

Gowtham Venkatraman

CONTACT INFORMATION

Senior Undergraduate,
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Indian Institute of Technology, Madras

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RESEARCH INTERESTS

- Time-Delayed Feedback Control
- Structural Control and Smart Material Control Applications
- Non-Linear Dynamics

EDUCATION

Indian Institute of Technology Madras

Bachelor of Technology (Honors) in Mechanical Engineering

2011 – present

- Cumulative Grade Point Average (CGPA) of **8.81** (on a scale of 10)

PUBLICATION

Control Theoretic Analysis of Gas-evolution Oscillators, 27th Chinese Control and Decision Conference(CCDC), 2015 (**under review**)

RESEARCH PROJECTS

- **Bifurcation Analysis of a delayed feedback oscillator** (submitted to CCDC)

Project, Prof. Gaurav Raina, IIT Madras

January 2014 - present

- Performed a bifurcation analysis on a non-linear chemical oscillator using delay-differential equations, studied orbital stability and characterized the bifurcating periodic solutions.
- Analyzed regions of convergence and performed a linear robust stability analysis of the system using the Vinnecombe metric for robustness with parametric uncertainties.
- Performed simulations in XPP and MATLAB softwares, and validated theoretical results.

- **Precision Structural Control using PZT**

Project Mentors: Prof.S.Narayanan, Dr. Shaikh Faruque Ali

July 2014 - present

- Aims to develop a **non-linear** controller for a cantilevered beam using piezoelectric actuators using infinite dimensional PDEs.
- Control objective to prevent structural deflection up to micron scale using minimum energy expenditure to electrically power the piezoelectric element.
- Electrical and mechanical coupled equations to be considered for the optimal control problem, and optimal dynamic inversion control technique to consider the distributed parameter system as a whole to be implemented.
- Optimization techniques for positioning, alignment of MFC patches for optimal control using state feedback to be developed, using heuristic algorithms.

- **Vibrating Mesh Nebulizer Design and Development**

Guide: Prof. Mahesh Panchagnula.

January 2014 - present

- Modeled a complete vibrating mesh nebulizer with sonotrode powered by piezoelectric stack actuators to nebulize medical fluid.
- New compact, efficiently powered design(to be submitted for patent) completed and ongoing fabrication and product development.

SCHOLASTIC ACHIEVEMENTS

- Awarded the **Kishore Vaigyanik Protsahan Yojana** (KVPY) fellowship in 2010, granted by the Department of Science and Technology, Government of India (amongst 40,000 applicants)
- Placed among top 1% (amongst 29,000 candidates) in the **National Standard Examination in Chemistry** (NSEC) organized by Indian Association of Physics Teachers (IAPT) in 2010.
- Secured **All India Rank 391** (amongst 475,000 students) in IIT-JEE 2011, a national-level competitive entrance examination.
- Selected for the CSIR Program on Youth for Leadership in Science(**CPYLS**) scheme organized by Council of Scientific and Industrial Research (CSIR), Government of India.

TECHNICAL SKILLS

- **Programming Languages** - Python, C, C++, C#, Excel VBA.
- **Simulation Tools** - Abaqus, ANSYS Fluent.
- **Other Tools** - MATLAB, Mathematica, R, Django framework, \LaTeX .

COURSE PROJECT	<ul style="list-style-type: none"> • Bootstrap simulations for estimating threshold auto-regressive models <i>Course Professor: Prof. Arun Tangirala</i> August 2014-present <ul style="list-style-type: none"> – Built and fit TAR (threshold auto-regressive) time series models on random time series input. – Used bootstrap simulations to estimate confidence intervals of parametric estimates of the estimated TAR model, as a part of the course Applied Time Series Analysis. 	
PROFESSIONAL EXPERIENCE	<p>Simulation and Software Development for Orifice Selection for Hoist Application Engineering Design Center, Caterpillar Inc., Chennai, INDIA Summer Internship position at Caterpillar Inc. June 2014 - July 2014</p> <ul style="list-style-type: none"> • Modeled hydraulic systems with restriction orifices and designed an automated system to retrieve system information, and suggest optimal orifice parameters for the application. • Designed a software tool to also suggest process changes to optimize energy usage by variable orifice sizing, to be submitted for patenting. • Selected to continue working with the institute in a collaboration project to simulate orifice flow models in ANSYS and for high-end software development in Microsoft Visual Studio™. <p>Convertible Freezer Design and Product Development Home Appliances Lab, LG Electronics, Noida, INDIA Summer Internship position at LG Inc. May 2013 - July 2013</p> <ul style="list-style-type: none"> • Fabricated a working prototype for a convertible freezer system. Manual control mechanism for variable cooling requirements was designed. • Improved cooling capacity of the freezer compartment at same power input, by customizing and redirecting airflow during reduced usage, increasing energy savings. • Performed air flow simulations in ANSYS for the novel flow control mechanism to achieve convertibility for s operations, and fabricated a proof of concept within a strict budget constraint. 	
RELEVANT COURSEWORK	<div> <div> <ul style="list-style-type: none"> - Analysis & Design of Smart Material Structure - Adaptive & Optimal Control - Geometric Nonlinear Control Theory - Nonlinear Solid Mechanics - Signal Processing of Mechanical Systems - Finite Element Analysis (^) </div> <div> <ul style="list-style-type: none"> - Random Vibrations - Applied Time Series Analysis - System Identification (^) - Computer Simulation - Differential Equations - Advanced Mechanics of Solids </div> </div> <p>* - Ongoing courses in fall semester ^ - Courses to be done in spring semester</p>	
POSITIONS OF RESPONSIBILITY	<ul style="list-style-type: none"> • Student Representative, Class Committee 2011 - present <ul style="list-style-type: none"> - Represented the department students in the class committee, comprising of both faculty members and students, which addresses courses and student related issues, and discusses new curricular initiatives. • Coordinator and Organizer Hovercraft Workshop, Shastra 2012 - 2013 <ul style="list-style-type: none"> - Organized a hands-on workshop, instructing 150 participants to fabricate a working hovercraft from scratch in a three day training program. - Designed and fabricated a model and kit for a remote controlled 1.5 foot hovercraft with independent lift and thrust mechanism at under 100 USD. • Coordinator Web Operations Team, Shastra 2014 <ul style="list-style-type: none"> - Worked with the backend team on the Django framework, and with AJAX for the website of Shastra and NSS, IITM. • Core Member, Manageral Team, National Service Scheme, NSS IITM, <ul style="list-style-type: none"> - Organized and managed website for the internal ERP management of NSS IITM. 	
EXTRA-CURRICULAR	<ul style="list-style-type: none"> • Special mention in GS Quantify 2014, a Quantitative Finance and Stochastic Modelling contest conducted by Goldman Sachs. • Third position in Contraptions, a design and build event at Shastra 2011, the Technical Festival of IIT Madras, with national level participation. • Volunteered to conduct education quality survey under the Eureka Child Foundation to evaluate rural education standards and feedback on school quality, under <i>AID India</i>, an NGO working on various such social issues. • Part of a volunteering team under the National Service Scheme (NSS) to translate scientific articles from Wikipedia, of high impact to high school rural students, to Tamil. 	