Mohammadreza Soltani

Personal Data

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Appointments

Sept 2022 - Present	Principal Data Scientist, Fidelity Investments
Oct 2021 - Aug 2022	Speech Research Scientist, 3M/M*Modal
May 2019 - Oct 2021	Postdoctoral Associate, Duke University
May 2018 - Dec 2018	Research Internship in AI Lab at Technicolor Company
Jan 2015 - April 2019	Research and Teaching Assistant, Iowa State University (ISU)
Jan 2013 - Dec 2014	Research and Teaching Assistant, University of Nebraska-Lincoln (UNL)

Education

Jan 2015 - May 2019	Ph.D., Iowa State University (ISU), Ames, IA, USA Major: Electrical Engineering - Signal Processing **Thesis:** Provable Algorithms for Nonlinear Models in Machine Learning and Signal Processing Advisor: Dr. Chinmay Hegde
Jan 2013 - Dec 2014	MSc., University of Nebraska - Lincoln (UNL), Lincoln, NE, USA Major: Telecommunication Engineering Minor: Mathematics Advisor: Prof. Hamid Sharif
Sept 2009 - Oct 2011	MSc., Amirkabir University of Technology (Tehran Polytechnic), Tehran, Iran Major: Electrical Engineering - Electronics (Digital) Advisor: Prof. Ahmad Motamedi
Sept 2005 - Sept 2009	BSc., University of Guilan, Rasht, Iran Major: Electrical Engineering

Research Interest

- Machine/Deep Learning
- Automatic Speech Recognition/Understanding
- Natural Language Processing/Understanding
- Signal Processing
- Information Theory and High-Dimensional Statistics

Publications

- C. Le, **M. Soltani**, J. Dong, V. Tarokh, Fisher Task Distance and Its Application in Neural Architecture Search, IEEE Access, vol. 10, p47235 - 47249, May 2022.
- C. Le, J. Dong, **M. Soltani**, V. Tarokh, "Task Affinity with Maximum Bipartite Matching in

Few-Shot Learning", International Conference on Learning Representation (ICLR), April 2021.

- J. Dong, S. Ren, Y. Deng, O. Khatib, J. Malof, **M. Soltani**, W. Padilla, V. Tarokh, "Blaschke Product Neural Networks (BPNN): A Physics-Infused Neural Network for Phase Retrieval of Meromorphic Functions", International Conference on Learning Representation (ICLR), April 2021.
- J. Dong, S. Wu, **M.Soltani**, V. Tarokh, "Multi-Agent Adversarial Attacks for Multi-Channel Communication", International Conference on Autonomous Agents and Multiagent Systems (AAMAS), May 2022.
- **M.Soltani**, S. Wu, J. Ding, V. Tarokh, "On The Energy Statistics of Feature Maps in Pruning of Neural Networks with Skip-Connections", International Conference on The Data Compression Conference (DCC), March 2022.
- S. Venkatasubramanian, C. Wongkamthong, **M. Soltani**, B. Kang, S. Gogineni, A. Pezeshki, M. Rangaswamy, V. Tarokh, "Toward Data-Driven STAP Radar", IEEE Radar Conference, March 2022.
- Y. Deng, J. Dong, S. Ren, O. Khatib, **M. Soltani**, V. Tarokh, W. Padilla, J. Malof, "Benchmarking Data-driven Surrogate Simulators for Artificial Electromagnetic Materials", NeurIPS 2021 Datasets and Benchmarks Track, 2021.
- C. Le, **M. Soltani**, J. Dong, V. Tarokh, "Fisher Task Distance and Its Applications in Transfer Learning and Neural Architecture Search", submitted, 2021.
- C. Le, **M. Soltani**, R. Ravier, V. Tarokh, "Neural Architecture Search From Task Similarity Measure", submitted, 2021.
- A. Yanchenko, **M. Soltani**, R. Ravier, S. Mukherjee, V.Tarokh, "A Methodology for Exploring Deep Convolutional Features in Relation to Hand-Crafted Features with an Application to Music Audio Modelingt, submitted 2021.
- M. Angjelichinoski, **M. Soltani**, J. Choi, B. Pesaran, V. Tarokh, "Deep Pinsker and James-Stein Neural Networks for Decoding Motor Intentions from Limited Data" , IEEE Transactions on Neural Systems & Rehabilitation Engineering (TNSRE), 2021.
- Y. Feng, C. Wongkamthong, **M. Soltani**, Y. NG, S. Gogineni, B. Kang, A. Pezeshki, R. Calderbank, M. Rangaswamy, V. Tarokh, "Knowledge-Aided Data-DrivenRadar Clutter Cancellation", IEEE Radar Conference, May, 2021
- M. Cho, **M.Soltani**, C. Hegde, "One-Shot Neural Architecture Search via Compressive Sensing", ICLR Workshop on Neural Architecture Search (NAS), May, 2021.
- C. Cannella, **M. Soltani**, V. Tarokh, "Projected Latent Markov Chain Monte Carlo: Conditional Sampling of Normalizing Flows", International Conference on Learning Representation (ICLR), May 2021.
- C. Le, **M.Soltani**, R. Ravier, V. Tarokh, "Task-Aware Neural Architecture Search", International Conference on Acoustics, Speech, and Signal Processing (ICASSP), June 2021.
- Y.Feng, C. Wongkamthong, **M. Soltani**, Y. NG, S. Gogineni, B. Kang, A. Pezeshki, R. Calderbank, M. Rangaswamy, V. Tarokh, "Knowledge-Aided Data-DrivenRadar Clutter Cancellation", IEEE Radar Conference, May, 2021.
- **M.Soltani**, S. Wu, Y.Li, R. Ravier, J. Ding, V. Tarokh, "Compressing Deep Networks Using Fisher Score of Feature Maps", International Conference on The Data Compression Conference (DCC), March 2021.
- **M.Soltani**, S. Wu, J. Ding, R. Ravier, V. Tarokh, "On the Information of Feature Maps and Pruning of Deep Neural Networks", International Conference on Pattern Recognition (ICPR), Jan 2021.

