

Manan Doshi

FINAL YEAR UNDERGRADUATE · MECHANICAL ENGINEERING

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Research Interests

I am interested learning ideas and algorithms for use in developing computational methods to numerically solve partial differential equations and applying them to problems in engineering and science. I am also interested in learning about parallel algorithms and their implementation on HPC systems.

Education

BTech with Honors in Mechanical Engineering

INDIAN INSTITUTE OF TECHNOLOGY, BOMBAY

- Department rank 7 out of a batch of 152 students

GPA: 9.33/10

Aug 2018

Minor in Computer Science and Engineering

INDIAN INSTITUTE OF TECHNOLOGY, BOMBAY

GPA: 8.50/10

Aug 2018

Higher Secondary School Certificate (MSBSHSE¹)

PACE JUNIOR COLLEGE, ANDHERI

90.15%

Jul 2014

All India Secondary School Examination (CBSE²)

THE INDIAN HIGH SCHOOL, DUBAI

GPA 10/10

Jul 2012

Key Projects

Simulating Incompressible fluid flow using DG methods

GUIDE: PROF. SHIVASUBRAMANIAN GOPALAKRISHNAN | IIT BOMBAY

Undergraduate Thesis

Aug 2017 - Current

- Developed a python framework to solve incompressible Navier Stokes equations using Discontinuous Galerkin methods
- Employed Weak Discontinuous Galerkin formulation to compute the advection, diffusion, and pressure terms using the Pressure Poisson formulation
- Tested the framework on a variety of benchmark problems to prove convergence of the method
- Analyzed accuracy of the algorithm with varying order, flux types (Rusanov vs Central), nodes (lobatto vs equispaced) and integration schemes (exact vs inexact)
- Rewriting the framework in C++ using LAPACK to improve speed

Accelerating Vesicle simulation using Machine learning

GUIDE: PROF. GEORGE BIROS | UNIVERSITY OF TEXAS AT AUSTIN

Summer Internship

May 2017 - Jul 2017

- Performed literature review on applying Machine Learning algorithms to accelerate simulations for incompressible flows and wrote a critical analysis of related existing work
- Attempted to use machine learning to speed up existing simulation of inextensible vesicles suspended in viscous fluid
- Obtained the training data using the existing boundary integral method based implementation for simulating a vesicle in random divergence free flow
- Created an autoencoder to perform model order reduction on the vesicle shape while retaining the physical features
- Attempted to develop an accurate deep Convolutional Neural Network to predict the new vesicle position with the initial shape and local velocity field as input
- Implemented networks using Distributed Tensorflow and trained it on an HPC system
- Integrated Tensorflow model with the existing MATLAB implementation by converting the model to a C executable

Vortex methods and Smoothed Particle Hydrodynamics (SPH)

GUIDE: PROF. PRABHU RAMACHANDRAN | PARTICLE METHODS IN FLUID FLOW SIMULATION

Course Project

Autumn 2017

- Employed Vortex Methods to accurately simulate vortex shedding in a flow past circular cylinder, including Panel Method to implement the boundary conditions and RVM for diffusion
- Solved the Dam Break problem with a rigid obstacle using the WCSPH method in pySPH

¹Maharashtra State Board of Secondary and Higher Secondary Education

²Central Board of Secondary Education

Solving Incompressible NS using SIMPLE method

Course Project

GUIDE: PROF. ATUL SHARMA | COMPUTATIONAL FLUID DYNAMICS AND HEAT TRANSFER

Autumn 2016

- Developed Navier Stokes solver using Semi-Implicit Method for Pressure Linked Equations
- Analyzed lid-driven cavity flow and verified that results were in good agreement with the existing benchmark solution

Characterization of Pre-Placed Laser Cladding

Course Project

GUIDE: PROF. RAMESH SINGH | IIT BOMBAY

Autumn 2017

- Used Abaqus to find the temperature distribution and predict the trends in width and height of the clad for different feeds and powers of the laser source
- Carried out experiments on a laser cladding machine and verified the predictions using an optical 3D profilometer and Coordinate Measuring Machine

