Sabur Hassan Baidya

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Research Interests

Internet of Things (IoT), Wireless Communication and Networks (WiFi, Cellular 4G/5G), Autonomous Systems (UAVs, Vehicles), Machine Learning, Adaptive Video Streaming, Distributed Systems, Edge/Cloud Computing

Education

University of California, Irvine Aug'19
PhD in Computer Science Current GPA: 3.95/4
Thesis: *Adaptive Communications for Intelligent & Autonomous Systems in the Urban IoT* Adviser: Dr. Marco Levorato

University of Texas at Dallas Aug.'13
MS in Computer Science (awarded Academic Excellence) GPA: 3.96/4
Thesis: *Performance Improvement of Multipath-TCP over Non-uniform Paths using Slow Path Adaptation* Adviser: Dr. Ravi Prakash

West Bengal University of Technology
B.Tech in Electronics & Communication Engineering Aug.'07
Class rank : 2 out of 65 students in ECE dept. GPA: 8.93/10
Thesis Project: *Sequence Detection & Channel State Estimation on Hidden Markov Modeled Flat Fading Channel*

Professional Experience

University of California, San Diego Sept.'19 - present
Postdoctoral Scholar, Mobile Systems Design Lab San Diego, CA

- Smart Transportation and Innovation Project with V2X communication and Edge Computing for Collaborative Perception and Guidance.

Nokia Bell Labs Jun.'17 - Sept.'17
Research Intern, Edge-Cloud Research Murray Hill, NJ

- Adaptive 360 degree video streaming from UAV to Edge-Cloud over LTE.

Huawei Research Lab Jun.'16 - Sept.'16
Research Intern, Network Virtualization Group Santa Clara, CA

- Virtual Network Functions (VNF) with extended Berkeley Packet Filter (eBPF).

Cisco Systems Sept.'13 - Sept.'14
Software Engineer , Software Routing Group for 3G/4G San Jose, CA

- 4G LTE Mobility, SNMP, SIM OIR on Cisco IOS for ISR Routers (c800 series).

BlackBerry Ltd. Jan.'13 - May'13
Software Developer Intern, Radio Applications R&D Irving, TX

- Memory Optimization and heap profiling of radio applications on BB10 OS.

IBM Sept.'07 - Jun.'11
Senior System Engineer, Telecom Group Noida, India

- Tuxedo middleware services for telecom operation of Vodafone Spain.

Academic Research Experience

Mobile Systems Design Lab, UCSD, CA Sept.'14 - present
Postdoctoral Research Scholar, Adviser: Dr. Sujit Dey

- **Smart Transportation and Innovation Program** [*NSF and Industry funded*]
  - Smart and safe transportation with collaborative vision with vehicular data from sensor including camera, radars, lidar for better perception and guidance.
  - Building a testbed for distributed edge-computing over C-V2X communication to deploy the collaborative vision algorithms.
- **Sustainable Renewable Energy based Cellular Communication**
  - Modeling the sustainability of solar and wind powered small cell base station for edge computing based tasks.
- **Self-managed V2X Networks with mmWave** (with Prof. Xinyu Zhang)
  - Creating a machine learning model for adaptive beam forming to handle the mobility and interference in mmWave based V2X networks.

Intelligent & Autonomous Systems Lab, UCI, CA Sept.'14 - Aug.'19
Graduate Research Assistant, Adviser: Dr. Marco Levorato

- **Unmanned Autonomous Systems (UAS)** [*NSF and DARPA funded*]
  - Robust computation and communication protocols for autonomous UAVs.
  - Design and implementation of a synchronized UAV network simulator.
- **Software Defined Edge Computing** [*Industry Collaboration*]
  - Built a framework for content & computation-aware real-time edge computing.
  - Implemented Network Function Virtualization (NFV) based on Berkeley Packet Filters (eBPF) for protocols running inside in-kernel virtual machines.
- **Wireless coexistence (LTE, WiFi and D2D communications)**
  - Developed novel cognitive interference control strategies for coexisting wireless applications sharing a frequency spectrum.
  - Implementations on ns-3 simulator and LTE emulators using USRPs with OpenAirInterface and SrsLTE.
- **Adaptive Multimedia Streaming** [*NSF funded*]
  - Adaptive streaming for live H.264 encoded videos over multi-path wireless.
  - Data-driven machine learning models for dynamic path selection.

