Amirhossein Rasoulian

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Education

- ***Master of Computer Science*** Jan 2022 – Dec 2023
  - **Concordia University, Montreal, Canada.**
  - **GPA: 4.3**/4.3.
  - **Courses:** Deep Learning (A^+), Computer Vision (A^+), Neuroimage Computing (A^+), Medical Image Processing (A^+).
  - **Thesis:** Cerebrovascular pathology segmentation using weakly supervised deep learning methods.
- ***Bachelor of Computer Engineering - Artificial Intelligence*** Sep 2017 – Sep 2021
  - **Amikabir University of Technology, Tehran, Iran.**
  - **GPA: 19.07**/20 (=**3.98**/4.00).
  - **Selected Courses:** Introduction to Bioinformatics (19.49/20), Information Retrieval (20.00/20), Principles and Applications of Artificial Intelligence (20.00/20), Algorithm Design (19.75/20), Applied Linear Algebra (18.70/20), Data Structures and Algorithms (19.25/20), Advanced Programming (19.25/20).
  - **Thesis:** Multiple sclerosis lesion detection using deep convolutional networks.

Work Experience

- ***Research and Development Engineer in Deep Learning and Image Processing*** Jan 2024 – Ongoing
  - NeuroRx, a leading image-analysis company in the pharmaceutical industry.
  - Designed and trained multiple deep-learning models for brain atrophy assessment, ventricles segmentation, multi-atlas corpus-callosum segmentation, and multiple sclerosis phase-rim legion instance segmentation.
- ***Deep Learning and Image Processing Intern*** Aug 2023 – Dec 2023
  - NeuroRx
  - Affiliated with Canada Mitacs Globalink Research Internship.
  - Designed and trained convolutional deep-learning models for contrast-invariant brain/spine detection and MRI super-resolution whose singularity images are being used to pre-process the vast amount of company's raw data.
- ***Computer Vision Research Intern*** Nov 2019 – Sep 2020
  - Human and Robot Interaction Laboratory, University of Tehran.
  - Designed a stand-alone, real-time object tracking software with the capability to gather a comprehensive dataset of agent movement paths.

Awards and Honors

- Received Mitacs Accelerate Fellowship. 2023
- Granted Split Concordia Merit Scholarship. 2022
- Offered direct admission to M.Sc. in Computer Engineering - Artificial Intelligence at Amirkabir University of Technology, based on academic excellence, bypassing the Nationwide University Entrance Exam. 2021
- Ranked within **top Ten** students in the Department of Computer Engineering, Amirkabir University of Technology. 2017 - 2021
- Ranked within **top 0.25%** in the Nationwide Univesity Entrance Exam for B.Sc. in Mathematics and Engineering, Iran. 2017
- Passed the first stage of Iran's National Computer Olympiad. 2015, 2016
- Passed the first stage of Iran's National Mathematical Olympiad. 2014 - 2016

Technical Skills

- ***Deep Learning:*** Pytorch, Tensorflow, Keras, Transformers, Weakly/Self-supervised Learning.
- ***Computer Vision:*** OpenCV, Torchvision, Scikit-Image.
- ***Data Science:*** Scikit-Learn, Numpy, Pandas, Matplotlib.
- ***Medical Image Analysis:*** Monai, SimpleITK, Nibabel, TorchIO, ANTS, 3D-Slicer, ITK-Snap.
- ***Programming Languages:*** Python, C/C++, Java, Javascript, SQL.
- ***Other Tools:*** Qt, Arduino, VirtualBox, PowerPoint, Excel, Zotero, Latex.
- ***Operating Systems:*** Linux, Windows, MacOS.

Conference Presentations

- ***Oral:***
  - The 5th MICCAI workshop on Machine Learning in Clinical Neuroimaging (MLCN-2022)

