P. N. Karthik

website | linkedin | scholar

Personal Data

Place and Date of Birth:	Bangalore, India | 20 Apr 1992
Address:	06-12, Block E4, Engineering Drive 3, National University of Singapore, 117583
Phone:	+65 85912944
Email:	karthik@nus.edu.sg

Research Interests

Multi-armed bandits, anomaly identification, statistical inference, federated learning

Work Experience

01/2022 - present
Research Fellow
Institute of Data Science, National University of Singapore
Supervisor: Prof. Vincent Y. F. Tan
Project: Towards Trustable Model-Centric Sharing for Collaborative Machine Learning

11/2019 - 03/2020
Intern
Netradyne Technology India Pvt Ltd
Mentors: Pratik Verma, Dr. Ajeesh Sahadevan, and Prof. Rajesh Sundaresan

08/2019 - 12/2019
Graduate Teaching Assistant
Indian Institute of Science
Course: E2 201: Information Theory
Course Instructor: Prof. Himanshu Tyagi

08/2018 - 12/2018
08/2017 - 12/2017
Graduate Teaching Assistant
Indian Institute of Science
Course: E2 202: Random Processes
Course Instructors: Prof. Utpal Mukherji and Prof. Parimal Parag

08/2014 - 06/2015
Project Assistant
Indian Institute of Science
Supervisor: Prof. Chandra R. Murthy

Education

07/2015 - 03/2022
Doctor of Philosophy and Master of Science (Engineering),
Indian Institute of Science, Bangalore
Department: Electrical Communication Engineering
Thesis: Sequential Controlled Sensing to Detect an Anomalous Process
Supervisor: Prof. Rajesh Sundaresan
GPA: 7.0/8.0

08/2010 - 07/2014
Bachelor of Engineering, R V College of Engineering, Bangalore
Major: Electronics and Communications
GPA: 9.72/10.00 (rank 2 among 140 students)

Awards and Honors

- First place in the 100 seconds competition organised by INAE Kanpur Chapter
- Best paper award at the 2020 EECS Research Students' Symposium, Indian Institute of Science
- Best 3-minute presentation award at the ECE Students' Seminar Series, Department of Electrical Communication Engineering, Indian Institute of Science
- Rank 136 (among the top 0.01%) in the 2015 Graduate Aptitude Test in Engineering
- Infineon India scholarship for securing rank 2 in the 2011 Visvesvaraya Technological University examinations.
- Rank 23 (among the top 0.02%) in the 2010 Karnataka Common Entrance Test

Publications

Preprints

1. *Federated Best Arm Identification with Heterogeneous Clients* [arxiv]
   Chen Zhirui, P. N. Karthik, Vincent Y. F. Tan, and Yeow Meng Chee
   Submitted, Oct 2022
2. *Bus Priority lane in Bangalore: A Study of its Effectiveness and Driver Stress*
   P. N. Karthik, Nihesh Rathod, Sarath Yasodharan, Wilson Lobo, Ajeesh Sahadevan, Rajesh Sundaresan and Pratik Verma
   Submitted to the Special Issue of Transport Policy Journal on Sustainable City Transportation in the Indian Subcontinent, Jan 2022
3. *Learning to Detect an Odd Restless Markov Arm with a Trembling Hand* [arxiv]
   P. N. Karthik and Rajesh Sundaresan
4. *Axiomatic Characterisation of Projection Rules: An Open Question* [draft]
   P. N. Karthik and Rajesh Sundaresan

Journal Publications

1. *Best Arm Identification in Restless Markov Multi-Armed Bandits* [arxiv]
   P. N. Karthik, Kota Srinivas Reddy, and Vincent Y. F. Tan
   IEEE Transactions on Information Theory, 2022+
2. *Detecting an Odd Restless Markov Arm with a Trembling Hand* [xplore]
   P. N. Karthik and Rajesh Sundaresan
   IEEE Transactions on Information Theory, Aug 2021
3. *Learning to Detect an Odd Markov Arm* [xplore]
   P. N. Karthik and Rajesh Sundaresan
   IEEE Transactions on Information Theory, Jul 2020

