Sabur Hassan Baidya

Email: saburhb@gmail.com Phone: 972-489-9637 Website: http://www.ics.uci.edu/~sbaidya/

Research Interests

Internet of Things (IoT), Intelligent and Autonomous Systems (UAVs, Vehicles), Machine Learning, Wireless Communication and Networks (4G LTE, 5G, WiFi, D2D), Software-defined Networking (SDN), Edge/Cloud Computing

Education

University of California, Irvine Sept.'14 - Sept.'19
PhD in Computer Science 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.'11 - 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, India
B.Tech in Electronics & Communication Engineering Aug.'03 - 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 Oct.'19 - present
Postdoctoral Scholar, ECE, Supervisor: Prof. Sujit Dey San Diego, CA

- Smart Transportation and Innovation Project with Edge Computing and V2X Communication 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, UC San Diego, CA Oct.'19 - present
Postdoctoral Research Scholar, Adviser: Dr. Sujit Dey

- **Collaborative Vehicular Edge Computing for Smart Transportation**
  - Collaborative vision for smart transportation with vehicular multi-sensor data including camera, radars, location sensors for better perception and guidance.
  - Building a testbed for distributed edge-computing over C-V2X communication to deploy the collaborative vision algorithms.
- **Sustainable Communication with Optimal Usage of Renewable Energy**
  - Creating prediction models for 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 self-managed mmWave based V2X networks with dynamic adaptations of communications and applications in real-time.

Intelligent & Autonomous Systems Lab, UC Irvine, 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
Visiting Researcher, Adviser: Dr. Dipankar Raychaudhuri

- **Mobility First Future Internet Architecture** [*NSF funded FIA project*]
  - 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

Conference Proceedings & Journals (peer reviewed):

[1] **Sabur Baidya** *and Marco Levorato.* "On the Feasibility of Infrastructure Assistance to Autonomous UAV Systems". International Workshop on Wireless Sensors and Drones in Internet of Things (Wi-DroIT) 2020. (*under review*)

[2] *Yoshitomo Matsubara, Davide Callegaro,* **Sabur Baidya**, *Marco Levorato, Sameer Singh. Title Anonymized (for double-blind reviewing).* Twenty first ACM International Symposium on Mobile Ad Hoc Networking and Computing (ACM SIGMETRICS), 2020. (*under review*)

[3] **Sabur Baidya**, *Peyman Tehrani and Marco Levorato. Data-Driven Path Selection for Real-Time Video Streaming at the Network Edge.* IEEE ICC Workshop on Edge Machine Learning for 5G Networks and Beyond, 2020. (*accepted*)

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

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

[6] *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).

[7] *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, ACM, 2019.

[8] **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 (ACM MSWiM) 2018.

[9] **Sabur Baidya**, *Marco Levorato.* "Content-Aware Cognitive Interference Control for Urban IoT Systems". IEEE Transactions on Cognitive Communications and Networking, 4(3), pp.500-512, 2018 (IEEE TCCN Journal).

[10] *Zoheb Shaikh,* **Sabur Baidya**, *Marco Levorato.* "Robust Multi-Path Communications for UAVs in the Urban IoT". IEEE International Conference on Sensing, Communication and Networking (SECON Workshops) (pp. 1-5), 2018.

[11] **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.

[12] **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.

[13] **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.

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

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

Book Chapter & Technical Reports

[16] A. Chowdhery, M. Levorato, I. Burago and **S. Baidya**, *Book 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

[17] **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.

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 Research Showcase., UC Irvine (Jun. 2016). [**Best Poster Award**]

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

Software Release

FlyNetSim https://github.com/saburhb/FlyNetSim

- An open source synchronized UAV-Network simulator using ns-3 and Ardupilot.
- It can simulate multi-UAVs, multiple Wireless Networks and IoT applications.

eBPF-cast https://github.com/saburhb/eBPF-cast

- An open source software for real-time Network Function Virtualization (NFV), created using extended Berkeley Packet Filter (eBPF) of Linux Kernel.

Honors & Awards

- **Student Travel Grant** offer for ACM SIGCOMM Conference (declined). 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
- Selected among **8 teams nationwide** for DARPA SDR Hackfest 2017
- **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, **IEEE INFOCOM 2018**, Honolulu, HI
12/2016 : Content-based Interference Control, **IEEE 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, **Cisco Systems**, San Jose, CA
08/2012 : Multihoming in Mobility First, **WINLAB, Rutgers University**, 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) — W'16, Sp'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

Mentorting Experience

Research Mentoring

Yujen Ku (*UCSD, PhD Student*) - Renewable energy-driven IoT — 2019 - present
Yaocong Hu (*UCSD, undergrad*) - QoS prediction in Wireless Networks — 2019
Zoheb Shaikh (*UCI Masters; Now at Microsoft*) - MS Thesis **(2 publications)** — 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 graduate students

Research in News

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

- Certified in Faculty Career Program and Course Design Program at UCI. 2018
- 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).

Synergistic Activities

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