

SABUR HASSAN BAIDYA

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RESEARCH INTERESTS Internet of Things (IoT), Intelligent and Autonomous Systems (UAVs, Connected and Autonomous Vehicles), Edge Computing, Wireless Communications and Networks (4G LTE, 5G, WiFi, D2D, C-V2X), Machine Learning, Smart & Connected Health

EDUCATION **University of California, Irvine** Sept.'14 - Sept.'19
Ph.D. in Computer Science GPA: 3.96/4
Thesis: *Adaptive Communications for Intelligent and Autonomous Systems in the Urban IoT* Advisor: Dr. Marco Levorato
Awards: Graduate Fellowship, Best Poster Award, People's Choice Award

University of Texas at Dallas Aug.'11 - Aug.'13
M.S. in Computer Science GPA: 3.96/4
Thesis: *Performance Improvement of Multipath-TCP over Non-uniform Paths using Slow Path Adaptation* Advisor: Dr. Ravi Prakash
Awards: Certificate of Academic Excellence

West Bengal University of Technology, India Aug.'03 - Aug.'07
B.Tech in Electronics & Communication Engineering GPA: 8.93/10
Class rank: 2nd in a class of 65 students
Thesis: *Sequence Detection & Channel State Estimation on Hidden Markov Modeled Flat Fading Channel*
Awards: IDB Scholarship for 4 years

PROFESSIONAL

EXPERIENCE **University of California, San Diego** Oct.'19 - present
Postdoctoral Scholar, ECE, Supervisor: Prof. Sujit Dey San Diego, CA

- Smart Transportation with Edge Computing and V2X Communication.
- Design-space exploration for AI-driven computing systems.

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.

Futurewei 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.

HONORS & AWARDS

- **NSF Travel Grant** offer for ACM SIGCOMM Conference (declined). 2019
- **People’s Choice Award**, Graduate Research Symposium, UCI. 2018
- **Student 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
- **Mentoring Excellence** Stipend award, GRC, UCI. 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

PUBLICATIONS

Journals (Peer-reviewed):

- [1] *Yu-Jen Ku, Sabur Baidya, Sujit Dey*. “Renewable Energy-Aware Resource-Efficient Vehicular Edge Computing Systems”. *IEEE Transactions on Vehicular Technology (IEEE TVT)* 2020. (*under review*)
- [2] *Yoshitomo Matsubara, Davide Callegaro, Sabur Baidya, Marco Levorato, Sameer Singh*. “Head Network Distillation: Splitting Distilled Deep Neural Networks for Resource-constrained Edge Computing Systems”. *IEEE Transactions on Vehicular Technology (IEEE TVT)* 2020. (*under review*)
- [3] *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, (IEEE TCCN) 2018 (Impact factor: 8.000).

Conference Proceedings (Peer-reviewed):

- [4] *Sabur Baidya, Yu-Jen Ku, Hengyu Zhao, Jishen Zhao, Sujit Dey*. “Vehicular and Edge Computing for Emerging Connected and Autonomous Vehicle Applications”. 57th ACM/EDAC/IEEE Design Automation Conference (DAC), 2020. (*Invited paper*)
- [5] *Sabur Baidya and Marco Levorato*. “On the Feasibility of Infrastructure Assistance to Autonomous UAV Systems”. 16th International Conference on Distributed Computing in Sensor Systems (DCOSS) 2020.
- [6] *Davide Callegaro, Sabur Baidya, Marco Levorato*. “Dynamic Distributed Computing for Infrastructure-Assisted Autonomous UAVs”. *IEEE International Conference on Communications*. *IEEE ICC* 2020.
- [7] *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.
- [8] *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)*, pp. 21-26, 2019.

