

Srinivasan Vairavan

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Immigration status: Permanent Resident

SUMMARY

- 4+ years of post-Ph.D. research experience using a variety of techniques from machine learning, pattern recognition and time series analysis for healthcare analytics
- Effectively led data analytics team for global challenges in healthcare and biomedical research conducted by Physionet and Computing in Cardiology
- Developed several advanced signal processing algorithms for pattern recognition applications in fetal Magnetoencephalography (fMEG)
- Authored and co-authored several (30+) research articles in peer-reviewed international journals, conferences (<http://bit.ly/1C9Hn0G>) and patent applications
- Reviewer for several peer reviewed international journals and conference proceedings

RESEARCH EXPERIENCE



Senior Member Research Staff, Acute Care Solutions Philips Research, Briarcliff Manor, NY, USA

May 2011 - present

- *Predictive modeling:* Developed a mathematical inference model using *Linear Discriminant Analysis (LDA)*, *Fuzzy Inference Systems (FIS)* and *Log-Likelihood Ratio (LLR)* for the prediction of Acute Respiratory Distress Syndrome (ARDS) and *random forest (RF)* based prediction model for Acute Kidney Injury (AKI) using EMR data in Intensive Care Unit (ICU). Investigating a *Dynamic Bayesian Network (DBN)* based critical care forecasting model for forecasting (similar to weather forecasting) critical illnesses such as ARDS, AKI, therapy recommendation and conducting “in-silico” clinical trials.
- *Physiological modeling:* Developed a physiology based dynamic model (based on first principles) for the development of Acute Respiratory Distress Syndrome (ARDS).
- Transferred several advanced data analytics solutions to Philips healthcare business
- *Global competition:* Led a team in the development of a fetal heart rate extraction algorithm from non-invasive abdominal Electrocardiogram (ECG) as a part of Physionet and Cinc2013 global competition and was ranked # 5 among 60 teams (<http://bit.ly/1EzA6UQ>). Led a team in the development of a mortality prediction algorithm as a part of Physionet and Cinc 2012 global competition and was ranked # 3 among 37 teams. (<http://bit.ly/1LFmDEk>).
- *Other activities:* Generation of intellectual property (**24+ invention disclosures and patent applications**), writing grant proposal (NIH), mentoring junior scientists and participating in data science challenges posted in Kaggle and Ideatory.



Graduate Research Assistant, SARA Lab University of Arkansas for Medical Sciences, Little Rock, AR, USA

Aug 2006 - May 2011

Conducted research in advance signal processing for extraction of fetal neurological maturational signatures from multi-sensor data obtained by a Super Conducting Quantum Interference Device (SQUID) based fetal Magnetoencephalography (MEG) device.

- *Source Localization:* Developed Independent component analysis (ICA) and Hilbert phase analysis based automated localization of the spontaneous fetal brain activity in a multi-sensor data obtained by a SQUID based Magnetoencephalography (MEG) device.
- *Signal processing and Pattern recognition:*
 - Developed a novel algorithm based on Hilbert phase for the detection of discontinuous brain patterns in neonatal and fetal MEG data.
 - Designed and implemented a novel method for the detection of distinct fetal heart rate patterns and fetal behavioral states.
 - Developed a novel algorithm to detect the fetal cardiac time intervals from fetal Magnetocardiogram (fMCG).
 - Developed a novel algorithm to detect the uterine contractions accurately in Magnetomyogram.

Visiting young researcher

Institute of Advanced Biomedical Techniques (ITAB), Italy

Jan 2006 - Aug 2006

Automated reconstruction of fetal Magnetocardiogram using ICA and entropy estimators:

- Proposed the use of entropy estimators, namely, approximate entropy and sample entropy for an automated reconstruction of fetal Magnetocardiogram with ICA.
- Achieved an independent component detection rate as high as 98.5% compared to the traditional techniques used to automatically identify the independent components.

