Swetank Kumar Saha

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Google scholar
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Education

2013-2019 **Doctor of Philosophy (Ph.D.)**, Computer Science & Engineering | GPA 3.81/4.0
University at Buffalo (UB), SUNY, NY, US | Advisor: Dr. Dimitrios Koutsonikolas
Thesis (CSE **Best PhD Dissertation** Award):
Improving Client Performance and Energy-Efficiency in Current and Next-Generation Wireless LANs

2009-2013 **Bachelor of Technology**, Computer Science & Engineering (*with Honors*) | GPA 9.01/10.0
IIIT-Delhi, New Delhi, IN
Thesis: *Smartphone-based Anomalous Human Activity Detection and Prediction*

Work Experience

Nov. 2019 – Current
802.11
Python
Firmware
OpenThread
TCP/IP

Software Development Enginner - Test (WiFi Performance), ***Apple Inc.***, Cupertino, CA, US.
Evaluating & Improving wireless connectivity performance

- Characterize and identify the optimal design choices for improving the wireless system performance on Apple devices and platforms
- Devise and build evaluation methodologies for benchmarking wireless performance of prorotypes, under different scnearios and stressors
- Analyze logs/data from multiple sub-systems (Application/TCP/IP/MAC/PHY), using tools and protocl analyzers, to identify areas of sub-optimal performance
- Define targets for critical WiFi performance metrics and lead cross-functional efforts to ensure targets are being met until commercialization
- Design and develop software, scripts and tools to analyze wireless performance data (using Python, Shell etc.)

Sep. – Nov. 2019
802.11ad

Unpaid Intern, ***State University of New York at Buffalo***, Buffalo, NY, US.
Introduction to Programming Languages

- Performed measurements to evaluate the performance of the IEEE 802.11ad wireless standard in indoor environments
- Processed and Analyzed collected measurement data to identify scenarios where wireless link performance is sub-optimal
- Prepared and submitted a Journal paper reporting the findings (published in IEEE TMC 2021)

Summer 2019
Programming Languages

Course Instructor, ***State University of New York at Buffalo***, Buffalo, NY, US.
Introduction to Programming Languages

- Course Instructor for introductory course on Programming Languages, focusing on functional programming
- Design and develop course material, assignments and exams

Summer 2017
C
Python
OpenWRT

Research Associate (Intern), ***Hewlett Packard Enterprise (HPE) Labs***, Palo Alto, CA, US.
LTE-Unlicensed/WiFi Co-existence in 5 GHz for WiFi Access Points (APs)

- Designed *DeMiLTE*, the first WiFi (802.11ac)-based system for enterprise APs to detect, quantify, and react to LTE-U/LAA interference in real time, without requiring additional AP hardware
- Implemented the system inside the AP firmware making it light-weight and fully 802.11ac-standard compliant
- Improved AP downlink throughput by up to **110%**, without requiring any client modifications
- Published 1 top-tier conference paper [C3] and filed 1 patent [P1]

Summer 2016
C
Python
Drivers
LEDE

Research Intern, ***IMDEA Networks Institute***, Madrid, Spain.
Millimeter-wave Networking

- Analyzed performance bottlenecks in next-generation of WiFi: 60 GHz (802.11ad)-based indoor WLANs
- Modified the Linux 802.11ad wireless device driver (`wil6210`) to export PHY/MAC information to userspace and allow control over PHY parameters, like beam direction
- Highlighted novel challenges and practical aspects like coverage and AP deployment, previously unreported
- Published the results of the study in a top-tier conference [C2]

Summer 2013 **Software Developer**, ***Google Summer of Code 2013***, Google.
`Python` `Java` `Android` `Django`
Funf: Open sensing and data collection framework for Android (acquired by Google)
- Improved Funf-in-a-box (FIAB), a service for users to build custom data collection app with zero programming
- Ported the entire FIAB service from an always-on architecture running on a single EC2 server to on-demand VM instantiation on Google cloud (in <1 month), significantly reducing costs & increasing performance.
- Added support for configuring and deploying custom surveys and capturing additional user input

Summer 2012 **Research Intern**, ***Airbus India, EADS Innovation Works***, Bangalore, India.
`Android` `Ubuntu Juju`
Image based localization techniques
- Built an indoor localization service that uses image features to estimate location of an Android device
- Packaged and deployed the system as a Juju charm for easy production orchestration

2013–2019 **Research Assistant (RA)** | **Teaching Assistant (TA)**, ***University at Buffalo***, *SUNY*, NY, US.

