

Tejaswin Parthasarathy

GRADUATE STUDENT, MECHANICAL SCIENCES

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EDUCATION	University of Illinois at Urbana-Champaign (UIUC), USA <i>Master of Science, Mechanical Sciences and Engineering</i>	GPA: 4.00/4.00 2016 - 2018 (Tentative)
	Indian Institute of Technology Madras (IITM), India <i>Bachelor of Technology (Honours), Mechanical Engineering</i>	Cumulative GPA: 9.67/10.00 2012 - 2016
RESEARCH INTERESTS	Fluid physics, Numerical Fluid Dynamics, Numerical Algorithms, High Performance and Parallel Computing, Flow and Instability Control, Aeroacoustics	
PUBLICATIONS	Tejaswin Parthasarathy and Mattia Gazzola. "The role of oscillations in fluid mediated interactions between two cylinders at finite Re numbers", arXiv preprint (pending) Paper	
	Tejaswin Parthasarathy and Mattia Gazzola. "Scaling arguments for flows induced by oscillating cylinders", 70 th Annual Meeting of the APS Division of Fluid Dynamics, Denver, USA Talk	
	Mattia Gazzola and Tejaswin Parthasarathy. "Viscous streaming for locomotion and transport", 70 th Annual Meeting of the APS Division of Fluid Dynamics, Denver, USA Talk	
	Das, Shyama Prasad, and Tejaswin Parthasarathy. "Effect of parameters on controlled flow using synthetic jet." International Journal of Fluid Mechanics Research. Jou.	
	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. (15 th Asian Congress of Fluid Mechanics) Conf.	
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, L ^A T _E X Software: Git, Makefiles, SolidWorks, Fluent, MS Excel, Tecplot, ParaView/VTK API, Simulink Other: HPC systems, Parallelism APIs (OpenMP , TBB , MPI) & High-Speed Camera Utilization	

¹Residence hall at IITM

RESEARCH PROJECTS

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)

ACADEMIC PROJECTS

A steady Stokes-PDE solver using Integral Equations Theory and Fast Algorithms

Instructor : [Prof. Andreas Kloeckner](#), CS598, UIUC

Aug '17 - Present

- Developing a higher-order, accurate solver for the steady linearized Navier-Stokes equations, building on extant infrastructure & code on Integral Equations & Fast Algorithms
- Involves 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 Finite Volume Methods (FVM), 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 ~ 30 s

Details and additional projects can be [found here](#).

RELEVANT COURSEWORK

Fluids

Viscous Flows
Inviscid Flows
Aeroacoustics
Turbulent Flows†
Flow Instabilities†

Numerics

Fast Algorithms
Comp. Mechanics
Numerical Fluids
Intro to CFD†

Math

Calculus†
Linear Algebra†
Diff. Equations†

Controls

Linear System Control
Nonlinear Control†

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 thereby reducing 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)

† represents courses taken in undergraduate