Ali Hashemi

I am an applied scientist with over seven years of experience and domain expertise in machine learning, statistics, optimization, and signal processing.

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Technical Skills

Programming and Software Skills: Python, R, MATLAB, C/C++, SQL, MySQL & PostgreSQL, Git & Github, LaTeX

Data Science Tools: TensorFlow; Keras; PyTorch; Python Libraries: Numpy, Pandas, Scipy, Scikit-learn, Seaborn, Bokeh; DNN Architectures and Methods: CNN, RNN, LSTM, VAE, LRP, Transformers.

Soft Skills: Leadership, Event Management, Writing, Public Speaking, Time Management

Domain Expertise: **Machine Learning**, Deep Learning, Graph Neural Network, Statistical Bayesian Inference with Uncertainty Analysis, Time-series Analysis and Forecasting, Large-scale Convex and Non-convex Optimization, Compressed Sensing and Sparsity, Signal Processing, Inverse Problems

Experiences

June 2021–present — **Research Scientist**, Chair of Uncertainty, Inverse Modeling and Machine Learning - *Computer Science Department*, Technische Universität Berlin, Germany.

- Managed three large research projects, in parallel; met regular deadlines.
- Designed efficient large-scale optimization algorithms for high-dimensional settings by utilizing the mathematical tools lying in the intersection of Bayesian statistics, machine learning, convex and non-convex algorithms, and time-series analysis.

Feb 2019–present — **Research Fellow**, Machine Learning/Intelligent Data Analysis Group - *Computer Science Department*, Technische Universität Berlin, Germany.

- Organised and presented large amounts of material in a structured and clear oral and written manner, resulted in more than 10 publications in tier-one journal and conferences
- Developed machine learning and sparse signal recovery tools as well as novel deep learning techniques by merging mathematically hand-crafted methods with the state-of-the-art data-driven artificial intelligence algorithms.
- Solved real-world challenges by applying developed methods to applications with various data types ranging from brain sources and telecommunications signals to thermal fields.

Feb 2019–May 2021 — **Data Scientist**, Brain and Data Science Lab, Berlin Center for Advanced Neuroimaging (BCAN) - Charité Universitätsmedizin Berlin, Germany.

- Team player with experience through different international multidisciplinary collaborations.
- Ability to work in a team, while doing specific assigned task, independently and effectively.
- Managed group assistants to deliver goal-oriented projects on-time for time frames from 3 months to 2 years.
- Developed methods to improve source estimations by automatically learning the spatio-temporal structure of the sources from observations in a hierarchical Bayesian framework using efficient non-linear optimization.
- Designed algorithms to automatically learn the mapping from sensor to source using state-of-the-art supervised deep learning techniques based on carefully designed synthetic training data.

Feb 2016–Jan 2019 — **Doctoral Researcher**, Computer Science Department and Institut für Mathematik, Technische Universität Berlin, Germany.

- Developed efficient optimization and machine learning techniques for solving ill-posed inverse problems with applications in neuroimaging and thermal monitoring, using co-sparsity, Bayesian inference and Compressed Sensing mathematical tools.

Feb 2015–Jan 2016 — **Research Scientist**, Information Systems Technology and Design Department, Singapore University of Technology and Design, Singapore.

- Developed a sparse domain for classifying brain signals using a "task-based dictionary" by merging machine learning with compressed sensing methods.
- Modeled and incorporated partial differential equations (PDE) as side information into the compressed sensing and sparse signal recovery algorithm.
- Achieved $10\ dB$ improvement in reconstruction accuracy with 90% less computational complexity, compared to the benchmark.
- Gained project management skills and fundamental international experiences through collaboration with MIT and UPenn.

2012–2014 — **Data Scientist**, Wireless Research Laboratory (WRL), Sharif University of Technology, Tehran.

- Teaching and examination of more than 300 electrical engineering and computer science students in 2 years.
- Prepared a complete survey of different classical machine learning approaches accompanied by their efficient implementation in MATLAB as a software product.
- Developed a MIMO wide-band spectrum sensing method based on the entropy of the cyclostationary signals and compressed sensing machinery.

Education

2016–2022 — **PhD–Technische Universität Berlin**, *Computer Science and Mathematics*, Berlin, Germany.

