Vaskar Raychoudhury

Senior Member, ACM **Senior Member, IEEE** **DAAD Fellow** **Humboldt Fellow**

CONTACT INFORMATION

Department of Computer Science & Software Engineering
Miami University
205V Benton Hall, 510 E. High St., Oxford, OH 45056
http://www.users.miamioh.edu/raychov/

Office: (+1) 513-529-0845
e-mail: vaskar@ieee.org
raychov@miamioh.edu

RESEARCH INTERESTS

Mobile and Pervasive Computing, (Mobile) Social Networks, Named Data Networks (NDN), Internet-of-Things, Wireless Sensor Networks (WSN), Crowdsourcing / Participatory Sensing, Smart Healthcare, Large-scale sensory data management

PAST WORK EXPERIENCE

- Postdoctoral Research Associate, Internet and Mobile Computing Lab, Department of Computing, The Hong Kong Polytechnic University (May 19, 2010 – February 28, 2011)
- Postdoctoral Researcher Engineer in the Handicom Lab, Telecommunication Network and Services Department, Institut TELECOM & Management SudParis, Evry, France (March 1, 2011 - October 31, 2011)
- Assistant Professor in the Department of Computer Science & Engineering, Indian Institute of Technology (IIT) Roorkee, India (October 27, 2011 – January 10, 2018)
- Visiting Assistant Professor, Department of Computer Science (Informatik), Technische Universität Darmstadt, from June 22-July 21, 2015
- Alexander von Humboldt Postdoctoral Research Fellow at University of Mannheim, Germany from May, 2016 to July, 2017 and June - August, 2018

EDUCATION

Ph.D. in Computer Science, The Hong Kong Polytechnic University, Hong Kong
April 2006 – May 2010
- *Advisor*: Dr. Jiannong Cao
- *Thesis title*: Reliable Service Discovery and Access in Pervasive Computing Environments
- *URI*: http://hdl.handle.net/10397/2769

M.S. (by research) in Information Technology, Indian Institute of Technology (IIT) Kharagpur, India
August 2003 – January 2006
- *Thesis title*: A Middleware for Building Mobile Agent Based Distributed Applications

B.Tech. in Information Technology, B.P. Poddar Institute of Management & Technology (Affiliated to Kalyani University), Kolkata, West Bengal, India
September 1999 – July 2003

HONOURS AND AWARDS

- ACM Senior Member since July, 2017
- Alexander von Humboldt fellowship in March, 2015 (One of only 9 people globally to receive AvH fellowship in Computer Science in 2015)
- Received DAAD-IIT joint fellowship on bilateral academic exchange for the year 2015.
- IEEE Senior Member since April, 2014
- Young Scientist Research Grant from SERB, Department of Science & Technology (DST), Govt. of India, 2012-2016
- Received International Travel Support (ITS) from the Department of Science & Technology (DST), Govt. of India for presenting the paper accepted in IEEE Healthcom 2014
- Received 10 Lakhs Indian Rupees from IIT Roorkee as Faculty Research Initiation Grant (the first faculty member to receive such a high amount)
- The Hong Kong Polytechnic University International Postgraduate Scholarship for PhD Studies. [Yr. 2005] (One of only 6 people globally to receive this scholarship in 2005)
- A national prize and a certificate of merit as a selected candidate in the 12th all India essay contest on nuclear science and technology, conducted by Bhabha Atomic Research Centre (BARC) & the Dept. of Atomic Energy, Govt. of India. [Yr. 2000]
- A national prize, a certificate of merit and a national scholarship for being 33rd (among 3, 38,

206 examinees) in the state (West Bengal) in Higher Secondary Examination (M.O: 89.9%) [Yr. 1999]

- A national prize, a certificate of merit and a national scholarship for being 24th (among 4, 72, 665 examinees) in the state (West Bengal) in Secondary Examination (M.O: 91.625%). [Yr. 1997]

PUBLICATIONS

Book Chapters

1. Jiannong Cao, Joanna Siebert, and *Vaskar Raychoudhury*, "Service Management in Pervasive Computing Environments", *Pervasive Computing and Networking*, Mohammad S. Obaidat, Mieso Denko, and Isaac Woungang (Eds.), John Wiley & Sons, Ltd.
2. Sobin CC, *Vaskar Raychoudhury*, Snehanshu Saha, "A Survey of Parallel Community Detection Algorithms," (IGI Global Book chapter under review)

Technical Reports

3. Biplav Srivastava, Sandeep Sandha, *Vaskar Raychoudhury*, Sukanya Randhawa, Viral Kapoor, Anmol Agrawal, "An Open, Multi-Sensor, Dataset of Water Pollution of Ganga Basin and its Application to Understand Impact of Large Religious Gathering," http://arxiv.org/abs/1612.05626, December, 2016.
4. Deepak Uniyal and *Vaskar Raychoudhury*, "Pervasive healthcare-a comprehensive survey of tools and techniques," pp. 1-48, arXiv preprint arXiv:1411.1821, Nov 2014,
5. *Vaskar Raychoudhury*, Rahul Raj, Pranay Chaudhary, Surendra Gadwal, "Text Detection in Natural Scenes," pp. 1-12, May 2014.

