Tejaswin Parthasarathy
GRADUATE STUDENT, MECHANICAL SCIENCES

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EDUCATION

University of Illinois at Urbana-Champaign (UIUC), USA   **GPA: 4.00/4.00**
Master of Science, Mechanical Sciences and Engineering   *2016 - 2018*

Indian Institute of Technology Madras (IITM), India   **Cumulative GPA: 9.67/10.00**
Bachelor of Technology (Honours), Mechanical Engineering   *2012 - 2016*

RESEARCH INTERESTS

Fluid physics, Numerical fluid dynamics, Numerical algorithms, High performance and parallel Computing, Flow and instability control, Aeroacoustics

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PUBLICATIONS

Tejaswin Parthasarathy, FK Chan and Mattia Gazzola. "Viscous streaming for transport enhancement at finite Reynolds numbers", arXiv preprint (pending)   Link

Tejaswin Parthasarathy & Mattia Gazzola. "Scaling arguments for flows induced by oscillating cylinders", 70th Annual Meeting of the APS Division of Fluid Dynamics, Denver, USA   Link

Mattia Gazzola and **Tejaswin Parthasarathy**. "Viscous streaming for locomotion and transport", 70th Annual Meeting of the APS Division of Fluid Dynamics, Denver, USA   Link

Das, Shyama Prasad, and **Tejaswin Parthasarathy**. "Effect of parameters on controlled flow using synthetic jet." International Journal of Fluid Mechanics Research.   Link

Parthasarathy, Tejaswin and S. P. Das. "Some aspects of flow control over a NACA0015 airfoil using synthetic jets." Journal of Physics: Conference Series. Vol. 822. No. 1. IOP Publishing, 2017. (15th Asian Congress of Fluid Mechanics)   Link

Parthasarathy, Tejaswin, Vignesh Srinivasaragavan, and Soundarapandian Santhanakrishnan. "ADAMS-MATLAB Co-Simulation of A Serial Manipulator." MATEC Web of Conferences. Vol. 95. EDP Sciences, 2017. ICMME 2016   Link

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AWARDS & ACHIEVEMENTS

Awarded the **H.C.Ting Distinguished Fellowship** at UIUC for scholastic aptitude   *2016*
Secured the **Z-Wing Award** for comprehensive performance across Narmada[1]   *2016*
Pursued the **Honours** degree at IITM, completing 3 additional graduate level courses, offered to select meritorious students   *2016*
Secured the **Dr. Vivekanand Kochikar Award** and **Dr. Dinesh Balagangadhar Prize** for excellence in academics in B.Tech. Mechanical Engineering   *2015* Ref.
Awarded the **Nissan Global Foundation Scholarship** for comprehensive performance across IITM   *2014* Ref.
Awarded the **KVPY Fellowship** & **DST-Inspire Fellowship** for scientific aptitude   *2012*
National high-school **Olympiad** (Astronomy, Physics) finalist   *2011*

SKILLS

Computing: C, C++, Matlab, Python, Bash, LaTeX
Software: Git, Makefiles, SolidWorks, Fluent, MS Excel, Tecplot, ParaView/VTK API, Simulink
Other: HPC systems, Parallelism APIs (OpenMP, TBB, MPI) & High-Speed Camera Utilization

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[1]Residence hall at IITM

Viscous Streaming - Physics & Applications
Advisor : Prof. Mattia Gazzola, MechSE, UIUC   *Dec '16 - Present*

Fluid Physics

- Numerically investigating the fundamental physics of viscous streaming using fluid dynamics, model-order reduction and dynamical systems theory (POD, DMD)

- Simultaneously deriving archetypal design principles for streaming assisted applications in micro scale & biological systems, such as particle transport (refer to the arXiv preprint for more details)

Numerics

- Leading the group's fluid dynamics research as the primary scientific developer of a 2D uniform resolution DNS code, used in investigating streaming and other Fluid-Structure Interaction (FSI) problems

- Extended the solver to simulate complex geometries, actuation patterns (e.g. squirming in high Re) and different boundary conditions

- Utilized the above mentioned extensions to validate oscillatory flow phenomenon across three orders of Re (length and time scales)

High Performance Computing

- Enhanced the scalability and performance of the shared memory code by refining data structures, optimizing memory access and localizing operators, improving the time to solution by 40%

Other

- Assisted in writing technical parts of two NSF proposals with Prof. Gazzola, exploring strategies for future research and providing/fact-checking scientific content

Flow Control over aerofoils using Synthetic Jets
Advisor : Prof. S.P Das, HTML, IITM   *Jul '15 - Apr '16*

- Extensively simulated and validated the cases of uncontrolled flow over an aerofoil, synthetic jets in quiescent media and controlled flow over an aerofoil

- Numerically investigated the effect of parameters on the control of boundary layer using single synthetic jets over 2-D aerofoils, with an emphasis on understanding the flow physics

