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Education

Washington University in St. Louis Ph.D. in Computer Engineering Research area: Blockchains and AI for cybersecurity solutions	St. Louis, MO, USA August 2015- May 2021
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Qatar University Master's in computing Research Area: Computer networks and physical layer security	Doha, Qatar August 2012- June 2015
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Qatar University Bachelor's in computer engineering Research Area: Computer networks	Doha, Qatar August 2007-June 2012
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Experience

Texas Tech University Assistant Professor of Computer Science	Lubbock. TX, USA September 2021-Present
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Washington University in St. Louis Graduate Research Assistant <i>Dissertation Title: A Collaborative Knowledge-Based Security Risk Assessments using Blockchains</i>	St. Louis, MO, USA August 2015- May 2021
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- Knowledge-based Blockchains: Can blockchains be extended for distributed decision making and security risk assessment solutions?
- AI enable cybersecurity: How to use machine learning to detect and categorize anomalies from penetration testing data? How to apply learned ML to real-time detection?
- Blockchains-based AI applications: Can we use the blockchains to securely and efficiently evaluate security assessments from multiple AI-enabled assessors?

Other projects: Safety score as a new metric to evaluate ML-based models built for security. Reputation schemes for blockchain systems. Blockchain platforms implementations. Blockchains performance evaluation.

Teaching and mentoring Assistant

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| • Graduate Course TA: Network Security | Spring 2017 |
| • Graduate Course TA: Advanced Computer Networks | Spring 2018 |
| • Help mentoring master thesis students | 2019-2020 |

Qatar University Research Assistant	Doha, Qatar August 2015- May 2021
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Thesis title: Parameter estimation to achieve distance-based security breaching

- Physical layer security research
 - Investigated distance and angle estimation between two moving nodes in wireless networks.
 - Implemented a breaking scheme for distance-based key generation algorithms.
 - Tasks included: Signal to noise ratio Estimation, Direction of arrival Estimation, Distance estimation, Hardware implementation of the estimation algorithms

Research Interests

Cybersecurity, Blockchains for cybersecurity decision-making, AI-enabled security, Decentralized AI for cybersecurity solutions

Research Grant Participation

1. "Extending Blockchain Technology - a Novel Paradigm and its Applications to Cybersecurity and Fintech," NPRP11S-0109-180242, awarded in 2018, PIs: Prof. Roberto Di Pietro (HBKU) and Prof. Raj Jain (WUSTL),
 - Worked with the PIs to write the grant proposal (Knowledge-based blockchain research).
2. SaTC 2017 proposal on Blockchain. PI: Prof. Raj Jain (WUSTL)
 - Worked with the PI to write this grant proposal (Knowledge-based blockchain research).
3. "CICI: Secure Data Architecture: Collaborative Research: AMDN Framework for Secure Scientific Collaboration," NSF CNS-1547380, GRA, PIs: Prof. Raj Jain (WUSTL), Prof. Elisa Bertino (Purdue), and Prof. Arjan Duresi (IUPUI)
 - Worked on the project after it was funded (AI enable cybersecurity research)
4. "Cyber Security For Next-Generation Healthcare In Qatar," NPRP10-0125-170250, awarded in 2017, PIs: Dr. Gabriele Oligeri (QU), Abdullatif Shikfa (QU), Abdulla Al-Ali (QU), and Prof. Raj Jain (WUSTL),
 - Worked on the project after it was funded (AI enable cybersecurity research)
5. "Intercloud WAN Delivery Platform for Business Applications," NPRP-8-634-1-131, GRA, PIs: Prof. R. Jain (WUSTL), Prof. A. Erbad (QU), and Prof. M. Samaka (QU)
 - Worked on the project after it was funded
6. "Information Theory Enabled Secure Wireless Networking: Scaling Laws, Network Control, and Implementation," NPRP5-559-2-227, PIs: Prof. C. Koksai (Ohio State), Prof. T. Elfouly (QU).
 - Worked on the project after it was funded (Master research)

Publications

Bibliometrics can be found in [My Google Scholar](#). (850+ Google scholar citations as of February. 4th, 2021). The asterisk (*) before the publication is an indication that the publication is closely related to dissertation.