Research Interests & Directions

Wireless Networking

- Next-generation WiFi: Millimeter-wave (60 GHz)/802.11ad based Wireless LANs (WLANs)
  - Characterize 802.11ad PHY/MAC performance using both commercial and SDR testbeds
  - Use Multipath-TCP to combine Leagcy/802.11ac and Gigabit/802.11ad WiFis
  - Related publications: [C11], [C9], [C8], [C5], [C3], [J2], [J1]
- LTE-Unlicensed and WiFi Co-existence in 5 GHz
  - Quantify coexistence issues with LTE-Unlicensed (LTE-U/LAA) and 802.11ac-based Enterprise WLAN
  - Build standard-compliant WiFi-based system to combat LTE inteferece and ensure fair channel usage
  - Related publications: [C10], [P1]

Mobile Systems

- WiFi Power-Performance Tradeoffs in Smartphones
  - Identify the power-performance relationship in the context of 802.11n/ac/ad in mobile devices
  - Build accurate power models that account for both CPU and network component of data transfers
  - Related publications: [C6], [C4], [C2]
- Multipath-TCP in Smartphones
  - Study MPTCP in the context of using LTE+WiFi interfaces together on smartphones
  - Characterize the impact of MPTCP on performance, power and CPU utilization for real applications
  - Related publications: [C7]

Publications

Conference

C11 **MuSher: An Agile Multipath-TCP Scheduler for Dual-Band 802.11ad/ac Wireless LANs**
Swetank Kumar Saha, Shivang Aggarwal, Rohan Pathak, Dimitrios Koutsonikolas, Joerg Widmer
ACM International Conference on Mobile Computing and Networking (**MobiCom**) *2019*

C10 **DeMiLTE: Detecting and Mitigating LTE Interference for Enterprise Wi-Fi in 5 GHz**
Swetank Kumar Saha, Christina Vlachou, Dimitrios Koutsonikolas, Kyu-Han Kim
ACM International Symposium on Mobile Ad Hoc Networking and Computing (**MobiHoc**) *2019*

C9 **Fast and Infuriating: Performance and Pitfalls of 60 GHz WLANs Based on Consumer-Grade Hardware**
Swetank Kumar Saha, Hany Assasa, Adrian Loch, Naveen Muralidhar Prakash, Roshan Shyamsunder Ananthara-makrishna, Shivang Aggarwal, Daniel Steinmetzer, Dimitrios Koutsonikolas, Joerg Widmer, and Matthias Hollick
IEEE International Conference on Sensing, Communication and Networking (**SECON**) *2018*

C8 **Medium Access and Transport Protocol Aspects in Practical 802.11ad Networks**
Hany Assasa, Swetank Kumar Saha, Adrian Loch, Dimitrios Koutsonikolas, Joerg Widmer
IEEE International Symposium on A World of Wireless, Mobile and Multimedia Networks (**WoWMoM**) *2018*

C7 **Multipath TCP in Smartphones: Impact on Performance, Energy, and CPU Utilization**
Swetank Kumar Saha, Abhishek Kannan, Geunhyung Lee, Nishant Ravichandran, Parag Kamalakar Medhe, Naved Merchant, Dimitrios Koutsonikolas
ACM International Symposium on Mobility Management and Wireless Access (**MobiWac**) *2017*

C6 **A Detailed Look into Power Consumption of Commodity 60 GHz Devices**
Swetank Kumar Saha, Tariq Siddiqui, Dimitrios Koutsonikolas, Adrian Loch, Joerg Widmer, Ramalingam Sridhar
IEEE International Symposium on A World of Wireless, Mobile and Multimedia Networks (**WoWMoM**) *2017*

C5 **A Feasibility Study of 60 GHz Indoor WLANs**
Swetank Kumar Saha, Tariq Siddiqui, Viral Vijay Vira, Anuj Garg, Dimitrios Koutsonikolas
IEEE International Conference on Computer Communication and Networks (**ICCCN**) *2016*

C4 **Revisiting 802.11 Power Consumption Modeling in Smartphones**
Swetank Kumar Saha, Pratham Malik, Selvaganesh Dharmeswaran, Dimitrios Koutsonikolas
IEEE International Symposium on A World of Wireless, Mobile and Multimedia Networks (**WoWMoM**) *2016*

