Amirhossein Khalilian-Gourtani

Contact Information

New York University, New York, NY.
Web: https://amirhkhalilian.github.io, E: akg404@nyu.edu
Linked-In: https://www.linkedin.com/in/amirhkhalilian/

Profile

Machine learning and signal processing engineer with 7+ years of experience developing advanced algorithms for image and video processing, neurophysiological signal analysis, and graph-based neural networks. Proven ability to design scalable solutions, collaborate with cross-disciplinary teams, and translate research prototypes into impactful tools. Strong programming skills in Python and MATLAB with deep expertise in deep learning frameworks such as PyTorch.

Technical Skills

- **Languages:** ∘ Python ∘ MATLAB ∘ Bash ∘ C/C++ ∘ Julia
- **Libraries:** ∘ PyTorch ∘ Pandas ∘ PyTorch-geometric ∘ SciPy ∘ scikit-learn ∘ PyVista
- **Tools:** ∘ VTK ∘ Git ∘ Docker
- **Methods:** ∘ deep learning, image and video processing, optimization, computer vision

Experience

Postdoctoral Research Fellow
NYU Langone Health – Sep. 2022 - Present
∘ Designed experiments and recorded human neurophysiology related to speech.
∘ Designed and implemented signal processing algorithms to analyze neural activity and connectivity.
∘ Designed deep learning frameworks for speech decoding from neural activity for BCI applications.
∘ Implemented graph-based deep learning models to analyze large-scale neural recordings.
∘ Developed visualization tools in Python and MATLAB for human intracranial data.
∘ Published findings in top-tier journals including PNAS and Nature Machine Intelligence.

Video Processing Research Intern
Dolby Laboratories Inc. – May. 2019 - Aug. 2019
∘ Designed and implemented video segmentation algorithms improving visual object tracking.
∘ Designed and implemented video processing algorithms and coding scheme for HDR content.
∘ Authored patent on user-guided image segmentation technologies and published IEEE conference paper.

Research Associate
Simons Foundation – May. 2018 - Aug. 2018
∘ Developed artifact detection and removal techniques for high-resolution scanning electron microscopy images.
∘ Built Python and MATLAB pipelines for large-scale image data processing.
∘ Published and presented findings in IEEE ICASSP conference paper.

Education

Ph.D. Electrical Engineering, **GPA**: 4.0/4.0 Fall 2018 (Sep.) - Sep. 2022
New York University, Tandon School of Engineering, New York, USA

M.Sc. Electrical Engineering, **GPA**: 4.0/4.0 Fall 2016 (Aug.) - Aug. 2018
New York University, Tandon School of Engineering, New York, USA

B.Sc. Electrical Engineering, **GPA**: 19.21/20 Sep. 2012 - Aug. 2016
Isfahan University of Technology, Isfahan, Iran

Selected Awards

∘ Postdoctoral Merit Award from Society for the Neurobiology of Language. ∘ Ernst Weber PhD Fellowship Award from New York University. ∘ Myron M. Rosenthal Award for Best Academic Achievement from New York University. ∘ Samuel Morse Fellowship Award from New York University.

Selected Projects

Neural Signal Processing and Speech Decoding
∘ Applied causal time-series analysis and unsupervised clustering to characterize information flow in the brain.
∘ Developed deep learning models to decode speech from human intracranial neural recordings, achieving improved accuracy for potential speech neuroprosthetics applications.

Neural Visualization Toolbox
∘ Developed a cross-platform visualization toolkit in MATLAB and Python for mapping ECoG/sEEG recordings.
∘ Support for electrode localization in standardized spaces with individualized anatomical alignment.

Interpretable Deep-learning for Image Processing

∘ Developed an interpretable deep learning architecture by unrolling convolutional dictionary learning algorithms into structured neural networks for image denoising.

∘ Achieved state-of-the-art blind denoising performance with significantly fewer learned parameters compared to black-box CNNs.

∘ Incorporated a noise-adaptive thresholding mechanism for near-perfect generalization to unseen noise levels.

∘ Explored structured, optimization-inspired architectures to improve interpretability, robustness, and generalization in inverse problems including compressed sensing MRI.

Masked-RPCA for Video Foreground Detection

∘ Designed a novel model-based signal processing algorithm for moving object detection in video, improving detection accuracy by explicitly modeling occlusions. Published in IEEE Open Journal of Signal Processing.

Selected Publications

Khalilian-Gourtani, A., Gadgil, N. J., & Su, G. M. "User-guided image segmentation methods and products." US Patent 12,327,392 (2025).

Khalilian-Gourtani, A., Wang, R., Chen, X., ... & Flinker, A. "A corollary discharge circuit in human speech." Proceedings of the National Academy of Sciences, (2024).

Chen, X., Wang, R., **Khalilian-Gourtani, A.**, Yu, L., ... & Flinker, A. "A neural speech decoding framework leveraging deep learning and speech synthesis." Nature Machine Intelligence, (2024).

Janjušević, N., **Khalilian-Gourtani, A.**, Flinker, A., & Wang, Y. "GroupCDL: Interpretable denoising and compressed sensing MRI via learned group-sparsity and circulant attention." IEEE Transactions on Computational Imaging (2025).

Janjušević, N., **Khalilian-Gourtani, A.**, & Wang, Y. "CDLNet: Noise-adaptive convolutional dictionary learning network for blind denoising and demosaicing." IEEE Open Journal of Signal Processing, (2022).

full list of publications on Google Scholar: A. Khalilian-Gourtani

Selected Presentations

2023	Society for the Neurobiology of Language annual meeting (SNL; Postdoctoral Best Paper Award).
2022	Annual Northeast Bioengineering Conference (NEBEC).
2020	IEEE Conference on Multimedia Information Processing and Retrieval (MIPR; Invited Talk).
2020	IEEE International Symposium on Biomedical Imaging (ISBI; Best Paper Award).
2019	IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP).
2018	IEEE International Conference on Engineering in Medicine and Biology Society (EMBC).

Invited Talks

2024	The Human Brain Mapping Laboratory, Feinstein Institute for Medical Research.
2023	Neuroscience Institute, NYU Langone Health.
2022	Comprehensive Epilepsy Center iEEG Research Seminar Series, NYU Langone Health.
2022	Liu Lab, NYU Langone Health.

Teaching Experiences

Fall 2023	Image and Video Processing, Guest Lecturer, New York University.
Spring 2022	Image and Video Processing, Guest Lecturer, New York University.
Spring 2019	Intro to Machine Learning, Teaching Assistant, New York University.
Fall 2018	Digital Signal Processing Lab, Teaching Assistant, New York University.
Spring 2018	Image and Video Processing, Teaching Assistant, New York University.
Fall 2017	Medical Imaging, Teaching Assistant, New York University.