# Vignesh Vittal Srinivasaragavan

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Doctoral candidate with strong research background in applied mathematics, scalable algorithms and high-performance computing complemented by seasoned software development skills

## EDUCATION

**Rensselaer Polytechnic Institute (RPI)** *Aug 2017 - Dec 2022 (expected)*
*PhD in Mechanical Engineering* GPA: **3.84/4.00**
***Coursework:*** *Parallel Computing, Machine Learning with Data, Uncertainty Quantification, Inverse Uncertainty Quantification, Finite Element Methods, Computational Fluid Dynamics*

**Indian Institute of Technology, Madras (IITM)** *Aug 2012 - Jul 2017*
*B.Tech / M.Tech in Mechanical Engineering* GPA: **8.38/10.00**
***Coursework:*** *Computational Engineering, Linear Algebra, Differential Equations, Computational Structural Dynamics, Transportation Network Analysis, Fundamentals of Operations Research*

## EXPERIENCE

**Graduate Research Assistant** at **SCOREC, RPI** *Aug 2018 - Dec 2022*
- Developed a minimal memory anisotropic structured mesh and improved allocatable memory for particles in plasma simulator from 70% to >99% of processor memory
- Designed novel scalable algorithms on structured and unstructured anisotropic meshes, packaged them into 3 open-source libraries & integrated each with HPC plasma physics codes
- Achieved >100x mesh entity reduction, >30x performance speedups on large-scale fusion simulations
- Collaborated with over 20 research scientists from 4 institutions on the SciDAC PSI2 project

**Internship** at **General Electric (GE) India Pvt. Ltd** *May 2015 - Jul 2015*
- Investigated sources of controllable noise and heat emissions in commercial GE Locomotive engines
- Researched commercial viability of micro-perforated plates as a singular hybrid noise/heat control solution with projected savings of $5000 (customization and installation costs) per engine

## PROJECTS

**High-performance anisotropic meshes for plasma simulations** *Jul 2019 - Dec 2022*
*Skills / Tools: HPC, C, C++, Kokkos, Python, software development* *SCOREC, RPI*
- Developed anisotropic block-structured mesh and employed efficient data structures to compactly store the mesh for complex domains -- O(10M) elements with O(100 kB) vs O(1 GB) unstructured mesh
- Realized >30x runtime reduction for plasma simulations on the reduced block-structured mesh
- Built unstructured mesh capabilities for a first-of-its-kind HPC 3D plasma impurity transport code
- Packaged the algorithms into 3 HPC mesh libraries - PUMImbbl-GPU, PUMImbbl & GITRm-Sheath
- Integrated the libraries into massively parallel plasma/impurity simulator codes and demonstrated weak & strong scalabilitiy with about 3.2 billion particles on upto 64 GPUs

**Virtual simulation environment for serial manipulators** *Aug 2015 - May 2016*
*Skills / Tools: MATLAB, Simulink, SolidWorks, Dynamic analysis* *IIT Madras*
- Reverse engineered a defunct 5 arm robot & performed dynamic analysis for end-effector path traversal
- Designed torque control modules for robot arms to ensure precise/accurate path adherence for minimally invasive orthopeadic surgery applications
- Integrated above control algorithms in MATLAB-Simulink with realistic 3D model in ADAMS and demonstrated path adherence upto 0.5% and/or upto 0.5mm error

## TECHNICAL SKILLS

**Programming** : C, C++, Python, MATLAB, Bash
**High Performance Computing** : Cuda, OpenMP, MPI, Kokkos
**Build systems and Toolchains** : Cmake, Make, Linux, Git, Github
**Documentation and Design** : LATEX, Doxygen, Inkscape/Illustrator