C3 **Multi-Gigabit Indoor WLANs: Looking Beyond 2.4/5 GHz**
Swetank Kumar Saha, Viral Vijay Vira, Anuj Garg, Dimitrios Koutsonikolas
IEEE International Conference on Communications (**ICC**) *2016*

C2 **Power-Throughput Tradeoffs of 802.11n/ac in Smartphones**
Swetank Kumar Saha, Pratik Deshpande, Pranav P Inamdar, Ramanujan K Sheshadri, Dimitrios Koutsonikolas
IEEE Conference on Computer Communications (**INFOCOM**) *2015*

C1 **Take Control of Your SMSes : Designing an Usable Spam SMS Filtering System**
Kuldeep Yadav, Swetank K Saha, Ponnurangam Kumaraguru, Rohit Kumra
IEEE International Conference on Mobile Data Management (**MDM**) 2012

Journal

J3 **Performance and Pitfalls of 60 GHz WLANs Based on Consumer-Grade Hardware**
Swetank Kumar Saha, Shivang Aggarwal, Hany Assasa, Adrian Loch, Naveen Muralidhar Prakash, Roshan Shyamsunder, Daniel Steinmetzer, Dimitrios Koutsonikolas, Joerg Widmer, Matthias Hollick
IEEE Transactions on Mobile Computing (**TMC**) *2020*

J2 **X60: A Programmable Testbed for Wideband 60 GHz WLANs with Phased Arrays**
Swetank Kumar Saha, Yasaman Ghasempour, Muhammad Kumail Haider, Tariq Siddiqui, Paulo De Melo, Neerad Somanchi, Luke Zakrajsek, Arjun Singh, Roshan Shyamsunder, Owen Torres, Daniel Uvaydov, Josep Miquel Jornet, Edward Knightly, Dimitrios Koutsonikolas, Dimitris Pados, Zhi Sun, Ngwe Thawdar
Elsevier Computer Communications (**COMCOM**) *2018*

J1 **60 GHz Indoor WLANs: Insights into Performance and Power Consumption**
Swetank Kumar Saha, Darshan Godabanahal Malleshappa, Avinash Palamanda, Viral Vijay Vira, Anuj Garg, Dimitrios Koutsonikolas
Springer Wireless Networks (**WINE**) *2017*

Workshop

W4 **X60: A Programmable Testbed for Wideband 60 GHz WLANs with Phased Arrays**
Swetank Kumar Saha, Yasaman Ghasempour, Muhammad Kumail Haider, Tariq Siddiqui, Paulo De Melo, Neerad Somanchi, Luke Zakrajsek, Arjun Singh, Owen Torres, Daniel Uvaydov, Josep Miquel Jornet, Edward Knightly, Dimitrios Koutsonikolas, Dimitris Pados, Zhi Sun
ACM Workshop on Wireless Network Testbeds, Experimental evaluation & CHaracterization (**WiNTECH**) *2017*

W3 **Improving Connectivity, Coverage, and Capacity in 60 GHz Indoor WLANs Using Relays**
Swetank Kumar Saha, Li Sun, Dimitrios Koutsonikolas
ACM Workshop on Wireless of the Students, by the Students, & for the Students (**S**^{3}) *2015*

W2 **A First Look at TCP Performance in Indoor IEEE 802.11ad WLANs**
Swetank Kumar Saha, Anuj Garg, Dimitrios Koutsonikolas
IEEE Conference on Computer Communications Workshops (**INFOCOM WKSHPS**) *2015*

W1 **Towards Multi-Gigabit 60 GHz Indoor WLANs**
Swetank Kumar Saha, Dimitrios Koutsonikolas
IEEE International Conference on Network Protocols (**ICNP PhD Forum**) *2015*

Patents

P1 **LTE Interference Detection and Mitigation for Wi-Fi Links**
Christina Vlachou, Swetank Kumar Saha, Kyu-Han Kim
Publication No.: US 2019/0335347 A1 (**Patent No.: US 11,076,307 B2**) *Application #: 15/962,722*

Poster

Po6 **Poster: Can Mobile Hardware Keep Up with Today's Gigabit Wireless Technologies?**
Shivang Aggarwal, Swetank Kumar Saha, Pranab Dash, Jiayi Meng, Arvind Thirumurugan, Dimitrios Koutsonikolas, Y. Charlie Hu
ACM International Conference on Mobile Computing and Networking (**MobiCom**) *2019*

