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Reshad Hosseini

Education

PhD "Electrical and Computer Engineering (Artificial Intelligence)"

2007 - 2012 Max Planck Institute for Biological Cybernetics/ Technical University of Berlin
Dissertation, *Grade: magna cum laude*
Title *Statistical modelling of natural images using mixture models*
Supervisor Prof. Bethge

Master of Science "Biomedical Engineering (Bio-electric)"

2004 - 2007 Amirkabir Univeristy (Tehran Polytechnique)
Master Thesis, *Grade: 20/20*
Title *Statistical analysis of fMRI images using wavelet transform*
Supervisor Prof. Vafadust

Bachelor of Science "Electrical Engineering (Telecommunication)"

2000 - 2004 University of Tehran
Bachelor Thesis, *Grade: 20/20*
Title *Fingerprint image enhancement using wavelet transform*
Supervisor Prof. Kamarei

Professional Experiences

2019 - now Co-Founder and Head AI of HARA Company
Activities:
- Leading R&D teams developing AI products
- Involving in the development of traffic control products
- Involving in strategic planning

2013 - now Assistant Professor at University of Tehran
Activities:
- Tutoring courses: deep learning, machine vision, advanced optimization, speech processing, operations research, intelligent systems
- Supervising Bachelor, Master and PhD students
- Conducting theoretical and applied research

2013 German Language Instructor at Sokhan Language Institute
Activities:
- Giving German courses at levels A-1 and A-2

Industrial Products in HARA

2021 - 2022 AI Team Lead
in automatic image reader of official letters
Started: March 2021
Ended: June 2022
This product has achieved **very high performance** in official letter OCR

2021 AI Team Lead
in automatic photo reader of cards
Started: March 2021
Ended: September 2021
This product has achieved **near human performance** in reading cards

2021 AI Team Lead
in fine verification bot product
Started: January 2021
Ended: April 2021
This product is currently in use and evaluated more than **10 Million** traffic fines
It verifies 95 percent of fines with **100% accuracy** and sends the rest of 5 percent to operator check

2020 AI Team Lead & Developer
in automatic traffic control
Started: March 2020
Ended: December 2020
This product has been currently installed on more than **1100** cameras, and successfully **passed police tests**
It is the rank one in Iran in terms of accuracy and number of installations

2021 - 2022 Advisor
in face recognition
Started: March 2021
Ended: December 2022
Achieving the accuracy higher than human

2021 - 2022 Advisor
in speaker verification
Started: March 2021
Ended: April 2022
Reaching the accuracy of best available methods, but still low for industry
Therefore, we stopped its further development

2021 - now Advisor
in text to speech
Started: March 2021
Currently under development

2021 - now AI Team Lead
in vehicle damage estimation
Started: March 2021
Currently under development

2020 - now AI Team Lead
in automatic call-center
Started: January 2020
Currently under development

Industrial Projects in HARA

2019 from Roham Company
for vehicle speed computation using machine vision
Duration: 1 month, Amount: 150 Million Tomans

Industrial Projects in University

2020 Investigator of an industrial project from Balad Company
for road map updating using GPS data
Duration: 6 months, Amount: 26.3 Million Tomans

2018 Principal investigator of an industrial project from Metaschip Company
for early detection of cancerous cells using machine vision
Duration: 6 months, Amount: 150 Million Tomans

2017 Investigator of an industrial project from Shatel Company
for segmenting internet users based on their traffic usage
Duration: 6 months, Amount: 12.5 Million Tomans

2017 Principal investigator of an industrial project from Shatel Company
for developing customer segmentation software
Duration: 12 months, Amount: 12.5 Million Tomans

2017 Principal investigator of an industrial project from Pardakht Novin Company
for developing document image validation software
Duration: 6 months, Amount: 114 Million Tomans

2016 Grant from a company in Tosan Holding
for developing speech processing systems
Duration: 6 months, Amount: 3.750 Million Tomans

Grants and Fundamental Projects

2022 Grant from Cognitive Science and Technologies Council
for developing computer methods for Parkinson diagnosis
Duration: 9 months, Amount: 222.2 Million Tomans