Distributed Systems Lab, UT Dallas, TX Sept.'11 - Aug.'13
Research Student, Adviser: Dr. Ravi Prakash

- **Multi-path TCP (MPTCP) Congestion Control**
  - Developed a Slow Path Adaptation algorithm to prevent the performance degradation of MPTCP with respect to the TCP performance as lower bound.
- **Dual-band WiFi**
  - Designed a dual band (2.4 GHz & 5.8 GHz) WiFi network using WiFi Direct.
  - Built soft and hard handoff mechanisms for mobility and failure scenarios.

WINLAB, Rutgers University, NJ May'12 - Aug.'12
Research Intern, Adviser: Dr. Dipankar Raychaudhuri

- **Mobility First Future Internet Architecture** [*NSF funded*]
  - Designed Multihoming feature in Mobility First Future Internet Architecture.
  - Proposed solutions for sender, receiver and network driven multihoming strategies using Global Name Resolution Service (GNRS).

Publications

Published & Accepted Papers:

[1] *Yoshitomo Matsubara*, **Sabur Baidya**, *Davide Callegaro, Marco Levorato, Sameer Singh*. "Distilled Split Deep Neural Networks forEdge-Assisted Real-Time Systems". ACM MobiCom Workshop on Hot Topics in Video Analytics and Intelligent Edges (HotEdgeVideo, 2019).

[2] *Davide Callegaro* , **Sabur Baidya**, *Gowri Sankar Ramachandran, Bhaskar Krishnamachari, Marco Levorato*. "Information Autonomy: Self-Adaptive Information Management for Infrastructure-Assisted Autonomous UAV Systems". IEEE Military Communications Conference (MILCOM 2019).

[3] *Davide Callegaro* , **Sabur Baidya**, *Marco Levorato*. "A Measurement Study on Edge Computing for Autonomous UAVs". ACM SIGCOMM Workshop on Autonomous Mobile AirGround Edge Computing, Systems, Networks, and Applications (MAGESys '19).

[4] **Sabur Baidya**, *Zoheb Shaikh, Marco Levorato*. "FlyNetSim: An Open Source Synchronized UAV Network Simulator based on ns-3 and Ardupilot". ACM international conference on Modeling, analysis simulation of wireless and mobile systems (MSWiM) 2018.

[5] **Sabur Baidya**, *Marco Levorato*. "Content-Aware Cognitive Interference Control for Urban IoT Systems". IEEE Transactions on Cognitive Communications and Networking, 2018

[6] *Zoheb Shaikh,* **Sabur Baidya**, *Marco Levorato*. "Robust Multi-Path Communications for UAVs in the Urban IoT". IEEE SECON Workshop on Communications, Data Processing and Control for Unmanned Autonomous Systems 2018

[7] A. Chowdhery, M. Levorato, I. Burago and **S. Baidya**, Chapter: "Urban IoT Edge Analytics" in Fog Computing in the Internet of Things (Intelligence at the Edge), Springer International Publishing, in press 2018. 101-120

[8] **Sabur Baidya**, *Yan Chen and Marco Levorato*. "eBPF-based Content and Computation-aware Communication for Real-time Edge Computing" . IEEE INFOCOM Workshop on Advances in Software Defined and Context-Aware Cognitive Networks, 2018

[9] **Sabur Baidya**, *Marco Levorato*. "Edge-assisted Content and Computation-Driven Dynamic Network Selection for Real-Time Services in the Urban IoT". IEEE INFOCOM Workshop on Advances in Software Defined and Context-Aware Cognitive Networks, 2017.

[10] **Sabur Baidya**, *Marco Levorato*. "Content-Based Interference Management for Video Transmission in D2D Communications Underlaying LTE." IEEE International Conference on Computing, Networking and Communications. ICNC 2017

[11] **Sabur Baidya**, *Marco Levorato*. "Content-based Cognitive Interference Control for City Monitoring Applications in the Urban IoT". IEEE Global Communications Conference. GLOBECOM 2016

[12] **Sabur Baidya**, *Ravi Prakash*. "Improving the performance of Multipath TCP over Heterogeneous Paths using Slow Path Adaptation". IEEE International Conference on Communications. ICC 2014