Doctoral Dissertation

- *Sequential Controlled Sensing to Detect an Anomalous Process* [pdf]
  Karthik Periyapattana Narayanaprasad
  Department of Electrical Communication Engineering, Indian Institute of Science, Nov 2021

Conference Publications

1. *Almost Cost-Free Communication in Federated Best Arm Identification* [arxiv]
   Kota Srinivas Reddy, P. N. Karthik, and Vincent Y. F. Tan
   37th AAAI Conference on Artificial Intelligence (AAAI), Feb 2023
2. *Best Restless Markov Arm Identification* [xplore]
   Karthik Periyapattana Narayana Prasad, Kota Srinivas Reddy, and Vincent Y. F. Tan
   IEEE Information Theory Workshop (ITW), Nov 2022

3. *Learning to Detect an Odd Restless Markov Arm* [xplore]
   P. N. Karthik and Rajesh Sundaresan
   IEEE International Symposium on Information Theory (ISIT), Jul 2021
4. *Detecting an Odd Restless Markov Arm with a Trembling Hand* [xplore]
   P. N. Karthik and Rajesh Sundaresan
   IEEE International Symposium on Information Theory (ISIT), Jun 2020
5. *Learning to Detect an Odd Markov Arm* [xplore]
   P. N. Karthik and Rajesh Sundaresan
   IEEE International Symposium on Information Theory (ISIT), Jul 2019
6. *On The Equivalence of Projections in Relative α-Entropy and Rényi Divergence* [xplore]
   P. N. Karthik and Rajesh Sundaresan
   National Conference on Communications (NCC), Feb 2018
7. *Model-Based Interference Cartography and Visualization* [xplore]
   P. N. Karthik, Raksha Ramakrishna, Geethu Joseph, Chandra R. Murthy,
   Joyson Sebastian, and Neelesh B. Mehta
   National Conference on Communications (NCC), Mar 2016

Research Presentations and Seminars

2022

1. *Best Restless Markov Arm Identification* [slides]
   IEEE Information Theory Workshop, Mumbai, India, Nov 2022
2. *Behind the Scenes of $Ax = b$: Axioms and an Open Question* [video] [slides]
   A talk given to Prof. Vincent Tan's research group, Mar 2022

2021

1. *Sequential Controlled Sensing to Detect an Anomalous Process* [video] [slides]
   Ph.D. defence, Department of Electrical Communication Engineering,
   Indian Institute of Science, Nov 2021
2. *Finding a Markov Anomaly Quickly and Accurately* [video]
   100 seconds competition organised by INAE Kanpur Chapter, Oct 2021
   First place under "Electronics and Communication Engineering" category
3. *GATE 2022: A Pathway to Research* [video]
   An online interactive session on the Graduate Aptitude Test in Engineering as a
   pathway to research organised by the Division of EECS, Indian Institute of Science, Oct 2021
4. *Information Geometry and Its Applications to Statistics* [video] [notes]
   An online lecture for the students of Indian Institute of Science, Sep 2021
5. *Learning to Detect an Odd Restless Markov Arm* [video] [slides]
   IEEE International Symposium on Information Theory, Jul 2021
6. *Sequential Controlled Sensing to Detect an Anomalous Process* [video] [slides]
   Ph.D. colloquium talk, Department of Electrical Communication Engineering,
   Indian Institute of Science, Jun 2021
7. *Crack Open the GATE* [video]
   A session conducted for the students of R V College of Engineering
   to educate them about the Graduate Aptitude Test in Engineering, May 2021
8. *Probability in Real-Life: Example Applications from Visual Neuroscience,*
   Colour Blindness Detection, and Covid-19 Outbreak Modelling [video] [slides]
   A talk presented virtually to the 5th semester students and the faculty of the Department of Electronics
   and Communication Engineering, R V College of Engineering, Sep 2020

