CONTACT

Anurag Gupta

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English, Hindi, and French

EDUCATION

2021-2024	Doctor of Philosophy Electrical and Computer Engineering Cornell University, Ithaca, New York, U.S.
2018 - 2020	Master of Technology (CGPA 9.89/10) Systems and Control Engineering Indian Institute of Technology, Bombay, Maharashtra, India
2012 - 2016	Bachelor of Technology (CGPA 9.09/10) Major with Honors in Electrical Engineering Minor in Industrial Design Indian Institute of Technology, Bombay, Maharashtra, India
2010 - 2012	Senior secondary City Montessori School, Gomtinagar, Lucknow, Uttar Pradesh, India
2008 - 2010	High school St. Dominic Savio College, Lucknow, Uttar Pradesh, India

ACHIEVEMENTS

- Institute silver medalist for notable performance in M.Tech.
- Department Rank 1 in Systems and Control Engineering, IIT Bombay
- Teaching assistant (TA) for the courses "Modeling and Identification of Dynamical Systems", "Optimization" and "Systems and Control Engineering Lab"
- MHRD scholarship to undertake research training in the Department of Electrical Engineering, Indian Institute of Science, Bangalore, for five months
- Shortlisting of the startup project 'Elegane Bikes' by In2Korea and invitation to bootstrap in Seoul, South Korea
- Amongst top 30 finalists selected for four months Innovation Readiness organized by IC^2 institute, University of Texas, Austin and XLR8AP, Tirupati
- Winner of Annual Robotics Challenge organized by STAB, IIT Bombay
- Undergraduate Research Award for the project "Mathematical modeling of hysteresis loops in magnetic materials"
- All India Rank 374 in Indian Institute of Technology - Joint Entrance Examination
- All India Rank 80 in Kishore Vaigyanik Protshahan Yojna scholarship program
- All India Rank 79 in National Science Talent Search Examination
- State wise top 1% in National Science Examination in Chemistry

EXPERIENCES

01/2018 - 06/2018 Indian Institute of Science, Bangalore

Research Assistant in Dr. Pavan Tallapragada's group

- Study of opinion dynamics in a community as multi-agent systems with partial information
- A game-theoretic approach to the design of incentives for achieving desired equilibrium property viz. consensus or fragmentation among opinions

04/2017- 11/2017 Elegane Bikes

Co-Founder

- Design and implementation of an easy to access framework for bicycle pooling inside universities campus and tech parks
- The project received recognition from several organizations including FICCI, XLR8AP, IC2 Institute, University of Texas, and In2Korea

10/2016 - 03/2017 Works Application, Singapore

R & D Engineer (Supply chain management)

- Development of an intelligent Enterprise Resource Planning (ERP) solution for supply chain management

05/2015 - 07/2015 CRANN, Trinity College, Dublin

Research Assistant in Prof. John Boland's group

- Study of connectivity found in Random Nanowire Network (RNN) under stress
- Development of an interface between Keithley instruments and Labview for two probe and four-probe measurements of RNN samples
- My contribution was acknowledged in the Nature article "Emergence of winner-takes-all connectivity paths in random nanowire networks" by Hugh G. Manning et al.

11/2014 - 12/2014 Systemantics Pvt. Ltd., Bangalore

Winter intern under the supervision of Dr. Jagannath Raju

- Stereo vision to identify the orientation of workpieces that have been loosely positioned for pickup by the robot end-effector
- Utilization of the obtained information to reference a robotic arm

05/2013 - 07/2014 Formula Student, IIT Bombay Racing

Junior Design Engineer, Electrical and Electronic subsystems

- Modeling and fabrication of an electronic differential and a data acquisition system for an electric automobile to participate in the international event organized by IMechE, Silverstone, U.K.

PUBLICATIONS

2015 A.P.S. Baghel, A. Gupta, K. Chwastek and S.V. Kulkarni, Comprehensive modeling of a dynamic hysteresis loop in the rolling and transverse directions for transformer laminations, *Physica B: Physics of Condensed Matter*

PROJECTS

01/2019 - Present — Converses for joint source-channel coding with feedback

Professor Ankur A. Kulkarni

- Formulated the stochastic control problem of joint source-channel coding with non-classical information structure as a non-convex optimization problem
- Relaxed the non-convex problem to obtain a linear program, and derived its equivalent dual counterpart
- Generated lower bounds on the original problem with clever construction of feasible dual variables

03/2019 - 04/2019 — Decentralized shape formation using Kilobots

Professor Arpita Sinha and Professor Leena Vachhani, IIT Bombay

- Designed a finite state machine to allow a single star to orbit around a multi-planet system
- Integrated it with a global shape matrix-based localization scheme to construct desired shapes

