

Homa Alemzadeh

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- WORK EXPERIENCE**
- University of Virginia, Charlottesville, VA** Jan. 2017 - Present
Assistant Professor
Charles L. Brown Department of Electrical and Computer Engineering
Department of Systems and Information Engineering
- IBM T. J. Watson Research Center** Mar. 2016 – Jan. 2017
Cognitive Research Staff Member
Contributed to design of IBM Watson software for analysis of Electronic Medical Records (EMR).
- University of Illinois, Coordinated Science Laboratory** Jan. 2009 – Mar. 2016
Graduate Research Assistant
Projects on analysis of safety and security of tele-operated surgical robots, data-driven safety analysis of medical devices, and design of resilient patient monitoring systems.
- Qualcomm Atheros, Bay Area** Jun. – Aug. 2013
Interim Engineering Intern – Wifi Cores Design
Contributed to design of adaptive PCI-E power management algorithms in Atheros Wifi chipsets.
- Qualcomm Corporate R&D, New Jersey Research Center** Jun. – Aug. 2012
Interim Engineering Intern – Modem ASCII Design
Contributed to design of a reconfigurable processor for real-time (de-) interleaving, (de-) rate matching, and descrambling in LTE and UMTS wireless technologies in the base station modems.
- University of Tehran, ECE Department** Aug. 2006 – Dec. 2008
Graduate Research Assistant
Projects on design for testability and reliability in digital integrated circuits and fault-tolerant network-on-chip architectures.
- EDUCATION**
- University of Illinois at Urbana-Champaign, Urbana, IL** Feb. 2016
Ph.D. in Electrical and Computer Engineering
Dissertation: Data-driven Resiliency Assessment of Medical Cyber-Physical Systems
Advisor: Prof. Ravishankar K. Iyer
- University of Tehran, Tehran, Iran** Nov. 2008
M.Sc. in Computer Engineering
Dissertation: Testable Primitives for SystemC Transaction Level Modeling (TLM)
Advisors: Prof. Zainalabedin Navabi and Prof. Paolo Prinetto
- University of Tehran, Tehran, Iran** Jul. 2005
B.Sc. in Computer Engineering
Dissertation: Evolutionary Design of Arithmetic Logic Circuits using Genetic Algorithms
Advisor: Sied Mehdi Fakhraei

AWARDS	William C. Carter Dissertation Award in Dependability	2017
	IEEE Technical Committee on Dependable Computing and Fault Tolerance	
	J. Maxwell Chamberlain Memorial Paper Award	2014
	The 50 th Annual Meeting of the Society of Thoracic Surgeons (STS)	
	Google GRAD CS Forum	2012
	One of the 75 computer science graduate students selected nationwide to attend the Google Graduate Researchers in Academia of Diverse backgrounds (GRAD) CS Forum.	
	CRA-W Travel Award for Graduate Cohort	2010
	NCSA Travel Award for Grace Hopper Celebration of Women in Computing	2009

PUBLICATIONS

Refereed Journals and Magazines

1. H. Alemzadeh, D. Chen, Z. T. Kalbarczyk, R. K. Iyer, "Cyber-Physical Attacks on Teleoperated Surgical Robots: Dynamic Model-based Detection and Mitigation," In preparation.
2. K. Varshney, H. Alemzadeh, "On the Safety of Machine Learning: Cyber-Physical Systems, Decision Sciences, and Data Products," Under revision for the *Big Data Journal, Special Issue on Technical and Social Trade-Offs*; <https://arxiv.org/pdf/1610.01256v1.pdf>.
3. X Li, H. Alemzadeh, Z. Kalbarczyk, R. K. Iyer and T. Kesavadas, "A Hardware-in-the-loop Simulator for Surgeon Training in Tele-robotic Surgery," *Journal of Healthcare Engineering, Special Issue on Robotics in Biomedical and Healthcare Engineering*.
4. H. Alemzadeh, R. K. Iyer, Z. T. Kalbarczyk, N. Leveson, J. Raman, "Adverse Events in Robotic Surgery: A Retrospective Study of 14 Years of FDA Data," *PLoS ONE 11(4): e0151470*, 2016: <http://arxiv.org/abs/1507.03518>.

MIT Technology Review, Gizmodo, BBC, NBCNews, DailyMail, GeekSnack, TechTimes, The Register, Examiner, Commonwealth News, EpochTimes, and Medical Daily, among others: "Robotic Surgery Linked To 144 Deaths Since 2000", July 21, 2015.

5. H. Alemzadeh, R. K. Iyer, Z. Kalbarczyk, J. Raman, "Analysis of Safety-Critical Computer Failures in Medical Devices," *IEEE Security & Privacy*, vol. 11, no. 4, pp. 14-26, July-Aug. 2013.