Journal Publications

6. Tarun Kulshrestha, Divya Saxena, Rajdeep Niyogi, *Vaskar Raychoudhury*, and Manoj Misra, "A SmartITS: Smartphone-based identification and tracking using seamless indoor-outdoor localization," Journal of Network and Computer Applications (JNCA), Elsevier, Volume 98, 15 November 2017, Pages 97-113.
7. Divya Saxena and *Vaskar Raychoudhury*, "Design and Verification of an NDN-based Safety-critical Application: A Case Study with Smart Healthcare," IEEE Transactions on Systems, Man, and Cybernetics: Systems, June 2017
8. Sobin CC, *Vaskar Raychoudhury*, Snehanshu Saha, "An Incentive-Based Scheme for Mitigating Node Selfishness in Smart Opportunistic Mobile Networks," Wireless Personal Communications, Springer, Pages 1-19. doi:10.1007/s11277-017- 4139-x, April 2017.
9. Divya Saxena and *Vaskar Raychoudhury*, "N-FIB: Scalable, Memory Efficient Name-based Forwarding," Journal of Network and Computer Applications (JNCA), Elsevier, Volume 76, December 2016, Pages 101–109 **(I/F: 2.331** source: Thomson Reuters**)**.
10. Divya Saxena, *Vaskar Raychoudhury*, Neeraj Suri, Christian Becker, and Jiannong Cao, "Named Data Networking: A Survey", Elsevier Computer Science Review, February, 2016.
11. Sobin CC, *Vaskar Raychoudhury*, Gustavo Marfia, and Ankita Singla, "A Survey of Routing and Data Dissemination in Delay Tolerant Networks," Journal of Network and Computer Applications (JNCA), Elsevier, Volume 67, May 2016, Pages 128–146 **(I/F: 2.331** source: Thomson Reuters**)**.
12. Divya Saxena and *Vaskar Raychoudhury*, "Radient: Scalable, Memory Efficient Name Lookup Algorithm for Named Data Networking," Journal of Network and Computer Applications (JNCA), Elsevier, Volume 63, March 2016, Pages 1–13 **(I/F: 2.331** source: Thomson Reuters**)**.
13. *Vaskar Raychoudhury*, Shikhar Shrivastav, Sandeep Singh Sandha, and Jiannong Cao, "Crowdsourcing based Context-aware Panoramic Map Generation for Smartphone Users," In IEEE Transactions on Parallel and Distributed Systems (TPDS), Vol. 26, Issue 8, pp. 2208 – 2219, 2015 **(I/F: 2.661** source: Thomson Reuters**).**
14. *Vaskar Raychoudhury*, Ajay D. Kshemkalyani, Daqing Zhang, and Jiannong Cao, "Automatic Event Scheduling in Mobile Social Network Communities," In IEEE Transactions on Parallel and Distributed Systems (TPDS), Vol. 25, Issue 11, pp. 2772 – 2782, 2014 **(I/F: 2.661**

source: Thomson Reuters**)**.

15. *Vaskar Raychoudhury*, Jiannong Cao, Rajdeep Niyogi, Weigang Wu, and Yi Lai, "Top K-leader Election in Mobile Ad Hoc Networks," In Journal of Pervasive and Mobile Computing (PMC), Elsevier, Vol. 13, pp. 181-202, August 2014 **(I/F: 1.719** source: Thomson Reuters**)**.
16. *Vaskar Raychoudhury*, Jiannong Cao, Mohan Kumar, and Daqiang Zhang, "Middleware for Pervasive Computing: A Survey," Journal of Pervasive and Mobile Computing, Elsevier, Volume 9, Issue 2, April 2013, Pages 177–200 **(I/F: 1.719** source: Thomson Reuters**)**.
17. Weiping Zhu, Jiannong Cao, Henry Chan, Xuefeng Liu, and *Vaskar Raychoudhury* "Mobile RFID with a High Identification Rate," Accepted for publication in IEEE Transactions on Computers (TC), February, 2013.
18. Daqiang Zhang, Zhijun Yang, *Vaskar Raychoudhury*, Zhe Chen, "An Energy-efficient Routing Protocol Using Movement Trend in Vehicular Ad-hoc Networks," in the Computer Journal, February, 2013.
19. *Vaskar Raychoudhury*, Jiannong Cao, Weigang Wu, and Steven Lai, "K-Directory Community: Reliable Service Discovery in MANET," Journal of Pervasive and Mobile Computing, Elsevier, Volume 7, Issue 1, February 2011, Pages 140-158 **(I/F: 1.719** source: Thomson Reuters**)**.