Publications

- **A. Rasoulian**, S. Salari, Y. Xiao, "Weakly Supervised Intracranial Hemorrhage Segmentation using Head-Wise Gradient-Infused Self-Attention Maps from a Swin Transformer in Categorical Learning," Machine Learning for Biomedical Imaging (MELBA) Journal, 2023. **[Invited for MLCN special issue.]**
- P. Spiegler, **A. Rasoulian**, Y. Xiao, "Uncertainty-Rectified YOLO-SAM for Weakly Supervised ICH Segmentation" The 2024 MICCAI Stroke Workshop on Imaging and Treatment Challenges (SWITCH), 2024.
- A. Harirpoush, **A. Rasoulian**, M. Kersten-Oertel, Y. Xiao, "Architecture Analysis and Benchmarking of 3D U-shaped Deep Learning Models for Thoracic Anatomical Segmentation," IEEE Access, 2024.
- S. Salari, **A. Rasoulian**, H. Rivaz, Y. Xiao, "FocalErrorNet: Uncertainty-aware focal modulation network for inter-modal registration error estimation in ultrasound-guided neurosurgery," Medical Image Computing and Computer Assisted Intervention – MICCAI 2023. **[Early acceptance, top 13% of submissions]**
- S. Salari, **A. Rasoulian**, H. Rivaz, Y. Xiao, "Towards multi-modal anatomical landmark detection for ultrasound-guided brain tumor resection with contrastive learning," Medical Image Computing and Computer Assisted Intervention – MICCAI 2023.
- **A. Rasoulian**, S. Salari, Y. Xiao, "Weakly Supervised Intracranial Hemorrhage Segmentation using Hierarchical Combination of Attention Maps from a Swin Transformer," the 5th MICCAI workshop on Machine Learning in Clinical Neuroimaging (MLCN), 2022.
- **A. Rasoulian**, S. Salari, Y. Xiao, "Weakly supervised segmentation of intracranial aneurysms using a 3D focal modulation UNet," ArXiv:2308.03001, 2023.
- S. Salari, **A. Rasoulian**, M. Battie, M. Fortin, H. Rivaz, Y. Xiao, "Uncertainty-aware transformer model for anatomical landmark detection in paraspinal muscle MRIs," SPIE Medical Imaging, 2023. **[Image Processing Best Student Paper Award]**
- S. Salari, **A. Rasoulian**, H. Rivaz, Y. Xiao, "Dense error map estimation for MRI-ultrasound registration in brain tumor surgery using Swin UNETR," The 2023 International Ultrasound Symposium, accepted, 2023.

Teaching Experience

- ***Teaching Assistant, Concordia University*** May 2022 – Dec 2023
  - **Courses:** Image Processing, Probability and Statistics for Computer Science, Program and Problem Solving, Data Structures and Algorithms, Computer Networks and Protocols, Data Communication and Computer Networks, Object-Oriented Programming I, Object-Oriented Programming II.
- ***Teaching Assistant, Amirkabir University of Technology*** Mar 2020 – Aug 2021
  - **Courses:** Principles and Applications of Artificial Intelligence (Head-TA), Research and Presentation in Engineering.

Selected Projects

- ***HGI-SAM:*** Developed and trained an innovative weakly-supervised model leveraging image-level labels and Swin transformer, achieving exceptional accuracies of 94%+ in detection and 44%+ in segmentation for challenging brain hemorrhage lesions, surpassing the performance of the fully-supervised U-Net.
- ***FocalSegNet:*** Developed and trained a novel weakly-supervised model, utilizing coarse annotations, focal modulation, and conditional random fields to achieve precise segmentation of the complex brain aneurysm pathology, yielding 80%+ sensitivity and 67%+ dice (paper in submission).
- ***Bioinformatics basic package:*** Implemented a diverse set of nucleotide sequence processing algorithms operating pairwise local alignment, multiple sequence alignment, profiling, calculating tree parsimony score, and protein regular expression matching.
- ***Search Engine:*** Implemented a searching motor capable of listing ordered query-relevant documents and sentences in the database, leveraging tf-idf-ranked search and clustered-based search techniques.
- ***Download Manager:*** Implemented a robust Java-based download manager featuring a user-friendly graphical interface, offering advanced functionalities such as concurrent multiple downloads, pause/resume/cancel capabilities, scheduled downloading, running in background, etc.

- ***Ball Tracker:*** Developed a graphical user interface program that connects to a camera, enabling real-time ball tracking and dynamic display of its precise location.
- ***Email Management System:*** Developed a comprehensive email management database integrated with a command-line user interface.
- ***Battle-Tanks:*** Developed a graphical 2D strategic game with multiplayer support, where players control tanks, and navigate to the final objective while engaging various enemy tanks.
- ***MahShop:*** Designed and developed a dynamic shopping website with user profiles, categorized item listings, and sorting options by name or price.

Licenses and Certificates

- TensorFlow Developer Specialization, DeepLearning.AI. Apr 2021
- Data Science in Stratified Healthcare and Precision Medicine, University of Edinburgh. Apr 2021

Languages

- **English:** Fluent.
- **Persian:** Native.

References

- ***Dr. Yiming Xiao***
  - Assistant Professor, Dept. of Computer Science and Software Engineering, Concordia University.
  - yiming.xiao@concordia.ca.
- ***Dr. Haz-Edine Assemlal***
  - Associate Director, Dept. of Machine Learning and Image Processing, NeuroRx Research.
  - hassemlal@neurorx.com.
- ***Dr. Hassan Rivaz***
  - Professor, Dept. of Electrical and Computer Engineering, Concordia University.
  - hrivaz@ece.concordia.ca.
- ***Dr. Reza Safabakhsh***
  - Professor, Dept. of Computer Engineering, Amirkabir University of Technology (Tehran Polytechnic).
  - safa@aut.ac.ir.
- ***Dr. Aiman Hanna***
  - Senior Lecturer, Dept. of Computer Science and Software Engineering, Concordia University.
  - contact@aimanhanna.com.