conservation issue at the sub-grid level in Gradient Augmented Level Set Method; identified the problem of interpolation errors in the C^1 level set function

MASTERS' THESIS

Stability of Stratified Flow using Smoothed Particle Hydrodynamics (SPH)

Advisors: Professor A. Bhattacharya & Professor P. Ramachandran Jun '14 - Aug '15

- Accurately captured flow instabilities (Kelvin-Helmholtz, Rayleigh-Taylor) using SPH
- Implemented and tested surface tension, and viscosity discontinuity schemes in the open source framework, PySPH

INDUSTRY EXPERIENCE

Robert Bosch Engineering Solutions, India (Coimbatore)

May '13 - Jun '13

Mesh Analysis for Boundary Layer Growth

- Drafted a strategy for grid generation aimed towards capturing hydraulic and thermal boundary layers; tested it through Fluent and CFX simulations
- Worked with the simulation team at Bosch to improve the stability, accuracy and convergence rate of their finite volume CFD analyses

TECHNICAL SKILLS

Simulation Tools: Extensive experience with OpenFOAM, MATLAB, Pointwise and EnSight; Limited experience with ANSYS CFX & Fluent, Adams, Simulink

Programming Languages & Libraries: C, C++, Python, Java, OpenMP, MPI, CUDA

Other Software: git, L^AT_EX, Mathematica, Solidworks, Mathcad, HTML

VOLUNTEERING AND LEADERSHIP	<p>Treasurer - Asha for Education Jun '17 - present Raising and disbursing funds to education related non-profit organizations in India</p> <p>Head - Departmental Academic Mentorship Program, IIT Bombay Feb '14 - Jul '15 Headed a team of 30 mentors helping UG students facing academic problems</p> <p>Mentor & Coordinator - Avanti Fellows May '11 - Aug '13 Mentored and tutored financially underprivileged students through High School for 2 years Coordinated selection of students for the fellowship</p> <p>Mentor - Institute Mentorship Program, IIT Bombay May '13 - Jul '15 Mentored 24 freshmen over 2 years towards achieving their personal, social and academic goals</p>
TEACHING	<p>Teaching Assistantships</p> <ul style="list-style-type: none"> • UW-Madison: Computational Fluid Dynamics (Fall 2017) • IIT Bombay: Graduate Fluid Dynamics (Spring 2015), Machine Design (Fall 2014), Thermodynamics (Spring 2013)
ACTIVITIES	<p>Reviewer for Society of Automotive Engineers (SAE) Apr '17 - present</p>
RELEVANT GRADUATE COURSEWORK	<p>Mechanical Engineering: Turbulent Flows, Particle Methods for Fluid Flow Simulations, Cryogenic Engineering, Geophysical Fluid Dynamics</p> <p>Computer Science & Mathematics: High Performance Scientific Computing, Methods of Computational Mathematics, Data Structures</p>
SELECT PROJECTS	<p>CFD Solver Development, Optimization and Acceleration</p> <ul style="list-style-type: none"> • Eulerian Solver: Solved the Lid-Driven Cavity Problem by developing a generic Finite Volume based steady state Navier-Stokes solver • Lagrangian Solver: Solved flow past a circular cylinder by developing a generic transient flow solver based on a 2D Vortex Particle Method • Achieved a 14X speedup of the Lagrangian solver through CUDA GPU acceleration <p>Turbulent Channel Flow - Case Study Dec '12 <i>Supervised Learning Project, Advisor: Professor S. Balasubramanian</i> Used Direct Numerical Simulation (DNS) data to obtain relevant turbulent statistics; interpreted the results to verify and analyze features like Kolmogorov's $5/3^{rd}$ law and log-law</p> <p>Design of Steam-Separator in Solar Air Dehumidifier May '12 <i>Undergraduate Research Project, Advisor: Professor M. Rane</i> Designed and conducted experiments to measure water fraction in the steam outflow; identified problems in the Steam-Separator and implemented solutions for the same.</p>
SCHOLASTIC ACHIEVEMENTS	<ul style="list-style-type: none"> • Secured an All India Rank of 532 in IIT-JEE 2010 among over 450,000 candidates • Secured an All India Rank of 712 in AIEEE 2010 among over 10,00,000 candidates • Awarded a scholarship for securing a state rank of 15 in The Science Foundation Examination
TEST SCORES	<p>GRE: 332/340; TOEFL: 112/120</p>
EXTRA - CURRICULAR ACTIVITIES	<ul style="list-style-type: none"> • Awarded DELF A2 certification in French (2015) • Mountaineering: Certified Advanced Level Mountaineer; summited 5300 m peak in the Himalayas • Endurance sports: Completed long distance swimming (15 km+) and triathlon competitions • Completed several technical projects with multiple DOF autonomous & remote-controlled bots