Conference Publications

20. Viral Kapoor, Divya Saxena, *Vaskar Raychoudhury*, Sandeep Kumar, "A Real Time Building and Maintaining Causal Congestion Graph for Intelligent Traffic Management, In Proceedings of Third IEEE International Workshop on Pervasive Context-Aware Smart Cities and Intelligent Transport Systems (PerAwareCity'18), in conjunction with IEEE International Conference on Pervasive Computing and Communications (PerCom), March 19-23, Athens, Greece.
21. Janick Edinger, Dominik Schaefer, Christian Krupitzer, *Vaskar Raychoudhury* and Christian Becker, "Fault-Avoidance Strategies for Context-Aware Schedulers in Pervasive Computing Systems," In Proceedings of IEEE International Conference on Pervasive Computing and Communications (PerCom), March 13-17, Hawaii, USA.
22. Divya Saxena, *Vaskar Raychoudhury* and Christian Becker, "Implementation and Performance Evaluation of Name-based Forwarding Schemes in V-NDN," In Proceedings of International Conference on Distributed Computing and Networking (ICDCN), January 4-7, Hyderabad, India, 2017 (short paper).
23. Divya Saxena, *Vaskar Raychoudhury* and Christian Becker, "An NDNoT based Efficient Object Searching Scheme for Smart Home using RFIDs," In Proceedings of International Conference on Distributed Computing and Networking (ICDCN)**,** January 4-7, Hyderabad, India, 2017.
24. Sobin CC, V*askar Raychoudhury* and Snehanshu Saha, "An Energy-efficient and Buffer-aware Routing Protocol for Opportunistic Smart Traffic Management," Accepted in International Conference on Distributed Computing and Networking (ICDCN), January 4-7, Hyderabad, India, 2017.
25. [Invited Paper] Divya Saxena, *Vaskar Raychoudhury*, Christian Becker and Neeraj Suri, "A Reliable Memory Efficient Name Forwarding in Named Data Networking," In Proceedings of 14th IEEE/IFIP International Conference on Embedded and Ubiquitous Computing (EUC), August 24-26, 2016, Paris, France.
26. Sobin CC, Alark Sharma, Deepak S. and V*askar Raychoudhury*, "Socio-Physical Interaction Network (SPIN)," In Proceeding of 4th International Conference on Advances in Computing, Communications and Informatics (ICACCI), August 10-13, 2015, Kochi, India.
27. Divya Saxena, *Vaskar Raychoudhury* and Nalluri SriMahathi, "*SmartHealth-NDNoT*: Named Data Network of Things for Healthcare Services," In Proceedings of ACM 5th International Workshop on Pervasive Wireless Healthcare (MobiHoc MobileHealth), June 22-25, 2015, Hangzhou, China.
28. *Vaskar Raychoudhury*, Divya Saxena, Mayank Chaudhary and Shivam Mangla "Shahbag

Movement: The Tweeted Perspective" In Proceedings of the Social Networking Workshop of the 7th International Conference on COMmunication Systems & NETworkS (COMSNETS), January 6-10, 2015, Bangalore, India.

29. Harsh Jhamtani, Suleep Kumar Bhogi and V*askar Raychoudhury*, "Word-level Language Identification in Bi-lingual Code-switched Texts," In Proceedings of the 28th Pacific Asia Conference on Language, Information and Computing (PACLIC), 2014.

30. Preetika, Rani, *Vaskar Raychoudhury*, Sandeep Singh Sandha and Dhaval Patel, "Mobile Health Application for Early Disease Outbreak-Period Detection," In Proceedings of the 16th IEEE International Conference on e-Health Networking, Applications and Services (Healthcom 2014), October 15-18, 2014, Natal, Brazil.

31. Peeyush Jain, Rohan Kabra, Sajal Rustagi, Tarun Bansal, Dhaval Patel and *Vaskar Raychoudhury*, "MC^2: On-the-Fly Mobile Compute Cloud for Computational Intensive Task," In Proceedings of the 5th IBM Collaborative Academia Research Exchange (I-CARE) Workshop, October 2013, New Delhi, India.

