

P. N. KARTHIK

[website](#)[linkedin](#)[scholar](#)

PERSONAL DATA

PLACE AND DATE OF BIRTH: Bengaluru, India | 20 Apr 1992
ADDRESS: 02-19, 19 Shelford Road, Singapore 288408
PHONE: +65 85912944
OFFICIAL EMAIL: karthik@nus.edu.sg
PERSONAL EMAIL: pnkarthik1992@gmail.com

RESEARCH INTERESTS

Markov decision problems, statistical learning, multi-armed bandits, statistical inference, stochastic adaptive control, optimal stopping problems, 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
- 11/2021 - 12/2021 RESEARCH ASSOCIATE - 1
Indian Institute of Science
SUPERVISOR: Prof. [Rajesh Sundaresan](#)
- 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](#)
- 08/2013 - 12/2013 PROJECT TRAINEE
Karnataka State Sericulture Research and Development Institute
MENTOR: Prof. [M. Govinda Raju](#)

EDUCATION

- 07/2015 - 03/2022 Doctor of Philosophy, **Indian Institute of Science**, Bengaluru
DEPARTMENT: Electrical Communication Engineering
THESIS: Sequential Controlled Sensing to Detect an Anomalous Process
SUPERVISOR: Prof. [Rajesh Sundaresan](#)
GPA: 7.0/8.0 | [List of Courses](#)
- 08/2010 - 07/2014 Bachelor of Engineering, **R V College of Engineering**, Bengaluru
MAJOR: Electronics and Communications
GPA: 9.72/10.00 (**RANK 2** among 140 students)

PUBLICATIONS

- PREPRINTS *Federated Best Arm Identification with Heterogeneous Clients* [[arxiv](#)]
Chen Zhirui, [P. N. Karthik](#), [Vincent Y. F. Tan](#), and [Yeow Meng Chee](#)
Submitted, OCT 2022
- Almost Cost-Free Communication in Federated Best Arm Identification* [[arxiv](#)]
[Kota Srinivas Reddy](#), [P. N. Karthik](#), and [Vincent Y. F. Tan](#)
Submitted, AUG 2022
- Best Arm Identification in Restless Markov Multi-Armed Bandits* [[arxiv](#)]
[P. N. Karthik](#), [Kota Srinivas Reddy](#), and [Vincent Y. F. Tan](#)
Submitted to the IEEE Transactions on Information Theory, MAR 2022
- Bus Priority lane in Bengaluru: A Study of its Effectiveness and Driver Stress*
[P. N. Karthik](#), [Niresh 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
- Learning to Detect an Odd Restless Markov Arm with a Trembling Hand* [[arxiv](#)]
[P. N. Karthik](#) and [Rajesh Sundaresan](#)
Submitted to the Journal of Machine Learning Research, JAN 2022
- Axiomatic Characterisation of Projection Rules: An Open Question* [[draft](#)]
[P. N. Karthik](#) and [Rajesh Sundaresan](#)
Draft
- JOURNAL PUBLICATIONS *Detecting an Odd Restless Markov Arm with a Trembling Hand* [[xplore](#)]
[P. N. Karthik](#) and [Rajesh Sundaresan](#)
IEEE Transactions on Information Theory, AUG 2021
- Learning to Detect an Odd Markov Arm* [[xplore](#)]
[P. N. Karthik](#) and [Rajesh Sundaresan](#)
IEEE Transactions on Information Theory, JUL 2020
- PH.D. THESIS *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 *Best Restless Markov Arm Identification*
[Karthik Periyapattana Narayana Prasad](#), [Kota Srinivas Reddy](#), and [Vincent Y. F. Tan](#)
Accepted for presentation at the IEEE Information Theory Workshop, Nov 2022
- Detecting an Odd Restless Markov Arm with a Trembling Hand* [[xplore](#)]
[P. N. Karthik](#) and [Rajesh Sundaresan](#)
IEEE International Symposium on Information Theory, JUN 2020
- Learning to Detect an Odd Markov Arm* [[xplore](#)]
[P. N. Karthik](#) and [Rajesh Sundaresan](#)
IEEE International Symposium on Information Theory, JUL 2019
- On The Equivalence of Projections in Relative α -Entropy and Rényi Divergence* [[xplore](#)]
[P. N. Karthik](#) and [Rajesh Sundaresan](#)
National Conference on Communications, FEB 2018
- 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, MAR 2016