2021 Grant from Computer Science Branch of IPM
for doing research in developing new optimization methods for 3D reconstruction
Duration: 12 months, Amount: 9 Million Tomans

2019 Grant from Computer Science Branch of IPM
for doing research in developing new optimization methods for 3D reconstruction
Duration: 12 months, Amount: 9 Million Tomans

2019 Grant from Cognitive Science and Technologies Council
for doing research in brain inspired modeling and design of primary visual cortex
Duration: 12 months, Amount: 11 Million Tomans

2018 Grant from Computer Science Branch of IPM
for doing research in developing new methods for avoiding local minima problem in machine learning
Duration: 12 months, Amount: 9 Million Tomans

2017 Principal investigator of a fundamental project from Iranian National Science Foundation
for developing large-scale mixture models
Duration: 16 months, Amount: 20 Million Tomans

2017 Grant from Computer Science Branch of IPM
for doing research in manifold learning and optimization
Duration: 12 months, Amount: 9 Million Tomans

2016 Grant from Innovation Park of University of Tehran
for developing automatic blood testing system using image processing
Duration: 6 months, Amount: 4 Million Tomans

2016 Grant from Computer Science Branch of IPM
for doing research in manifold learning and optimization
Duration: 12 months, Amount: 8 Million Tomans

2014 Grant from National Elite Foundation
for further developing image compression algorithm
Duration: 6 months, Amount: 3 Million Tomans

Awards

2017 Winner of the Research Scholarship from National Elite Foundation
This scholarship is awarded to highly qualified young faculty members
Amount: 20 Million Tomans

2016 Winner of the National Elite Foundation Prizes (Housing Loan, Marriage Present)
The prizes are awarded only to highly qualified university graduates

2013 Winner of the Innovation Festival Prize
Winning the prize in the regional innovation festival

2010 Outstanding Research Scholarship
Research Scholarship from Max-Planck-Institute for doing outstanding research on image compression
Amount: 4 Thousands Euros

2009 Winner of the Great08Challenge prize
for the highest performance in the main challenge of GREAT08 PASCAL competition (Gravitational Lensing and Accuracy Testing 2008)
Amount: 1 Thousand Euros

2007 PhD Scholarship
Scholarship from Max-Planck-Institute for doing PhD studies

2000 Outstanding achievement in the university entrance examination
Ranking number 1 in Kurdistan province (26 among nearly 100,000 participants) in the National University Admission exam in 2000, hence being able to enter the much sought after Tehran University.

1999 Khwarazmi Award
Award from Ministry of Education, for advancing into the highest stage of the prestigious Kharazmi Olympiad

1998 National Olympiad
Award from Ministry of Education, for succeeding in the National Scientific Olympiad in Mathematics, Physics, Chemistry

1995 Scientific Competition
Award from Ministry of Education, for obtaining the first rank in the scientific competition of the Kurdistan province

Research Skills and Expertise

Machine Learning	Deep learning, deep mixture models, metric learning, recommender systems, hidden-Markov models, reinforcement learning
Computer Vision	Deep visual recognition, image modeling, 3D reconstruction, morphable models, image compression
Optimization	Optimization on manifolds, large-scale methods, convex optimization, fixed-point algorithms
Wavelet	Filterbank design, complex wavelet
Statistical modeling	Hypothesis testing, signal estimation, signal detection, general linear model
Signal processing	Filter design, stability analysis, power-spectrum estimation, speech processing

Programming Languages

C++	Advanced knowledge in programming Grade 20/20 in bachelor course "Computer Programming" (Except me only one person got the full grade among around 500 participants in university of Tehran)
Python	Advanced knowledge in programming
MATLAB	Advanced knowledge in programming
Visual C++	Basic knowledge in programming

Patents

- H. Pourmehrani, H. Moradi, and R. Hosseini. Flow detection system for leakage detection inside water pipes, June 2023. IR Patent 140150140003007515.
- M. Abbaszadeh, R. Hosseini, S. Saghari, and A. Taghizadeh. Automatic slide scanner with capability of joining to microscope as a motorized accessory, September 2018. IR Patent 139650140003004297.
- M. Bethge and R. Hosseini. Method and device for image compression, October 2014. US Patent 8,750,603.
- M. Bethge and R. Hosseini. Method and device for image compression, August 2013. EU Patent 2131594B1.