Professional Experience

HDFC RED

Summer Internship

DATA SCIENTIST

May 2016 - Jul 2016

- Used a machine learning algorithm (NeuralTalk by Andrej Karpathy) to write a program that identifies the type of room from its picture
- Analytics Dashboard
 - Developed a Django application for analyzing live data using efficient algorithms for fast extraction and processing of data (Over 10^7 entries) present in mongo and SQL databases
 - Used cost and leads data to find the best and worst performing URLs and created an interactive webapp to visualise the data

Other Projects

ChessAI

Course Project

GUIDE: SUPRATIK CHAKRABORTHY | COMPUTER PROGRAMMING AND UTILIZATION

Autumn 2014

- Worked in a team of two to develop a one player game of chess
- Implemented minimax algorithm with α - β pruning to predict the best move for the AI
- The AI runs almost instantaneously when analyzing to a depth of four moves and is capable of defeating amateur players
- Used SDL to implement an intuitive graphical interface

ChessOverIP

Technical Summer Project

STUDENT TECHNICAL ACTIVITIES BODY

May 2015 - Jul 2015

- Designed and built a one-player chess playing bot which allows a user to play on a physical chessboard against either an opponent situated remotely, or an AI
- Used OpenCV module for image processing to dynamically capture the state of the board and detect the moves played
- Built a rack and pinion driven gantry for movement of an electromagnet in the XY plane
- Implemented all the modules including motor control using python on Raspberry Pi
- Won the prize for best project implementation at TechRnD Expo 2015

pyScorify

FACEBOOK HACKATHON

March 2015

- Developed a desktop sports score notification system using python and won the prize for best freshmen project
- Used the beautiful-soup module in python to parse webpages of famous sport sites and display scores of teams supported by the user

Scholastic Achievements

- CURRENT** Department Rank 7 in a class of over 150 students
- 2015** Received an AP grade for exceptional performance in the course on Linear Algebra (MA106), which was awarded to 8 out of 872 students
- 2014** Obtained All India Rank 472 in the Joint Entrance Examination 2014 out of 1.36 million candidates
- 2013** Was in the top 1% in the state of Maharashtra for National Standard Examination in Physics, 2013, qualifying for Indian National Physics Olympiad

Technical Skills

LANGUAGES	C++, Python, Scilab, Octave/MATLAB, SQL, JS, \LaTeX
LIBRARIES	Scipy Stack, Distributed Tensorflow, LAPACK, openCV, pySPH, SDL, Django
SOFTWARES	git, ANSYS, ABAQUS
PLATFORMS	Raspberry PI, Arduino, 8085 μP

Standardized Tests

GRE®	335/340	Q: 170/170	V: 165/170	AWA: 4.5/5	Aug 2017
TOEFL®	115/120	S: 27/30	R: 30/30	W: 28/30	L: 30/30 Sept 2017

Positions of Responsibility

TEACHING ASSISTANT: LINEAR ALGEBRA (MA 106) Spring 2017

- Carried out weekly tutorial sessions for 50 freshmen on various topics pertaining to the course
- Conducted regular tests to evaluate the students' performance

WEB NOMINEE, INSIGHT Mar 2016 - Feb 2017

- Administered the web operations for Insight, the student media body of the institute, receiving an annual traffic of over 400,000
- Created a beta website in Django set to replace the main website in the following years

TECHNICAL SECRETARY, HOSTEL 5 Mar 2015 - Feb 2016

- Responsible for conducting various technical events in the hostel and maintaining the hostel tech room
- Awarded the hostel *Tech Special Mention* for the tenure

Extra-curricular Interests

CHESS Was a part of the team that won the gulf zone chess championship and represented the school in CBSE National Chess tournament for two consecutive years

SWIMMING Completed a year of training as a part of the National Sports Organization. Swam 4.3km as a part of institute swimathon

QUIZZING Part of a team that secured first place in Word Games GC and third place in Logic GC at IIT-B

References

Prof. Shivasubramanian Gopalakrishnan

DEPARTMENT OF MECHANICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY BOMBAY

Web Page: www.me.iitb.ac.in/~sgopalak/

Contact: sgopalak@iitb.ac.in

Prof. George Biros

INSTITUTE FOR COMPUTATIONAL ENGINEERING AND SCIENCES, UNIVERSITY OF TEXAS AT AUSTIN

Web Page: <https://www.ices.utexas.edu/people/1056/>

Contact: biros@ices.utexas.edu

Prof. Arunkumar Sridharan

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Prof. Supratik Chakraborty

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