32. *Vaskar Raychoudhury*, Ajay D. Kshemkalyani, Daqing Zhang, Jiannong Cao, Mohit Bakshi, Kanik Gupta, Vishal Mittal and Siddharth Maheshwari, "Automatic Event Scheduling in Mobile Social Network Communities," In Proceeding of 5th IEEE International Conference on Social Computing (SocialCom), September 8-14, 2013, Wasington D.C., USA [**accepted initially as a journal paper: Top 3%**].

33. *Vaskar Raychoudhury*, Jiannong Cao, Weiping Zhu and Ajay D. Kshemkalyani, "Context Map for Navigating the Physical World," In Proceedings of 20th Euromicro International Conference on Parallel, Distributed and Network-Based Computing (PDP), Pages 146-153, February 15-17, 2012, Munich, Germany.

34. *Vaskar Raychoudhury*, Ajay D. Kshemkalyani and Jiannong Cao, "Querying Context Maps using Relative Timing Predicates in Pervasive Environments," In Proceedings of 6th International Workshop on Middleware Tools, Services and Run-time Support for Networked Embedded Systems (MidSens'11) to be held with Middleware 2011 Conference, December 12-16, 2011, Lisbon, Portugal.

35. Daqing Zhang, Zhu Wang, Bin Guo, Xingshe Zhou and *Vaskar Raychoudhury*, "A Dynamic Community Creation Mechanism in Opportunistic Mobile Social Networks," In Proceedings of Privacy, security, risk and trust (PASSAT), IEEE 3rd International conference on social computing (SOCIALCOM), pp. 509-514, October 9-11, 2011, Boston, MA, USA.

36. Weiping Zhu, Jiannong Cao, Yi Xu and *Vaskar Raychoudhury*, "Event Aggregation with Different Latency Constraints and Aggregation Functions in Wireless Sensor Networks," In Proceedings of IEEE International Conference on Communications (ICC), pp. 1-5, June 5-9, 2011, Kyoto, Japan.

37. *Vaskar Raychoudhury*, Jiannong Cao, Weigang Wu, and Cheng Hui, "Service Handoff for Reliable and Continuous Service Access in Pervasive Computing," In Proceedings 19th Euromicro International Conference on Parallel, Distributed and Network-Based Computing (PDP), pp. 172-179, February 09-11, 2011, Ayia Napa, Cyprus.

38. *Vaskar Raychoudhury*, Jiannong Cao, Weigang Wu, and Steven Lai, "K-Directory Community: Reliable Service Discovery in MANET," In Proceedings of 11th International Conference on Distributed Computing and Networking (ICDCN2010), Springer LNCS Volume 5935, 2010, pp. 420-433, January 3-6, 2010, Kolkata, India (http://dx.doi.org/10.1007/978-3-642-11322-2_40).

39. *Vaskar Raychoudhury*, "Efficient and Fault Tolerant Service Discovery in MANET using Quorum-based Selective Replication," In Proceedings of 7th Annual IEEE International Conference on Pervasive Computing and Communications (Percom 2009: Google PhD Forum), pp. 1-2, Galveston, Texas, USA, March 9-13, 2009.

40. Daqiang Zhang, Jiannong Cao, Jingyu Zhou, Minyi Guo, and *Vaskar Raychoudhury*, "An Efficient Collaborative Filtering Approach Using Smoothing and Fusing," In Proceedings of the 38th International Conference on Parallel Processing (ICPP'09), pp. 558 – 565, September 22-25, 2009, Vienna, Austria.

41. [Invited Paper] *Vaskar Raychoudhury*, Jiannong Cao, and Weigang Wu, "Top K-leader

Election in Wireless Ad Hoc Networks," In Proceedings of 17th International Conference on Computer Communications and Networks (ICCCN'08), pp. 1 – 6, August 3-7, 2008, St. Thomas, U.S. Virgin Islands.

42. Joanna Izabela Siebert, Jiannong Cao, Yu Zhou, Miaomiao Wang, and *Vaskar Raychoudhury*, "Universal Adaptor: A Novel Approach to Supporting Multi-protocol Service Discovery in Pervasive Computing," In Proceedings of International Conference on Embedded and Ubiquitous Computing (EUC'07), pp. 683-693, December, 2007, Taipei, Taiwan.

43. Miaomiao Wang, Jiannong Cao, Joanna Izabela Siebert, *Vaskar Raychoudhury*, and Jing Li, "Ubiquitous Intelligent Object: Modeling and Applications," In Proceedings of 3rd International Conference on Semantics, Knowledge and Grid (SKG'07), pp. 236 – 241, Oct. 29-31, 2007. Xian, China.

