

EDUCATION

North Carolina State University, Raleigh, NC, *PhD in Electrical Engineering, anticipated May 2016* GPA 4.0/4.0
Dissertation Topic: A Topo-Geometric Framework for Data Mining

University of New Mexico, Albuquerque, NM, *MS, Electrical Engineering, July 2012* GPA 3.94/4.0
Masters Topic: Attack Detection and Identification in Cyber-Physical Systems

Amirkabir University of Technology, Tehran, Iran, *MS in Electrical Engineering, November 2010* GPA: 3.94/4.0
Thesis Topic: Formation Control for Autonomous Underwater Vehicles with Limited Communication

Amirkabir University of Technology, Tehran, Iran, *BS, Electrical Engineering, Feb 2008* GPA: 3.5/4.0
Thesis Topic: Design and implementation of a scaling force feedback telerobotic system

RESEARCH SKILLS

Data Mining, Machine Learning, Signal Processing, Biomedical Data Analysis, Algorithm Development, Statistical Modeling, Digital Audio Analysis, Optimization, Applied Mathematics, Classification, Clustering, Pattern Recognition, Graph Mining

PROFESSIONAL EXPERIENCE

Novartis Pharmaceutical, R&D Informatics group East Hanover, NJ
Data Scientist Intern Jun 2015 - Aug 2015

- Developed machine learning techniques for modeling disease progression in a clinical trial dataset of breakthrough treatments for chronic heart failure disease
- Created a software that implements multi-task learning methods on a dataset of 8442 patients

Relevant publication

J1. "Modeling Heart Failure Disease Progression Using Multi-task Learning", to be submitted to *IEEE Journal of Biomedical and Health Informatics*, with D. Saldana and G. Clark.

Microsoft Research, Computational User Experiences group (CUE) Redmond, WA
PhD Research Intern May 2014 - Aug 2014

- Worked on data analysis and signal processing for cutting edge health sensors on Microsoft Band 2
- Developed a novel framework for analysis of pressure wave data recorded noninvasively from the radial artery using topological signal processing
- Established a measure for automated pulse wave quality identification
- Extracted the pulse signals from radial pulse pressure data under motion (walking, jogging and running) for accurate heart rate calculation
- Designed and completed a 15 subject data collection study using a wearable tonometer with acceleration and noise reference for the purposes of algorithm training and verification

Relevant publication

J2. "A Novel Framework for Pulse Pressure Wave Analysis Using Persistent Homology", *Signal Processing Letters, IEEE, vol.22, no.11, pp.1879-1883, Nov. 2015*, with T. S. Saponas and D. Morris.

North Carolina State University, Electrical and Computer Engineering Department, VISSTA group

NSF ASSIST Nanosystems Center

Research Assistant Aug 2012 - present

- Constructing a comprehensive connectivity map of brain data by analyzing the temporal evolution of the spatial functional connectivities of EEG/MEG time series data
In collaboration with Tomaso Poggio from Department of Brain and Cognitive Sciences, MIT
- Developed a robust and accurate algorithm to detect and quantify the periodic structures in the data with very low computational complexity

- Built a software for real time, accurate and robust detection of wheezes and their spectral estimation in lung sound data
- Analyzed and classified breathing sound signals using time-frequency techniques and wavelet packet decomposition method
- Developed and validated a mathematical model for non-stationary physiological data with harmonic patterns

Patents

"Efficient Wheeze Detection Software", North Carolina State University, *accepted on Aug 2015*, with H. Krim.

Relevant Publications

J3. "Persistent Homology of Delay Embeddings and its Application to Wheeze Detection," *Signal Processing Letters, IEEE*, vol. 21, no. 4, pp. 459-463, April 2014, with T. Gentimis and H. Krim.

C1. "Spectral Estimation of Highly Transient Data", *Eusipco 2015*, with H. Krim.

C2. "Robust Detection of Periodic Patterns in Gene Expression Microarray Data using Topological Signal Analysis", *GlobalSIP14- Workshop on Genomic Signal Processing and Statistics (GENSIPS'14)*, with H. Krim.

C3. "Real Time Detection of Harmonic Structure: a Case for Topological Signal Analysis", *2014 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP'14)*, with H. Chintakunta and H. Krim.

C4. "Wheeze Detection and Location using Spectro-temporal Analysis of Lung Sounds", *The 29th Southern Biomedical Engineering Conference, SBEC 2013*, with H. Krim.

Amirkabir University of Technology, Electrical Engineering Department, Computational Intelligence group

Research Assistant

May 2009 - Nov 2010

- Designed and simulated adaptive and decentralized formation controller for multiple AUVs in spatial motion with limited communication
- Used neural networks and fuzzy controllers for nonlinear coverage control of nonholonomic mobile robots
- Developed individual particle optimized functional link neural network
- Designed and simulated a fuzzy controller for a 3-DOF gymnastic robot

Relevant Publications

J4. "Coverage Control in Unknown Environments using Neural Networks", *Artificial Intelligence Review*, vol. 38, no. 3, pp. 237-255, 2012, with A. Dirafzoon, S. M. A. Salehizadeh and M. B. Menhaj.

