Varshini Subhash

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Education

Manipal Institute of Technology — Manipal, India
Bachelor of Technology in Mechanical Engineering, CGPA: 9.09/10.0 — *Aug 2014 – July 2018*
Minor in Mechanical Design

Research Publications

- **Varshini Subhash**, Karran Pandey, Vijay Natarajan, "GPU Parallel Computation of Morse-Smale Complexes", *Short Paper*, IEEE VIS 2020. [arXiv]
- **Varshini Subhash**, Karran Pandey, Vijay Natarajan, "GPU Parallel Computation of Morse-Smale Complexes", *(In Preparation: To be submitted to IEEE Transactions on Visualization and Computer Graphics)*

Invited Talks

- "GPU Parallel Computation of Morse-Smale Complexes", IEEE VIS 2020 Conference. [Talk] [Preview]
- "GPU Parallel Computation of Morse-Smale Complexes", Bangalore VIS Workshop 2020.

Research Experience

Indian Institute of Science — Bangalore, India
Research Assistant — *June 2019 - Present*
Mentor: Professor Vijay Natarajan

GPU Parallel Computation of Morse-Smale Complexes | *Project Page*

- Designed the **first** completely GPU parallel framework for the computation of Morse-Smale complexes on 3D scalar fields, which improves upon the state-of-the-art pipeline by up to **7x**.
- Devised novel parallel graph traversal algorithms for saddle-saddle reachability and path counting, which demonstrate speedups of up to **4.5x** and **129x** each.
- Accepted for **publication** and **presentation** at the IEEE VIS 2020 Conference, Salt Lake City, Utah.
- Presented results at the Bangalore VIS Workshop 2020 and submitted them to the ARCS Symposium 2020.
- Developing a parallel algorithm for the topological persistence simplification of a Morse-Smale complex.

Indian Institute of Science — Bangalore, India
Research Assistant — *May 2018 - December 2018*
Mentor: Professor Ramsharan Rangarajan

Parallel Performance in Mesh Optimization | *Project Page*

- Improved the performance and scalability of a parallel mesh optimization algorithm named DVR.
- Reduced mesh optimization time by **47.4%** and enabled **100%** scalability with a **40**× speedup in triangular (2D) and tetrahedral (3D) meshes.
- Enabled optimization of a **14 million** element mesh to drop from **52.16** mins to **1.33** mins.
- Used CGAL, HyperMesh and TetGen to prepare large scale meshes demonstrating parallel speedup.

Indian Institute of Science — Bangalore, India
Research Intern — *January 2018 - May 2018*
Mentor: Professor Ramsharan Rangarajan

Adaptive Mesh Refinement Using Quadtrees | *Project Page*

- Implemented the paper 'Provably Good Mesh Generation' by Bern and Eppstein which uses quadtrees for adaptive mesh refinement in Finite Element Analysis [code].
- The algorithm takes error functions or point clouds as input and selectively refines erroneous FE regions.
- Improved the accuracy of an obstacle problem by an **order of magnitude**.

Indian Institute of Technology Mumbai, India
Research Intern *May 2017 - June 2017*
Mentor: Professor Arindrajit Chowdhury

Spray Ignition Setup for Combustion of Hypergolic Propellants | *Project Page*

- Developed a spray ignition setup for the combustion of hypergolic propellants in rocket propulsion, under the auspices of DRDO, DRDL for their proprietary missile technology.
- Modeled the combustion chamber using SolidWorks & conducted structural analysis using ANSYS. Designed and validated a theoretical injector system.
- Experiments were performed using High Speed Imaging to study impingement characteristics of a triplet injector.

Achievements

- Recognized as a top performer (∼**3%**) during Deloitte's Annual Talent Review 2019.
- Ranked in the top **3%** among **270** students in Semesters 5 and 6 during Bachelors.
- One of the **35** IAESTE selects (out of **800** applicants) – awarded title of 'Signing Authority' (**4** out of **35** students).
- Award for securing **3rd position** in the Merit List of the SSC Board Examination.
- Awarded the Dr. Doctor Memorial Scholarship for excellence in academics and securing **Rank 1** in a class of **120**.
- Qualified for the **quarter-finals** of the All-India Tata Energy Q-Quiz.

Personal Projects

- **Global Initiative to End Gender Based Violence** | *Project Page* | *BTB Feature* | *Podcast*
  Confirmed sharp rise in domestic violence in the US due to COVID-19 using interactive visualizations.
- **Visualization of Fractals** | *Code* | *Project Page*
  Visualized the Mandelbrot Set and Julia Sets using the Python Imaging Library
- **Fourier Transforms** | *Code* | *Project Page*
  Computed and visualized Fourier Transforms for input signals and extracted constituent pure signals.

Work Experience

Deloitte Bangalore, India
Business Analyst *Aug 2018 - June 2019*

- Led the cloud deployment of PTC Windchill configurations on client servers, worked on performance tuning and part classification. Developed an application to automate Part Creation in Windchill and customized BMIDE Teamcenter for efficient data extraction.
- Recognized as a top performer (∼**3**%) during the Annual Talent Review.

Fiat Chrysler Automobiles Pune, India
Summer Intern *June 2016 - July 2016*

- Worked on the optimization of FCA's proprietary assembly line technology called 'WPI Implementation in Car Assembly'. Studied assembly line process sheets, prepared spaghetti charts, PFMEAs, MURI charts and performed NVAA analysis.

PTC Pune, India
Summer Intern *June 2015 - July 2015*

- Assisted the MPMLink Scrum Team with the Sprint testing of stories.
- Conducted regressive testing as well as testing of new stories of PTC Windchill MPMLink.

Social Impact

- **'She Belongs' Podcast** | *Co-Founder & Co-Host* *September 2020 - Present*
- **'STEM For Her - Code To Inspire' Fundraiser** | *Panelist* | [YouTube] *October 2020*
- **Coronavirus Visualization Team, Harvard University** | [Webpage] *June 2020 - Present*
  Project Planning Co-Director | *Project Co-Lead* | *Community Manager*
- **Testbook** | *Educator & Subject Matter Expert* *March 2018 - September 2018*