Refereed Conferences and Workshops

6. H. Almohri, L. Cheng, D. Yao, H. Alemzadeh, "On Threat Modeling and Mitigation of Medical Cyber-Physical Systems", To appear in *Proc. Second IEEE International Workshop on Security, Privacy, and Trustworthiness in Medical Cyber-Physical Systems, IEEE CHASE*, 2017.
7. H. Alemzadeh and M. V. Devarakonda, "An NLP-based Cognitive System for Disease Status Identification in Electronic Health Records," *Proc. IEEE Int. Conf. on Biomedical and Health Informatics (EMBS BHI)*, 2017.
8. X. Li, H. Alemzadeh, D. Chen, Z. Kalbarczyk, R. K. Iyer, T. Kesavadas, "A Hardware-in-the-loop Simulator for Safety Training in Robotic Surgery," *Proc. IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS)*, 2016.
9. H. Lin, H. Alemzadeh, D. Chen, Z. T. Kalbarczyk, R. K. Iyer, "Safety-critical Cyber-physical Attacks: Analysis, Detection, and Mitigation," *Proc. Symposium and Bootcamp on the Science of Security (HOTSOS)*, 2016.
10. H. Alemzadeh, D. Chen, X. Li, T. Kesavadas, Z. T. Kalbarczyk, R. K. Iyer, "Targeted Attacks on Teleoperated Surgical Robots: Dynamic Model-based Detection and Mitigation," *Proc. 46th IEEE/IFIP Int. Conf. on Dependable Systems and Networks (DSN)*, 2016.
11. H. Alemzadeh, D. Chen, A. Lewis, Z. Kalbarczyk, J. Raman, N. Leveson, R. K. Iyer, "Systems-theoretic Safety Assessment of Robotic Telesurgical Systems," *Proc. 34th Int. Conf. Computer Safety, Reliability, and Security (SAFECOMP)*, Sep. 2015.

12. Q. Li, H. Alemzadeh, Z. Kalbarczyk, R. K. Iyer, "A Fault-Tolerant Hardware Architecture for Robust Wearable Heart Rate Monitoring," *Proc. 9th Int. Conf. Pervasive Computing Technologies for Healthcare (Pervasive Health'2015)*, Istanbul, Turkey, May 2015.
13. H. Alemzadeh, D. Chen, Z. Kalbarczyk, R. K. Iyer, X. Li, T. Kesavadas, J. Raman, "A Software Framework for Simulation of Safety Hazards in Robotic Surgical Systems," *SIGBED Review*, vol. 12, no. 4, *Special Issue on Medical Cyber Physical Systems workshop (MedicalCPS'15)*, Apr. 2015.

***ECE Illinois News, Engineering at Illinois News, and CSL News*, "Illinois researchers making virtual surgery simulation a reality", Oct. 8, 2015.**

14. H. Alemzadeh, R. Hoagland, Z. Kalbarczyk, R. K. Iyer, "Automated Classification of Computer-based Medical Device Recalls," *Proc. 27th IEEE Int. Symp. Computer-Based Medical Systems (CBMS'2014)*, New York, May 2014.
15. H. Alemzadeh, C. D. Martino, Z. Jin, Z. Kalbarczyk, R. K. Iyer, "Towards Resiliency in Embedded Medical Monitoring Devices," *Proc. DSN Workshop Open Resilient Human-aware Cyber-physical Systems (WORCS'2012)*, Boston, MA, Jul. 2012.
16. H. Alemzadeh, Z. Jin, Z. Kalbarczyk, R. K. Iyer, "An Embedded Reconfigurable Architecture for Patient-Specific Multi-Parameter Medical Monitoring," *Proc. 33rd Annu. Int. IEEE EMBS Conf. (EMBC'11)*, Boston, MA, Sep. 2011.

***ECE Illinois News*, "Monitoring devices help to detect signs of impending medical crisis", 2013. University of Illinois Provisional Patent, App. No. 61536251, Filed Sep. 2011.**

17. H. Alemzadeh, M. U. Saleheen, Z. Jin, Z. Kalbarczyk, R. K. Iyer, "RMED: A Reconfigurable Architecture for Embedded Medical Monitoring," *Proc. 5th Annu. IEEE-NIH Life Science Systems and Application Workshop (LiSSA'11)*, Bethesda, Apr. 2011.
18. M. U. Saleheen, H. Alemzadeh, A. M. Cheriyan, Z. T. Kalbarczyk, R. K. Iyer, "An Efficient Embedded Hardware for High Accuracy Detection of Epileptic Seizures," *Proc. 3rd Int. Conf. BioMedical Engineering and Informatics (BMEI'10)*, China, Oct. 2010.