01/2019 - 02/2019 — Model predictive control (MPC) of multi-input, multi-output (MIMO) system

Professor Arpita Sinha and Professor Leena Vachhani, IIT Bombay

- Generated an ARMAX model for a single board multiple heater system
- Formulated the problem as a discrete-time stochastic control problem with imperfect state measurement and implemented an MPC for its output regulation

10/2018 - 11/2018 — Shared economy for battery storage

Professor Ankur A. Kulkarni

- Surveyed different game-theoretic models for multiple agents interaction in an electricity market
- Compared the benefit of cooperation for three standard pricing policies enforced by the utilities

03/2018 - 04/2018 — Support vector machine (SVM) using log-barrier method

Dr. Kunal N. Chaudhary, IISc Bangalore

- Adapted the quadratic-constrained quadratic program (QCQP) formulation of SVM to an interior point method and used the central point method to recursively obtain the best estimate of the separating hyperplane for a given dataset

01/2016 - 04/2016 — Multi-output flyback converter for powering Nixie tube and a micro-controller

Professor Mukul C. Chandorkar, IIT Bombay

- Designed a multi-output flyback converter in discontinuous conduction mode for 110-220 VAC supply and 5 V (10 W), 180 V (0.36 W) as its output rating
- Fabricated a high-frequency transformer using the area product approach

10/2015 - 06/2016 — Data acquisition hardware for measuring B-H loop using Epstein tester

Professor S.V. Kulkarni, IIT Bombay

- Used AD7768 for synchronous acquisition of two signals
- Implemented a finite state machine on DE0-Nano board for parallel acquisition of data from ADC and its subsequent transfer to computer using the SPI protocol
- Created a GUI in Python for controlling the setup parameters

02/2016 - 03/2016 Image stitching for an arbitrary camera motion

Professor Subhasis Chaudhuri, IIT Bombay

- Applied 'Speeded Up Robust Feature' algorithm to generate feature set
- Obtained a stitched image using the common features on adjacent pair of images using MATLAB

07/2015 - 04/2017 Modular Multilevel Converter (MMC)

Professor Mukul C. Chandorkar, IIT Bombay

- Designed a 100-200 V input and 15 V, 2 A output flyback converter for pre-charging of module capacitors of a MMC when the module switches are driven by a source derived from the module capacitors

10/2015 - 11/2015 Generalized Hough transform using gradient information

Professor Shabbir N. Merchant, IIT Bombay

- Implemented the Hough transformation algorithm to detect a non-parametric shape in an image using its gradient information
- Improvised the algorithm to detect imperfect instances of a shape up to a quantized scale factor

10/2014 - 11/2014 Implementation of a pipelined RISC architecture on FPGA

Professor Virendra Singh, IIT Bombay

- Designed a five-stage datapath to meet the prescribed demands of a pipelined architecture and hazard mitigation
- Synthesized a VHDL code for the same, and verified it using a Signal tap II logic analyzer

06/2014 - 11/2014 Verification of sequential circuits using embedded systems

Sponsored by Technovation, IIT Bombay

- Studied fault models to identify anomalies in sequential circuits
- Employed graph theory to validate small-scale sequential circuits using a state table based test pattern generation scheme using Beaglebone Black
- Created a graphical user interface using Tkinter library in Python

01/2014 - 10/2014 Hysteresis loop modelling for rolling and transverse direction of grain-oriented (GO) magnetic materials

Professor S.V. Kulkarni, IIT Bombay

- Presented a viscosity-based modified Jiles-Atherton (JA) model to accurately predict dynamic loops over a frequency range of 1-200 Hz
- Analyzed the variation of static and dynamic losses with frequency in both direction

05/2014 - 07/2014 Classification of image features for remote sensing

Professor P. Venkatachalam, CSRE, IIT Bombay

- Compared the efficiency of three algorithms namely K-mean, C-mean, and min-cut clustering scheme on a satellite image dataset
- Created a Python-based graphical user interface for the same using the Tkinter library

08/2013 - 11/2013 Spatial flux distribution at T-joint of a 3-phase transformer

Professor S.V. Kulkarni, IIT Bombay

- Developed a modified Jiles-Atherton (JA) model to incorporate frequency-dependent losses in non-grain oriented magnetic materials
- Utilized Finite Element Method and JA Model to simulate a 3-phase transformer and analyzed its loss distribution at T-joints