44. Yu Zhou, Jiannong Cao, *Vaskar Raychoudhury*, Joanna Izabela Siebert, and Jian Lu, "A Middleware Support for Agent-Based Application Mobility in Pervasive Environments," In Proceedings of the 27th International Conference on Distributed Computing Systems Workshops (ICDCSW'07), pages -9, June 25-29, 2007, Toronto, Ontario, Canada.

45. *Vaskar Raychoudhury* and Arobinda Gupta, "A Middleware for Building Mobile Agent-Based Distributed Applications," In Proceedings of the 13th International Conference on Advanced Computing & Communications (ADCOM'05), December 14-17, 2005, Coimbatore, India.

RESEARCH EXPERIENCE

Postdoctoral Researcher — **HANDICOM Lab**
March 2011 – October 2011 — Institut TELECOM & Management SudParis, France

I have worked in an EU FP7 funded project named *Self Orchestrating CommunIty ambiEnT IntelligEnce Spaces*, or SOCIETIES (http://www.ict-societies.eu/), in short. The vision of SOCIETIES was to develop a complete, integrated Community Smart Space (CSS), which extends pervasive systems beyond the individual to dynamic communities of users. CSSs would embrace on-line community services, such as Social Networking in order to offer new and powerful ways of working, communicating and socialising. The project had 16 partners spread over 10 different EU countries.

Our primary task in this project was to develop a user agent functionality that will coordinate and manage the implementation of behaviors on behalf of a user. Therefore it would provide various intelligent decision making functionalities with the aim of mitigating the need for user intervention while automatically resolving conflicts in the CSS. Decisions had to be based on the needs of the user as an individual and as a member of multiple communities. My responsibility was to analyse the user agent function over various application use cases and then proposing a suitable and effective architecture for the user agent system. Later I was responsible for implementing the user agent functionalities.

Postdoctoral Research Associate — **Internet and Mobile Computing Laboratory**
May 2010 – February 2011 — The Hong Kong Polytechnic University

During my PhD study, I have written the proposal with another team mate for the project titled "*A Ubiquitous Searching and Browsing Framework (USBF)*" for NOKIA Research Centre, Beijing and we received the funding of **224,980 Hong Kong dollars (~23,652 Euros)**. I have worked on this project during my postdoctoral research. The objective of this project was to develop a Google-like search engine to enable users to identify, search, and browse information about objects and people in the physical world as they do in the cyber space of the Internet. We considered that all the physical world objects as well as humans are smart entities with embedded sensing, computing and communication capabilities, and they are interconnected through different contextual relationships. We developed a smart logistics system which entitles users to search objects and people and browse through their contextual links. Link (http://imc.comp.polyu.edu.hk/pvc/doku.php?id=demonstration) contains a demo video and related documentation.

I have also worked in another project titled "*Programming Pervasive Computing Middleware based on Ubiquitous Interacting Objects*". A middleware for pervasive computing is required to assist application developers by bridging the huge gap between the high-level application requirements and the heterogeneity of the underlying devices, networks and platforms. However, Most existing

middleware systems for pervasive computing are based on a top-down, centralized model which lacks flexibility. In this project, we worked to develop a bottom-up, decentralized approach for designing and programming pervasive computing middleware functions based on ubiquitous interacting objects (UIOs), which are smart objects augmented with various processing capabilities. Many middleware functions, such as service discovery and composition, context derivation, and context inconsistency checking, could be performed through the decentralized interaction and autonomous collaboration of the UIOs. I, along with a team member, wrote a proposal requesting funding for this topic, under the guidance of my supervisor, and we received a grant of **1,218,000 Hong Kong dollars (~127,844 Euros)** from GRF Hong Kong for the period 2010-2013.

A third project I have worked during my postdoctoral stint at The Hong Kong Polytechnic University dealt with designing a novel simulation platform for aiding developers in developing applications, protocols, and algorithms in pervasive networking and computing (PNC) environment. Development and deployment of systems and applications for PNC is challenging due to the need of creating various application specific smart environments. In many cases, it is very difficult and even impractical to experiment with and test the proposed mechanisms due to the overhead of managing a large number of smart devices. Existing test-beds and simulators for experimenting with PNC systems are limited in scale and are mostly designed for simulating applications and not protocols and algorithms. In this project we aimed to develop a generic framework and software environment for simulating different types of PNC applications, protocols and algorithms. Along with the traditional computing devices, sensors and actuators, we planned to model everyday physical objects as smart entities called ubiquitous interacting objects (UIOs), and to develop the simulation system based on the abstraction of UIO and their interactions. I, along with a team member, wrote a proposal requesting funding for this topic, under the guidance of my supervisor, and we received a grant of **945,000 Hong Kong dollars (~99,189 Euros)** from GRF Hong Kong for the period 2011-2014.

