

Homa Alemzadeh

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- PROFESSIONAL EXPERIENCE**
- University of Virginia, Charlottesville, VA** Jan. 2017 – Present
Assistant Professor
Charles L. Brown Department of Electrical and Computer Engineering
Joint appointment with Systems and Information Engineering Department
Courtesy appointment with Computer Science Department
- 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 IEEE Technical Committee/IFIP Working Group 10.4 on Dependable Computing and Fault Tolerance	2017
	J. Maxwell Chamberlain Memorial Paper Award The 50 th Annual Meeting of the Society of Thoracic Surgeons (STS)	2014
	Google GRAD CS Forum One of the 75 computer science graduate students selected nationwide to attend the Google Graduate Researchers in Academia of Diverse backgrounds (GRAD) CS Forum.	2012
	CRA-W Travel Award for Graduate Cohort	2010
	NCSA Travel Award for Grace Hopper Celebration of Women in Computing	2009

RESEARCH FUNDING

- **Title:** Towards Cognitive Assistant Systems for Emergency Response
Sponsor: National Institute of Standards and Technology (NIST)
Amount: \$1,119,855 (my share: \$462,214)
Period: 06/01/2017 – 05/31/2020
PI: Homa Alemzadeh
Co-PIs: Jack Stankovic (UVA), Ronald Williams (UVA)
- **Title:** Machine Learning in Adversarial Contexts
Sponsor: UVA SEAS (Research Innovation Award)
Amount: \$86,448 (my share: 1 month PI effort + 50% GRA)
Period: 06/01/2017 – 08/30/2018
PI: David Evans (CS)
Co-PIs: Homa Alemzadeh, Quanquan Gu (CS), Mohammad Mahmoody (CS), and Yanjun Qi (CS).
- **Title:** EAGER: Implantable Medical Devices and Body Area Networks: Resilience by Construction
Sponsor: National Science Foundation (NSF)
Amount: \$199,322
Period: 09/01/2017 – 08/31/2019
PI: Homa Alemzadeh (Former Co-PI)
Co-PI: Jim Aylor (UVA) (Former PI)

PUBLICATIONS

Refereed Journals and Magazines

1. 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*, 2017.
2. K. Varshney, H. Alemzadeh, “On the Safety of Machine Learning: Cyber-Physical Systems, Decision Sciences, and Data Products,” *Big Data Journal* 5:3, 246–255, DOI: 10.1089/big.2016.0051, 2017: <https://arxiv.org/pdf/1610.01256v1.pdf>.
3. 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>.

Media Coverage: *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
Bloomberg, “China’s Deadly Advantage in Driverless Cars”, April 26, 2016.

4. 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

5. H. Almhori, L. Cheng, D. Yao, H. Alemzadeh, “On Threat Modeling and Mitigation of Medical Cyber-Physical Systems”, *Proc. Second IEEE International Workshop on Security, Privacy, and Trustworthiness in Medical Cyber-Physical Systems, IEEE CHASE*, 2017. (Invited Paper)
 6. H. Alemzadeh and M. V. Devarakonda, “An NLP-based Cognitive System for Disease Status Identification in Electronic Health Records,” *Proc. IEEE EMBS Int. Conf. on Biomedical and Health Informatics (EMBS BHI)*, 2017.
 7. 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.
 8. 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.
 9. 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.
 10. 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.
 11. 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.
 12. 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.
- Media Coverage:** [ECE Illinois News](#), [Engineering at Illinois News](#), and [CSL News](#), “Illinois researchers making virtual surgery simulation a reality”, Oct. 8, 2015.
13. 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.
 14. 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.
 15. 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.
- Media Coverage:** [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.
16. 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.
 17. 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.

Media Coverage: [Biomedical Computation Review](#), “Smart Embedded Devices: Here They Come”, vol. 8, issue 3 (2012), pp. 4-6. Simbios: NIH Center for Biomedical Computation.

18. 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.
19. 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.
20. 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.
21. 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.
22. 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)*, Oct. 2008.
23. 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.
24. 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)

25. 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>.

<i>J. Maxwell Chamberlain Memorial Paper in Adult Cardiac Surgery at the 50th Annual Meeting of the Society of Thoracic Surgeons (STS)</i> , Jan. 2014.
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Media Coverage: <i>The Wall Street Journal</i> , "Report Raises Concerns on Robotic Surgery Device", Nov. 8, 2013. <i>CSL News</i> , "Study questions safety of popular robotic surgical device", Apr. 2014.

