MISHAL ASSIF P K

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EDUCATION

PhD, Electrical Engineering, University of Illinois Urbana Champaign	2019-2024 (Expected)
MS, Mathematics, University of Illinois Urbana Champaign	2019-2023 (Expected)
B.Tech + M.Tech, Mechanical Engineering, Indian Institute of Technology Bombay	2014 - 2019

EXPERIENCE

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

- Theoretical aspects of Biparametric persistent homology(BPH) (see publications #1 and #3)
  - Developed a geometric theory of BPH for extracting robust topological features from data
  - Derived asymptotic laws for statistical properties of BPH descriptors extracted from Gaussian random fields
- Applications of Persistent homology
  - Recovered the topology of state space of dynamical systems from time series of low dimensional observations
  - Developed machine learning models for 3D shape classification using the persistent homology transform

Nokia Bell Labs — **Murray Hill, NJ**
Math & Algorithms Intern, Advisors: Dr. Iraj Saniee, Dr. Carl Nuzman — *Jun 2022 - May 2023*

- AI/ML: Designed convolutional and transformer autoencoder based neural compression architectures for efficient compression of Channel State Information (CSI) matrices in Massive MIMO wireless communication systems
- Signal Processing: Reduced the encoder complexity of sparse-recovery based compression algorithms for mMIMO CSI matrices by a linear factor
- Game theory: Determined fair reward allocation schemes for various crowd sourced systems, such as decentralized wireless networks, using tools from cooperative game theory (see publication #2)

Corteva Agriscience — **Champaign, IL**
Research Intern — *Jun 2020 - Aug 2020*

- Developed mathematical models and simulations for the onset of genetic resistance to pest management techniques in insects

PUBLICATIONS

1. **M. Assif P K**, Y. Baryshnikov *Biparametric persistence of smooth filtrations*, Submitted [arXiv preprint]
2. **M. Assif P K**, W. Kennedy, I. Saniee *Fair Allocation in Crowd-Sourced Systems*, Games, Vol.14(4), 2023 (Poster presented at ACM Conference on Economics and Computation, 2023) [doi] [arXiv preprint]
3. **M. Assif P K** *Singularities of Gaussian random maps into the plane*, Journal of Applied and Computational Topology, Vol.7, 2023 [doi] [arXiv preprint]
4. **M. Assif P K**, M. R. Sheriff, D. Chatterjee *Measure of quality of finite-dimensional linear systems: A frame theoretic view,* Systems and Control Letters, Vol.151, 2021 [doi] [arXiv preprint]
5. **M. Assif P K**, D. Chatterjee, R. Banavar *Scenario approach for minmax optimization in the nonconvex setting: Positive results and caveats*, SIAM Journal on Optimization, Vol.30(2), 2020 [doi] [arXiv preprint]
6. **M. Assif P K**, D. Chatterjee, R. Banavar *A simple proof of the discrete time geometric Pontryagin maximum principle, Automatica*, Vol.114, 2020 [doi] [arXiv preprint]
7. **M. Assif**, R. Banavar, A. M. Bloch, M. Camarinha, L. Colombo *Variational collision avoidance on Riemannian manifolds*, Proceedings of the IEEE Conference on Decision and Control, 2018 [doi] [arXiv preprint]

PROJECTS

Autonomous Underwater Vehicle team (AUV-IITB) — **Bombay, India**
Software Developer — *Sep 2014 - May 2016*

- Worked in a 25 member team developing an underwater robot that secured second place at the International AUVSI Robosub competition 2016
- Developed a motion controller, debug interface and simulator for the robot and maintained a modular software stack written in C++ and Python using ROS for integration of various subsystems

SKILLS & COURSEWORK

- **Software Skills:** Python, C++, Matlab, PyTorch, Tensorflow, Keras, scikit-learn, numpy, ROS, Git
- **Coursework**: Machine Learning, Generative AI, High dimensional geometric data analysis, Statistical learning theory