Invited Talks

- R. Hosseini. Computer vision and industry, Jan 2023. Invited Talk at IAAA webinar, Tehran.
- R. Hosseini. Deep learning, Jan 2022. Invited Lectures at Turbovision Winter School at Part AI, Tehran.

- R. Hosseini. Computer vision, Sep 2022. Invited Lectures at Hamrah Academy Summer School at Part AI, Tehran.
- R. Hosseini. Deep learning, Jan 2020. Invited Talk at Data Science Winter School at University of Tehran, Tehran.
- R. Hosseini. Optimization on manifolds for machine learning, Jul 2019. Invited Talk at Amirkabir Artificial Intelligence Summer Summit, Tehran.
- R. Hosseini. Deep recurrent neural networks and applications, Feb 2019. Lecture in Deep Learning Tutorial Session at CiDaS Conference, Zanjan.
- R. Hosseini. Deep recurrent neural networks, Jul 2018. Lecture in Deep Learning Summer School at University of Tehran, Tehran.
- R. Hosseini. Semantic in perceptual systems as a compression tool: Evidence and consequences, Dec 2013. Invited Talk at BCNC Conference, Tehran.
- R. Hosseini. Natural image modelling, Jan 2013. Invited Talk at IPM, Tehran.
- R. Hosseini. Spectral stacking: Key to weak gravitational lensing, Jul 2009. Prize Winning Talk at Cosmosta09 Conference, Ascona.

Publications

Book Chapters

- S. Sra and R. Hosseini. *Geometric Optimization in Machine Learning*. Springer, October 2016.
- R. Hosseini and S. Sra. *Recent Advances in Stochastic Riemannian Optimization*. Springer, 2019.

Journal Papers

- S. F. Razavi, R. Hosseini, and T. Behzad. FRMDN: Flow-based recurrent mixture density network. *Expert Systems with Applications*, 237:121360, 2023.
- S-M. Nasiri, R. Hosseini, and H. Moradi. The optimal triangulation method is not really optimal. *IET Image Processing*, pages 2855 – 2865, 2023.
- P. Baghershahi, R. Hosseini, and H. Moradi. Self-attention presents low-dimensional knowledge graph embeddings for link prediction. *Knowledge-Based Systems*, page 110124, 2023.
- M. H. Nasseri, M. Babaee, H. Moradi, and R. Hosseini. Online relational tracking with camera motion suppression. *Journal of Visual Communication and Image Representation*, page 103750, 2022.
- S-M. Nasiri, R. Hosseini, and H. Moradi. Multiple solution RANSAC for finding axes of symmetry in fragments of objects. *Pattern Recognition*, page 108805, 2022.
- Z. M. Kouzehkanan, S. Saghari, S. Tavakoli, P. Rostami, M. Abaszadeh, F. Mirzadeh, M. Gheidishahran E. S. Satlsar, F. Gorgi, S. Mohammadi, and R. Hosseini. A large dataset of white blood cells containing cell locations and types, along with segmented nuclei and cytoplasm. *Scientific Reports*, 11:1123, 2022.