EDUCATION

University of Arkansas, Little Rock, AR, USA
PhD in Applied Science / Engineering Science and Systems

Aug 2006 - May 2011

Multimedia University, Cyberjaya, Malaysia
Masters by research in Information Technology

Jan 2004 - Jan 2006

University of Madras, Chennai, India
Bachelors in Electrical Engineering

Sep 1999 - May 2003

SKILLS

- **Programming:** R, MATLAB, Simulink, SQL
- **Quantitative analysis:**
 - **Signal Processing:** Time Series Analysis, Spectral analysis, Wavelet Analysis, Array Sensor Processing, Blind Source Separation, Source Localization, SVD
 - **Machine Learning:** Bayesian Inference, Dynamic Bayesian Network, Logistic Regression, Linear Discriminant Analysis, Expectation Maximization, SVM, Decision Trees, Random Forests, Boosting and Clustering techniques
 - **Mathematical Modelling:** Compartment type modelling of physiological systems

PROFESSIONAL SERVICES

Reviewer for peer-reviewed international journals published by: **Elsevier:** Physica A: Statistical Mechanics and its Applications, and Computers in Biology and Medicine, **IEEE:** Transactions on Biomedical Engineering, **Institution of Engineering and Technology (IET):** signal processing, **EURASIP:** Journal on

Advance signal processing, **Springer:** Neural Computing and Applications, Medical & Biological Engineering and Computing, and international conferences organized by EMBC.

HONORS & AWARDS

- Awarded as *Philips team for the year 2012* (<http://www.wearephilips.com/profiles/team-pgi.html>) for participating in a global challenge on prediction of mortality in ICU. Led a team of four researchers and our solution ranked # 1 amongst businesses, and # 3 behind Oxford and Harvard across institutions.
- Received *M. K. Testerman award* in 2011 from the department of Applied Science, University of Arkansas at Little Rock, AR for the best doctoral dissertation.
- Received *Publication and Presentation* award in 2010 from the department of Applied Science, University of Arkansas at Little Rock, AR for outstanding publications in journals and conferences as a first author.
- Received a *young researcher grant* in 2006 from Institute of Advanced Biomedical Techniques (ITAB), University of Chieti, Italy to pursue research in fetal Magnetocardiogram.

PATENTS & PUBLICATIONS

Selected Patents (filed):

- **Vairavan, Srinivasan;** Bryan Conroy. “Imputation of missing data using inherent dependencies between features and generation of confidence intervals for predictive modeling based clinical outcome biomarker.”, 2015
- **Vairavan, Srinivasan;** Chbat, Nicolas, Chiofolo, Caitlyn. “Protective Ventilation Therapy Recommendation Tool Guided by ARDS Risk.”, 2014
- **Vairavan, Srinivasan;** Chiofolo, Caitlyn; Chbat, Nicolas. “Computerization and visualization of clinical rules and definitions for patient monitoring systems”. US 61/858801, 2013.
- **Vairavan, Srinivasan;** Chiofolo, Caitlyn; Chbat, Nicolas. “Acute Lung Injury (ALI) / Acute Respiratory Distress Syndrome (ARDS) assessment and monitoring”. 61/600308, 2012.
- **Vairavan, Srinivasan;** Eshelman, Larry; Flower, Abigail; Syed Haider. “Modelling Techniques for predicting mortality in Intensive Care Units”. US 61/695586, 2012.

Selected Publications: (<http://bit.ly/1C9Hn0G>)

- **Vairavan, Srinivasan,** Rathinaswamy B. Govindan, Naim Haddad, Hubert Preissl, Curtis L. Lowery, Eric Siegel, and Hari Eswaran. “Quantification of fetal magnetoencephalographic activity in low-risk fetuses using burst duration and interburst interval.” *Clinical Neurophysiology* 125, no. 7 (2014): 1353-1359. PMID: 24361251.
- **Vairavan, Srinivasan;** Chiofolo, Caitlyn; Ahmed, Adil; Clinic, Mayo; Kashyap, Rahul; Wilson, Gregory; Li, Man; Li, Guangxi; Clinic, Mayo; Gajic, Ognjen; Chbat, Nicolas “Early Detection of Acute Lung Injury in Critically Ill Patients Using A Mathematical Inference Model.” *Critical Care Medicine*, 40.12 (2012), 1-328.
- **Vairavan, Srinivasan,** Larry Eshelman, Syed Haider, Abigail Flower, and Adam Seiver. “Prediction of Mortality in an Intensive Care Unit using Logistic Regression and a Hidden Markov Model” *Computing in Cardiology 2012*, 39 (2012), 393-396.