

# Arani Bhattacharya

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## Summary

Assistant Professor with experience in design of algorithms and creation of testbeds in the domain of wireless networks, video streaming and edge computing

## Education

- **Stony Brook University** Incheon, Korea & Stony Brook, NY, USA  
*Ph.D. Computer Science* 2013 - 2019
  - Thesis Title: Towards Performance Guarantees in Emerging Wireless Network Applications
  - Committee: Samir R. Das (Advisor), Himanshu Gupta, Jie Gao, Petar M. Djuric (External Member), Pradipta De (External Member)
  - GPA: 3.98 / 4
  - Awarded ICTCCP Best Researcher Award in 2018
- **Indian Statistical Institute** Kolkata, India  
*M. Tech Computer Science* 2011 - 2013
  - Thesis Title: Power-Aware Decoding of H.264 Videos on Multicore Systems (Nominated for Best Dissertation)
  - Advisors: Ansuman Banerjee, Susmita Sur-Kolay
  - Graduated with First Class with Distinction (Score: 77 / 100)
- **West Bengal University of Technology** Kolkata, India  
*B. Tech Computer Science* 2007 - 2011
  - GPA: 8.56 / 10

## Professional Experience

- **Assistant Professor** New Delhi, India  
**Indraprastha Institute of Information Technology Delhi** 2020 onwards
  - Taught undergraduate course Operating Systems and graduate course Wireless Networks
  - Currently advising a total of 3 PhD students, and graduated 2 MTech thesis students
- **Postdoctoral Researcher, KTH Royal Institute of Tech** Stockholm, Sweden  
*Postdoctoral Supervisor: James Gross* 2019-2020  
The work involved optimizing performance of closed-loop control applications by leveraging edge computing. Work involves both actual building of testbed, as well as theoretical modeling of a system.
- **Research Assistant, Stony Brook University** Incheon & New York  
*Doctoral Advisor: Samir R. Das* 2013-2019
  - **Detection of Spectrum Violations:** With spectrum becoming a scarce commodity, it has become important to ensure that it is not used without a proper license. Thus, regulatory authorities need to protect the licensed spectrum from potential violations. One way of detecting such violation is crowdsourcing the task of sensing across heterogeneous sensors available with users. I designed both algorithms as well as an actual testbed to draw conclusions about the presence and location of spectrum

violators by adding up the data coming from multiple heterogeneous sensors. This work led to multiple publications in several reputed conferences and journals, including IEEE Infocom (2018 and 2020), IEEE/ACM IPSN (2020), IEEE DySPAN (2018) and IEEE Transactions on Cognitive Communications and Networking (2019).

- **Optimized Streaming of 360 Video:** Recently, streaming of high-quality 360 video is increasingly becoming an important application. However, most of the video pixels that are fetched are not seen by the user. This leads to a lot of data wastage. In this project, we focus on predicting user viewports and intelligently fetch pixels to avoid wastage of data. This work led to publications in venues like IFIP Networking (2019), IEEE Infocom (2020) and IEEE Transactions on Network Service and Management (2021).
- **Computation Offloading from Resource-Constrained Devices:** In lossy networks, the performance of offloading can vary widely. I designed an algorithm that provides theoretical guarantees on offloading performance in the presence of channel loss. I also proposed and evaluated a polynomial-time dynamic programming based algorithm to provide the lowest possible execution time. This work led to publications in venues like IEEE Globecom (2016), Journal of Networks and Computer Applications (2017) and ICSOC (2020).

- **IMDEA Networks Institute** Madrid, Spain  
*Research Intern* *Fall 2018*  
Worked on finding spectrum anomalies on data collected from a localization contest, and detecting spoofing of GPS signals.
- **Computer Science Department, Stony Brook University** New York, USA  
*Teaching Assistant* *2016-2017*  
Worked as Teaching Assistant for the courses Graduate Operating Systems and Scripting Languages. The work involved grading answer scripts, and provide remedial lessons to students.
- **Samsung Research America** Mountain View, USA  
*Research Intern* *Summer 2017*  
Worked on understanding the working of Z-Wave protocol for home automation and identified latency as a major problem for users. I also proposed a technique of balancing latency and consistency in a smart home programming framework.
- **Formal Verification Lab, Indian Statistical Institute** Kolkata, India  
*Masters Advisor: Ansuman Banerjee & Susmita Sur-Kolay* *2011-2013*  
Video decoding forms an important workload of mobile devices, which have limited capacity of battery. I looked at improving the energy efficiency of video decoder while limiting the degradation in its quality.
- **Texas Instruments** Bangalore, India  
*Collaborators: Bhaskar J. Karmakar, Prasenjit Basu* *Summer 2012*  
Although multi-core processors are widely available, few video decoders actually utilize more than a single core to decode video. We proposed an algorithm that improves scalability and leads to much faster decoding of videos. This research work was published in VLSI Design and Test (VDAT 2013).

