

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 Graduate Teaching Assistant
08/2017 - 12/2017 *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)

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](#)
Draft
4. *Axiomatic Characterisation of Projection Rules: An Open Question* [draft]
[P. N. Karthik](#) and [Rajesh Sundaresan](#)
Draft

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* [xplora]
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 the Kanpur Chapter of INAE, 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]
2020 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

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

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 of Mathematics,
Department of Electrical and Computer Engineering (ECE),
National University of Singapore, Singapore 119077
E-mail: vtan@nus.edu.sg