Muhammad Taqi Raza

CONTACT INFORMATION

1130 E. Helen St
McClelland Hall, Room 430EE
Tucson, Arizona, 85721-0108

web: http://u.arizona.edu/~taqi/
phone: +1 520-626-7566
e-mail: taqi@email.arizona.edu

RESEARCH INTERESTS

Systems Security and Reliability, Internet of Things (IoT), Mobile 4G and 5G Networks, and Cloud Computing.

EMPLOYMENT

University of Arizona, United States

Assistant Professor of Management Information Systems   August 2019 –

EDUCATION

University of California Los Angeles, United States

Doctor of Philosophy of Computer Science (CGPA: 4/4)   September 2013 – June 2019

- Advisors: Professor Songwu Lu and Professor Mario Gerla.
- Thesis: Paving the Way for Secure and Available Mobile Networked Systems.
- **Awards**: Dissertation Year Fellowship, 2018 – 2019; Teaching Fellow, 2015 – 2019.

Master of Computer Science (CGPA: 4/4)   September 2013 – March 2017
- Advisors: Professor Songwu Lu and Professor Mario Gerla.
- Thesis: On the Analysis of 3G and 4G Protocols Interactions.
- **Awards**: Departmental Fellowship, 2013 – 2014; Qualcomm Innovation Fellowship Finalist, 2015.

Ajou University, South Korea

Master of Information and Communication Engineering   September 2006 – August 2008

- Advisors: Professor Ki-Hyung Kim and Professor Seung-Wha Yoo.
- Thesis: Design and Implementation of Sensor Service Portals (SSPs).
- **Awards**: Korean Government Fellowship, 2006 – 2008; Ajou University Fellowship, 2006 – 2008.

National University of Sciences and Technology, Pakistan

Bachelor of Information Technology   September 2002 – August 2006

- Advisors: Professor N.D. Gohar and Professor Michael Fiddy (UNCC).
- Thesis: Target Detection, Prediction and Tracking in Wireless Sensor Networks.
- **Awards**: Thesis Research Funded by Pakistan Telecommunication Authority, 2005–2006.

HONOURS AND AWARDS

- UCLA Dissertation Year Fellowship, 2018 – 2019.
- Best Paper Award Nominee, ACM MobiWac, Miami, 2017.
- Qualcomm Innovation Fellowship Finalist, 2015.
- Teaching Fellow in Computer Science Department, 2015 – 2019.
- Recipient of PhD Fellowship from the Computer Science Department, 2013 – 2014.
- MC President Award, LG Electronics, for contribution in LTE platform, 2012.
- Outstanding Performance Award for contributions in LTE protocols, 2011.

- Outstanding Performance Award for contributions in LTE protocols, 2010.
- Korean Government Scholarship Award, 2006 – 2008.
- Ajou University Tuition Fee Scholarship Award, 2006 – 2008.
- Travel Grants: ACM MobiHoc 2018, IEEE ICNP 207, ACM Sigcomm 2016 & 2017, NDSS 2016.

SELECTED
PUBLICATIONS
(PUBLISHED)
CITATIONS LINK

1. *Muhammad Taqi Raza*, and Songwu Lu, "Systematic Way to LTE Testing", In 25th *ACM International Conference on Mobile Computing and Networking (ACM MobiCom), 2019.* acceptance rate: 24.03%

2. *Muhammad Taqi Raza*, and Songwu Lu, "vEPC-sec: Securing LTE Network Functions Virtualization on Public Cloud", *IEEE Transactions on Information Forensics and Security (IEEE TIFS), 2019.*

3. *Muhammad Taqi Raza*, Songwu Lu, Mario Gerla, and Xi Li, "Refactoring Network Functions Modules to Reduce Latencies and Improve Fault Tolerance in NFV", In *IEEE Journal on Selected Areas in Communications (IEEE JSAC), 2018.*

4. *Muhammad Taqi Raza*, Dongho Kim, Kyu-Han Kim, Songwu Lu, and Mario Gerla, "Rethinking LTE Network Functions Virtualization", In 25th *IEEE International Conference on Network Protocols (IEEE ICNP), 2017.* acceptance rate: 18.8%