Thesis title: "Advances in Hierarchical Bayesian Learning and Applications to Neuroimaging"
Supervisors: Prof. Dr. Klaus-Robert Müller, and Prof. Dr. Stefan Haufe.

2015-2016 **Visiting Research Fellow–Singapore University of Technology and Design**, *Singapore*.
Research title: "Studying Compressed Sensing under Partial Differential Equation (PDE) Constraints"

2011-2013 **MSc–Sharif University of Technology**, *Electrical Engineering – Communication Systems*, Tehran, Iran.
Thesis title: "Compressed Spectrum Sensing in Cognitive Radio Networks"

2007-2011 **BSc–University of Tabriz**, *Electrical and Computer Engineering – Communication Systems*, Iran.
Thesis title: "Practical Physical Layer Network Coding for Two-Way Relay Channels Performance Analysis and Comparison"

Transferable Skills

Drive and motivation

- Passionate about machine learning and deep learning and try to constantly improve my skills and stay up-to-date with the most state-of-the-art methods and algorithms in the mentioned areas.
- Fast learner, take selective online courses from top-ranked universities and watch presentations and tutorials from tier one conferences (**NeurIPS, ICML**), related to the latest developments in data-science technologies.

Communication

Experienced speaker with the ability to write extensive engineering and scientific reports and proposals, and present findings to peers at internal seminars and international conferences in front of diverse audiences: **My full list of publications** plus **my detailed CV including the full list of my talks.**

Selected Research Papers, Conferences and Seminars (Participation and Presentations):

- "Efficient Hierarchical Bayesian Inference for Spatio-temporal Regression Models in Neuroimaging.", NeurIPS, Dec-2021.
- "Joint Hierarchical Bayesian Learning of Full-structure Noise for Brain Source Imaging.", Medical Imaging meets NeurIPS (MedNeurIPS) workshop, Dec-2020.
- "Compressed Sensing: From Theory to Praxis.", Book Chapter, Edited by C.H. Chen, CRC Press, May-2017.
- "Robust Estimation of Noise for Electromagnetic Brain Imaging with the Champagne Algorithm.", NeuroImage, Feb-2021.
- "Unification of Sparse Bayesian Learning Algorithms for Electromagnetic Brain Imaging with the Majorization Minimization Framework.", Neuroimage, Aug-2021.
- Joint Learning of Full-structure Noise in Hierarchical Bayesian Regression Models., Preprint submitted to TMI, 2021, Draft is available on bioRxiv.
- Improving EEG Source Localization Through Spatio-Temporal Sparse Bayesian Learning., 26th IEEE European Signal Processing Conference (EUSIPCO), 2018.
- "Deep Brain Source Imaging: An LSTM-inspired Approach for EEG Source Localization based on Sparse Bayesian Learning.", Signal Processing with Adaptive Sparse Structured Representations (SPARS), Toulouse, France, Jul-2019.
- "Mathematics of Deep Learning Summer School.", Technische Universität Berlin, Germany, Aug-2019.
- "Intense Course on Deep Learning.", Technische Universität Berlin, Germany, Dec-2017.
- "Workshop on Mathematics of Deep Learning.", Weierstrass Institute (WIAS), Berlin, Germany, Sep-2017.
- "Structured Regularization for High-Dimensional Data Analysis.", Institut Henri Poincarè, Paris, France, Jun-2017.

Honors and Awards

2019 **Awarded scholarship for 3 Years**, *Machine Learning-Intelligent Data Analysis Group*, Technische Universität Berlin, Germany.

2015 **Awarded full fellowship for 3 Years**, *Berlin International Graduate School in Model and Simulation-based Research (BIMoS)*, Technische Universität Berlin, Germany.

2014 **Awarded research scholarship for 1 Year**, *Singapore University of Technology and Design*, Singapore.

2011 **Ranked 1st**, *Highest Grade Point Average (GPA) among all the electrical and computer engineering undergraduate students (among above 200)*, University of Tabriz, Iran.

2010 **Ranked 10th/30,000**, *National Electrical Engineering Olympiad for Undergraduate Students*, Tehran, Iran.

Languages

- **English** (Fluent) & **German** (Intermediate-Level B2) - **Persian** (Native Speaker).