Amirhossein **Kazerouni**

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Education

University of Toronto (U of T) — *Toronto, Canada*

PhD in Computer Science — *Jan. 2024 - present*

- **Courses:**: CSC2506: Probabilistic Machine Learning, CSC2421: Mathematical Foundations of Algorithmic Fairness, CSC2541: Generative AI for Images, CSC2539: Physics-Informed Neural Representations for Visual Computing

Iran University of Science and Technology (IUST) — *Tehran, Iran*

B.S. in Electrical Engineering — *Sep. 2017 - Feb. 2022*

- **GPA:** 17.95/20 (3.85/4)
- **Thesis topic:** Design, Simulation, and Construction of an Autonomous Vehicle with Environment Perception, Planning, and Control Capabilities. **(Thesis Grade: 20/20)** — **Supervisor:** Dr. Saeed Shamaghdari, Associate Professor at IUST

Publications

Conference Papers

1. **LIFT: Latent Implicit Functions for Task- and Data-Agnostic Encoding**
   Amirhossein Kazerouni, *Soroush Mehraban, Michael Brudno, Babak Taati*
   Published in **IEEE/CVF ICCV (2025)** (**Paper**, **Project Page**)

2. **SUM: Saliency Unification through Mamba for Visual Attention Modeling**
   Alireza Hosseini,* ***Amirhossein Kazerouni****, *Saeed Akhavan, Michael Brudno, Babak Taati*
   Published in **IEEE/CVF WACV 2025 (Oral presentation)** (**Paper**, **GitHub**)

3. **FuseNet: Self-Supervised Dual-Path Network for Medical Image Segmentation**
   Amirhossein Kazerouni, *Sanaz Karimijafarbigloo, Reza Azad, Yury Velichko, Ulas Bagci, Dorit Merhof*
   Published in **ISBI 2024** (**Paper**, **GitHub**)

4. **INCODE: Implicit Neural Conditioning with Prior Knowledge Embeddings**
   Amirhossein Kazerouni, *Reza Azad, Alireza Hosseini, Dorit Merhof, Ulas Bagci*
   Published in **IEEE/CVF WACV 2024** (**Paper**, **GitHub**, **Project Page**)

5. **Beyond Self-Attention: Deformable Large Kernel Attention for Medical Image Segmentation**
   Reza Azad, Leon Niggemeier, Michael Huttemann, ***Amirhossein Kazerouni***, *Ehsan K. Aghdam, Yury Velichko, Ulas Bagci, Dorit Merhof*
   Published in **IEEE/CVF WACV 2024** (**Paper**, **GitHub**)

6. **Laplacian-former: Overcoming the limitations of vision transformers in local texture detection**
   Reza Azad, ***Amirhossein Kazerouni***, *Babak Azad, Ehsan Khodapanah Aghdam, Yury Velichko, Ulas Bagci, Dorit Merhof*
   Published in **MICCAI 2023 (top 14%)** (**Paper**, **GitHub**)

7. **Unlocking Fine-Grained Details with Wavelet-Based High-Frequency Enhancement in Transformers**
   Reza Azad, ***Amirhossein Kazerouni***, *Alaa Sulaiman, Afshin Bozorgpour, Ehsan Khodapanah Aghdam, Abin Jose, Dorit Merhof*
   Published in **MLMI @ MICCAI 2023** (**Paper**, **GitHub**)

8. **DermoSegDiff: A Boundary-Aware Segmentation Diffusion Model for Skin Lesion Delineation**
   Afshin Bozorgpour, Yousef Sadegheih*,* ***Amirhossein Kazerouni****, *Reza Azad, Dorit Merhof*
   Published in **PRIME @ MICCAI 2023** (**Paper**, **GitHub**)

9. **Self-supervised Semantic Segmentation: Consistency over Transformation**
   Sanaz Karimijafarbigloo, Reza Azad, ***Amirhossein Kazerouni***, *Yury Velichko, Ulas Bagci, Dorit Merhof*
   Published in **CVAMD @ IEEE/CVF ICCV 2023** (**Paper**, **GitHub**)

10. **Implicit Neural Representation in Medical Imaging: A Comparative Survey**
    Amirali Molaei, Amirhossein Aminimehr, Armin Tavakoli, ***Amirhossein Kazerouni***, *Bobby Azad, Reza Azad, Dorit Merhof*
    Published in **CVAMD @ IEEE/CVF ICCV 2023** (**Paper**, **GitHub**)

11. **HiFormer: Hierarchical Multi-scale Representations Using Transformers for Medical Image Segmentation**
    Moein Heidari,* ***Amirhossein Kazerouni****, *Milad Soltany*, Reza Azad, Ehsan Khodapanah Aghdam, Julien Cohen-Adad, Dorit Merhof*
    Published in **IEEE/CVF WACV 2023** (**Paper**, **GitHub**)

