Vignesh Vittal Srinivasaragavan - Curriculum Vitae

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Profile Summary

A graduate student with strong research background in computation and applied mathematics complimented with proven/tested software development skills

Education

Rensselaer Polytechnic Institute, New York, USA *(Aug '17 – present)*
PhD in Mechanical Engineering *GPA 3.83/4.00*
Advisor: Dr. Onkar Sahni

Indian Institute of Technology Madras, India *(Aug '12 – Jul '17)*
B,Tech/M.Tech. in Mechanical Engineering (Product Design) *GPA 8.38/10.00*
Minor: Industrial Engineering *Major GPA 8.61/10.00*

Research Interests

• **Uncertainty quantification:** Stochastic PDEs, Intrusive and Non-Intrusive UQ, Stochastic Finite Elements, Multi-level and Multi-fidelity UQ
• **Fluid Mechanics:** Computational Fluid Dynamics, Stabilized Finite Elements

Research Projects

• **Implicit non-uniform mesh for large- scale scrape-off layer simulations** *(Aug '16 – Present)*
o *Guide: Dr. Onkar Sahni, RPI*
o *Skills and Tools: Software development, High-performance computing*
- Developed PUMI-MBBL, an implicit block-structured mesh library for scrape-off layer simulation
- Optimized particle locate APIs and achieved close to 100x speedup for a large-scale plasma simulation
- Implemented higher order b-spline based charge schemes to address noise in non-uniform mesh

• **Wavelet methods for Linear-Elastic Solids** *(Aug '16 – May '17)*
o *Guide: Dr. Raju Sethuraman, IIT Madras*
o *Skills and Tools: Mathematical modeling, MATLAB*
- Conducted a detailed research on solving ODE/PDEs using Haar wavelets with an emphasis on implementing the same for Linear Elastic equations
- Developed custom MATLAB codes for the same and achieved greater precision, convergence while minimizing computations
- Performed extensive research on Wavelet-Galerkin methods for ODE/PDEs and developed MATLAB codes that evaluates necessary functions (like wavelet integrals, moment terms and connection coefficients) associated with the method
- Thrust also placed on investigation of effect of parameters (like genus of wavelet and resolution used) on convergence and stability of the solutions

• **Modeling, Simulation and Control of a Robot** *(Dec '14 – Aug '16)*
o *Guide: Dr. S. Soundarapandian, IIT Madras*
o *Skills and Tools: 3D modeling, Structural analysis, Kinematic and Dynamic analysis, Control systems, ADAMS, MATLAB, SIMULINK, SolidWorks*
- Reverse engineered a robot, created a 3-D model and constructed a path planning algorithm for the same
- Designed the control software for the manipulator arm, which ensures precise and accurate path

adherence in minimally-invasive orthopedic surgery applications
- Validated the model and the control systems by creating a co-simulation in the ADAMS environment, with custom MATLAB codes in a SIMULINK module
- An aspect of the project was presented in the *3rd International Conference on Mechatronics and Mechanical Engineering* held at Shanghai, October 2016 and published in the conference proceedings

Course Projects

• **Performance benchmark for a sparse linear system solver** *(Jan '20 – May '20)*
o *Course: Parallel Computing / Course instructor: Dr. Chrisopher Carothers, RPI*
o *Skills and Tools: CPU/GPU parallel programming*

• **Quantifying uncertainty on fluid-flow over uncertain geometry** *(Aug '19 – Dec '19)*
o *Course: Computational Fluid Dynamics / Course instructor: Dr. Onkar Sahni, RPI*
o *Skills and Tools:*

• **Stochastic Variational Multi-Scale method for 1D fluid flows** *(Aug '19 – Dec '19)*
o *Course: Finite Element Methods / Course instructor: Dr. Mark Shephard, RPI*
o *Skills and Tools:*

• **Design and Development of Scope-I** *(Aug '16 – Dec '16)*
o *Course: Design Synthesis / Course instructor: Dr. Krishnan Balasubramanian, IITM*
o *Skills and Tools:*

Academic Experience

• **Teaching Assistant, Rensselaer Polytechnic Institute** *(Aug '17 – Dec'17)*
o *Course: Engineering Dynamics / Course instructor: Dr. Jeremy Laflin*
- Supervised a class of ∼45 undergraduate students in the sophmore level course
- Assisted course instructor in class, assignments and proctoring examinations

• **Teaching Assistant, Indian Institute of Technology Madras** *(Aug '16 – Nov'16)*
o *Course: Advanced Mechanics of Solids / Course instructor: Dr. Raju Sethuraman*
- Supervised ∼60 undergraduate and post graduate students in the advanced-level course
- Assisted course instructor in conducting class tutorials and examinations

Industrial Experience

• **Winter Intern, Forbes Marshall Ltd.** *(Dec '15 – Jan'16)*
- Mathematically modeled the concentration factor of a Fresnal-type Evacuated Tube Collector in terms of input design parameters
- Estimated the optimal parameter set by running a Monte Carlo simulation

• **Summer Intern, GE India Pvt. Ltd, Transportation division** *(May '15 – Jul'15)*
- Optimized the parameters in Variable Valve Timing (VVT) mechanism in GE Engines
- Suggested possible noise mitigation and heat screening methods to be implemented in GE Engines
- Generated a Requirement Traceability Matrix (RTM) for Lube Oil pump test rig

Skills

• **Modeling** : CreO Parametric, AutoCAD, Inventor, SolidWorks
• **Analysis and Simulation** : MATLAB, SIMULINK, Paraview, Adams, ANSYS, C/C++

- **Symbolic Computation** : Maple, Mathematica
- **Presentation and Documentation** : LaTeX

Scholastic Achievements

- Ranked in **top 1%** in the **IIT-JEE 2012** (from over 0.5 million applicants)
- Ranked in **top 1%** in the **AIEEE 2012** (from over 1.2 million applicants)
- Qualified for the **Indian National Maths Olympiad** 2011 (Among the **top 500** in India)
- Secured **top 1%** in state in **National Standard Examination in Physics** 2011

Publications

- ADAMS-MATLAB Co-Simulation of A Serial Manipulator, Tejaswin Parthasarathy, Vignesh Srinivasaragavan, Soundarapandian Santhanakrishnan. MATEC Web Conf. 95 08002 (2017) DOI: 10.1051/matecconf/20179508002