- [9] *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), pp. 40-45, 2019.
- [10] *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, pp. 29-35, 2019.
- [11] **Sabur Baidya**, *Zoheb Shaikh, Marco Levorato*. “FlyNetSim: An Open Source Synchronized UAV Network Simulator based on ns-3 and Ardupilot”. 21st ACM International Conference on Modeling, Analysis and Simulation of Wireless and Mobile Systems (ACM MSWiM), pp. 37-45, 2018.
- [12] *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.
- [13] **Sabur Baidya**, *Yan Chen and Marco Levorato*. “eBPF-based Content and Computation-aware Communication for Real-time Edge Computing” . IEEE Conference on Computer Communications Workshops (INFOCOM WKSHPS), pp. 865-870, 2018.
- [14] **Sabur Baidya**, *Marco Levorato*. “Edge-assisted Content and Computation-Driven Dynamic Network Selection for Real-Time Services in the Urban IoT”. IEEE conference on computer communications workshops (INFOCOM WKSHPS), pp. 796-801, 2017.
- [15] **Sabur Baidya**, *Marco Levorato*. “Content-Based Interference Management for Video Transmission in D2D Communications Underlying LTE.” IEEE International Conference on Computing, Networking and Communications (ICNC), pp. 144-149, 2017.
- [16] **Sabur Baidya**, *Marco Levorato*. “Content-based Cognitive Interference Control for City Monitoring Applications in the Urban IoT”. IEEE Global Communications Conference (GLOBECOM), pp. 1-6, 2016.
- [17] **Sabur Baidya**, *Ravi Prakash*. “Improving the performance of Multipath TCP over Heterogeneous Paths using Slow Path Adaptation”. IEEE International Conference on Communications (ICC), pp. 3222-3227, 2014.

Book Chapter, Abstracts & Technical Reports:

- [18] *Yoshitomo Matsubara, Sabur Baidya, Davide Callegaro, Marco Levorato and Sameer Singh* ”Distilled Split Deep Neural Networks for Edge-Assisted Real-Time Systems.” In Southern California Machine Learning Symposium (SCMLS), 2020.
- [19] 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
- [20] **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.

SELECTED POSTERS

- [1] **Sabur Baidya**, Yu-Jen Ku, Henry Zhao, Jishen Zhao and Sujit Dey. “Vehicular and Edge Computing for Emerging Connected and Autonomous Vehicle Applications” at CWC Research Review, UC San Diego, CA (May. 2020).
- [2] *D. Callegaro, S. Baidya, Y. Matsubara, M. Levorato, G. Ramachandran and B. Krishnamachari*. “Resilient Communication and Computation for Heterogeneous Infrastructure-Assisted UAV Swarms”, Beyond 5G SDR Showcase, Air Force Research Lab (AFRL), Wright Brother Institute, Dayton, OH (May. 2019).
- [3] **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](#)]
- [4] **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](#)]
- [5] **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).

SELECTED TALKS

- 06/2020 : *On the Feasibility of Infrastructure Assistance to Autonomous UAV Systems*, International Conference on Distributed Computing in Sensor Systems (**DCOSS 2020**)
- 06/2020 : *Data-Driven Path Selection for Real-Time Video Streaming at the Network Edge*, IEEE International Conference on Communications (**IEEE ICC 2020**)
- 03/2020 : *Adaptive Computing & Communications for Intelligent and Autonomous Systems in the Internet-of-Things*, **University of Louisville (UofL)**
- 03/2019 : *Adaptive Communications for Intelligent & Autonomous Systems*, **University of Southern California (USC)**
- 04/2018 : *Robust Multi-Path Communications for UAVs in the Urban IoT*, AGS Symposium, University of California Irvine (**UCI**)
- 04/2018 : *eBPF-based Content and Computation-aware Communication for Real-time Edge Computing*, **IEEE INFOCOM 2018**, Honolulu, HI
- 12/2016 : *Content-based Cognitive Interference Control for City Monitoring Applications in the Urban IoT*, **IEEE GLOBECOM 2016**, Washington DC
- 08/2016 : *eBPF Filtering and Packet Processing in Virtual Network Environment*, **Huawei Research Labs**, Santa Clara, CA
- 06/2016 : *Content-based Cognitive Interference Control for City Monitoring Applications*, Graduate Research Showcase, University of California, Irvine (**UCI**)
- 06/2014 : *Improving the performance of MPTCP using Slow Path Adaptation*, IEEE International Conference on Communications (**IEEE ICC 2014**), Sydney Australia
- 12/2013 : *Information-Centric Networking*, **Cisco Systems**, San Jose, CA
- 08/2012 : *Multihoming in Mobility First Future Internet Architecture*, **WINLAB, Rutgers University**, North Brunswick, NJ

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.

