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]

Talks

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

Research Experience

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

  · **GPU Parallel Computation of Morse-Smale Complexes**:
  - Designed parallel algorithms for the efficient computation of a topological descriptor called the Morse-Smale Complex, which improve upon the state-of-the-art pipeline by upto **7x**.
  - Individual algorithms demonstrate speedups upto **4.5x** and **129x** each.
  - This work was accepted for publication and presentation at the IEEE VIS 2020 conference.
  - Presented results at the Bangalore VIS Workshop 2020.

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

  · **Parallel Performance in Mesh Optimization**:
  - Enabled **100%** scalability (**40x** speedup) in a parallel mesh optimization algorithm named DVR by conducting scalability and performance analysis.
  - Reduced parallel execution time by **47.4%**.
  - Used CGAL, Hypermesh and TetGen to prepare large scale meshes that demonstrate parallel optimization.

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

  · **Adaptive Mesh Refinement Using Quadtrees**:
  - Developed a C++ implementation of the paper 'Provably Good Mesh Generation' which uses quadtrees [code] for adaptive mesh refinement in Finite Element Analysis (FEA).
  - The mesh generation algorithm selectively refines erroneous FE regions based on a specified error function or point cloud, thus improving the accuracy of the FEA solution.
  - Successfully demonstrated the reduction of error by an **order of magnitude** in an obstacle problem.

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

  · **Spray Ignition Setup for Combustion of Hypergolic Propellants**:
  - Developed a spray ignition setup for the combustion of hypergolic propellants in rocket propulsion.
  - Modeled the combustion chamber on SolidWorks & conducted structural analysis on ANSYS.
  - A theoretical injector system was designed and validated.
  - Experiments were performed using High Speed Imaging to study impingement characteristics of a triplet injector.

Projects

- **Global Initiative to End Gender-Based Violence**: Heading the research effort by the Coronavirus Visualization Team to study gender-based violence during the COVID-19 pandemic.
  - Obtained street-level and time-series visualizations for several cities in the United States, which compare violent crimes against women during 2019 and 2020.
  - A podcast and policy paper comparing policies across states is in the pipeline.
- **Visualization of Fractals**: Visualized the Mandelbrot Set and Julia Sets using the Python Imaging Library [code].
- **Fourier Transforms**: Computed Fourier Transforms for input signals and visualized the constituent pure signals by wrapping input signals around a circle at varying frequencies [code].

Work Experience

- **Deloitte** Bangalore, India
  Business Analyst *Aug 2018 - June 2019*
  - Led the deployment of PTC Windchill configurations on client servers and worked on Windchill performance tuning.
  - Developed an application to automate Part Creation in Windchill.
  - Awarded a perfect performance scatterplot during the Annual Talent Review.

- **Fiat Chrysler Automobiles** Pune, India
  Summer Intern *June 2016 - July 2016*
  - Worked on 'WPI Implementation in Car Assembly' by studying assembly line process sheets, preparing spaghetti charts, PFMEAs, MURI charts and performing 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.

Awards and Honors

- **Deloitte Annual Talent Review**: Received a perfect performance scatterplot for excellence in performance (2019).
- **Rank Holder, SSC Board Examination**: Award for securing **3rd position** in the Merit List of the SSC Board Examination (2012).
- **Dr. Doctor Memorial Scholarship**: Recipient of the award for excellence in academics and securing **1st position** in a class of **120** (2011).
- **State Rank 4, International English Olympiad**: Awarded a **Silver Medal** in the International English Olympiad for securing **State Rank 4** (2010).
- **Quarter Finalist, All-India Tata Energy Q-Quiz**: Qualified for the quarter-finals of the national level Tata Energy Q-Quiz (2009).

Volunteer Experience

- **Coronavirus Visualization Team (CVT)** *June 2020 - Present*
  Project Planning Co-Director | Project Co-Lead | Community Manager
  - CVT is a student-run non-profit at Harvard University that aims to fight the COVID-19 infodemic with visualization and data analysis.
  - Leading the Project Planning Team which oversees all CVT projects, helps plan project timelines and feasibility.
  - Leading the 'Global Initiative to End Gender Based Violence' project.
  - Managing member activity and community engagement in the Social Media team.

- **Testbook** *March 2018 - September 2018*
  Subject Matter Expert
  - Testbook is an IIT Bombay alumni startup focused on providing competitive coaching for rural students attempting Indian government examinations.
  - Designed **500+** English mock test questions for enrolled students.

Programming Skills

- **Languages**: C, C++, Java, Python **Packages**: OpenMP, CUDA, cuSPARSE, cuBLAS, CGAL, Hypermesh