Patents

1. *Raj Jain, **Tara Salman**, "Systems and Methods for Probabilistic Blockchains," U.S. Patent No. 11,392,613. 19 Jul. 2022, available at (Eprint): <https://www.cse.wustl.edu/~jain/patents/671780.htm>.

Book chapters

1. **Tara Salman** and Raj Jain, "Networking Protocols and Standards for Internet of Things," in IoT Handbook Edited by Hwaiyu Geng and to be published by Wiley, 2017, <http://onlinelibrary.wiley.com/doi/10.1002/9781119173601.ch13/summary>. (89 Google scholar citations as of Feb. 9th, 2021)

Journal papers

1. Zebo Yang, **Tara Salman**, Raj Jain and R. D. Pietro, "Decentralization using Quantum Blockchain: A Theoretical Analysis," IEEE Transactions on Quantum Engineering, 2022 <https://ieeexplore.ieee.org/abstract/document/9893393/>.
2. Lav Gupta, **Tara Salman**, Ali Ghubaish, Devrim Unal, Abdulla Khalid Al-Ali, Raj Jain, "Cybersecurity of multi-cloud healthcare systems: A hierarchical deep learning approach," Applied Soft Computing, 2022, https://www.sciencedirect.com/science/article/pii/S1568494622000175?casa_token=rTL9LtQAc8AAAAA:tQ7I2LPcmdecbgvmmbRgtSuUGBiF7uNF8NjYpWx7Lzf_pO5pYQkm1yq05wnZtpjMeCXJqBY1KyVCX.
3. Ali Ghubaish, **Tara Salman**, Maede Zolanvari, Devrim Unal, Abdulla Khalid Al-Ali, Raj Jain, "Recent Advances in the Internet of Medical Things (IoMT) Systems Security," IEEE Internet of Things Journal, accepted December 2020, <https://ieeexplore.ieee.org/document/9298452>.

4. ***Tara Salman**, Ali Ghubaish, Devrim Unal, Raj Jain, "Safety Score as an Evaluation Metric for Machine Learning Models of Security Applications," IEEE Networking Letter, accepted August 2020, <https://ieeexplore.ieee.org/document/9167254>.
5. Anar A. Hady, Ali H. Ghubaish, **Tara Salman**, Devrim Unal, Raj Jain, "Intrusion Detection System for Healthcare Systems Using Medical and Network Data: A Comparison Study," accepted for IEEE access, May 2020, <https://ieeexplore.ieee.org/abstract/document/9109651>.
6. Maede Zolanvari, Raj Jain, and **Tara Salman**, "Potential Data Link Candidates for Civilian Unmanned Aircraft Systems: A Survey," in IEEE Communications Surveys & Tutorials, vol. 22, no. 1, pp. 292-319, Firstquarter 2020, <https://ieeexplore.ieee.org/document/8935306>.
7. Lav Gupta, **Tara Salman**, Maede Zolanvari, Aiman Erbad, and Raj Jain, "Fault And Performance Management In Multi-Cloud Virtual Network Services Using AI: A Tutorial And A Case Study," Computer Network, Accepted October 2019, <https://doi.org/10.1016/j.comnet.2019.106950>.
8. Ali Ghubaish, **Tara Salman**, and Raj Jain, "Experiments with a LoRaWAN based Remote ID System for Locating Unmanned Aerial Vehicles (UAVs)," Wireless Communications and Mobile Computing, Volume 2019, Article ID 9060121, Eprint: http://www.cse.wustl.edu/~jain/papers/uav_lora.htm.
9. ***Tara Salman**, Maede Zolanvari, Aiman Erbad, Raj Jain, and Mohammed Samaka, "Security Services Using Blockchains: A State of the Art Survey," in IEEE Communications Surveys & Tutorials, Volume 21, Issue 1, pp. 858-880, 2018, <https://ieeexplore.ieee.org/document/8428402>. (158 Google scholar citations as of Feb. 9th, 2021)
10. Marcio Andrey Teixeira, **Tara Salman**, Maede Zolanvari, Raj Jain, Nader Maskin, and Mohammed Samaka, "SCADA System Testbed for Cybersecurity Research Using Machine Learning Approach," in future internet, vol. 10, issue 8, Jul 2018, <https://www.mdpi.com/1999-5903/10/8/76/pdf>. (25 Google scholar citations as of Feb. 9th, 2021)
11. **Tara Salman** and Raj Jain, "A Survey of Protocols and Standards for Internet of Things," Advanced Computing and Communications, Vol. 1, No. 1, March 2017, <http://digital/a-survey-of-protocols-and-standards-for-internet-of-things-10/>. (64 Google scholar citations as of Feb. 9th, 2021)
12. Ahmed Badawy, **Tara Salman**, Tarek El-Fouly, Tamer Khattab, and Amr Mohamed, "Estimating the Number of Sources in White Gaussian Noise: Simple Eigenvalues Based Approaches," IET Signal Processing, 2017, <http://digital-library.theiet.org/content/journals/10.1049/iet-spr.2016.0128>.

