

Arani Bhattacharya

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Research Interests

I am interested in designing algorithms, protocols and systems to improve the performance of emerging wireless network applications.

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: 78 / 100)
- **West Bengal University of Technology** Kolkata, India
B. Tech Computer Science 2007 - 2011
 - GPA: 8.56 / 10

Professional Experience

- **Department of Computer Science & Engg,** 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 4 undergraduate and 2 graduate students, with research papers on edge computing and video streaming
- **Division of Information Science & Engg, 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.
- **Computer Science Department, Stony Brook University** Incheon, Korea & New York, USA
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 (available at www.cs.stonybrook.edu/~arbhattachar/publications)

1. 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
2. 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
3. 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”, accepted for publication in IEEE Transactions on Network Service and Management (Impact Factor: 3.878)

4. 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
5. 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
6. 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
7. 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
8. **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
9. 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
10. **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
11. 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
12. 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
13. 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
14. 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
15. 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
16. **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
17. **Arani Bhattacharya**, Pradipta De. “A Survey of Adaptive Techniques in Computation Offloading”, In Journal of Network and Computer Applications, published in Volume 78, 2017, DOI: 10.1016/j.jnca.2016.10.023 (Impact Factor: 5.273)
18. **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

19. **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
20. **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
21. **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

Skills

- **Programming Languages:** C (Kernel/systems), C++, Java/Android, Python, Bash shell
- **Libraries/Software Packages:** Matlab, fftw, numpy, scipy, JavaFX, openMP
- **Software Tools:** PhantomNet, SAT Solver (miniSAT, picoSAT, zchaff), CPLEX, graphviz, git

Other Invited Talks

- Presented research talk “SpecSense: Towards Low-Cost Distributed Radio Frequency Spectrum Patrolling” at:
 - IIIT-Delhi, New Delhi (April 2019)
 - Graduate Research Day, Computer Science Department, Stony Brook University (February 2019)
 - CS Colloquium, SUNY-Korea, Incheon, Korea (October 2018)

Awards

- 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

- Reviewer, IEEE Transactions on Green Communications and Networking (2019)
- Reviewer, ACM Transactions on Embedded Computing Systems (2019)
- Reviewer, Ad Hoc Networks (2019)
- Reviewer, IEEE Transactions on Wireless Communications (2019)
- Reviewer, IEEE Transactions on Parallel and Distributed Systems (2019)
- Reviewer, IEEE Transactions on Cognitive Communications and Networking (2019)

- Reviewer, IEEE Wireless Communication Letters (2019)
- Reviewer, IEEE Access (2019)
- Member of Shadow Program Committee, ACM Internet Measurement Conference (2018)
- External Reviewer, IEEE DySPAN (2019)
- Reviewer, IEEE Transactions on Mobile Computing (2016)

References

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Additional Personal Details

- **Country of Origin:** India
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