- M. Angjelichinoski, **M. Soltani**, J. Choi, B. Pesaran, V. Tarokh, "Deep James-Stien Neural Networks for Brain-Computer Interfaces", International Conference on Acoustics, Speech, and Signal Processing (ICASSP), May 2020.
- C. Cannella, J. Ding, **M. Soltani**, Y. Zhou, V. Tarokh, "Perception-Distortion Trade-Off with Restricted Boltzmann Machines", International Conference on Acoustics, Speech, and Signal Processing (ICASSP), May 2020.
- **M.Soltani**, S. Jain, C. Hegde, "Learning Structured Signals Using GANs with Applications in Denoising and Demixing", Asilomar Conference on Signals, Systems, and Computers, Nov 2019.
- **M.Soltani**, S. Jain, A. Sambasivan, "Unsupervised Demixing of Structured Signals from Their Superposition Using GANs", ICLR Workshop on Deep Generative Models for Highly Structured Data, May 2019.
- **M. Soltani** and C. Hegde, "Fast and Provable Algorithms for Learning Two-Layer Polynomial Neural Networks", IEEE Transactions on Signal Processing (TSP), vol. 67, no. 13, p3361-3371, July 2019.
- **M. Soltani** and C. Hegde, "Fast Low-Rank Estimation for Ill-Conditioned Matrices", International Symposium on Information Theory (ISIT), June 2018.
- **M. Soltani** and C. Hegde, "Towards Provable Learning of Polynomial Neural Networks Using Low-Rank Matrix Estimation", Artificial Intelligence and Statistics (AISTAT), April 2018. (**acceptance rate: %33**)
- **M. Soltani** and C. Hegde, "Fast Low-Rank Matrix Estimation without the Condition Number", https://arxiv.org/abs/1712.03281, Dec 2017.
- **M. Soltani** and C. Hegde, "Towards Provable Learning of Polynomial Neural Networks Using Low-Rank Matrix Estimation", NIPS Workshop On Deep Learning: Bridging Theory and Practice (DLP), Dec 2017.
- **M.Soltani** and C. Hegde, "Demixing Structured Superposition Signals from Periodic and Aperiodic Nonlinear Observations", IEEE GlobalSIP Symposium on Sparse Signal Processing and Deep Learning, Nov 2017.
- V. Shah, **M.Soltani** and C. Hegde, "Reconstruction from Periodic Nonlinearities, with Applications to HDR Imaging", Asilomar Conference on Signals, Systems, and Computers, Nov 2017.
- **M.Soltani** and C. Hegde, "Fast Algorithms for Learning Latent Variables in Graphical Models", ACM KDD Mining and Learning With Graphs (KDD MLG), Aug 2017.
- **M.Soltani** and C. Hegde, Improved Algorithms for Matrix Recovery from Rank-One Projections, poster presentation in Midwest Machine Learning Symposium (MMLS), May 2017. (**Winner of the best poster award**)
- **M.Soltani** and C. Hegde, "Fast Algorithms for Demixing Sparse Signals from Nonlinear Observations", IEEE Transactions on Signal Processing (TSP), vol. 65, no. 16, p4209-4222, Aug 2017.
- **M.Soltani** and C. Hegde, "Stable Recovery of Sparse Vectors From Random Sinusoidal Feature Maps", International Conference on Acoustics, Speech, and Signal Processing (ICASSP), March 2017.
- **M. Soltani** and C. Hegde, "Iterative Thresholding for Demixing Structured Superpositions in High Dimensions", NIPS Workshop on Learning in High Dimensions with Structure (LHDS), Dec 2016. (**Oral presentation; acceptance rate: 2/50**)