RESEARCH PRESENTATIONS AND SEMINARS

- 2022 *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 *Sequential Controlled Sensing to Detect an Anomalous Process* [[video](#)] [[slides](#)]
Ph.D. defence, Department of Electrical Communication Engineering,
Indian Institute of Science, NOV 2021
- 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
- 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
- Information Geometry and Its Applications to Statistics* [[video](#)] [[notes](#)]
An online lecture for the students of Indian Institute of Science, SEP 2021
- Learning to Detect an Odd Restless Markov Arm* [[video](#)] [[slides](#)]
2021 IEEE International Symposium on Information Theory, JUL 2021
- 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
- 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

- 2020 *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
- 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
- Detecting an Odd Restless Markov Arm with a Trembling Hand* [[video](#)] [[slides](#)]
2020 IEEE International Symposium on Information Theory, JUN 2020
- 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
- On Detecting an Anomalous Arm in a Multi-armed Bandit with Markov Observations* [[slides](#)]
STCS Symposium, School of Theory and Computer Science,
Tata Institute of Fundamental Research, Mumbai, JAN 2020
- 2019 *Search in Research: The Importance of the Theory of Probability in Real-Life* [[slides](#)]
R V College of Engineering, DEC 2019
- Learning to Detect an Odd Markov Arms* [[slides](#)]
Lectures on Probability and Stochastic Processes XIV,
Indian Statistical Institute Delhi, DEC 2019
- 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
- Learning to Detect an Odd Markov Arm* [[poster](#)]
2019 Joint Telematics Group Summer School,
Indian Institute of Technology, Madras, AUG 2019
- Learning to Detect an Odd Markov Arm* [[slides](#)]
ICTS Program on Advances in Applied Probability,
International Centre for Theoretical Sciences, AUG 2019
- Learning to Detect an Odd Markov Arm* [[slides](#)]
2019 IEEE International Symposium on Information Theory (ISIT), JUL 2019
- A Short Course on Probability and Random Processes* [[course material](#)]
R V College of Engineering, JUN 2019
- $Ax = b$: 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 *On the Equivalence of Projections in Relative α -Entropy and Rényi Divergence* [[slides](#)]
National Conference on Communications,
Indian Institute of Technology, Hyderabad, FEB 2018

2017 *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

- Graduate teaching assistant for the course "E2-201: Information Theory", AUG-DEC 2019, Department of Electrical Communication Engineering, Indian Institute of Science
- Graduate teaching assistant for the course "E2-202: Random Processes", AUG-DEC 2018, 2017, Department of Electrical Communication Engineering, Indian Institute of Science
- Reviewer, IEEE Transactions on Information Theory
- Reviewer, IEEE Transactions on Signal Processing
- Reviewer, Entropy
- Reviewer, Sadhana
- Reviewer, IEEE International Symposium on Information Theory
- Reviewer, National Conference on Communications

SOFTWARE KNOWLEDGE

Python | Microsoft [PowerBI](#) | [Notion](#) | \LaTeX | MATLAB

PROFESSIONAL REFEREES

Name	Designation	Department	Institute	Email
Vincent Y. F. Tan	Associate Professor	ECE ¹	NUS ²	vtan@nus.edu.sg
Rajesh Sundaresan	Professor	ECE ³	IISc ⁴	rajeshs@iisc.ac.in
Utpal Mukherji	Professor	ECE ³	IISc	utpal@iisc.ac.in
Navin Kashyap	Professor	ECE ³	IISc	nkashyap@iisc.ac.in
Himanshu Tyagi	Associate Professor	ECE ³	IISc	htyagi@iisc.ac.in
Parimal Parag	Associate Professor	ECE ³	IISc	parimal@iisc.ac.in

¹ ECE: Electrical and Computer Engineering

² NUS: National University of Singapore

³ ECE: Electrical Communication Engineering

⁴ IISc: Indian Institute of Science

Doctor of Philosophy, Indian Institute of Science

List of Courses Taken for Credit and Grades Obtained

COURSE CODE	COURSE	GRADE*	CREDIT HRS
E2 201	Information Theory	S	3
E2 202	Random Processes	S	3
E2 205	Error-Control Codes	A	3
MA 221	Analysis-I	D	3
E1 244	Detection and Estimation Theory	S	3
MA 222	Analysis-II: Measure and Integration	A	3
MA 229	Calculus on Manifolds	B	3
MA 241	Ordinary Differential Equations	A	3
MA 361	Probability Theory	S	3

TOTAL CREDIT HRS	27
GPA (OUT OF 8.0)	7.0

* GRADING SCHEME: S=8, A=7, B=6, C=5, D=4

List of Courses Taken for Audit

Topics in Information Theory and Statistical Learning	Online Prediction and Learning
Concentration Inequalities	Data Analytics
Topics in Multi-user Communications	Stochastic Approximation Algorithms
Large Deviations	