Graduate Research Assistant — **Internet and Mobile Computing Laboratory**
April 2006 – May 2010 — The Hong Kong Polytechnic University

Service discovery is one of the fundamental services in pervasive computing where different services are provided by various portable devices interconnected in an ad hoc manner. Given its dynamic nature, service unavailability can frequently occur in pervasive environments due to service provider failure, network partitioning, or service scope outage by service provider or user mobility. As part of my Ph.D. thesis, I attempted to address some of the fault-tolerance issues associated with service discovery applications in pervasive and mobile computing environments and proposed some algorithms and protocols. Following is a brief description of these approaches.

- **Formation of a Directory Community:** Directory community framework consists of a set of relatively resource-rich mobile devices acting as directory nodes and the framework along with a suite of protocols works as the basis of our research in reliable service discovery and access in ad hoc networks. The directory community formation problem has been modeled as top-K highest resource leader election in mobile ad hoc networks and a distributed algorithm has been proposed to achieve the objective in a scalable, reliable, and message-efficient manner.

- **Quorm-based Reliable Service Discovery:** Using the directory community framework, a quorum-based fault-tolerant service discovery protocol has been developed. The elected directory nodes are divided into multiple quorums. Services registered with a directory are replicated among its quorum members, in order to increase availability. This approach guarantees network-wide service availability using the quorum intersection property and reduces replication and update costs by minimizing the quorum size.

- **Service Handoff based Reliable Service Access:** Based on the directory community, a reliable and continuous service access mechanism has been developed for mobile users and it works using service handoff. Service handoff provides mobile users seamless service access by proactively finding new matching services once the original service becomes unavailable. Three different service handoff protocols have been designed for different situations. The handoff protocols can reduce handoff message cost and time delay while achieving a load balance on service providers.

Junior Project Assistant — **Microsoft Laboratory**
August 2003 – January 2006 — Department of Computer Science and Engineering, Indian Institute of Technology, Kharagpur

During my M.S. study, I was associated with the project "*A Middleware for Building Mobile Agent-Based Distributed Applications*", sponsored by the Ministry of Human Resource Development (MHRD), Govt. of India. This project was targeted to the users unacquainted with mobile agent programming. The project aimed to develop a middleware to facilitate the automatic generation of mobile agent codes based on certain input parameters specified by the user. The middleware also provided certain fault-tolerant functionalities. I solely developed the middleware in C#.

FUNDED RESEARCH PROJECTS (Completed)

- *Development of an Internet-of-Things (IoT) framework for navigating the physical world*, Faculty Initiation Research Grant, Ministry of Human Resources Development (MHRD), Govt. Of India || Rs. 10 Lakh (~15,000 USD) (2012-16)
- *SPIN: Socio-Physical Interaction Network to facilitate searching, tracking, and socializing between smart entities*, Fast Track Scheme for Young Scientists, Department of Science & Technology (DST), Govt. of India || Rs. 15.42 Lakh (~ 24,000 USD) (2013-16)
- Information Security and Education Program-II, The Department of Electronics and Information Technology (DeitY), Ministry of Communications and Information Technology, Govt. of India (co-PI of this joint project)

RESEARCH STUDENTS

Graduate (PhD) Students:
- Ongoing – 2 [IIT-Roorkee]

Graduate (M.Tech) Students:
- Ongoing – 1 [Maimi U]
- Completed – 17 [IIT-Roorkee]

Undergraduate (B.Tech) FYP/BTP Students:
- Completed – 17 [IIT-Roorkee]

