

# 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.

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## Technical Experience

- Summer 2020 **Corteva Agriscience, Insect Resistance Modeling**, Summer Intern.
- Modelled the onset of insect resistance for a variety of different seed and chemical scenarios.
  - Generated tools that describe insect resistance predictions and various management practices used to influence resistance behaviour.
- 2015 - 2016 **AUV-IITB, Autonomous Underwater Vehicle Team**, 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, Basic Shell scripting.

**Other tools:** L<sup>A</sup>T<sub>E</sub>X, ROS, Gazebo, OpenCV, Git.

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## Coursework

### Teaching Experience

- Spring 2018 **SC 624 Differential Geometric Methods in Control**, TEACHING ASSISTANT, IITB
- 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, IITB.
- 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, IITB.
- Assisted in conducting weekly Lab experiments.
- Fall 2020 **Control Systems**, TEACHING ASSISTANT, UIUC.
- Course contents: Modeling and dynamics response, Root locus design method, Frequency response design methods, State-space design.
  - Assisted in grading test problems and weekly assignments.

## 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

## Standardized Test Scores

**GRE** Quantitative: 160, Verbal: 152, Writing: 4.5, Total: 332

**TOEFL** Reading: 30, Listening: 30, Speaking: 27, Writing: 28, Total: 115

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## References

### **Yuliy Baryshnikov**

Professor

Electrical and Computer Engineering  
University of Illinois Urbana Cham-  
paign

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### **Debasish Chatterjee**

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