2020

1. *Odd Arm Identification in Multi-armed Bandits with Markov Observations* [video] [slides]
   EECS Research Students' Symposium, Indian Institute of Science, Jul 2020
   Best paper award under "Signal Processing, Communication Networks, and Information Theory" track
2. *Detecting an Odd Restless Markov Arm with a Trembling Hand* [video] [slides]
   IEEE International Symposium on Information Theory, Jun 2020
3. *Visual Search with a Trembling Hand: An Analysis of Odd Arm Identification in Restless Multi-armed Bandits* [video] [slides]
   Centre for Networked Intelligence, Indian Institute of Science, May 2020
4. *On Detecting an Anomalous Arm in a Multi-armed Bandit with Markov Observations* [slides]
   STCS Symposium, Tata Institute of Fundamental Research, Mumbai, Jan 2020

2019

1. *Search in Research: The Importance of the Theory of Probability in Real-Life* [slides]
   R V College of Engineering, Dec 2019
2. *Learning to Detect an Odd Markov Arm* [slides]
   Lectures on Probability and Stochastic Processes XIV,
   Indian Statistical Institute Delhi, Dec 2019
3. *On Detecting an Anomalous Arm in Multi-armed Bandits with Markov Observations* [slides]
   Networks Seminar, Robert Bosch Centre for Cyber Physical Systems,
   Indian Institute of Science, Nov 2019
4. *Learning to Detect an Odd Markov Arm* [poster]
   Joint Telematics Group Summer School, Indian Institute of Technology, Madras, Aug 2019
5. *Learning to Detect an Odd Markov Arm* [slides]
   Program on Advances in Applied Probability,
   International Centre for Theoretical Sciences, Aug 2019
6. *Learning to Detect an Odd Markov Arm* [slides]
   IEEE International Symposium on Information Theory, Jul 2019
7. *A Short Course on Probability and Random Processes* [course material]
   R V College of Engineering, Jun 2019
8. $Ax = b$*: A Familiar Setup, Axioms and An Open Question* [slides]
   ECE Students' Seminar Series, Department of Electrical Communication Engineering,
   Indian Institute of Science, Feb 2019

2018 and Earlier

1. *On the Equivalence of Projections in Relative α-Entropy and Rényi Divergence* [slides]
   National Conference on Communications,
   Indian Institute of Technology, Hyderabad, Feb 2018
2. *On the Equivalence of Projections in Relative α-Entropy and Rényi Divergence* [slides]
   Lectures on Probability and Stochastic Processes XII,
   Indian Statistical Institute, Kolkata, Dec 2017

Professional Service

- Reviewer, IEEE Transactions on Information Theory (T-IT)
- Reviewer, IEEE Transactions on Signal Processing (TSP)
- Reviewer, Entropy
- Reviewer, Sadhana
- Reviewer, Journal on Selected Areas in Communications (JSAC)
- Reviewer, IEEE International Symposium on Information Theory (ISIT)
- Reviewer, National Conference on Communications (NCC)

Software Knowledge

Python | Microsoft PowerBI | Notion | LaTeX | MATLAB

Professional Referees

1. Prof. Rajesh Sundaresan (Ph.D. supervisor)
   Professor, Department of Electrical Communication Engineering (ECE),
   Robert Bosch Centre for Cyber-Physical Systems,
   Centre for Networked Intelligence
   Indian Institute of Science, Bangalore 560012
   E-mail: rajeshs@iisc.ac.in
2. Prof. Utpal Mukherji
   Professor, Department of Electrical Communication Engineering (ECE),
   Indian Institute of Science, Bangalore 560012
   E-mail: utpal@iisc.ac.in
3. Prof. Navin Kashyap
   Professor,
   Department of Electrical Communication Engineering (ECE),
   Indian Institute of Science, Bangalore 560012
   E-mail: nkashyap@iisc.ac.in
4. Prof. Himanshu Tyagi
   Associate Professor,
   Department of Electrical Communication Engineering (ECE),
   Robert Bosch Center for Cyber Physical Systems
   Indian Institute of Science, Bangalore 560012
   E-mail: htyagi@iisc.ac.in
5. Prof. Parimal Parag
   Associate Professor,
   Department of Electrical Communication Engineering (ECE),
   Indian Institute of Science, Bangalore 560012
   E-mail: parimal@iisc.ac.in
6. Prof. Vincent Y. F. Tan
   Associate Professor,
   Department Department of Mathematics,
   Department of Electrical and Computer Engineering (ECE),
   National University of Singapore, Singapore 119077
   E-mail: vtan@nus.edu.sg