AZAAN REHMAN

Email: azaanrehman919@gmail.com ◇ Github: github.com/AzR919

EDUCATION

Carnegie Mellon University (CMU), Pittsburgh, Pennsylvania Graduated May 2021
Bachelor of Science in Computer Science GPA: 3.56/4.0
Minor in Machine Learning and Physics
Relevant coursework: Advanced Deep Learning, Introduction to Machine Learning for PhD, Deep Reinforcement Learning and Control, Computer Vision, Matrices and Linear Transformations

SELECT RESEARCH PROJECTS

Convolution Neural Net Transformer (CNNT) 2021 - 2024
National Heart, Lung, and Blood Institute (NHLBI), National Institutes of Health (NIH)

- Developed a transformer-based architecture integrating convolutions within the attention mechanism, achieving significant gains in computational efficiency for high-dimensional medical imaging tasks
- Adapted the CNNT model for multiple imaging domains, improving both quality and efficiency

CNNT for Microscopy Denoising [1][2] 2022 - 2024
NHLBI, NIH

- Directed a team of researchers, extending CNNT architecture for fluorescence microscopy denoising
- Designed an adaptation of transfer learning technique for microscopy, reducing the effective train time by 90%, requiring only fine-tuning for practical applications
- Coordinated multi-lab partnerships, achieving deployment in biomedical research workflows
- Published in Nature Scientific Reports [1]; algorithm utilized in a publication in Biology Open [2]

CNNT for Magnetic Resonance Imaging (MRI) Denoising [3][4][5] 2021 - 2022
NHLBI, NIH

- Applied the CNNT architecture to MRI denoising, achieving a 170% boost in image quality compared to industry standards
- Enabled free breathing scans of patients over previous breath-holding techniques
- Achieved high-quality results on low-cost 0.55 Tesla scanners, comparable to results on 3 or 7 Tesla [4]
- Awarded top abstract at the SCMR EACVI conference in May 2022 [5]

Modal-Temporal Attention Graph [6] 2020 - 2021
MultiComp Lab CMU

- Developed a Graph Neural Net framework for robust fusion of unaligned multimodal sequences
- Reduced the number of model parameters by 94% while maintaining state of the art performance

WORK EXPERIENCE

Artificial Intelligence Engineer in the Office of AI Research Aug 2021 - Aug 2024
National Heart, Lung, and Blood Institute (NHLBI), National Institutes of Health (NIH)

- Researched and developed novel machine learning algorithms and architectures for medical applications, with a focus on image denoising for MRI and fluorescence microscopy
- Deployed MRI and microscopy denoising networks which are actively used by NIH researchers

Teaching Assistant for Introduction to Computer Systems Aug 2019 - May 2021
Carnegie Mellon University (CMU)

- Led recitations and organized office hours for 20+ teaching assistants and 200+ students

PUBLICATIONS

[1] **A. Rehman**, A. Zhovmer, R. Sato, Y.-S. Mukouyama, J. Chen, A. Rissone, R. Puertollano, J. Liu, H. D. Vishwasrao, H. Shroff, C. A. Combs, and H. Xue, "Convolutional Neural Network Transformer (CNNT) for fluorescence microscopy image denoising with improved generalization and fast adaptation," *Scientific Reports*, Aug. 2024.

[2] W. Li, K. Lipsius, N. G. Burns, R. Sato, **A. Rehman**, H. Xue, C. Combs, L. Minichiello, H. Gangrade, E. Tampakakis, and Y.-S. Mukouyama, "Vascular smooth muscle cell-derived nerve growth factor regulates sympathetic collateral branching to innervate blood vessels in embryonic skin," *Biology Open*, May 2024.

[3] H. Xue, S. Hooper, **A. Rehman**, I. Pierce, T. Treibel, R. Davies, W. P. Bandettini, R. Ramasawmy, A. Javed, Y. Yang, J. Moon, A. Campbell-Washburn, and P. Kellman, "Imaging transformer for MRI denoising with SNR unit training: Enabling generalization across field-strengths, imaging contrasts, and anatomy," in *International Society for Magnetic Resonance in Medicine*, May 2024.

[4] Z. Zhu, **A. Rehman**, M. Ohliger, Y. J. Lee, H. Xue, and Y. Yang, "Deep learning enabled MRI general denoising at 0.55T," in *International Society for Magnetic Resonance in Medicine*, May 2024.

[5] **A. Rehman**, R. H. Davies, I. Pierce, M. Fontana, J. C. Moon, P. Kellman, and H. Xue, "Convolutional Neural Net Transformer (CNNT) for free-breathing real-time cine imaging," in *Society for Cardiovascular Magnetic Resonance, European Association of Cardiovascular Imaging*, May 2022.

[6] J. Yang, Y. Wang, R. Yi, Y. Zhu, **A. Rehman**, A. Zadeh, S. Poria, and L.-P. Morency, "MTAG: Modal-temporal attention graph for unaligned human multimodal language sequences," in *North American Chapter of the Association for Computational Linguistics: Human Language Technologies*, Jun. 2021.

ACHIEVEMENTS

Top Abstract, SCMR EACVI	*May 2022*
Graduated with University Honors, CMU	*May 2021*
Vice President, Recreational Badminton, CMU	*Sep 2019-May 2021*
SCS Dean's List, CMU	*Fall 2019 & Fall 2020*
100% Scholarship for A level Highschool	*Aug 2015-May 2017*

SKILLS

Programming Languages	Python, C/C++/C#, MATLAB, HTML, OCaml, Java
Machine Learning Tools	Pytorch, Tensorflow, Keras, Wandb, Streamlit