Conference papers

1. John Akoto, **Tara Salman**, "Machine Learning vs Deep Learning for Anomaly Detection and Categorization in Multi-cloud Environments", accept in CloudSummit October 2022.
2. ***Tara Salman**, Raj Jain, and Lav Gupta, "A Reputation Management Framework for Knowledge-Based and Probabilistic Blockchains," IEEE 1st International Workshop on Advances in Artificial Intelligence for Blockchain (AICchain 2019), held in conjunction with the 2019 IEEE International Conference on Blockchain, Atlanta, July 14, 2019, Eprint: <http://www.cse.wustl.edu/~jain/papers/rpmcewa.htm>.
3. ***Tara Salman**, Raj Jain, and Lav Gupta, "Probabilistic Blockchains: A Blockchain Paradigm for Collaborative Decision-Making", in IEEE 9th Annual Ubiquitous Computing, Electronics & Mobile Communication Conference (UEMCON), New York, NY, 2018, Eprint: https://www.cse.wustl.edu/~jain/papers/pbc_uem.htm.
4. Lav Gupta, **Tara Salman**, Ria Das, Aiman Erbad, Raj Jain, and Mohammed Samaka, "HYPER-VINES: A HYbrid Learning Fault and Performance Issues ERadiator for VIRTUAL NETWORK Services over Multi-cloud," CNC-WS, IEEE ICNC, 2019, Eprint: <https://www.cse.wustl.edu/~jain/papers/ftp/hypervin.pdf>.
5. ***Tara Salman**, Deval Bhamare, Aiman Erbad, Raj Jain, and Mohammed Samaka, "Machine Learning for Anomaly Detection and Categorization in Multi-cloud Environments," The 4th IEEE International Conference on Cyber Security and Cloud Computing (IEEE CSCloud 2017), New York, June 26-28, 2017, <https://ieeexplore.ieee.org/document/7987183/>. (34 Google scholar citations as of Feb. 9th, 2021)
6. Deval Bhamare, **Tara Salman**, Mohammed Samaka, Aiman Erbad, and Raj Jain, "Feasibility of Supervised Machine Learning for Cloud Security," 2016 International Conference on Information Science and Security (ICISS), Pattaya, 2016, pp. 1-5, Eprint: <http://www.cse.wustl.edu/~jain/papers/iciss16.htm>. (47 Google scholar citations as of Feb. 9th, 2021)
7. **Tara Salman**, Ahmed Badawy, Tarek El-Fouly, Amr Mohamed, and Tamer Khattab, "Estimating the number of sources: An efficient maximization approach," 2015 International Wireless Communications and Mobile Computing Conference (IWCMC), Dubrovnik, 2015, pp. 199-204, <http://ieeexplore.ieee.org/document/7289082/>.

8. **Tara Salman**, Ahmed Badawy, Tarek El-Fouly, Tamer Khattab and Amr Mohamed, "Non-data-aided SNR estimation for QPSK modulation in AWGN channel," 2014 IEEE 10th International Conference on Wireless and Mobile Computing, Networking and Communications (WiMob), Larnaca, 2014, pp. 611-616, <http://ieeexplore.ieee.org/document/6962233/>. (18 Google scholar citations as of Feb. 9th, 2021)

Under preparation

1. ***Tara Salman**, Ali Ghubaish, and Raj Jain, "CrowdFAB: A Framework for Crowdsourced Forecasting Applications using Blockchains and its use for Security," submitted in July 2020.