- **M. Soltani** and C. Hegde, "A Fast Iterative Algorithm for Demixing Sparse Signals from Nonlinear Observations", IEEE GlobalSIP Symposium on Compressed Sensing and Deep Learning, Dec 2016.
- **M. Soltani** and C. Hegde, "Demixing Sparse Signals from Nonlinear Observations," Asilomar Conference on Signals, Systems, and Computers, Nov 2016.
- **M. Soltani,** M. Hempel, and H. Sharif, "Utilization of Convex Optimization for Data Fusion-driven Sensor Management in WSNs", International Wireless Communications & Mobile Computing Conference (IWCMC), 2015.
- **M. Soltani,** M. Hempel, and H. Sharif, "Data Fusion Utilization for optimizing Large-Scale Wireless Sensor Networks", International Conference on Communications (ICC), 2014.
- M. Maadani, S. A. Motamedi, and **M. Soltani**, "EDCA Delay Analysis of Spatial Multiplexing in IEEE802. 11-Based Wireless Sensor and Actuator Networks", International Journal of Information and Electronics Engineering, 2(3), p.318, 2012.
- **M.Soltani,**, "A novel Tunable Opportunistic Routing Protocol for WSN Applications", Amirkabir University of Technology, Technical Report, 2012.
- M. Maadani, S. A. Motamedi, and **M. Soltani**, "Delay Analysis of MIMO-Enabled IEEE 802.11-Based Soft-Real-Time Wireless Sensor and Actuator Networks", Dela, vol. 150, p200, 2011.
- **M. Soltani,** S. A. Motamedi, S. Ahmadi, and M. Maadani, "Power-Aware and Void-Avoidant Routing Protocol for Reliable Industrial Wireless Sensor Networks", International Conference on Wireless Communications, Networking and Mobile Computing (WiCOM), 2011.

Funding Experience

- Machine Learning Techniques for Radar Signal Processing, Air Force Research Lab (AFRL), 2020 (Link)
- Utilizing Graph Neural Networks for Robust and Intelligent Communication Protocols Networks, NSF, 2021 (Pending)

Teaching Experience

Spring 2021	Head T.A. for *Advanced Topics in Deep Learning*, Duke University
Fall 2020	Instructor for *Multivariable Calculus*, Duke University
Fall 2020	Head T.A. for *Deep Learning*, Duke University
Spring 2020	Head T.A. for *Signal and Systems*, Duke University
Fall 2019	Head T.A. for *Deep Learning*, Duke University
Fall 2017	T.A. for *Deep Learning*, Iowa State University (ISU)
Spring 2015 - Fall 2015	T.A. for *Signal and Systems I*, Iowa State University (ISU)
Fall 2014	T.A. for *Electrical and Electronic Circuits*, University of Nebraska-Lincoln (UNL)
2011 - 2012	Private Tutor for *Engineering Mathematics, Differential Equations, and Engineering Probability and Statistic*, Iran

Talk and poster presentations

- Multi-Agent Adversarial Attacks for Multi-Channel Communications, AFRL University Center of Excellence, Oct, 2021.

