Mishal Assif P K

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in/mishalassif – github.com/Mishalassif

EDUCATION

University of Illinois Urbana-Champaign — **Urbana-Champaign, IL, USA**
Ph.D in Electrical Engineering, GPA: 3.97/4.00 — *08/19 - 05/24 (Expected)*
M.S in Mathematics, GPA: 4.00/4.00 — *08/19 - 12/22 (Expected)*

Indian Institute of Technology Bombay — **Bombay, India**
B.Tech + M.Tech in Mechanical Engineering, GPA: 8.63/10.00 — *07/14 - 08/19*

PUBLICATIONS

Research interests: Topological data analysis and machine learning, Network analysis, Nonlinear control and optimization.
Preprints and more details of all papers are available on arXiv and Google scholar.

1. Fair Allocation in Crowd-Sourced Systems
   M. Assif P K, W. Kennedy, I. Saniee *2022*
   Submitted to IEEE Conference on Computer Communications (INFOCOM), 2023.
2. Singularities of Gaussian random maps into the plane
   M. Assif P K *2022*
   Submitted to Journal of Applied and Computational Topology. [arXiv preprint]
3. Biparametric persistence for smooth filtrations
   M. Assif P K, Y. Baryshnikov *2021*
   Submitted to Computational Geometry. [arXiv preprint]
4. Measure of quality of finite-dimensional linear systems: A frame-theoretic view
   M. Assif P K, M. R. Sheriff, D. Chatterjee *2021*
   Systems and Control Letters, Vol.151, 2021. [doi], [arXiv preprint]
5. Scenario approach for minmax optimization in the nonconvex setting
   M. Assif P K, D. Chatterjee, R. Banavar *2020*
   SIAM Journal on Optimization, Vol.30(2), 2020. [doi], [arXiv preprint]
6. A simple proof of the discrete time geometric Pontryagin maximum principle
   M. Assif P K, D. Chatterjee, R. Banavar *2020*
   Automatica, Vol.114, 2020. [doi], [arXiv preprint]
7. Variational collision avoidance on Riemannian manifolds
   M. Assif, R. Banavar, A. M. Bloch, M. Camarinha, L. Colombo *2018*
   Proceedings of the IEEE Conference on Decision and Control, 2018. [doi], [arXiv preprint]

EXPERIENCE

Coordinated Sciences Laboratory, UIUC — **Urbana, IL, USA**
Graduate Research Assistant, Advisor: Prof. Yuliy Baryshnikov — *Fall 2019 - Present*

- Developed a geometric approach to biparametric persistent homology (BPH) for extracting robust topological features from data.
- Derived various formulae and asymptotic laws for the statistical properties of BPH descriptors extracted from Gaussian random fields on manifolds.
- Working on applications of BPH to 3D shape classification and retrieval.

Nokia Bell Labs — **Murray Hill, NJ, USA**
Math & Algorithms Intern — *Summer 2022*

- Deep Learning based compression for wireless communication.
- Game-theoretic algorithms for fair reward allocation in decentralized wireless networks.

Corteva Agriscience **Champaign, IL, USA**
Research Intern *Summer 2020*

- Mathematical modelling and simulation of onset of genetic resistance to various pest management techniques in insects.

Autonomous Underwater Vehicle Team (AUV-IITB) **Bombay, India**
Software developer *Fall 2014 - Spring 2016*

- Worked as part of a ~20 member team in the development of an AUV and secured second place at the International AUVSI Robosub competition 2016.
- Maintained a modular software stack written in C++ and Python, using ROS for integration of various subsystems.
- Developed and tuned a PID controller for controlling the 5 degrees of freedom of the AUV.
- Created various ancillary tools such as drivers for sensors, simulators and runtime debug interfaces.

SOFTWARE SKILLS

Languages	Python, C++, Matlab, Mathematica.
Other Tools	PyTorch, Tensorflow, Keras, scikit-learn, Git, LaTeX, ROS.

RELEVANT COURSES

- **Probability**: Probability and random processes, Information theory, Stochastic processes.
- **ML**: Pattern recognition, Generative AI models, High dimensional geometric data analysis, Statistical learning theory.
- **Math**: Algebraic topology (I, II), Differentiable manifolds (I, II), Lie groups and Lie algebras.
- **Control theory**: Differential geometric control, Adaptive and Nonlinear control, Optimization.

TEACHING ASSISTANTSHIPS

- ECE 486 Control Systems, UIUC. *Fall 2020/Spring 2021*
- ME 310 Microprocessors and Automatic Control(Theory + Lab), IITB. *Fall 2018/Spring 2019*
- SC 624 Differential Geometric Methods in Control, IITB. *Spring 2018*