- S. Tavakoli, A. Ghaffari, Z. M. Kouzehkanan, and R. Hosseini. New segmentation and feature extraction algorithm for classification of white blood cells in peripheral smear images. *Scientific Reports*, 11:19428, 2021.
- H. Asheri, R. Hosseini, and B. N. Araabi. A new em algorithm for flexibly tied gmms with large number of components. *Pattern Recognition*, 114:107836, 2021.
- S-M. Nasiri, R. Hosseini, and H. Moradi. Novel parametrization for gauss-newton methods in 3d pose graph optimization. *IEEE Transactions on Robotics*, 37(3):780 – 797, 2020.
- Y. Madadi, V. Seydi, K. Nasrollahi, R. Hosseini, and T. B. Moeslund. Deep visual unsupervised domain adaptation for classification tasks: A survey. *IET Image Processing*, 14(14):3283 – 3299, 2020.
- A. Khozaei, H. Moradi, R. Hosseini, H. Pouretemad, and B. Eskandari. Early screening of autism spectrum disorder using cry features. *PloS One*, 15(12):e0241690, 2020.
- R. Hosseini and S. Sra. An alternative to EM for Gaussian mixture models: Batch and stochastic Riemannian optimization. *Mathematical Programming, Series A*, 181(1):187 – 223, 2020.
- M. Hashemzadeh, R. Hosseini, and M. N. Ahmadabadi. Clustering subspace generalization to obtain faster reinforcement learning. *Evolving Systems*, 11(1):89 – 103, 2020.
- M. Hashemzadeh, R. Hosseini, and M. N. Ahmadabadi. Exploiting generalization in the subspaces for faster model-based reinforcement learning. *IEEE Transactions on Neural Networks and Learning Systems*, 30(6):1635 – 1650, 2019.
- P. H. Zadeh and R. Hosseini. Expected logarithm of central quadratic form and its use in KL-divergence of some distributions. *Entropy*, 18(8):278, 2016.
- A. Mehrjou, B. N. Araabi, and R. Hosseini. Improved Bayesian information criterion for mixture model selection. *Pattern Recognition Letters*, 69:22–27, 2016.
- R. Hosseini, S. Sra, L. Theis, and M. Bethge. Inference and mixture modeling with the elliptical gamma distribution. *Computational Statistics & Data Analysis*, 101:29–43, 2016.
- S. Sra and R. Hosseini. Conic geometric optimization on the manifold of positive definite matrices. *Siam Journal on Optimization*, 25(1):713–715, 2015.
- L. Theis, R. Hosseini, and M. Bethge. Mixtures of conditional Gaussian scale mixtures applied to multiscale image representations. *PLoS ONE*, 7(7):e39857, 2012.
- T. Kitching, A. Amara, M. Gill, S. Harmeling, C. Heymans, R. Massey, B. Rowe, T. Schrabback, L. Voigt, S. Balan, G. Bernstein, M. Bethge, S. Bridle, F. Courbin, M. Gentile, A. Heavens, M. Hirsch, R. Hosseini, A. Kiessling, D. Kirk, K. Kuijken, R. Mandelbaum, B. Moghaddam, G. Nurbaeva, S. Paulin-Henriksson, A. Rassat, J. Rhodes, B. Schölkopf, J. Shawe-Taylor, M. Shmakova, A. Taylor, M. Velander, L. van Waerbeke, D. Witherick, and D. Wittman. Gravitational lensing accuracy testing 2010 (great10) challenge handbook. *The Annals of Applied Statistics*, 5(3):2231–2263, 2011.
- R. Hosseini, F. Sinz, and M. Bethge. Lower bounds on the redundancy of natural images. *Vision Research*, 50(22):2213–2222, 2010.
- S. Bridle, S. T. Balan, M. Bethge, M. Gentile, S. Harmeling, C. Heymans, M. Hirsch, R. Hosseini, M. Jarvis, D. Kirk, T. Kitching, K. Kuijken, A. Lewis, S. Paulin-Henriksson, B. Schölkopf, M. Velander, L. Voigt, D. Witherick, A. Amara, G. Bernstein, F. Courbin, M. Gill, A. Heavens,

R. Mandelbaum, R. Massey, B. Moghaddam, A. Rassat, A. Refregier, J. Rhodes, T. Schrabback, J. Shawe-Taylor, M. Shmakova, L. van Waerbeke, and D. Wittman. Results of the great08 challenge: An image analysis competition for cosmological lensing. *Monthly Notices of the Royal Astronomical Society*, 405(3):2044–2061, 2010.

