# Ali Jalali

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## Objective

Analyzing complex data structures and building predictive models.

## Research Interests

Data Analysis and and modeling of complex biomedical and biological systems using machine learning techniques and computational modeling techniques with applications in ICU outcome prediction, cardiopulmonary resuscitation research, arrhythmia detection and cardiovascular engineering.

Analyzing unstructured data-set for building predictive analytics tools.

Image processing and acquisition, clinical experiments.

Dynamics and control with focus on the fault diagnostics techniques and vibration isolation.

## Academic Background

PhD, Mechanical Engineering, Villanova University *Aug. 2011 - Dec. 2014*

**Research**: **Integration of Model Based Methods and Data Driven Techniques for Prediction Of Clinical Outcomes**
**Supervisor: Dr. C. Nataraj, Mr. & Mrs. Robert F. Moritz, Sr. Endowed Chair Professor in Engineered Systems**

MSc, Mechanical Engineering, K. N. Toosi University of Technology, IRAN *Sep. 2005 - Feb. 2008*

**Research**: **Identification of sympathetic and parasympathetic nerves function in cardiovascular regulation using ANFIS approximation**
**Supervisor: Dr. A Ghaffari, Professor of Mechanical Engineering**

BSc, Material Science and Engineering, Ferdowsi University, IRAN *Sep. 1999 - Jun. 2005*

## Clinical Experience

Research Intern at Children's Hospital of Philadelphia (CHOP), Sept. 2013-Present

I have been a research intern at the Department of Anesthesia and Critical Care's Center for Resuscitation Science at the Children's Hospital of Philadelphia. I report to Vinay M. Nadkarni MD, attending physician and Associate Director of the Center. As a student research intern, I also work with Robert Sutton, MD, MSCE to format and download/analyze de-identified human CPR waveform data to characterize the hemodynamic profiles of chest compressions delivery in critically ill children from 7 North American ICUs. In addition, my duties include analyzing the data from the porcine CPR lab.

## Professional Service

Panelist for National Science Foundation (NSF)

Directorate for Engineering, Small Businesses Innovation and Research (Mar. 2014, Sep. 2014, Feb. 2015).

### Student Liaison

ASME Dynamic Systems and Control Bio-Systems Subcommittee (Nov. 2013 - Nov. 2014).

### Organized Symposiums

Invited Session on "Dynamical Modeling and Diagnostics in Biomedical Systems" ASME DSCC 2012-2013-2014.

### Reviewer

Artificial Intelligence in Medicine (Journal).

Medical and Biological Engineering (Journal).

Digital Signal Processing (Journal)

IDETC Conference (2012-2013), DSCC Conference (2013-2014)

## Teaching Experience

Various dynamics and control labs in Villanova University including: Data Acquisition, Piezoelectric sensors and actuators, and vibration isolation.

Teaching assistant for advanced vibration course in Villanova University.

## Volunteer Experience

Mentor: Several summer research undergraduates and high school students during my time at Villanova University (2011-2014).

Volunteer: Organization of Marine Advanced Technology Education (MATE) competition held at Villanova University (2011-2014).

## Awards

### Ranked 1st in Physionet/Computing in Cardiology Challenge 2007

Computing in Cardiology is one of the leading conferences in the field. The annual PhysioNet/CinC Challenges seek to provide stimulating competitions, while at the same time offering both specialists and non-specialists alike opportunities to make progress on significant open problems whose solutions may be of profound clinical value. The aim of the 2007 challenge was to characterize the location and extent of moderate to large, relatively compact infarcts using electrocardiographic evidence.

### Best poster award: Sigma-Xi Society Villanova Meeting 2011

## Courses/Workshops

### Graduate Courses

Computational Intelligence, Advanced control systems, stochastic control, adaptive control, nonlinear control, nonlinear dynamics, advanced vibrations, rotating machinery, stochastic signal processing, biomedical signal processing, system identification, neural networks.

Implantable/Wearable Biomedical Circuits and Systems, Full day tutorial, EMBC 2011

Multiscale Modeling of the Nervous System, Full day tutorial, EMBC 2012

Hands on Introduction to Android and iPhone Programming, Full day workshop, IEEE Philadelphia Section, Feb 2013

## Industry Experience

NIPEC Consultant Feb. 2008 - Dec. 2009

Worked primarily as a design review engineer for Copper industries. Developing and organizing bid-packages for various Copper projects.

## Computer Skills

MATLAB, Python, R, C#, LabVIEW, PowerLab, LaTeX, Microsoft Office, HTML

## Publications

### Book Chapter

C Nataraj, A Jalali, P Ghorbanian **Application of Computational Intelligence Techniques for Cardiovascular Diagnostics** In Book: The Cardiovascular System - Physiology, Diagnostics and Clinical Implications, InTech, 2012.

### White Papers

A. Jalali, M. Rehman, and C Nataraj, **Machine Learning in Pediatric Anesthesiology: Role of The Big Data** To be presented at the NSF Workshop on Cyber-Physical Systems, Feb. 2014.

A. Jalali, V. M. Nadkarni, R. A. Berg, and C. Nataraj, **Modeling, Optimization and Outcome Prediction of Cardiopulmonary Resuscitation in Advanced Life Support** To be presented at the NSF Workshop on Cyber-Physical Systems, Feb. 2014.

A. Jalali, D. Bender, D. J. Licht, and C. Nataraj, **Prediction of Periventricular Leukomalacia Occurrence in Neonates After Neonatal Heart Surgery** To be presented at the NSF Workshop on Cyber-Physical Systems, Feb. 2014.