5. *Muhammad Taqi Raza*, and Songwu Lu, "Enabling Low Latency and High Reliability for IMS-NFV", In 13th *ACM/IEEE International Conference on Network and Service Management (ACM CNSM), 2017.* acceptance rate: 17.6%

6. *Muhammad Taqi Raza*, Fatima Muhammad Anwar, and Songwu Lu, "Exposing LTE Security Weaknesses at Protocol Inter-Layer, and Inter-Radio Interactions", In 13th *International Conference on Security and Privacy in Communication Networks (SecureComm), 2017.* acceptance rate: 29.5%

7. *Muhammad Taqi Raza*, Hsiao-Yun Tseng, ChangLong Li, and Songwu Lu, "Modular Redundancy for Cloud based IMS Robustness", In 15th *ACM International Symposium on Mobility Management and Wireless Access (ACM MobiWac), 2017.* (best paper award nominee). acceptance rate: 28%

8. *Muhammad Taqi Raza*, Fatima Muhammad Anwar, Seung-Wha Yoo, and Ki-Hyung Kim, "FESP: Fast and Energy Efficient Service Provisioning in 6LoWPAN", In 21st *IEEE International Symposium on Personal Indoor and Mobile Radio Communications (IEEE PIMRC), 2010.*

9. Fatima Muhammad Anwar, *Muhammad Taqi Raza*, Seung-Wha Yoo, and Ki-Hyung Kim, "ENUM based Service Discovery Architecture for 6LoWPAN", In *IEEE Conference on Wireless Communications and Networking Conference (IEEE WCNC), 2010.*

10. *Muhammad Taqi Raza*, Ryu Jeatek, Seung-Wh Yoo, Ki-Hyung Kim, Seong-Soon Joo, and Wun-Cheol Jeong, "An Architectural Framework for Web Portal in Ubiquitous Pervasive Environment", In 7th *IEEE Annual Conference on Communication Networks and Services Research (IEEE CNSR), 2009.*

11. Gargi Bag, SM Saif Shams, Ali Hammad Akbar, *Muhammad Taqi Raza*, Ki-Hyung Kim, and Seung-wha Yoo, "Network Assisted Mobility Support for 6LoWPAN", In 6th *IEEE Conference on Consumer communications and networking (IEEE CCNC), 2009.*

12. Gargi Bag, *Muhammad Taqi Raza*, Hamid Mukhtar, Ali Hammad Akbar, SM Saif Shams, Ki-Hyung Kim, Seung-wha Yoo, and Donghwa Kim, "Energy-Aware and Bandwidth-Efficient Mobility Architecture for 6LoWPAN", In 26th *IEEE Conference on Military Communications (IEEE*

MILCOM), 2008.

13. Syed Rehan Afzal, Subir Biswas, Jong-bin Koh, `Taqi Raza`, Gunhee Lee, and Dong-kyoo Kim, "RSRP: A Robust Secure Routing Protocol for Mobile Ad Hoc Networks", In *IEEE Conference on Wireless Communications and Networking (IEEE WCNC), 2008.*

14. `Muhammad Taqi Raza HM`, Ali Hammad Akbar, Shafique Ahmad Chaudhry, Gargi Bag, Seung-wha Yoo, and Ki-Hyung Kim, "A Yaw Rate Aware Sensor Wakeup Protocol (YAP) for Target Prediction and Tracking in Sensor Networks", In 25th *IEEE Conference on Military Communications (IEEE MILCOM), 2007.*

15. Ali Tufail, Syed Ali Khayam, `Muhammad Taqi Raza`, Amna Ali, and Ki-Hyung Kim, "An Enhanced Backbone-Assisted Reliable Framework for Wireless Sensor Networks", In *Sensors Journal, 2010.*

16. `Muhammad Taqi Raza`, Seung-Wha Yoo, Ki-Hyung Kim, Seong-Soon Joo, and Wun-Cheol Jeong, "Design and Implementation of an Architectural Framework for Web Portals in a Ubiquitous Pervasive Environment", In *Sensors Journal, 2009.*

17. `Muhammad Taqi Raza`, Gargi Bag, Seung-Wha Yoo, and Ki-Hyung Kim, "Dead Reckoning based Target Tracking in Wireless Sensor Networks", In *ACM SIGBED Review, 2009.*