26. 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.

INVITED TALKS

- "Resiliency in Cyber-Physical Systems for Robot-Assisted Surgery"
Raven/dVRK User Group Meeting 2017, **IROS Conference**, Vancouver, Sep. 2017.
- "Towards Cognitive Assistant Systems for Emergency Response"
Annual Public Safety Broadband Stakeholder Meeting (NIST PSCR), San Antonio, Jun. 2017.
- "Medical Cyber-Physical Systems: Data-driven Resiliency Assessment and Design"
ECE Department, **University of British Columbia (UBC)**, Vancouver, Sep. 2017.
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.

PROFESSIONAL ACTIVITIES **Invited Participant/Panelist:**

- The IFIP Working Group 10.4 on Dependable Computing and Fault Tolerance Meeting 2017
- NSF Computer Systems Research 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 Co-Chair/Organizer:

- The First DSN Workshop on Dependable and Secure Machine Learning (DSML) 2018
- The International IEEE Workshop on Software Certification (WoSoCer) 2015–2017

Program Committee Member:

- The 7th ICCPS Workshop on Medical Cyber Physical Systems 2018
- The 48th IEEE/IFIP International Conference on Dependable Systems and Networks (DSN) 2018
- IEEE Workshop on Silicon Errors in Logic - System Effects (SELSE) 2018
- The Symposium and Bootcamp on the Science of Security (HotSoS) 2018
- The IEEE International Symposium on Software Reliability Engineering (ISSRE) 2017

Reviewer:

- ACM Transactions on Software Engineering and Methodology (TOSEM) 2017
- IEEE Embedded Systems Letters (IEEE-ESL) 2017
- AAMI’s Horizon Magazine (Special Issue on Cybersecurity in Healthcare Technology) 2017
- IEEE Transactions on Dependable and Secure Computing (TDSC) 2017
- IEEE Robotics and Automation Letters (RAL) 2017
- Elsevier Robotics and Autonomous Systems Journal 2017
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2017
- Reliability Engineering and System Safety Journal 2016
- IEEE Int. Symp. on Circuits and Systems (ISCAS) 2014–2017
- Biomedical Circuits & Systems Conf. (BioCAS) 2016

External Reviewer:

- IEEE/IFIP Int. Conf. on Dependable Systems and Networks (DSN) 2010–2016

Professional Society Memberships:

- IEEE Computer Society
- IEEE Engineering in Medicine and Biology Society (EMBS)
- IEEE Women in Engineering
- American Society for Engineering Education (ASEE)

**TEACHING
EXPERIENCE**

Instructor, ECE Department, University of Virginia

- **ECE 4501/6501 - Advanced Embedded Systems** Fall 2017
A new graduate/senior undergraduate course, focusing on the basic principles and hand-on-experience in design and validation of embedded systems, with a focus on embedded software programming and real-time operating systems. Topics include: embedded architectures, hardware/software interfacing, memory management, multitasking, real-time scheduling.
- **ECE/CS 4434/6434 - SYS 6582 – Dependable Computing Systems** Spring 2017, 2018
A new graduate/senior undergraduate course on fundamentals of dependable computing and fault-tolerance. Topics include: system reliability modeling and analysis, hardware, software, and network fault-tolerance, information redundancy, error detection and recovery in processors and distributed systems, and experimental dependability evaluation.

Teaching Assistant, ECE Department, University of Illinois

- **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 evaluation. Designed and graded homework, 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.

**ADVISING/
MENTORING
EXPERIENCE**

Research Advisor, ECE Department, University of Virginia

- Bulbul Ahmed – First year Ph.D. in CpE (Co-advised with Jim Aylor)
- Hasnat Mohammad Rubaiyat – First year Ph.D. in CpE
- Mohammad Samin Yasar – First year Ph.D. in CpE
- Mustafa Hotaki – First year M.S. in CpE
- Sile Shu – Second year M.E. in CpE
- Yongming Qin – Second year M.S. in EE

Mentor, UNLEASH Program, University of Virginia

Fall 2017

- Yueying Pan – Second year undergraduate in CS

Mentor, University of Virginia

- Jiancheng Xie – Senior high at Tandem Friends Fall 2017 – Present
- Elli Veer – Fourth year undergraduate in CS Summer 2017
- Robert Pierce – First year M.S. in CS Summer 2017

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