## Selected Publications

1. **Arani Bhattacharya**, Paritosh Shukla, Saumya Jaipuria, Nanjangud C. Narendra, Dhruv Garg . “Multitask Scheduling of Computer Vision Workload on Edge Graphical Processing Units”, In Proceedings of International Conference on COMmunication Systems & NETworkS (COMSNETS) 2023, DOI: 10.1109/COMSNETS56262.2023.10041358
2. **Arani Bhattacharya**, Abhishek Maji, Jaya Prakash Verma Champati, James Gross. “Fast and Efficient Online Selection of Sensors for Transmitter Localization”, In Proceedings of International Conference on COMmunication Systems & NETworkS (COMSNETS) 2022, DOI: 10.1109/COMSNETS53615.2022.9668385
3. **Arani Bhattacharya**, Caitao Zhan, Abhishek Maji, Himanshu Gupta, Samir R. Das, Petar M. Djuric. “Selection of Sensors for Efficient Transmitter Localization”, In IEEE/ACM Transactions on Networking (Impact Factor: 3.796), vol. 30, no. 1, pp. 107-119, Feb. 2022, DOI: 10.1109/TNET.2021.3104000

4. Aritrik Ghosh, **Arani Bhattacharya**, “A Gaussian Process Based Technique of Efficient Sensor Selection for Transmitter Localization”, In IEEE International Symposium on Dynamic Spectrum Access Networks (DySPAN) 2021, held in Los Angeles, CA, USA, DOI: 10.1109/DySPAN53946.2021.9677290
5. Subrat Prasad Panda, Ansuman Banerjee, **Arani Bhattacharya**, “User Allocation in Mobile Edge Computing: A Deep Reinforcement Learning Approach”, In Proceedings of IEEE International Conference on Web Services (ICWS) held virtually in 2021, DOI: 10.1109/ICWS53863.2021.00064
6. Sohee Kim Park, Minh Hoai, **Arani Bhattacharya**, Samir R. Das. “Adaptive Streaming of 360-Degree Videos With Reinforcement Learning”, In Proceedings of IEEE/CVF Winter Conference on Applications of Computer Vision held virtually in 2021, DOI: 10.1109/WACV48630.2021.00188
7. Sohee Kim Park, **Arani Bhattacharya**, Zhibo Yang, Samir R. Das, Dimitris Samaras. “Advancing User Quality of Experience in 360-degree Video Streaming with Machine Learning”, In IEEE Transactions on Network Service and Management (Impact Factor: 3.878), vol. 18, no. 1, pp. 1000-1015, March 2021, DOI: 10.1109/TNSM.2021.3053183
8. Rahul Mudam, Saurabh Bhartia, Soumi Chattopadhyay, **Arani Bhattacharya**. “Mobility-Aware Service Placement for Vehicular Users in Edge-Cloud Environment”, In Proceedings of International Conference on Service-Oriented Computing (ICSOC) held virtually in 2020, DOI: 10.1007/978-3-030-65310-1\_19
9. Roberto Calvo-Palomino, **Arani Bhattacharya**, G r me Bovet, Domenico Giustiniano. “Short: LSTM-based GNSS Spoofing Detection Using Low-cost Spectrum Sensors”, In Proceedings of the 21st International Symposium on A World of Wireless, Mobile and Multimedia Networks (WoWMoM) held virtually in 2020, DOI: 10.1109/WoWMoM49955.2020.00055
10. Vasudevan Nagendra, **Arani Bhattacharya**, Vinod Yegneswaran, Amir Rahmati, Samir R. Das. “An Intent-Based Automation Framework for Securing Dynamic Consumer IoT Infrastructures”, In Proceedings of the WEB Conference (WWW) held virtually in 2020, DOI: 10.1145/3366423.3380234
11. Caitao Zhan, Himanshu Gupta, **Arani Bhattacharya**, Mohammad Ghaderibaneh. “Efficient Localization of Multiple Intruders in Shared Spectrum System”, In Proceedings of IEEE/ACM Information Processing for Sensor Networks (IPSN) held virtually in 2020, DOI: 10.1109/IPSN48710.2020.00025
12. **Arani Bhattacharya**, Caitao Zhan, Himanshu Gupta, Samir R. Das, Petar M. Djuric. “Selection of Sensors for Efficient Transmitter Localization”, In Proceedings of IEEE Infocom held virtually in 2020, DOI: 10.1109/INFOCOM41043.2020.9155230
13. Mallesh Dasari, **Arani Bhattacharya**, Santiago Vargas, Pranjal Sahu, Aruna Balasubramanian, Samir R. Das. “Streaming 360 Videos using Super-resolution”, In Proceedings of IEEE Infocom held virtually in 2020, DOI: 10.1109/INFOCOM41043.2020.9155477
14. **Arani Bhattacharya**, Ayon Chakraborty, Samir R. Das, Himanshu Gupta, Petar M. Djuric. “Spectrum Patrolling with Crowdsourced Spectrum Sensors”, Accepted for publication in IEEE Transactions on Cognitive Communications and Networking (*Extended version of paper published in Proceedings of IEEE Infocom 2018*), DOI: 10.1109/TCCN.2019.2939793
15. Sohee Kim Park, **Arani Bhattacharya**, Zhibo Yang, Mallesh Dasari, Samir R. Das, Dimitris Samaras. “Advancing User Quality of Experience in 360-degree Video Streaming”, In Proceedings of IFIP Networking held in 2019, Warsaw, Poland, DOI: 10.23919/IFIPNetworking.2019.8816847
16. Vasudevan Nagendra, **Arani Bhattacharya**, Anshul Gandhi, Samir R. Das. “Scalable and Resource Efficient Control Plane for Next Generation Cellular Packet Core”, In Proceedings of ACM Symposium on SDN Research (SOSR) held in 2019, San Jose, California, USA, DOI: 10.1145/3314148.3314345
17. Mallesh Dasari, Bershgal Muhammad Atique, **Arani Bhattacharya**, Samir R. Das. “Spectrum Protection from Micro-Transmissions using Distributed Spectrum Patrolling”, In Proceedings of Passive and Active Measurement (PAM) held in 2019, Puerto Varas, Chile, DOI: 10.1007/978-3-030-15986-3\_16
18. Mallesh Dasari, Santiago Vargas, **Arani Bhattacharya**, Aruna Balasubramanian, Samir R. Das, Michael Ferdman. “Impact of Device Parameters on QoE of Internet-based Mobile Applications”, In Proceedings of ACM Internet Measurement Conference (IMC) held in 2018, Boston, Massachusetts, USA, DOI: 10.1145/3278532.3278533