18. Gargi Bag, `Muhammad Taqi Raza`, Ki-Hyung Kim, and Seung-Wha Yoo, "LoWMob: Intra-PAN Mobility Support Schemes for 6LoWPAN", In *Sensors Journal, 2009.*

19. `Muhammad Taqi Raza`, Zeeshan Hameed Mir, Ali Hammad Akbar, Seung-Wha Yoo, and Ki-Hyung Kim, "Adaptive Yaw Rate Aware Sensor Wakeup Schemes Protocol (A-YAP) for Target Prediction and Tracking in Sensor Networks", In *IEICE Transactions on Communications, 2008.*

BOOK
CHAPTERS

20. `Muhammad Taqi Raza`, Fatima M. Anwar, Seung-Wha Yoo, and Ki-Hyung Kim, "Requirements and Design Architectures of Sensor Service Portal (SSP) in Ubiquitous Pervasive Environment", In *Handbook of Research on Mobile Software Engineering: Design, Implementation, and Emergent Applications, IGI Global, 2012.*

PATENTS

21. `Muhammad Taqi Raza`, Dongho-Kim, and Kyu-Han Kim, "Fine Grained Functional Decomposition in LTE NFV", *US patent filed, 2015.*

22. Gargi Bag, `Muhammad Taqi Raza`, Seung-Wha Yoo, and Ki-Hyung Kim, "LoWMob and DLoWMob System", *US patent, US8582481B2, November 2013.*

23. `Muhammad Taqi Raza`, Seung-Wha Yoo, and Ki-Hyung Kim, "Method of Tracking Mobile Target in Sensor Network", *Korea patent, KR101133522B1, April 2012.*

TEACHING
EXPERIENCE
(MORE THAN 4
YEARS)

University of California Los Angeles, United States

Teaching Fellow   September 2015 – March 2019

(**Honor**: Student rating of 9/10)

- CS118 – Computer Networks   Fall'18, Spring'18, Winter'18, Winter'17, Fall'15
  Topics: Network architecture, network protocols, routing protocols, network security, etc.

- CS111 – Operating Systems   Fall'16, Winter'16, Spring'15, Winter'15, Fall'14
  Topics: Concurrency, scheduling, file systems, resource allocation, distributed systems, etc.

- CS33 – Introduction to Computer Organization   Fall'17
  Topics: Assembly language, machine organization, memory management, and related topics.

- CS219 – Cloud Computing   Spring'17
  Topics: Data center networking, systems software, service platforms and applications, and more.

Co–instructor

- CS219 – Cloud Computing   Spring'16
  Topics: File systems, BigData, and lock services for loosely coupled distributed systems.

- CS211 – Wireless Systems   Winter'16, Spring'17
  Topics: Wireless TCP, TCP control and data planes decoupling, and mobile system diagnosis.

- CS118 – Computer Networks   Fall'17
  Topics: TCP congestion management, multimedia, and network security.

Course Design

- CS Seminar Series – Introduction to Cloud Computing (Through Top-Down Approach)
  Topics: Cloud applications, data center topologies, transport protocols, file system, and more.

PREVIOUS WORK EXPERIENCE (MORE THAN 5 YEARS)

Hewlett Packard Labs, Palo Alto, United States

Intern   May 2016 – August 2016

Intern   June 2015 – September 2015
- Led first study and implementation efforts to virtualizes LTE Network Functions (NFs).
- Provided fault tolerance schemes in virtualized LTE NFs.
- Designed novel solutions to reduce data access latencies in NFV of 4G LTE.
- Addressed concurrency and scheduling issues in state-of-the-art LTE Mobile Edge Compute design.

Qualcomm Research Center, San Diego, United States

Intern   June 2014 – September 2014
- Resolved dependencies between Fusion and Peregrnic platforms of LTE Acolye project.
- Implemented message passing schemes between kernel and user space.
- Worked on Acolyte hardware prototype and resolved timing issues to cater DC offset.
- Prototyped patent ideas to and beyond Acolyte project.