***Biomedical Computation Review*, "Smart Embedded Devices: Here They Come", vol. 8, issue 3 (2012), pp. 4-6. Simbios: NIH Center for Biomedical Computation.**

19. H. Alemzadeh, S. D. Carlo, A. Scionti, P. Prinetto, Z. Navabi, "Functional Testing Approaches for "BIFSTable" *tlm_fifo*," *Proc. IEEE Int. High-Level Design Validation and Test Workshop (HLDVT'08)*, Las Vegas, Nevada, Nov. 2008.
20. H. Alemzadeh, S. D. Carlo, F. Refan, Z. Navabi and P. Prinetto, "Plug & Test at System Level via Testable TLM Primitives," *Proc. Int. Test Conf. (ITC'08)*, Oct. 2008.
21. H. Alemzadeh, M. Cimei, P. Prinetto, Z. Navabi, "Facilitating Testability of TLM FIFO: SystemC Implementations" *Proc. IEEE East-West Design & Test Int. Symp. (EWDTS'08)*, 2008.
22. F. Refan, P. Kabiri, H. Alemzadeh, P. Prinetto and Z. Navabi, "Application Specific Configuration of a Fault-tolerant NoC Architecture," *Proc. 11th Biennial Baltic Electronics Conf.*, Oct. 2008.
23. H. Alemzadeh, S. Aminzadeh, R. Saberi, Z. Navabi, "Code Optimization for Enhancing SystemC Simulation Time" *Proc. IEEE East-West Design & Test Int. Symp. (EWDTS'08)*, Ukraine, Oct. 2008.
24. F. Refan, H. Alemzadeh, S. Safari, P. Prinetto and Z. Navabi, "Reliability in Application Specific Mesh-based NoC Architectures," *Proc. 14th IEEE Int. Online Testing Symp. (IOLTS'08)*, pp. 207-212, Rhodes, Greece, Jul. 2008.
25. H. Alemzadeh, F. Refan, P. Prinetto and Z. Navabi, "High-level Analysis for Reconfiguration of a Fault Tolerant Mesh-based NoC Architecture Using Transaction Level Modeling," *Proc. 5th IEEE East-West Design & Test Int. Symp. (EWDTS'07)*, pp. 256-261, Armenia, 2007.

Refereed Abstracts (Presented in Medial Professional Society Meetings)

26. H. Alemzadeh, J. Raman, N. Leveson, R. K. Iyer, "Safety Implications of Robotic Surgery: A Study of 13 Years of FDA Data on da Vinci Surgical Systems," *CSL Technical Report*, Nov. 2013: <http://web.engr.illinois.edu/~alemzad1/papers/UIIU-ENG-13-2208.pdf>.

J. Maxwell Chamberlain Memorial Paper in Adult Cardiac Surgery at the 50th Annual Meeting of the Society of Thoracic Surgeons (STS), Jan. 2014.

The Wall Street Journal, "Report Raises Concerns on Robotic Surgery Device", Nov. 8, 2013.
CSL News, "Study questions safety of popular robotic surgical device", Apr. 2014.

27. H. Alemzadeh, Z. Kalbarczyk, R. K. Iyer., T. Kesavadas, S. Small, J. Raman, "Simulation-based Training for Safety Incidents: Lessons from Analysis of Adverse Events in Robotic Surgical Systems," *American College of Surgeons' 8th Annual Meeting of the Consortium of ACS-accredited Education Institutes*, March 2015.

TEACHING EXPERIENCE

Instructor, ECE Department, University of Virginia

- **ECE/CS 4434/6434 - SYS 6582 – Dependable Computing Systems** Spring 2017
A graduate/senior undergraduate level course, focusing on fundamentals of dependable computing, reliability modeling and analysis, and hardware, software, and network fault-tolerance.
- **Advanced Embedded Systems** Fall 2017
A graduate/senior undergraduate level course, focusing on embedded software programming, hardware/software interfacing and synchronization, and real-time operating systems.

Teaching Assistant, ECE Department, UIUC

- **ECE 313 – Probability with Engineering Applications** Fall 2013, Fall 2014
Contributed to development of a new course section for CompE students, emphasizing applications of probability in data analytics and reliability analysis of computer systems. Designed homeworks, in-class activities, mini projects, and exams, led discussion sessions, and presented part of lectures.
- **ECE 391 – Computer Systems Engineering** Spring 2012
Led discussion sessions, designed and graded exam problems, and held office hours.