Po5 **Poster: AMuSe: An Agile Multipath TCP Scheduler for Dual-Band 802.11ad/ac Wireless LANs**
Swetank Kumar Saha, Shivang Aggarwal, Dimitrios Koutsonikolas, Joerg Widmer
ACM International Conference on Mobile Computing and Networking (**MobiCom**) *2018*

Po4 **Poster: Can MPTCP Improve Performance for Dual-Band 60 GHz/5 GHz Clients?**
Swetank Kumar Saha, Roshan Shyamsunder, Naveen Muralidhar Prakash, Hany Assasa, Adrian Loch, Dimitrios Koutsonikolas, Joerg Widmer
ACM International Conference on Mobile Computing and Networking (**MobiCom**) *2017*

Po3 **Poster: X60: A Programmable Testbed for Wideband 60 GHz WLANs with Phased Arrays**
Swetank Kumar Saha, Yasaman Ghasempour, Muhammad Kumail Haider, Tariq Siddiqui, Paulo De Melo, Neerad Somanchi, Luke Zakrajsek, Arjun Singh, Owen Torres, Daniel Uvaydov, Josep Miquel Jornet, Edward Knightly, Dimitrios Koutsonikolas, Dimitris Pados, Zhi Sun
ACM International Conference on Mobile Computing and Networking (**MobiCom**) *2017*

Po2 **LTE/WiFi Coexistence in 5 GHz: Bringing LTE-Awareness to Enterprise WiFi**
Swetank Kumar Saha, Christina Vlachou, Kyu-Han Kim
Hewlett Packard Enterprise (**Technical Conference**) *2017*

Po1 **On the Feasibility of Indoor IEEE 802.11ad WLANs**
Swetank Kumar Saha, Viral Vijay Vira, Anuj Garg, Andrew Tennenbaum, Dimitrios Koutsonikolas
IEEE Conference on Computer Communications Workshops (**INFOCOM WKSHPS**) *2015*

Awards

- **CSE Best PhD Dissertation Award** UB Computer Science & Engineering department 2019
- **Faculty Choice Graduate Award** UB Computer Science & Engineering department 2019
- **2**nd **Runner Up** ACM Student Research Competition (SRC) 2017 [P2]
- **Best Paper Runner Up** ACM WiNTECH 2017 [W4]
- **1**st prize at the UB School of Engineering & Applied Sciences (SEAS) Lightning Talk Competition
- **Winner** of the *Tally Innovation Award* at the All-India Jedi Project Challenge 2012, IISc., Bangalore.
- Travel Grants: 2018: IEEE SECON, ACM SRC; 2017: ACM MobiCom, ACM SRC; 2016: ACM MobiCom, IEEE ICCC; 2015: ACM IMC, IEEE ICNP

Professional Service

Chair
- ACM Wireless of the Students, by the Students, and for the Students (S^3) Workshop 2018

Web Chair
- International Conference on Embedded Wireless Systems and Networks (EWSN) 2018
- ACM Workshop on Wireless Network Testbeds, Experimental evaluation & CHaracterization (WiNTECH) 2016

Invited Journal Reviews
- IEEE Transactions on Mobile Computing (TMC) 2021, 2020, 2018, 2017
- IEEE Transactions on Wireless Communications (TWC) 2020, 2019, 2017
- Elsevier Ad Hoc Networks 2019
- IEEE/ACM Transactions on Networking 2019
- IEEE Vehicular Technology Magazine 2019
- IEEE Journal on Selected Areas in Communications 2018
- MDPI Applied Sciences 2017
- IEEE Symposium on Computers and Communications (ISCC) 2017
- MDPI Sensors 2015

Technical Program Committee (TPC)
- IEEE INFOCOM 2022
- IEEE WoWMoM 2021
- IFIP Networking 2021
- ACM mmNets 2020

Technical Skills

Languages Proficient: C, Python | Intermediate: Java | Familiar: C++

Linux Kernel Wireless device drivers (`ath9k`, `ath10k`, `wil6210`, `iwlwifi`), TCP and MPTCP Networking subsystem

Networking TCP/IP, HTTP, WiFi, LTE, packet sniffer, protocol analyzer, OpenWRT, ns2, ns3

Smartphone Android applications (SDK/NDK), Platform (AOSP), Kernel

SDRs USRP, GNURadio, LabView

Web Django, PHP, HTML, JavaScript, Jekyll