

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

PUBLICATIONS

Research interests: Topological data analysis, Machine learning, Nonlinear control/optimization

- M. Assif P K**, Y. Baryshnikov *Biparametric persistence of smooth filtrations*, Submitted to SIAM Journal of Applied Algebra and Geometry [\[arXiv preprint\]](#)
- 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) [\[doi\]](#) [\[arXiv preprint\]](#)
- M. Assif P K** *Singularities of Gaussian random maps into the plane*, Journal of Applied and Computational Topology, Vol.7, 2023 [\[doi\]](#) [\[arXiv preprint\]](#)
- 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 [\[doi\]](#) [\[arXiv preprint\]](#)
- 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 [\[doi\]](#) [\[arXiv preprint\]](#)
- M. Assif P K**, D. Chatterjee, R. Banavar *A simple proof of the discrete time geometric Pontryagin maximum principle*, Automatica, Vol.114, 2020 [\[doi\]](#) [\[arXiv preprint\]](#)
- 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 [\[doi\]](#) [\[arXiv preprint\]](#)

EXPERIENCE

Coordinated Sciences Laboratory, UIUC <i>Graduate Research Assistant, Advisor: Prof. Yuliy Baryshnikov</i>	Urbana, IL <i>Aug 2019 - Present</i>
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- Theoretical aspects of Biparametric persistent homology(BPH) (see publications #2 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
 - Recovering the topology of state space of dynamical systems from time series of low dimensional observations
 - Machine learning models for 3D shape classification using the persistent homology transform

Nokia Bell Labs <i>Math & Algorithms Intern, Advisors: Dr. Iraj Saniee, Dr. Carl Nuzman</i>	Murray Hill, NJ <i>Jun 2022 - Present</i>
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- 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: Reducing the encoder complexity of sparse-recovery based compression algorithms for mMIMO CSI matrices
- 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 #1)

Corteva Agriscience <i>Research Intern</i>	Champaign, IL <i>Jun 2020 - Aug 2020</i>
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- Mathematical modelling and simulation of onset of genetic resistance to pest management techniques in insects

Autonomous Underwater Vehicle team (AUV-IITB) <i>Software Developer</i>	Bombay, India <i>Sep 2014 - May 2016</i>
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- Part of 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

- Software Skills:** Python, C++, Matlab, PyTorch, Tensorflow, Keras, scikit-learn, numpy, ROS, Git
- Languages:** English (Full professional), Malayalam (Native), Hindi (Limited working)

COURSEWORK

- Probability:** Probability and random processes, Information theory, Markov Chains, Quantum Channels
- ML:** Pattern recognition, Generative AI, High dimensional geometric data analysis, Statistical learning theory