TEACHING EXPERIENCE

Associate Professor – *Miami University, Oxford, OH, USA*

- *CSE 464/564: Algorithms – Spring 2018 [Enrolment 66]*

Assistant Professor – *IIT Roorkee, Uttarakhand, India*

- *EC-252: Computer Architecture & Microprocessors – Spring 2012 (3L-4T-0P) [Enrolment 159]*
- *EC-253: System Software – Autumn 2012-13 (2L-2T-0P) [Enrolment 84]*
- *EC-351: Design & Analysis of Algorithms – Autumn 2012 (3L-2T-0P) [Enrolment 124]*
- *EC-252: Computer Architecture & Microprocessors – Spring 2013 (3L-4T-0P) [Enrolment 167]*
- *EC-351: Design & Analysis of Algorithms – Autumn 2013 (3L-2T-0P) [Enrolment 129]*
- *EC-252: Computer Architecture & Microprocessors – Spring 2014 (3L-4T-0P) [Enrolment 173]*
- *EC-652: Parallel and Distributed Algorithms – Spring 2014 (3L-0T-0P) [Enrolment 24]*
- *CS-503: Advanced Computer Networks – Autumn 2014 (3L-1T-0P) [Enrolment 54]*
- *EC-652: Parallel and Distributed Algorithms – Spring 2015 (3L-0T-0P) [Enrolment 80]*
- *CSN-101: Introduction to Computer Sc. and Engg. – Autumn 2015 (2L-0T-0P) [Enrolment 80]*
- *CSN-232: Operating Systems – Spring 2016 (3L-1T-0P) [Enrolment 98]*
- *CSN-221: Computer Architecture & Microprocessors – Autumn 2017 (3L-4T-0P) [Enrol. 169]*

Teaching Assistant – *The Hong Kong Polytechnic University*

- *Information Technology Systems (COMP 111) – Spring 2008*
  Assisted undergraduate students in computer laboratory to learn C programming. I was in charge of projects and assignments for this course.
- *Computer Applications (COMP 250) – Fall 2006 and 2007*
  Taught undergraduate students the basic computer applications using Microsoft Word, Excel, PowerPoint and Access. Also assisted them to develop simple Web applications using HTML.

Teaching Assistant – *Indian Institute of Technology, Kharagpur*

- *Computing Systems Laboratory*
  Assisted graduate students in laboratory assignments.

PROFESSIONAL ACTIVITIES

Invited Talks

- Siemens Corporate Technology, Cyber-Physical Systems Division, Princeton NJ, Mar. 24, 2017
- IBM T.J. Watson Research Centre, Yorktown Heights, NY USA, Mar. 6, 2017
- Dept. of CS, Rochester Inst. of Technology, NY, USA, Mar. 3, 2017
- Dept. of CS and Software Engineering, Miami University, OH, USA, Mar. 1, 2017
- Dept. of Computer Science, University of Bologna, Italy, Feb 23, 2017
- IBM India Research Lab (IRL), Vasant Kunj, New Delhi, April 20, 2016.
- Invited talk (3-day lecture series) in Government Engineering College, Idukki, Kerala, Apr. 2-4, 2016.
- Invited talk (3-day lecture series) in Government Engineering College, Palakkad, Kerala, Mar. 30-Apr. 1, 2016.
- Invited talk in Dept. of Computer Science, IIT Roorkee in the short-term course on Security in Internet-of-Things, February 2016
- Invited talk in Indian Institute of Engineering Science and Technology (IIEST), Shibpur, West Bengal, India, January 8, 2016
- Invited talk in GNIT, Kolkata, India, January 7, 2016
- Plenary speaker in Indian Science Congress 2016, Mysore, India, January 4, 2016.
- Invited talk (2-day lecture series) in Government Engineering College, Wayanad, Kerala, Dec. 31, 2015-Jan. 01, 2016.
- Invited talk in MES College of Engineering, Kuttippuram, Kerala, India, Dec. 30, 2015.

Chairing Responsibilities:

- Publicity co-Chair,
- General co-Chair, IEEE PerAwareCity'18
- Publicity co-Chair in ICDCN 2018
- General Chair and TPC Chair, IEEE AIST 2017
- TPC Chair in ACM Mobile Health 2017 (with ACM MobiHoc)
- Track Chair on *Privacy and Security in Smart City Environment: A Synergy of IoT, Big Data and Cloud* in IEEE ATC 2016, IEEE ATC 2015
- Track Chair on *Hardware/Software for Internet of Things (IOT)* in IEEE iNIS 2017, 2016, 2015
- Publicity co-Chair in ACM Mobile Health 2016
- Publicity co-Chair for SDDCS 2016 (with IEEE ICDCS)
- General Chair in BSCI 2015 (with ICSOC)
- Track Chair on IoT Architecture in IEEE TENSYMP 2015
- Track Chair on *Applications of Bio-inspired Techniques to Social Computing* in BIC-TA 2012
- Track Chair on *Cyber Physical Society with SOA, BPM and Sensor Networks* in WETICE-2012
- Coordinator of Research Promotion Workshop on *Introduction to Graph and Geometric Algorithms*, 6-8 March, 2014, IIT Roorkee.