Mobile Communications R&D Center, LG Electronics, Seoul, South Korea

Senior Software Engineer   June 2010 – September 2013
- In depth understanding of 3GPP LTE standardization, especially LTE Protocols.
- Implementing part of System Determination and System Selection procedures LTE module.
- Implementation of call control and event notification services of Call Manager of LTE module.
- In depth understanding of Qualcomm's LTE chipset implementation.
- On site debugging and fixture of LTE firmware issues as raised during Interoperability Testing.
- Issue debugging by analyzing logs from the network, i.e. LTE core network and the base station.
- Responsible for developing test plans, interpreting product specifications, and debugging failures.
- Managed LGE project called, Xenon, and supervised the group of four engineers.

Electronics and Telecommunication Research Institute, ETRI, Daejon, South Korea

Member of Technical Staff   August 2008 – June 2010
- R&D on TDMA and channel hopping MAC schemes of Wireless Sensor Network project, S-MoRe.
- Asynchronous Multi-threaded MAC (M-MAC) for Wireless Sensor Network.
- Worked on Acolyte hardware prototype and resolved timing issues to cater DC offset.
- Participating in standardization activities of IEEE 802.15.4 and IETF 6LoWPAN working groups.

SK Telecom, Seoul, South Korea

Intern   December 2007 – February 2008

Intern   December 2006 – February 2007
- Implemented part of Interactive Learning System, and Sentence Recognition System for SK telecom.
- Worked on the implementation of "T-Ecosystem" for SK telecom's mobile platform "T-PAK".
- Feasibility study on T-PAK Ecosystem to replace Qualcomm's BREW and Nokia's NCD.

Students Mentoring (More Than 16 Students)

University of California Los Angeles, United States

Selected Mentored Projects   September 2016 – June 2019

- Beyond Cambridge Analytica: Defeating Facebook Anti–Crawler
  - Building a tool to mine Facebook users public profiles.
  - Prototype to show Facebook users are susceptible to a number of privacy attacks.
  - **Status**: Reported to Facebook to address the issue.

- Finding the Security Vulnerabilities in LTE NFV Implementation
  - A systematic approach to security vulnerabilities diagnoses in LTE NFV implementations.
  - Building a tool to find all security loopholes in LTE NFV softwares (e.g. OpenAirInterface).

- Eliminating the Data Charging Gap in 5G Networks
  - Empirical validation to show that distributed charging functions do not provide unified charging.
  - Studied device to device communication as a use case.
  - A novel method that charges LTE users based on the radio resources utilization.

Services

Conferences/Journals Reviewer   September 2008 – present
- IEEE Journal on Selected Areas in Communications (JSAC), IEEE Transactions on Networking (ToN), IEEE Transactions on Mobile Computing (TMC), IEEE Transactions on Cloud Computing, ACM CCS 2018 (external), ACM Mobicom 2018 (external), ACM Mobicom 2017 (external), Wiley's Networks, Sensors Journal, Autosoft Journal, PIER & JEMWA, IEEE Milcom, IEEE CCNC, and others.

Research and Community Services   September 2010 – present
- Leading graduate students candidate mentoring program, Gradapp lab (http://gradapplab.pk).

- Mentoring several UCLA undergraduate students in their research and studies (beyond teaching office hours).

- Lead "Innovative Idea" group at LG Electronics.

TALKS (OTHER THAN CONFERENCE TALKS)	• Conducting lectures on "Machine Learning in Networking" for UCLA ENGR 197 undergraduate research seminar. Fall 2018
	• UCLA GradSlam talk on "Bringing Self-Driving Cars to Reality", using the language appropriate for a non-specialist audience. Winter 2018
	• University of Central Florida talk on "Re-Thinking LTE NFV". Fall 2017
	• Invited talk on "M-MAC: Multithreading MAC Protocol for Sensor Networks" at NIMS–National Institute for Mathematical Sciences South Korea. Spring 2009
	• Invited speaker on "Future Technologies' Impact on Our Society" at Korean radio. Winter 2012
PROGRAMMING	C, C++, Matlab, Linux shell scripting, Network simulators, Python, LaTeX, SQL, Java, .NET.
REFERENCES	• Professor Songwu Lu Computer Science Department University of California, Los Angeles slu@cs.ucla.edu
	• Professor Mario Gerla Computer Science Department University of California, Los Angeles gerla@cs.ucla.edu
	• Dongho Kim, PhD Senior Member of Technical Staff AT&T Labs dongho.kim@att.com