Keivan H. Monfared

Applied Mathematician - University of Calgary

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EDUCATION

UNIVERSITY OF WYOMING PHD 2014 and MSC 2011 in MATHEMATICS / Laramie, WY, USA

(Numerical) Linear Algebra

SKILLS singular value decomposition, eigendecomposition, non-negative matrix decomposition, QR factorization, Cholesky decomposition, stochastic gradient descent, compressed sensing, sparse matrix computations.

- Solved a 30+ years old problem and various extensions of it in inverse eigenvalue problems with applications in mechanical and quantum physics, biology, neuroscience, and economics.
- Modelled a physical problem as a quadratic eigenvalue problem and solved the inverse problem, including numerical computations.

Network Analysis

SKILLS graph clustering, spectral analysis, centrality, network dynamics, synchrony, random graphs, random walks, matching, cycle analysis, graph search, (large scale) combinatorial optimization

- Constructed functional connectivity networks from electroencephalography (EEG, LFP) recordings and functional magnetic resonance imaging of human's and rat's brain.
- Analyzed various centrality measures of the constructed networks to identify the hubs.
- Developed and implemented graph clustering methods to identify parts of the hippocampus and brain, before/during/after an epileptic seizure.

Data Science

STATISTICS Statistical testing/learning, text mining, graph/ information network mining, time series analysis, prediction, linear and generalized linear models, sampling, multivariate data: dimension reduction, clustering, classification, stochastic processes, support vector machines, neural networks, signal/image processing

APPLIED DATA Hand on experience with building mathematical
model temporally resolved data s using spacially and in neuroscienceand
dataset from social media

MACHINE LEARNING regression models, optimization methods, classification, neural networks, bias/variance analysis, Gaussian kernels, support vector machines, principal component analysis, clustering, classification, anomaly detection, recommender systems.

BIG DATA Parallel processes in Linux, GPU programming, familiar with Hadoop, Apache Spark, TensorFlow

- Used multivariable (regularized) linear/polynomial/logistic regression, and implemented gradient descent, simulated annealing, and particle swarm optimization in several projects including predicting students' admission to a university based on multiple test scores and other criteria.
- Used one-vs-all classification to classify microchips based on various test results.
- Used neural networks for handwritten digit recognition based on MNIST data set.
- Analyzed the performance of learning methods measuring bias/variance, validation curves, and made suggestions on how to improve the method in predicting the amount of overflow of water from a dam based on the historical data of the water levels.
- Implemented multivariate Gaussian kernels to develop support vector machines for email processing and spam detection.
- Used principal component analysis for dimension reduction and combined it with k-means clustering method for image compression.
- Used Gaussian kernels for anomaly detection in electroencephalography recorded data, and for performance check of server computers.
- Implemented collaborative recommendation systems to recommend movies based on MovieLenz 100K data set.

Signal Processing

PROGRAMMING Extensive experience with Matlab/Octave, Python (Pandas, SciKitLearn), R, Unix shell, Sage; competent with HTML

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WORK EXPERIENCE

UNIVERSITY OF WYOMING PHD 2014 and MSC 2011 in MATHEMATICS / Laramie, WY, USA

UNIVERSITY OF CALGARY

POSTDOCTORAL RESEARCH FELLOW, MATHEMATICS and NEUROSCIENCE

2015 – Present | Calgary AB, Canada

- Developed, implemented, tested and deployed new spectral and graph theory based methods for classification and clustering of temporally resolved (electroencephalogram) and spatial (functional magnetic resonance imaging) data to understand epilepsy in humans and model organisms.
- Served as statistics and mathematics expert for several research groups within Department of Neuroscience.
- Conducted theoretical and computational research on matrix theoretic properties of graphs and corresponding matrices.
- Delivered several invited and contributed talks communicating the results of my research to academics and industry.
- Taught college mathematics with a total of 2000 students, and managed teams of teaching assistants.

Leadership
Independent Reasearch
Team Building
Commiunication Skills
Delivering Results

WESTERN ILLINOIS UNIVERSITY

VISITING ASSISTANT PROFESSOR of MATHEMATICS

2014 – 2015 | Macomb IL, USA

- Conducted and published mathematical research in graph theory, linear algebra and combinatorics.
- Taught undergraduate and graduate level courses in mathematics, probability theory and statistics.
- Management team of math instructors for Statistics and Calculus series.

Collaboration
Team Management
Project Managment

UNIVERSITY OF WYOMING

GRADUATE RESEARCH and TEACHING ASSISTANT in MATHEMATICS

2009 – 2014 | Laramie, WY, USA

- Solved a 30+ years old problem and various extensions of it in inverse eigenvalue problems with applications in mechanical and quantum physics, biology, neuroscience, and economics.
- Extended the theory of permanent ranks of matrices with applications in graph theory, computational neuroscience and social sciences.
- Conducted research in mathematics and published manuscripts describing results of my research.
- Taught undergraduate and graduate level mathematics courses.

Theory
Numerical Experience
Team Work
Teaching

AWARDS

- PIMS postdoctoral fellowship Award - University of Calgary 2017
Pacific Institute for the Mathematical Sciences, Calgary, AB, Canada
- Teaching Award for Sessional Instructors (Nominated) - University of Calgary 2016
Outstanding contributions to student learning, Calgary, AB, Canada
- Ms. Catherine A. Shaw Award - University of Wyoming 2012
Excellence in Mathematics, Laramie, WY, USA
- Bronze Medal - Iranian Mathematical Society 2007
Nationwide Mathematics Competitions for University students, Mashhad, Iran

SERVICES

- Invited Reviewer (Journal of Linear Algebra and its Applications, Electronic Journal of Linear Algebra, Linear and Multilinear Algebra, Mathematical Reviews, International Journal of Computer Mathematics)
- Conference Organizer (Joint Mathematics Meeting - Atlanta 2017 and San Diego 2018)
- Diversity & Equity Committee for the Dean of Sciences at University of Calgary
- Safety Improvement Training Committee (Mathematics Department, and Faculty of Sciences) at University of Calgary
- Junior Math Contest Committee (University of Calgary, and Western Illinois University)