Mishal Assif P K

Fourth year Ph.D. student, ECE, UIUC

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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, Nonlinear control and optimization, Communication theory.
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 — *08/19 - Present*

- Graduate research in Topological data analysis and Machine learning
- Developed a geometric approach to biparametric persistent homology (BPH) for extracting robust topological features from data
- Derived asymptotic laws for the statistical properties of BPH descriptors extracted from Gaussian random fields on manifolds
- Combining topological features with deep learning for 3D vision applications

Nokia Bell Labs — **Murray Hill, NJ, USA**
Math & Algorithms Intern — *06/22 - Present*

- Deep Learning based compression algorithms for massive MIMO wireless communication systems
- Game-theoretic analysis of fair reward allocation in decentralized wireless networks

Corteva Agriscience — **Champaign, IL, USA**
Research Intern — *06/20 - 08/20*

- 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 *09/14 - 05/16*

- 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

SKILLS

- **Languages:** English (Full professional), Malayalam (Native), Hindi (Limited working)
- **Programming:** Python, C++, Matlab, Mathematica
- **Machine Learning:** PyTorch, Tensorflow, Keras, scikit-learn, Git, LaTeX, ROS

RELEVANT COURSES

- **Probability**: Probability and random processes, Information theory, Markov Chains, Stochastic Calculus
- **Machine Learning**: 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*

SERVICE

- Reviewed articles for Journal of Computational Geometry, IEEE L-CSS, Automatica *2021*