05/2013 - 07/2013 Spindle integration of an indigenous CNC machine

Professor R.K. Singh, IIT Bombay

- Studied various techniques for control of electrical drives
- Integrated control of two motors from different manufacturers by a single software

05/2013 - 07/2013 Quadruped

Supported by Institute Technical Summer Project, IIT Bombay

- Prototyped a remote-controlled four-legged robot with 12 degrees of freedom
- Keyboard based interface for controlling the robot using UART protocol

WORKSHOPS

01/2020 Bombay information theory seminar

Organized by Tata Institute of Fundamental Research and IIT Bombay

- Convertible codes: New class of codes for efficient conversion of coded data in distributed storage by Rashmi Vinayak (CMU)
- Inference of spatial fields with a location-unaware mobile sensor by Animesh Kumar (IITB)
- Variations on the theme of synthetic control by Devavrat Shah (MIT)
- Community detection and matrix completion with two-sided graph side-information by Vincent Tan (NUS)

01/2020 Workshop on learning theory

Organized by Tata Institute of Fundamental Research, Mumbai

- Graphical Models: Causal Inference and Total Positivity by Caroline Uhler (MIT)
- Stochastic Gradient Descent: Marrying Theory with Practice by Prateek Jain (MSR)
- Exploration and Exploitation in Structured Stochastic Bandits by Wouter Koolen (CWI)

01/2019 Games on networks and queues

Organized by Electrical Engineering, IIT Bombay

- Rational queuing by Rafael Hassin (Tel Aviv University)
- Differential pricing, zero-rating and net neutrality by Vishal Mishra (Columbia University)

01/2019 Workshop on distributed energy management and data science for smart grid

Organized by Electrical Engineering, IIT Bombay

- Meta-game approach to cross-layer cyber defense and resilient control design for power systems by Quanyan Zhu (New York University)

11/2018 IEEE workshop on innovations in predictive control

Organized by Systems and Control Engineering, IIT Bombay

- Infinite horizon performance estimates for nonlinear model predictive control by Lars Grüne (Universität Bayreuth)
- Model predictive control for changing operating conditions by Daniel Limon (LAAS-CNRS and Institute of Mathematics)
- An overview of compressed sensing by M. Vidyasagar (IIT Hyderabad)

07/2018 Joint Telematics Group/Information Theory Society summer school

Organized by Electrical Engineering, IIT Bombay

- Topics in social algorithm by Ashish Goel (Stanford University)

KEY COURSES

Control Stochastic and networked control, Optimal control system, Control of nonlinear dynamical systems, Optimization, Automation and feedback, Modeling and identification of systems, Multivariable control systems, Games and information, Systems theory

Electrical Information theory and coding, Nonlinear systems and applications, Switched and hybrid systems, Convex optimization and applications, Microprocessors, Digital systems, Analog circuits, Network theory, Electronic devices, Control system, Power electronics, Matrix computation, Communication systems, Probability and random processes, Signals and systems, Data analysis and interpretation, Digital communications, Digital image processing, Digital signal processing, Radar systems, Computer Vision, Electromagnetic waves, Power machines and power electronics, Power system, Computer-aided power system analysis, Linear algebra, Microprocessor application in power electronics, Calculus, Chemistry, Electricity and magnetism, Differential equations, Complex analysis

Biology Modeling biological processes and systems

Management Economics of firm strategy, Psychology, Microeconomics, Macroeconomics

Design Introduction to design, Human-computer interaction, Technology and animation, Sound and music technology, Visual communication, Elements of design, Studio project 1, Studio project 2

Online Discrete optimization, Control of mobile robots, Machine learning, Mathematical thinking in computer science, Blockchain: foundation and use cases

SKILLS

Basic ROS

Advanced Matlab/Simulink, Python, Labview, VHDL, Assembly language, C/C++, Java, HTML, CSS, PHP, Javascript, LaTeX, Vim, AutoCAD, Solidworks, Eagle, Inkscape, Gimp

SUNDRIES

- Coordinator of 'Jumpstart' session for startups, and IBM key talk organized as a part of the EECS symposium at Indian Institute of Science, Bangalore
- Presentation on "Technological solution to Traffic Management" in the regional round of IET scholarship award
- Highest scorer in the inter-hostel technical general competition conducted by Student Technical Activities Body (STAB), IIT Bombay

- Technical Secretary, Hostel-7, IIT Bombay
- 'Tech Color' award for active participation and performance in Institute technical events
- Best design award for football playing robot in XLR8 2.0
- Certified short term course on 'Sound and Music Technology'
- Convener, Robotics club, Student Technical Activities Body (STAB), IIT Bombay