- R. Hosseini and M. Vafadust. Almost perfect reconstruction filter bank for non-redundant, approximately shift-invariant, complex wavelet transforms. *Journal of Wavelet Theory and Applications*, 2(1):1–14, 2008.

Technical Reports

- S. M. Rouzban and R. Hosseini. A rate of convergence for two-block coordinate descent. Technical report, arXiv preprint arXiv:1901.08794, 2019.
- P. H. Zadeh, R. Hosseini, and S. Sra. Deep-RBF networks revisited: robust classification with rejection. Technical report, arXiv preprint arXiv:1812.03190, 2018.
- R. Hosseini and M. Mash'al. Mixest: An estimation toolbox for mixture models. Technical report, arXiv preprint arXiv:1507.06065, 2015.
- R. Hosseini and M. Bethge. Spectral stacking: Unbiased shear estimation for weak gravitational lensing. Technical report, Max Plank Institute for Biological Cybernetics, 2009.

Conference Papers

- R. Oji, S. F. Razavi, S. Abdi Dehsorkh, A. Hariri, H. Asheri, and R. Hosseini. Parsinorm: A persian toolkit for speech processing normalization. In *International Conference on Signal Processing and Intelligent Systems (ICSPIS)*, pages 1–5. IEEE, 2021. Best Paper Award.
- R. Godaz, B. Ghojogh, R. Hosseini, F. Karray, and M. Crowley. Vector transport free riemannian lbfgs for optimization on symmetric positive definite matrix manifolds. In *Asian Conference on Machine Leaning (ACML)*, pages 1–16. IEEE, 2021.
- T. Younesian, S. Masoudnia, R. Hosseini, and B. Nadjar Araabi. Active transfer learning for persian offline signature verification. In *International Conference on Pattern Recognition and Image Analysis (IPRIA)*, pages 234–239. IEEE, 2019.
- M. H. Nasseri, H. Moradi, S. M. Nasiri, and R. Hosseini. Power line detection and tracking using hough transform and particle filter. In *RSI International Conference on Robotics and Mechatronics (IcRoM)*, pages 130–134. IEEE, 2018.
- S. M. Nasiri, H. Moradi, and R. Hosseini. A linear least square initialization method for 3D pose graph optimization problem. In *IEEE International Conference on Robotics and Automation (ICRA)*, pages 2474–2479, 2018.
- P. H. Zadeh, R. Hosseini, and S. Sra. Geometric mean metric learning. In *International Conference on Machine Learning (ICML)*, pages 2464–2471, 2016.
- S. Sra, R. Hosseini, L. Theis, and M. Bethge. Data modeling with the elliptical gamma distribution. In *International Conference on Artificial Intelligence and Statistics (AISTATS)*, pages 903–911, 2015.
- A. Mehrjou, R. Hosseini, and B. N. Araabi. Mixture of ICAs model for natural images solved by manifold optimization method. In *Conference on Information and Knowledge Technology (IKT)*, pages 1–6. IEEE, 2015.

- A. Mehrjou, B. N. Araabi, and R. Hosseini. Separation of multiplicative image components by Bayesian independent component analysis. In *International Conference on Pattern Recognition and Image Analysis (IPRIA)*, pages 1–7. IEEE, 2015.
- M. Mash'al and R. Hosseini. K-means++ for mixtures of von Mises-Fisher distributions. In *Conference on Information and Knowledge Technology (IKT)*, pages 1–6. IEEE, 2015.
- R. Hosseini and S. Sra. Matrix manifold optimization for Gaussian mixtures. In *Advances in Neural Information Processing Systems (NIPS)*, pages 910–918, 2015.
- S. Sra and R. Hosseini. Geometric optimisation on positive definite matrices for elliptically contoured distributions. In *Advances in Neural Information Processing Systems (NIPS)*, pages 2562–2570, 2013.
- S. Hatami, R. Hosseini, M. Kamarei, and H. Ahmadi. Wavelet based fingerprint image enhancement. In *IEEE International Symposium on Circuits and Systems (ISCAS)*, pages 4610–4613, 2005.