19. Ayon Chakraborty, **Arani Bhattacharya**, Snigdha Kamal, Samir R. Das, Himanshu Gupta, Petar M. Djuric. “Spectrum Patrolling with Crowdsourced Spectrum Sensors”, In Proceedings of IEEE Infocom held in 2018, Honolulu, Hawaii, USA, DOI: 10.1109/INFOCOM.2018.8486343
20. **Arani Bhattacharya**, Han Chen, Peter Milder, Samir R. Das. “Quantifying Energy and Latency Improvements of FPGA-Based Spectrum Sensors”, In Proceedings of IEEE Dynamic Spectrum Access Networks (DySPAN) held in 2018, Seoul, Korea, DOI: 10.1109/DySPAN.2018.8610459
21. **Arani Bhattacharya**, Pradipta De. “A Survey of Adaptive Techniques in Computation Offloading”, In Journal of Network and Computer Applications (Impact Factor: 5.273), published in Volume 78, 2017, DOI: 10.1016/j.jnca.2016.10.023
22. **Arani Bhattacharya**, Ansuman Banerjee, Pradipta De. “Scheduling with Task Duplication for Application Offloading”, In Proceedings of IEEE Consumer Communication and Networking Conference (CCNC) held in 2017, Las Vegas, Nevada, USA, DOI: 10.1109/CCNC.2017.7983212
23. **Arani Bhattacharya**, Ansuman Banerjee, Pradipta De. “Service Level Guarantee for Mobile Application Offloading in Presence of Wireless Channel Errors”, In Proceedings of IEEE Global Telecommunications Conference (Globecom) held in 2016, Washington DC, USA, DOI: 10.1109/GLOCOM.2016.7842264
24. **Arani Bhattacharya**, Pradipta De. “Computation Offloading from Mobile Devices: Can Edge Devices Perform Better Than the Cloud?”, In Proceedings of the Workshop on Adaptive Resource Management Scheduling for Cloud Computing (ARMS-CC) in conjunction with ACM PODC held in 2016, Chicago, USA, DOI: 10.1145/2962564.2962569
25. **Arani Bhattacharya**, Ansuman Banerjee, Pradipta De. “Parametric Analysis of Mobile Cloud Computing Frameworks using Simulation Modeling”, In Proceedings of the Workshop on Adaptive Resource Management Scheduling for Cloud Computing (ARMS-CC) in conjunction with ACM PODC held in 2015, Donostia-San Sebastián, Spain, DOI: 10.1007/978-3-319-28448-4\_3