### Journal Publications

1: A Jalali, DJ Licht, C Nataraj, **Prediction of Periventricular Leukomalacia (PVL) Occurrence in Neonates After Neonatal Heart Surgery** IEEE Journal of Health and Biomedical Informatics, (18) 1453 - 1460, 2014.

2: A Jalali, DJ Licht, C Nataraj, **Wavelet Analysis of Hemodynamic Waveforms for Prediction of Periventricular Leukomalacia Occurrence in Neonates** Annals of Biomedical Engineering, (revision submitted).

3: A Jalali, P Ghorbanian, A Ghaffari, C Nataraj, **A novel technique for identifying patients with ICU needs using hemodynamic features** Advances in Fuzzy Systems, 2012.

4: A Jalali, A Ghaffari, P Ghorbanian, C Nataraj, **Identification of sympathetic and parasympathetic nerves function in cardiovascular regulation using ANFIS approximation** Artificial Intelligence in Medicine, (52) 27-32, 2011.

5: P Ghorbanian, A Jalali, A Ghaffari, C Nataraj, **An improved procedure for detection of heart arrhythmias with novel pre-processing techniques** Expert Systems, (29) 478-491, 2012.

6: A Ghaffari, A Jalali, **Predicting Acute Hypotensive Episodes Based on HR Baroreflex Model Estimation** Cardiovascular Engineering, (9) 161-164, 2009.

## Conference Publications

1: A Jalali, V Nadkarni, C Nataraj, **Modeling Mechanical Properties of the Chest During the Cardiopulmonary Resuscitation Procedure** Computing in Cardiology (CinC2014) Pages 13-16.

2: A Jalali, RA Berg, V Nadkarni, C Nataraj, **Improving Cardiopulmonary Resuscitation (CPR) by Dynamic Variation of CPR Parameters** Dynamic Systems and Controls Conference (DSCC), 2013.

3: A Jalali, DJ Licht, C Nataraj, **Discovering Hidden Relationships in Physiological Signals For Prediction of Periventricular Leukomalacia (PVL)** Engineering in Medicine and Biology Society (EMBC), 2013 Annual International Conference of the IEEE.

4: A Jalali, DJ Licht, C Nataraj, **Time-Frequency analysis of hemodynamic waveforms to predict the occurrence and severity of Periventricular Leukomalacia** Dynamic Systems and Controls Conference (DSCC), 2012.

5: A Jalali, DJ Licht, C Nataraj, **Application of decision tree in the prediction of periventricular leukomalacia (PVL) occurrence in neonates after heart surgery** Engineering in Medicine and Biology Society (EMBC), 2012 Annual International Conference of the IEEE Pages 5931-5934.

6: A Jalali, RA Berg, V Nadkarni, C Nataraj, **Model based optimization of the cardiopulmonary resuscitation (CPR) procedure** Engineering in Medicine and Biology Society (EMBC), 2012 Annual International Conference of the IEEE Pages 715-718.

7: A Jalali, DJ Licht, C Nataraj, **Prediction of occurrence of Periventricular Leukomalacia (PVL) in Neonates after Heart Surgery Using a Decision Tree Algorithm** International Design Engineering Technical Conferences and Computers and Information in Engineering Conference (IDETC/CIE2012).

8: A Jalali, GF Jones, DJ Licht, C Nataraj, **Computational Modeling of Hypoplastic Left Heart Syndrome (HLHS) in Newborn Babies** Engineering in Medicine and Biology Society (EMBC), 2011 Annual International Conference of the IEEE Pages 185-189.

9: A Jalali, DJ Licht, C Nataraj, **Computational Modeling of Hypoplastic Left Heart Syndrome (HLHS) in Newborn Babies** International Design Engineering Technical Conferences and Computers and Information in Engineering Conference (IDETC/CIE2011) Pages 185-189.

10: A Jalali, M Butchy and A Ghaffari, C Nataraj, **Feature Extraction and Abnormality Detection in Autonomic Regulation of Cardiovascular System** International Design Engineering Technical Conferences and Computers and Information in Engineering Conference (IDETC/CIE2011) Pages 201-205.

11: P Ghorbanian, A Ghaffari, A Jalali, C Nataraj, **Heart arrhythmia detection using continuous wavelet transform and principal component analysis with neural network classifier** Computing in Cardiology (CinC2010) Pages 669-672.

12: A Jalali, A Ghaffari, P Ghorbanian, F Jalali, C Nataraj, **Quantitative analysis of heart rate baroreflex in healthy subjects using adaptive neuro fuzzy inference system approximation** Computing in Cardiology (CinC2010) Pages 951-954.

13: A Jalali, A Ghaffari, M Ghasemi, H SadAbadi, P Ghorbanian, H Golbayani, **Disorder classification in the regulatory mechanism of the cardiovascular system** Computing in Cardiology (CinC2007) Pages 489-492.

14: M Ghasemi, A Jalali, H SadAbadi, M Atarod, H Golbayani, P Ghorbanian, A Ghaffari, **Electrocardiographic imaging of myocardial infarction using heart vector analysis** Computing in Cardiology (CinC2007) Pages 625-628.

15: H SadAbadi, A Jalali, M Ghasemi, P Ghorbanian, M Atarod, H Golbayani, A Ghaffari, **Variation of ECG features on torso plane: An innovative approach to myocardial infarction detection** Computing in Cardiology (CinC2007) Pages 629-632.