Technical Program Committee Membership:

- IEEE PIMRC Track 4 - Services, Applications and Business
- IEEE ATC 2017
- IEEE Globecom (SAC-SN) 2017, 2016
- ICDCN Networking Track, 2018, 2017, 2016, 2015 (+Student Research Forum), 2014
- ACM Mobile Health 2017, 2016, 2015 (with ACM MohiHoc)
- Social Informatics, 2015, 2014, 2012
- IEEE SocialCom 2014, 2013, 2012
- Big Data, 2015
- ACM IMCOM, 2015
- ICIT 2014
- ICCC, 2013
- KAMIoT 2012 (with IEEE IUCC)

Coordinator:

- Department of Computer Science and Engineering is hosting Research Promotion Workshop on Introduction to Graph and Geometric Algorithms during 6-8 March, 2014 as a part of celebrating 50 years of excellence

Short-term Course:

- Organized a week-long (June 25-29, 2012) AICTE sponsored short-term course in IIT Roorkee, titled "*Applying Pervasive Computing and Social Networks to Accelerate the Growth of Rural and Urban India*". The course received extremely-positive feedback from the participants.

Member – *ACM (senior), IEEE (senior), IEEE Computer Society, IEEE Communication Society*

Reviewer:

- International Journals including Communications of the ACM, Pervasive and Mobile Computing Journal – Elsevier, International Journal of Information Technology and Decision Making, Multiagent and Grid Systems Journal, Journal of Parallel and Distributed Computing – Elsevier, Journal of Ubiquitous Computing and Intelligence, IEEE Communications Magazine, Ad Hoc Networks – Elsevier, International Journal of Computers and Applications, KSII Transactions on Internet and Information Systems, Journal of Computer Sc. And Technology, International Journal of Signal and Imaging Systems Engineering (IJSISE), Journal of Internet Technology, EURASIP Journal on Wireless Communications and Networking, IEEE Transactions on Systems, Man and Cybernetics, Part A, IEEE Transactions on Parallel and Distributed Systems, IEEE Transactions on Computers, IEEE Transactions on Mobile Computing and many others.

- International Conferences and Workshops including ICDCS, ICPP, PERCOM, ICNP, ICC, SRDS, AD HOC NOW, APSCC, CHINACOM, EUC, HiPC, MDM, MP2P, NPC, OPODIS, PRDC, ICDCN, SKG, CCGrid, SCC, FGCN, HPCC, ICPADS, GPC, GLOBECOM, SSS, TrustCom, Mobilware, CCNC, and many others.

Summer Research Visit(s):

- Department of Computer Science (Informatik), Technische Universität Darmstadt, from June 22-July 21, 2015
- Department of Computing, The Hong Kong Polytechnic University, from May 12-June 11, 2014
- Department of Computing, The Hong Kong Polytechnic University, from May 20-July 18, 2013

ADMINISTRATIVE ACTIVITIES (for the Department)

- Member, Department Academic Program Committee (DAPC), IIT Roorkee
- Past-Member, Department Research Committee (DRC), IIT Roorkee
- Past-Member, Department Faculty Search Committee, IIT Roorkee
- (Past) Professor-in-charge, Department Website Maintenance, IIT Roorkee
- (Past) Professor-in-charge, Training and Placement, Dept. of Comp. Sc. & Engg., IIT Roorkee
- (Past) Professor-in-charge, Research Scholar's Lab, Dept. of Comp. Sc. & Engg., IIT Roorkee
- Professor-in-charge, Information Security Lab, Department of Computer Science & Engg., IIT Roorkee (*Supported by Ministry of Information & Communication Technology, GoI*)
- Professor-in-charge, Network Security Lab, Department of Computer Science & Engg., IIT Roorkee (*Supported by CISCO Systems Inc.*)
- Youngest member of the committee constituted by the Director, IIT Roorkee, for restructuring of the Department of Electronics and Computer Engineering (E&CE), IIT Roorkee into two different departments namely, Computer Science & Engineering and Electronics & Communication Engineering. (Role*: Preparing a 20-year-vision document to set the direction of teaching, research, and development of the new Computer Science & Engineering department*.)

ADMINISTRATIVE ACTIVITIES
(For Government of India)

- Member of the Project Review and Supervisory Group in the fields of *Development of e-content, quality assurance, pedagogy and regional language* under the National Mission on Education through ICT (NMEICT) funded by Ministry of Human Resource Development (MHRD), Department of Higher Education (TEL Division), Government of India.
- Expert reviewer of several technical projects submitted for funding by the Science & Engineering Research Board (SERB), under the Department of Science and Technology, Government of India.
- Reviewer of International project proposals submitted for funding by Indo-French Centre for the Promotion of Advanced Research (CEFIPRA), Department of Science and Technology (DST), Government of India and Institut National de Recherche en Informatique et en Automatique (INRIA) jointly with the Centre National de la Recherche Scientifique of France (CNRS).