[13] **Sabur Baidya**, *Pramod Shirol, Abhishek Basu, Ravi Prakash*. "Employing WiFi Direct to Build a Wireless Network over both 2.4 GHz and 5.8 GHz bands". Technical Report UTDCS-16-13, Computer Science Department, University of Texas at Dallas, Richardson, Texas, Sept. 2013

Papers Submitted & Under Review

[14] **Sabur Baidya**, *Peyman Tehrani and Marco Levorato. Title Omitted for Anonymity.* IEEE INFOCOM 2019

[15] *Yoshitomo Matsubara, Davide Callegaro,* **Sabur Baidya**, *Marco Levorato, Sameer Singh.* 'Distilled Split Deep Neural Networks for Edge-Assisted Real-Time Systems". IEEE Transaction on Mobile Computing, 2019.

[16] *Davide Callegaro ,* **Sabur Baidya**, *Marco Levorato.* "Dynamic Distributed Computing for Infrastructure-Assisted Autonomous UAVs". IEEE International Conference on Communications. ICC 2020.

Manuscripts Under Preparation

[17] **Sabur Baidya** *and Marco Levorato.* "Optimal Infrastructure assistance for Autonomous UAV Systems". IEEE Transaction on Vehicular Technology

[18] *Yujen Ku,* **Sabur Baidya**, *and Sujit Dey.* "Predictive Model for Sustainability of Green Enegy-driven Communications".

Posters

[1] **Sabur Baidya**, *Yan Chen.* "eBPF Filtering and Packet Processing in Virtual Network Environment" at Intern Research Showcase, Huawei Research Lab, CA (Aug.'2016). [**3rd Best Poster Award**]

[2] **Sabur Baidya**, *Marco Levorato.* "Content-based Cognitive Interference Control for City Monitoring Applications in the Urban IoT" at Computer Science Dept., UC Irvine (Jun.'2016). [**Best Poster Award**]

[3] **Sabur Baidya**, *Kai Su, Kiran Nagaraja, Ivan Seskar, Dipankar Raychudhuri.* "Multihoming in Mobility First Future Internet Architecture" at WINLAB Summer Research Program Open House, Rutgers University (Aug.'2012).

Honors & Awards

- **Student Travel Grant** offer for ACM SIGCOMM Conference. 2019
- **People's Choice Award**, Graduate Research Symposium, UCI. 2018
- **NSF Travel Grant** for ACM MobiHoc Conference. 2018
- **Student Travel Grant** for ACM SIGMETRICS Conference. 2018
- **Best Poster Award** in Computer Science Research Showcase, UCI. 2016
- **Third best poster award** in Intern Research Showcase at Huawei Research Labs, Santa Clara, CA. 2016
- Stipend award for **Mentoring Excellence** at UC Irvine. 2015 - 2017
- **Graduate Fellowship** from Computer Science dept. of UC Irvine. 2014
- **Certificate of Academic Excellence**, Computer Science Department, University of Texas at Dallas. 2013
- Nominated for **'Golden Key International Honour Society'** by the University of Texas at Dallas for academic excellence. 2012
- 5th Place award in the workshop and competition on Cyber Security and ethical hacking at TexSAW in University of Texas at Dallas. 2011
- **IDB** scholarship for 4 years of undergraduate studies. 2003-2007

Research Talks

03/2019 : Adaptive Communications for Intelligent & Autonomous Systems, USC
04/2018 : Robust Communications for UAVs in Smart Cities, AGS Symposium, UCI
04/2018 : eBPF-based Edge Computing, INFOCOM Workshop, Honolulu HI
12/2016 : Content-based Cognitive Interference Control, Globecom, Washington DC
08/2016 : eBPF Filtering and Packet Processing, Huawei Labs, Santa Clara, CA
06/2016 : Content-based Interference Control in Urban IoT, Research Showcase, UCI
06/2014 : MPTCP with Slow Path Adaptation, IEEE ICC 2014, Sydney Australia
12/2013 : Information-centric Networking Architecture, Cisco Systems, San Jose, CA
08/2012 : Multihoming in Mobility First, Open House, WINLAB, Rutgers, NJ

Teaching Experience

Lectures at **University of California, Irvine**

- Guest lecture on Queuing Theory in Computer Communications & Networks course (Graduate level, Class Size : 80) — Fall '15
- Guest tutorial lecture on Networks Simulator NS-3 for Wireless Networks course (Graduate level, Class Size : 15) — Winter '16, Spring'17
- Guest tutorial lecture on Networks and Unmanned Aerial Vehicle (UAV) Simulator (Graduate level, Class Size : 20) — Spring '18