## Funded Projects

- SERB CORE Grant, “Latency Optimization for Reliable Edge Compute Service Delivery using Reinforcement Learning”, Soumi Chattopadhyay (PI) and **Arani Bhattacharya (co-PI)**, Monetary Amount: ₹14.75 lakhs (co-PI’s share), Duration: Jan 2023–Dec 2026
- Cisco University Research Grant, “Can Traffic Surveillance be Made More Sustainable?”, **Arani Bhattacharya (PI)**, Monetary Amount: ₹30.5 lakhs (\$37800), Unrestricted duration

## Invited Talks

- Energy-efficient spectrum sensing
  - IIT-Madras (Feb 2023)
  - NISER Bhubaneswar (Sep 2021)
  - Indian Association for Cultivation of Science, Kolkata (Jan 2020)
  - IIIT-Delhi, New Delhi (May 2019)
- Vehicular Traffic Surveillance
  - Indian Statistical Institute, Kolkata (Aug 2022)
  - Sungkyunkwan University, Korea (Oct 2022)
  - Yonsei University, Korea (Oct 2022)
  - State University of New York Korea Campus (Oct 2022)

## Students Mentored/Mentoring

- Shubham Chaudhary (Ongoing PhD student; funded from project) – Since Jan 2021; working on video traffic surveillance to improve public safety
- Jyoti Shokhanda (Ongoing PhD student; funded from project) – Since Jan 2022; working on tail latency of edge compute applications
- Najiya Naj (Ongoing PhD student; funded by AICTE) – Since Jan 2023
- Harshal Dev (Graduated with MTech thesis, co-advised with Mukulika Maity) – Thesis Title: An Evaluation of Multi-user OFDMA Performance in WiFi 6 and its Optimization for Deadline-Constrained Settings; currently working at Qualcomm India
- Ravi Rathee (Graduated with MTech thesis) – Thesis Title: Exploiting the Tradeoff Between Energy Consumption and Execution Time in Mixed CPU-GPU Edge-Cloud Environment; currently working at MathWorks India

## Awards

- Best Paper Award at LastMiLeS workshop, COMSNETS 2022, for the preliminary paper, “VISTA: Fast and Efficient Traffic Surveillance by Tile Filtering”
- ICTCCP Award for Excellent Research, SUNY Korea (2018)
- Annual Research Fellowship (ICTCCP) of \$32000, SUNY Korea (2013-2016)
- Full scholarship, Indian Statistical Institute (2011-2013)
- Conference travel grant for IEEE/ACM ISCA 2016, ACM CoNEXT 2016, IEEE DySPAN 2018

## Academic Service

- Member of Program Committee of ICDCIT 2022, PAM 2022-2023 and ICDCN 2023 (Poster)
- Reviewer, IEEE/ACM Transactions on Networking (2021-2022)
- Reviewer, IEEE Transactions on Green Communications and Networking (2019, 2022)
- Reviewer, ACM Transactions on Embedded Computing Systems (2019)
- Reviewer, Ad Hoc Networks (2019)
- Reviewer, IEEE Transactions on Wireless Communications (2019-2022)
- Reviewer, IEEE Transactions on Parallel and Distributed Systems (2019, 2022-2023)
- Reviewer, IEEE Transactions on Cognitive Communications and Networking (2019, 2022)
- Reviewer, IEEE Communication Letters (2022)
- Reviewer, IEEE Wireless Communication Letters (2019, 2023)
- Reviewer, IEEE Access (2019)
- Member of Shadow Program Committee, ACM Internet Measurement Conference (2018)
- Reviewer, IEEE Transactions on Mobile Computing (2016)