Mishal Assif P K

Curriculum Vitae

Hostel 7, IIT Bombay
Bombay, India 400076
✉ *mishal_assif@iitb.ac.in*

Education

2014–Present **IIT Bombay**, *B.Tech + M.Tech: Mechanical Engineering*.
GPA: 8.42/10.00

2014 **CBSE**, *All India Senior School Certificate*.
Score: 95.2%

2012 **CBSE**, *All India Secondary School Certificate*.
GPA: 10.0/10.0

Publications

2019 **Scenario approach for minmax optimization with emphasis on the nonconvex case: positive results and caveats**,
M. Assif P K, *D. Chatterjee, R. Banavar*.
Submitted to IEEE Transactions on Automatic Control. [arXiv preprint]

2019 **Measure of quality of finite-dimensional linear systems: A frame-theoretic view**,
M. Assif P K, *M. R. Sheriff, D. Chatterjee*.
Submitted to Automatica. [arXiv preprint]

2018 **A simple proof of the discrete time geometric Pontryagin maximum principle**,
M. Assif P K, *D. Chatterjee, R. Banavar*.
Provisionally accepted in Automatica. [arXiv preprint]

2017 **Variational collision avoidance on Riemannian manifolds**,
M. Assif, *R. Banavar, A. M. Bloch, M. Camarinha, L. Colombo*.
Proceedings of the IEEE Conference on Decision and Control, 2018. [arXiv preprint]

Teaching

Spring 2018 **Differential Geometric Methods in Control**, Teaching Assistant.
- Course contents: Primer on topology, Introduction to Differentiable manifolds, Tangent vectors, Tangent bundle, Vector fields, Lie bracket of vector fields, Lie groups, Feedback linearization, Lyapunov stability on manifolds.
- Posed and graded test problems and conducted weekly tutorial sessions.

Fall 2018 **Microprocessors and Automatic control**, Teaching Assistant.
- Course contents: Introduction to feedback control, block diagrams, LTI systems, Fourier and Laplace transform, Impulse response, Transfer functions, Bode plots, Stability, Linear control design.
- Assisted in grading test problems and conducting weekly tutorial sessions.

Spring 2019 **Microprocessors and Automatic control**, Teaching Assistant.
- Assisted in conducting weekly Lab experiments.

Presentations

July 2018 Presented a short talk on "Geometric Pontryagin Maximum Principle for discrete time optimal control problems" at the **12th International ICMAT Summer School on Geometry, Mechanics and Control** held at Universidade de Santiago de Compostela, Spain.

Technical Projects

2015 - 2016 **Autonomous Underwater Vehicle team (AUV-IITB)**, Software team.
- Developed and tuned a PID controller for controlling a 4 DOF AUV.
- Wrote drivers for a Doppler Velocity Log (DVL) and an Inertial Measurement unit (IMU).
- Secured second place at the International AUVSI Robosub competition 2016.

Course Projects

Spring 2018 **Variational integrators and the Newmark Algorithm**.
ME 6106: Computational structural dynamics
- Reviewed the theory of Discrete Lagrangian mechanics, the construction of Variational integrators and their structure preserving properties.
- Observed that the Newmark family of integrators, widely used in computational structural dynamics, are variational in nature.
- Validated through numerical simulations that the Newmark family of integrators exhibit excellent energy behaviour for conservative systems as expected from a Variational integrator.

Spring 2018 **Adaptive control under input constraints**.
SC 617: Adaptive control
- Reviewed two adaptive control techniques that can handle input constraints:
  1. Positive mu-modification method for linear systems with bounded magnitude inputs,
  2. An adaptive tracking controller for a class of control affine systems with both magnitude and rate constraints on the input.
- Validated the performance of the two control laws through numerical simulation for a 1D system with a single input.

Academic Achievements

2018 Awarded an AP grade in *Sparsity methods in control* for distinctive performance.

2017 Awarded an AP grade in *Probability and Random processes* for distinctive performance.

2016 Awarded an AP grade in *Differential geometric methods in control* for distinctive performance.

Software Skills

Programming Languages: C++, Python, Matlab

Other tools: LaTeX, ROS, Gazebo, OpenCV

Key Courses

- Sparsity methods in control
- Probability and Random processes
- Physics and Control
- Nonlinear control
- Systems theory
- Optimization
- Stochastic models
- Differential geometric methods in control
- Adaptive control
- Behavioural theory of systems

References

Dr. Debasish Chatterjee
Associate Professor
Systems and Control Engineering
Indian Institute of Technology Bombay
✉ dchatter@iitb.ac.in

Dr. Ravi Banavar
Professor
Systems and Control Engineering
Indian Institute of Technology Bombay
✉ banavar@iitb.ac.in

Dr. Srikant Sukumar
Assistant Professor
Systems and Control Engineering
Indian Institute of Technology Bombay
✉ srikant@iitb.ac.in