Teaching Assistant, ECE Department, University of Tehran

- **Digital Logic Circuits Laboratory** Fall 2006, Spring 2007, Spring 2008
- **Digital System Design with VHDL** Fall 2007

SELECTED MENTORING EXPERIENCE

Graduate Mentor, PURE Program, ECE Department, UIUC

- **Automatic Retrieval and Analysis of Medical Device Recalls** Fall 2013 – Fall 2014
Raymond Hoagland – Senior student in ECE
Results published in the 2014 IEEE CBMS Conference
- **Real-time Monitoring of Physiological Signals on an Android Device** Fall 2013
Shivam Khanna – Junior student in ECE

Best Poster Award from the PURE Committee.

Co-Mentored with Prof. Ravishankar Iyer, CSL, UIUC

Fall 2012 – Fall 2014

- **An energy-efficient hardware system for robust and Reliable heart rate monitoring**
Qingkun Li – M.S. student in ECE
Results published in the 2015 Pervasive Health Conference

Graduate Mentor, DEPEND Group, CSL, UIUC

Fall 2012 – Spring 2013

- **An Android Application for Real-time Monitoring of Physiological Signals**
Jingrui Zhai – Senior student in ECE

Co-Mentored with Prof. Zbigniew Kalbarczyk, ITI Intern Program, UIUC

Summer 2010

- **Reconfigurable Embedded Hardware Design for Patient Health Monitoring**
Valentin Sidea – Senior student in ECE

INVITED TALKS

- “Medical Cyber-physical Systems: Data-driven Resiliency Assessment and Design”
ECE Department, **Virginia Commonwealth University (VCU)**, Richmond, Mar. 2017.
Electrical Engineering Department, **University of Washington**, Seattle, Apr. 2016.
Link Lab, **University of Virginia**, Charlottesville, Mar. 2016.
- “Data-driven Resiliency Assessment of Medical Cyber-physical Systems”
The 20th **Software Design for Medical Devices (SDMD) Conference**, Oct. 2015.
DeepQA Research Team, **IBM T. J. Watson Research Center**, Sep. 2015.
- “Resiliency in Cyber-physical Systems for Robot-assisted Surgery”
The 2nd **Health Care Engineering Systems Symposium**, University of Illinois, Sep. 2015.
- “Robotic Tele-Surgical Systems: From Safety to Cyber-security,”
Archimedes Medical Device Security Workshop, University of Michigan, Ann Arbor, May 2015.
- “Adverse Events in Robotic Surgery: Systems-theoretic Simulation of Safety Hazards,”
Biorobotics Laboratory, University of Washington, Seattle, WA, Jan. 2015.
- “Use of CAST for Medical Devices,”
The 3rd **STAMP/STPA Workshop, MIT**, Boston, MA, Mar. 2014.
- “Safety-critical Medical Devices: Measurement-driven Accident Analysis and Safety Monitoring,”
System Safety Research Laboratory, **MIT**, Boston, MA, Feb. 2014.
TIMAN Research Forum, UIUC, Feb. 2014.
Yahoo-DAIS Seminar, CS Department, UIUC, Mar. 2014.
CSL Student Conference, UIUC, Feb. 2014.
Research Mela, **Rush University Medical Center**, Chicago, IL, Dec. 2013.
- “Safety Implications of Robotic Surgery: Analysis of Adverse Event Reports of da Vinci Surgical Systems,” The 50th **annual meeting of the Society of Thoracic Surgeons**, Orlando, FL, Jan. 2014.
- “Safety-Critical Medical Devices: From Measurements to Design,”
Computer Science Laboratory, **SRI International**, Menlo Park, CA, Aug. 2013.

SELECTED PROFESSIONAL ACTIVITIES

Invited Participant/Panelist:

- NSF Division of Computer and Network Systems 2017
- IBM Research Workshop on Architectures for Cognitive Computing and Datacenters 2016
- The 20th Software Design for Medical Devices (SDMD) Conference 2015
- IEEE Workshop to Develop a Building Code for Medical Device Software Security 2014

Program Committee/Chair:

- IEEE International Symposium on Software Reliability Engineering (ISSRE) 2017
- The Int. IEEE Workshop on Software Certification (WoSoCer) 2015–2017

Reviewer:

- IEEE Transactions on Dependable and Secure Computing 2017
- IEEE Robotics and Automation Letters 2017
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2017
- ACM Conf. on Architectural Support for Programming Languages and Operating Systems 2016
- Reliability Engineering and System Safety Journal 2016
- IEEE Int. Symp. on Circuits and Systems (ISCAS) 2014–2017
- Biomedical Circuits & Systems Conf. (BioCAS) 2016
- Journal of Medical and Biological Engineering 2015

External Reviewer:

- IEEE/IFIP Int. Conf. on Dependable Systems and Networks (DSN) 2010–2016
- IEEE Int. On-Line Testing Symp. (IOLTS) 2010, 2011, 2013

Professional Society Memberships:

- IEEE Computer Society
- IEEE Engineering in Medicine and Biology Society (EMBS)
- IEEE Women in Engineering