C5. "Adaptive Decentralized Formation Control of Multiple Autonomous Underwater Vehicles", *Control Applications (CCA), 2011 IEEE International Conference on*, Denver, USA, Sept. 2011, pp 693-698, with A. Dirafzoon and H. A. Talebi.

C6. "Leader-Follower Formation Control of Autonomous Underwater Vehicles with Limited Communication, in *Control Applications (CCA), 2011 IEEE International Conference on*, Denver, USA, Sept. 2011, pp 921-926, with A. Dirafzoon, and H. A. Talebi.

C7. "Adaptive Leader-Follower Formation Control for Multiple AUVs in Spatial Motion", in *36th Annual Conference of the IEEE Industrial Electronics Society, IECON 2010*, USA, pp. 59-64, with A. Dirafzoon, H. A. Talebi and S. K. Y. Nikravesh.

C8. "Virtual Force Based Individual Particle Optimization for Coverage in Wireless Sensor Networks", in *23rd IEEE Canadian Conference on Electrical and Computer Engineering, CCECE 2010*, Calgary, Canada, May 2010, pp. 1-4, with A. Dirafzoon, S. M. A. Salehizadeh and M.B. Menhaj.

C9. "Individual Particle Optimized Functional Link Neural Network for Real-time Identification of Nonlinear Dynamic Systems", *The 5th IEEE Conference on Industrial Electronics and Applications, ICIEA, 2010*, pp. 35-40, with S. M. A. Salehizadeh, A. Dirafzoon and M.B. Menhaj.

C10. "Fuzzy Virtual Torque Approach for Coverage Control of Nonholonomic Mobile Robots", in *2010 world congress on Intelligent Control and Automation, WCICA 2010*, with A. Dirafzoon, S. M. A. Salehizadeh and M.B. Menhaj.

C11. "Coverage Control for Nonholonomic Mobile Robots Using Virtual Force Field", in *2010 IEEE International Conference on Control & Automation, ICCA 2010*, with A. Dirafzoon, S. M. A. Salehizadeh, M. B. Menhaj, and A. Afshar.

C12. "Coverage Control for Mobile Sensing Robots in Unknown Environments Using Neural Networks", in *Intelligent Control (ISIC), 2010 IEEE International Symposium on*, Sept. 2010, with A. Dirafzoon, S.M.A. Salehizadeh, M.B. Menhaj and A. Afshar.

Amirkabir University of Technology, Computer Engineering Department, Robotics Laboratory

Undergraduate Research Assistant

Jan 2006 - Sep 2007

- Designed and implemented a scaling force feedback telerobotic system
- Built a host-target interface for real-time monitoring of master-slave manipulators

COMPUTATIONAL SKILLS

MATLAB, C++, R, SQL, ROS, PLC

TEACHING EXPERIENCE

- Circuit Analysis II, Lecturer, ECE Department, UNM Summer 2012
- Circuit Analysis I, Teaching Assistant, ECE Department, UNM Spring 2011, 2012
- Control of Stochastic Systems, Teaching Assistant, EE Department, AUT Spring 2010
- Linear Control Systems Lab. Instructor, EE Department, AUT Spring 2010
- Signals and Systems, Teaching Assistant, EE Department, International branch of AUT, University of Birmingham Fall 2009
- Linear Control Systems Lab. Instructor, EE Department, AUT Fall, Spring 2009

HONORS AND AWARDS

- Guaranteed Research Support from NSF as part of ASSIST Nanosystems Center Aug 2012 - present
- NSF student travel award for Genomic Signal Processing and Statistics (GENSIPS'14) Dec 2014
- Travel award for IEEE International Conference on Control Applications Sep 2011
- Full Scholarship from University of New Mexico for graduate studies 2011 - 2012
- Full Scholarship for MS degree in Electrical engineering from Amirkabir University of Technology 2008 - 2010
- Ranked 1st among MS Control Engineering students in Amirkabir University of Technology 2008 - 2010
- Honored as exceptional talents of AUT 2003-2004, 2008-2010
- Ranked 73rd among more than 20000 participants in National Entrance Exam for Graduate Studies in Electrical Engineering, Iran 2008
- Ranked 21st among more than 5000 participants in National Entrance Exam for Graduate Studies in Control Engineering, Iran 2008
- Full Scholarship for B.S degree in Electrical engineering from Amirkabir University of Technology 2003-2008
- Ranked 282nd (among top 0.1%) in Iranian National University Entrance Exam among 500,000 participants 2003
- Admitted to National Organization for Development of Exceptional Talents for high school and middle school (among top 5%), Arak, Iran