- Compressing Deep Networks Using Fisher Score of Feature Maps, University of Northern Texas (UNT), April 2021.
- On The Information of Feature Maps and Pruning of Deep Neural Networks, New Colledge of Florida (NCF), Feb 2021.
- Deep Neural Compression From Model-Free Information, 4th annual review of the MURI, Oct 2020.
- Fast and Provable Algorithms for Learning Two-Layer Polynomial Neural Networks, INFORMS Annual Meeting, Phoenix, Arizona, Nov 2018.
- Improved Algorithms for Matrix Recovery from Rank-One Projections, Midwest Machine Learning Symposium (MMLS), Chicago, June 2017.
- Nonlinear Demixing Problem, Park City Mathematics Institute (PCMI), July 2016.
- Data Fusion Utilization for Large-Scale Dynamic WSN Management", Poster presentation in UNL Research Fair, May 2014.

Mentoring

- Deep learning course project, Duke University, Fall 2019:
  1. "Automated Theorem Prover", Chengyu Wang, Wendi Zhang
  2. "Pedestrian Trajectory Prediction", A. Morales, A. Angadi, A. Jimenez, X. Sun
  3. "Differentially Private Synthetic Data Generation using GANs", Y. Zhang, Z. Chen
  4. "Secure State Estimation for Cyber-Physical Systems Under Sensor Attacks Using Generative Adversarial Networks", A. Khazraei, M. Momenifar
  5. "Theory of Deep Learning", Y. Ng, M. Ford
- "Video Completion Using Deep Learning", Y. Li, Since Feb 2020
- "Machine Learning for High Resolution Radar", C. Wongkamthong, Since March 2020
- "Task Similarity and its Application in Meta-Learning", C. le, Since April, 2020
- "Meta-Material Design Using Deep Learning", J. Dong, Since March 2021

Honors and Awards

- Winner of the best poster award in Midwest ML Symposium (MMLS), June 2017.
- IEEE Signal Processing Society travel grant for participation in GlobalSip conference, Dec 2016.
- Professional Advancement Grants (PAG), Iowa State University, Nov 2016.
- Fully funded for participation in Graduate Summer School (GSS) of PCMI Summer Session, July 2016.

Reviewer

- Neural Information Processing Systems (NeurIPS)
- SIAM Journal on Imaging Sciences (SIIMS)
- International Joint Conferences on Artificial Intelligence (IJCIA)
- Association for the Advancement of Artificial Intelligence (AAAI)

- IEEE Transaction on Signal Processing (TSP)
- IEEE Transactions on Mobile Computing (TMC)
- IEEE Transactions on Vehicular Technology (TVT)
- IEEE Asilomar Conference on Signals, Systems, and Computers
- Multimedia Tools and Applications (MTAP)
- IEEE International Conference on Signal and Image Processing Applications (ICSIPA)
- Wireless Personal Communications
- Mobile Networks and Applications
- Security and Communication Networks
- IEEE Symposium on Computer Applications & Industrial Electronics
- IEEE International Conference on Signal Processing and Communications (SPCOM)

Computer Skills

Programming Language:	Python (Proficient) Numpy, Scipy, Pandas, Multiprocessing/Multithreading, SpeechBrain, S3PRL, Hugging Face, Matplotlib, Seaborn, Plotly, Streamlit, Scikit-learn, Pytorch/PyTorch Lightning, Tensorflow, Keras, Matlab (Proficient), C/C++ (familiar), OpenCV, LabVIEW, NS-2
Cloud Technology:	AWS (Sagemaker, Boto3, EC2, Athena, S3)
Containerization and Job Scheduling:	Docker, Slurm
Database:	Snowflake, Athena
Big-Data Technology:	Hadoop ecosystem-Spark (familiar)
Operating System:	macOS/Linux/Windows
Other Skills:	LaTeX, Git, Excel, Word, PowerPoint

Professional Activities

- Organizing Data Science Reading Group (DSRG)
  - https://isudsrg.wordpress.com/
- Participating at ISU Future Faculty Program (FFP)

Languages

Persian (Farsi):	Mother tongue
English:	Fluent
Turkish:	Familiar

References

- **Prof. Vahid Tarokh** (vahid.tarokh@duke.edu)
  Professor, Duke University
- **Dr. Chinmay Hegde** (chinmay.h@nyu.edu)
  Assistant Professor, New York University (NYU)

- **Prof. Hamid Sharif-Kashani** (hamidsharif@unl.edu)
  Professor, University of Nebraska-Lincoln (UNL)