Graduate Teaching Assistant, **University of California, Irvine**

- TA for Programming in C/C++ (ICS 46) — Spring '16
- TA for Advanced Computer Networks Lab (CS 233, 133) — Winter '16
- TA for Computer Communications & Networks (CS 232) — Fall '15
- TA for Introductory Python Programming (ICS 31) — Summer '15
- TA for Programming Data Structures with C/C++ (ICS 45C) — Spring '15
- TA for Programming with Software Library in Python (ICS 32) — Winter '15

Teaching Assistant, **University of Texas at Dallas**

- TA for Java Programming course (CS 1331) — Fall '11

MENTORING EXPERIENCE

Research Mentoring

Yujen Ku (*UCSD, PhD Student*) - Optimal sustainable renewable energy — 2019
Yaocong Hu (*UCSD, undergrad*) - QoS prediction in Wireless Networks — 2019
Zoheb Shaikh (*UCI Masters; Now at Microsoft*) - Master's Thesis — 2018
Jatin Mehta (*UCI Masters; Now at Salesforce*) - Vision Learning Project — 2017
Beichen Yang (*UCI Masters; Now PhD student at UL*) - Wireless IoT Project — 2017
Kai Ding (*UCI PhD student, Mechanical Engg.*) - Wireless NS3 Project — 2016
Moin Aminnaseri (*UCI Masters student*) - Wireless NS3 Project — 2016
Bahram Seifi (*UCI Masters; Now EECS PhD student*) - Wireless NS3 Project — 2016

Peer Mentoring

Graduate Resource Center, UC Irvine — 2015 - 2018

- Graduate Peer Mentor for International incoming Masters and PhD students

Research in News

- PC Magazine: S.C. Stuart, "Inside the DARPA's Hackfest" at the NASA Research Park. — Dec.'17
- "Levorato and DeepEdge tackle DARPA SDR Hackfest", UCI News. — Dec.'17
- "Armed with Science: DARPA Puts Techies to the Test at Bay Area Hackfest". The Official US Defense Department Science Blog. — Nov.'17
- "CCI Team Participates in DARPA SDR Hackefest", USC Viterbi News. — Nov.'17

Computer Skills

Programming: C, C++, Matlab, Python, Shell scripts, nesC, LaTeX
OS: Linux, Mac, Windows, Tiny OS (embedded), RancherOS (Container OS)
Simulator/Emulator: SrsLTE, OpenAirInterface (LTE), NS-3, hotspot, R
Tools: Tensorflow, Ardupilot, KVM, Docker, Open Vswitch, ffmpeg, Gnuplot, Git
Debugging: gdb, C scope, Valgrind
Networking: IEEE 802.11, LTE Radio Protocol Stack (EUTRAN), 3GPP, SDR, Container Networking, SDN Video Streaming, Cisco IOS, Wireshark
Linux Kernel Programming: TCP/IP stack, Berkeley Packet Filters (eBPF)

Certifications

- Machine Learning certification with Coursera by Stanford University. 2017
- Certified in Mentoring Excellence Program (MEP) in UCI. 2015
- IBM certified SOA (Service Oriented Architecture) Associate. 2008
- Certified in Presentation Skills & Time mgmt. by IBM Siksha Consulting. 2007
- Summer training certificate on MMDS networks, TATA Communications. 2006

Affiliations

- Peer mentor, Graduate Resource Center, University of California, Irvine.
- Member, Golden Key International Honour Society.
- Member, IEEE Communication Society.
- Student Member. IEEE.
- Member, Association of Computing Machinery (ACM).

Services

- **Student Organizer:** Campus visit for incoming PhD students, Computer Science department, UCI, 2018
- **Student Volunteer:** IEEE SECON Conference 2017, San Diego, CA
- **External Relations Committee:** IEEE-UCI 2016
- **Reviewer for Journals:** IEEE Transactions of Cognitive Comm. & Networking, IEEE Access, ACM Computing Surverys
- **Reviewer for Conferences:** Several IEEE conferences including SECON, WCNC, ICNC , PIMRC and ACM conference MSWiM
- **Student Speaker:** Workshop on "Understanding the U.S. Classroom as a Student and Teaching Assistant" at GRC, UC Irvine (Oct. 22, 2015)