- Optimized the operational parameters of the aforementioned synthetic jets to achieve performance enhancement and explored the use of quick return mechanisms to control the time of blowing/suction

- Contributed to the fundamental understanding of the effect of synthetic jets as a means of extracting energy from the flow to control/enhance the lift and shedding performance

Surgical Robot Simulation and Path Planning
Advisor : Prof. S. Soundarapandian, MES, IITM   *Dec '14 - Sep '15*

- Reverse engineered, modeled and & drafted a path planning algorithm for a defunct robotic arm

- Designed the control software for the aforesaid robotic arm, ensuring precise and accurate path adherence in orthopaedic surgery applications, which was verified by simulating the same in the ADAMS environment, with custom codes for robot activation and feedback control

- Arrived at a final design for retrofitting the arm to meet high degrees of precision and accuracy at affordable costs, with help from ABB, after an iterative design process

- Simultaneously developed a framework for retrofitting obsolete robotic arms for use as an educational aid in robotics labs & courses (for modules such as path planning and trajectory control)

A spectral-element solver for the incompressible Navier-Stokes equations with thermal coupling
Instructor : Prof. Paul F. Fischer, CS555, UIUC   *Feb '18 - May'18*

- Constructed a (fast) higher-order solver for the incompressible Navier-Stokes equations using spectral-element methods, with thermal coupling

- Studied the pure and modified Rayleigh-Benard convection problem using the same to successfully predict critical dynamical parameters for the associated instability problem

- Developed a solver for the Stokes PDE using hybrid Finite-Elements (FEM) re-using the infrastructure

A steady Stokes-PDE solver based on Integral Equation methods
Instructor : Prof. Andreas Kloeckner, CS598, UIUC   *Aug '17 - Dec'17*

- Developed (in-part) a higher-order, accurate solver for the Stokes equations based on an Integral Equation formulation, building on extant infrastructure

- Involves a subset of 'fast', efficient $\mathcal{O}(n)$ algorithms, for linear system solve and matrix vector (kernel evaluation) products, with the details of numerics listed in the link given at the end of this section

3-D Navier-Stokes Solver for simulation of Atmospheric Phenomena
Instructor : Prof. Brian Ford Jewett, ATMS502, UIUC   *Feb '17 - May '17*

- Developed a 3-D nonlinear quasi-compressible flow solver using linear finite volume methods, grid staggering and operator splitting, with OpenMP for parallelism

- Also developed an equivalent version for 2-D with Adaptive Mesh Refinement (AMR) capabilities

Solutions for Potential Flow past Cylinders
Instructor : Prof. Arul K Prakash, AM5530, IITM   *Jul '15 - Nov '15*

- Analytically derived solutions for potential flow past multiple cylinders using complex number theory, based on Crowdy's seminal work & implemented efficient numerical algorithms in MATLAB/Mathematica for solving the system within ~ 30s

Details and additional projects can be found here.

RELEVANT COURSEWORK

Fluids	**Numerics**	**Math**	**Controls**
Viscous Flows	Fast Algorithms	PDE†	Linear Control Theory
Inviscid Flows	Comp. Mechanics	Calculus†	Nonlinear Control†
Aeroacoustics	Numerical Fluids	Linear Algebra†	
Flow Instabilities†	Intro to CFD†	Diff. Equations†	

PROFESSIONAL EXPERIENCE

Technical Intern, Hindustan Unilever Ltd, India
Guide : Sugam Kumar, COO, Khamgaon Division   *May '15 - Jul '15*

- Designed & implemented an indigenous automatic reel-changing mechanism for soap tablet wrapping that reduced machine downtime from *41* s per reel change to *4* s & saving $ *11000* p.a. per line

- Initiated rollout of this universal, safe & automated design across affiliated soap factories

- Investigated & partially solved the tablet-infeed jamming issue, reducing incidence by *86* % (controlled environment) & recovering *$6314* p.a. in direct cost

Details of additional experience at TVS Motor Company Ltd. and Forbes Marshall Pvt. Ltd.can be found here.

POSITIONS OF RESPONSIBILITY

Head, Marketing and Student Relations
Shaastra 2016, Annual Technical Festival of IITM   *Apr '15 - Jan '16*

- Managed one of Asia's biggest technical festival, with a budget of $165000 & a footfall of 30000

- Spearheaded a team of 40, reaching out to 20000 students across India, improving brand penetration by 10%

Also undertook other leadership roles in student & technical affairs. Please visit here for details.

EXTRA CURRICULARS

Software Dev.: Member, CSE & THW Illinois chapters and regular HPC workshop participant (XSEDE, Nvidia Deep Learning, BW Scaling to Petascale 2017)
Honor Societies: Pi Tau Sigma
Hobbies: Hiking, Quizzing, Thespian (Short Film and Dramatics)

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† represents courses taken in undergraduate