Mishal Assif P K

Curriculum Vitae

CSL 164, 1308 W Main Street
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Education

2019–Present **University of Illinois Urbana-Champaign**, *Ph.D: Electrical Engineering*.
GPA: 4.00/4.00

2014–2019 **IIT Bombay**, *B.Tech + M.Tech: Mechanical Engineering*.
GPA: 8.63/10.00

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

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

Research

Research Interests

Theory and applications of Optimization, Learning and Control.

Publications

2020 **Scenario approach for minmax optimization in the nonconvex setting: positive results and caveats**,
M. Assif P K, *D. Chatterjee, R. Banavar*.
SIAM Journal on Optimization, Vol.30(2), 2020. [doi], [arXiv preprint].

2020 **A simple proof of the discrete time geometric Pontryagin maximum principle**,
M. Assif P K, *D. Chatterjee, R. Banavar*.
Automatica, Vol.114, 2020. [doi], [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. [arXiv preprint].

2018 **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. [doi], [arXiv preprint].

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 Experience

Projects

2015 - 2016 **Autonomous Underwater Vehicle Team (AUV-IITB)**, Software developer.

- Worked as part of a team in the development of algorithms to enable an AUV to autonomously localise itself and perform realistic missions based on feedback from visual, inertial and acoustic sensors.
- Secured second place at the International AUVSI Robosub competition 2016.
- Maintained a very modular software stack written in C++ and Python, using ROS for integrations of various subsystems.
- Implemented a finite state machine for planning the execution flow of the AUV.
- Developed and tuned a PID controller for controlling the 5 degrees of freedom of the AUV.
- Wrote drivers for sensors such as a Doppler Velocity Log and an Inertial Measurement unit.
- Created a Simulator using Gazebo for proper in-air testing of the code before deployment of the AUV in water.
- Designed an extensive set of Debug interfaces using Qt framework for easy logging and manipulation of various parameters of the AUV during runtime.

Software Skills

Programming Languages: C++, Python, Matlab.

Other tools: LaTeX, ROS, Gazebo, OpenCV.

Coursework

Teaching Experience

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.

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 on a 100,000 DOF system 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 the positive mu-modification method for adaptive control of linear systems with bounded input magnitudes
- Validated the performance of the derived control law through numerical simulations in Matlab.

Key Courses

- Probability and Random processes
- Optimization
- Statistical Learning Theory
- Nonlinear and Adaptive Control

Academic Achievements

Awarded an AP grade for distinctive performance in:

- Complex Analysis
- Sparsity Methods in Control
- Probability and Random Processes
- Differential Geometric Methods in Control

References

Dr. Debasish Chatterjee
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