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

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.
- **Renewable Energy-driven Edge Computing** [*NSF funded*]
 - Creating prediction models for the sustainability of solar and wind powered small cell base station for edge computing based tasks.
- **Design Space Exploration for Machine Learning Applications on Embedded Systems** (with Prof. Anand Raghunathan, Purdue University)[*DARPA funded*]
 - Creating optimal software and hardware configurations for optimizing power, area, speed and security of AI driven systems.

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*]
 - 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
Research Student, Adviser: Dr. Ravi Prakash

Sept.'11 - Aug.'13

- **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.

WINLAB, Rutgers University, NJ

May'12 - Aug.'12

Visiting Researcher, 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).

TEACHING

Lectures at University of California, Irvine

EXPERIENCE

- 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

MENTORING

EXPERIENCE

- 2019- Curr: Yujen Ku, ECE PhD Student, UCSD, *Renewable energy-driven Edge Computing* [Results published in DAC 2020, IEEE TVT Journal under preparation]
- 2020- Curr: Runfa Li, ECE MS Student, UCSD, *Real-time Augmented Perception of Occluded Objects on moving Vehicular Camera View* [Manuscript under preparation]
- 2019 - 2020: Yaocong Hu, ECE Undergrad Student, UCSD, *QoS prediction in Heterogeneous Wireless Networks*
- 2017 - 2018: Zoheb Shaikh, CS MS Student, UCI (Now at Microsoft), *Robust Communications for UAV* [Results published for his MS Thesis and 2 joint publications in ACM MSWiM and IEEE SECON CPC-UAV]
- 2017 - 2018: Jatin Mehta, CS MS Student, UCI (Now at Salesforce), *Data-driven Network selection for Video Streaming*
- 2016 - 2017: Beichen Yang, CS MS Student, UCI (Now PhD student at UL), *Opportunistic Activation and Deactivation of Sensors for Activity Detection*

TECHNICAL SKILLS

Programming: C, C++, Matlab, Python, Shell scripts, nesC, L^AT_EX
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)

PROFESSIONAL SERVICES

- Organizer:**
- TPC Member for IEEE ICNC 2017, IARIA Emerging 2018
 - Student Organizer for Campus visit event for incoming PhD students, Computer Science department, UCI, 2018
 - External Relations Committee IEEE-UCI 2016
- Reviewer:**
- **Reviewer for Journals:** IEEE Transactions of Cognitive Comm. & Networking (IEEE TCCN), IEEE Access, ACM Computing Surveys, IEEE Consumer Electronics Magazine
 - **Reviewer for Conferences:** IEEE SECON, ICNC, PIMRC, M2M IOT and ACM MSWiM
- Volunteer:**
- **Student Volunteer,** IEEE SECON Conference 2017, San Diego, CA
 - **Student Speaker,** Workshop on “Understanding the U.S. Classroom as a Student and Teaching Assistant” at GRC, UC Irvine (Oct. 22, 2015)
- Member:**
- Peer mentor, Graduate Resource Center, University of California, Irvine
 - Member, Golden Key International Honour Society
 - Member, IEEE
 - Member, IEEE Communication Society.
 - Member, Association of Computing Machinery (ACM)

REFERENCES

Dr. Sujit Dey

Professor, Director of CWC & IGE
Dept. of Electrical & Computer Engg.
University of California, San Diego
Email: dey@ece.ucsd.edu
Phone: (858)-761-7518
Web: <http://mesdat.ucsd.edu/sujit-dey>

Dr. Bhaskar Krishnamachari

Professor, Ming Hsieh Faculty Fellow
Department of Electrical Engineering
University of Southern California
Email: bkrishna@usc.edu
Phone: (213)-821-2528
Web: <http://ceng.usc.edu/~bkrishna>

Dr. Marco Levorato

Associate Professor,
Dept. of Computer Science
University of California, Irvine
Email: levorato@uci.edu
Phone: (949) 824-2175
Web: <http://www.ics.uci.edu/~mlevorat>

Dr. Ravi Prakash

Professor, Dept. of Computer Science
University of Texas at Dallas
Email: ravip@utdallas.edu
Phone: (972) 883-2289
Web: <http://www.utdallas.edu/~ravip>