Reports

1. **Tara Salman**, "Performance Analysis of Traditional Cryptosystems in Multi-Cloud Management Platform", CSE567M: Computer Systems Analysis paperwork, Fall 2017, WUSTL, https://www.cse.wustl.edu/~jain/cse567-17/ftp/adn_sec/index.html.
2. **Tara Salman**, "Internet of Things Protocols and Standards," CSE570S: Recent Advances in Networking paperwork, Fall 2015, WUSTL, http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html.
3. **Tara Salman**, "Cloud RAN: Basics, Advances and Challenges," CSE574: Wireless and Mobile Networking paperwork, Spring 2016, WUSTL, <http://www.cse.wustl.edu/~jain/cse574-16/ftp/cloudran/index.html>.
4. **Tara Salman**, "Parameters Estimation to Achieve Distance-Based Security Breaching," Master thesis, Spring 2015, Qatar University (Doha-Qatar).

Selected Talks

- 1- *Tara Salman, "*Extending Blockchains with AI for Cybersecurity*," TTU CS External Board Meeting, October 7th, 2021.
- 2- *Tara Salman, "Pairing Blockchains and AI for Future Distributed Risk Management," Rising Stars in EECS 2020 Job Talk Starts, November 11th, 2020.
- 3- *Tara Salman, "*Collaborative Knowledge-Based Security Risk Assessments Using Blockchains*," Rising Stars in EECS 2020 poster session, November 10th, 2020.
- 4- * Tara Salman, "*A Collaborative Knowledge-Based Risk Assessments Solution using Blockchains*," invited Colloquium Talk at University of Missouri-St. Louis (Department of Mathematics and Computer Science), November 22nd, 2019.
- 5- Tara Salman, "*Extending Blockchains for Collaborative Decision Making and Risk Assessment Applications*," 30th November, DSS Talk, Washington University in St. Louis, MO, USA.

Academic Activities

Reviewer: ACM Computing Surveys 2020, IEEE Access 2020, IEEE Transaction of Service Computing 2019-2020, Journal of Computer Science and Technology 2019, IEEE Transactions on Industrial Informatics 2019, IEEE Communications Surveys & Tutorials, 2018-2019, IEEE Wireless Communications and Networking Conference (WCNC) 2017, International Journal of Distributed Sensor Networks (IJDSN) 2018, International Journal on Advances in Internet Technology (IARIA) 2018, International Conference on Information Science and Communications Technologies (ICISCT) 2016, Recent Advances in Communications and Networking Technology (RACNT), 2016, Vehicular Communications Journal (VEHCOM), 2016, IEEE 2nd International Conference on Contemporary Computing and Informatics (iC3I), 2016.

Honor and Achievements

Academia

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| • Rising Stars 2020, an academic career workshop for women in EECS hosted by UC Berkeley | October 2020 |
| • Honors Award (top 15-20%) in Periodic Review of Doctoral Students (Started 2020) | May 2020 |
| • NSF Networking Technology and Systems Early-Career Investigators Workshop Travel Award, https://sites.google.com/view/netsearlycareer2019/home | August 2019 |
| • McKelvey School of Engineering fellowship | 2015-2020 |
| • CCNA academic, Qatar University | July 2011 |
| • Qatar University Scholarship | 2007-2012 |

Industry

- Cisco Certified Network Associate (CCNA), English Sep. 2011

PROFESSIONAL SOCIETY MEMBERSHIPS

- IEEE student member 2012-Present
- ACM student chapter 2008-Present
- Women in Cyber Security (WiCS) 2019-Present

SKILLS AND PERSONAL

Technical Skills

- Hardware: Wireless Open-Access Research Platform (WARP) (good)
- Software: Experience in MATLAB, R, LabVIEW, Cisco packet tracer. (good)
- Programming languages: Python, Golang , Java, and C/C++. (excellent)
- Networking: Cisco Certified Network Associate Routing & Switching (CCNA) certified, 2011.

Personal Skills:

- Written and verbal communication skills in Arabic and English languages.
- Being able to play an active role in a team
- Collaboration skills with world-class research teams