12. **Reducing Uncertainty in 3D Medical Image Segmentation under Limited Annotations through Contrastive Learning**
    Sanaz Karimijafarbigloo, Reza Azad, ***Amirhossein Kazerouni***, *Dorit Merhof*
    Published in **MIDL 2024** (**Paper**, **GitHub**)

13. **MMCFormer: Missing Modality Compensation Transformer for Brain Tumor Segmentation**
    Sanaz Karimijafarbigloo, Reza Azad, ***Amirhossein Kazerouni***, *Dorit Merhof*
    Published in **MIDL 2023 (Oral presentation)** (**Paper**, **GitHub**)

14. **MS-Former: Multi-scale Self-guided Transformer for Medical Image Segmentation**
*Sanaz Karimijafarbigloo, Reza Azad, **Amirhossein Kazerouni**, Dorit Merhof*
Published in **MIDL 2023 (Oral presentation)** (**Paper**, **GitHub**)

15. **An Intelligent Modular Real-Time Vision-Based System for Environment Perception**
***Amirhossein Kazerouni**, Amirhossein Heydarian, Milad Soltany, Aida Mohammadshahi, Abbas Omidi, Saeed Ebadollahi*
Published in **ML4AD @ NeurIPS 2022** (**Paper**, **GitHub**, **Workshop Page**)

Journal Papers

1. **MedScale-Former: Self-guided multiscale transformer for medical image segmentation**
*Sanaz Karimijafarbigloo, Reza Azad, **Amirhossein Kazerouni**, Dorit Merhof*
Published in **Medical Image Analysis Journal (2023)** (**Paper**)

2. **Diffusion models in medical imaging: A comprehensive survey**
***Amirhossein Kazerouni**, Ehsan K. Aghdam, Moein Heidari, Reza Azad, Mohsen Fayyaz, Ilker Hacihaliloglu, Dorit Merhof*
Published in **Medical Image Analysis Journal (2025)**(**Paper**,

3. **Advances in Medical Image Analysis with Vision Transformers: A Comprehensive Review**
*Reza Azad, **Amirhossein Kazerouni**, Moein Heidari, Ehsan Khodapanah Aghdam, Amirali Molaei, Yiwei Jia, Abin Jose, Rijo Roy, Dorit Merhof*
Published in **Medical Image Analysis Journal (2023)** (**Paper**, **GitHub**)

Pre-print Papers

1. **STAF: Sinusoidal Trainable Activation Functions for Implicit Neural Representation**
*Alireza Morsali, MohammadJavad Vaez, Hossein Soltani, **Amirhossein Kazerouni**, Babak Taati, Morteza Mohammad-Noori*
Published on arXiv preprint arXiv:2502.00869 (2025) (**Paper**, **GitHub**)

2. **Enhancing Efficiency in Vision Transformer Networks: Design Techniques and Insights**
*Moein Heidari, Reza Azad, Sina Ghorbani Kolahi, René Arimond, Leon Niggemeier, Alaa Sulaiman, Afshin Bozorgpour, Ehsan Khodapanah Aghdam, **Amirhossein Kazerouni**, Ilker Hacihaliloglu, Dorit Merhof*
Published on arXiv preprint arXiv:2403.19882 (2024) (**Paper**, **GitHub**)

3. **Foundational Models in Medical Imaging: A Comprehensive Survey and Future Vision**
*Bobby Azad, Reza Azad, Sania Eskandari, Afshin Bozorgpour, **Amirhossein Kazerouni**, Islem Rekik, Dorit Merhof*
Published on arXiv preprint arXiv:2310.18689 (2023) (**Paper**, **GitHub**)

4. **Ensemble Neural Representation Networks**
Milad Soltany Kadarvish, Hesam Mojtahedi*, Hossein Entezari Zarch*, **Amirhossein Kazerouni***, Alireza Morsali, Azra Abtahi, Farokh Marvasti*
Published on arXiv preprint arXiv:2110.04124 (2021) (**Paper**, **GitHub**)

Research Interests

- Computer Vision
- Medical Image Analysis
- Deep Learning
- Diffusion Models
- Machine Learning
- Transformers
- Computer Graphics
- Neural Representations

Honors & Awards

2022	**Ranked 3rd** among 41 students who chose Control as a subfield	*IUST, Iran*
2022	**Ranked 4th** among 127 Electrical Engineering students	*IUST, Iran*
2021	**Ranked 1st** team in the national Rahneshan competitions for autonomous vehicles	*INEF, Iran*
2021	**Ranked 2nd** team in FIRA World Cup Competitions in Autonomous Cars League	*FIRA, Iran*
2015	**Ranked 1st** team in the A-lympiad National Mathematical Competition	*Iran*
2016	**Hold a diploma** from the A-lympiad World Mathematical Competition	*Utrecht University, Netherlands*
2017	**Ranked within the top 1%** among approximately 148,000 participants in the National University Entrance Exam	*Iran*

Skills

Programming Python, MATLAB, C/C++, Latex, Familiar with HTML, CSS, PHP
AI Tools/ Libraries PyTorch, TensorFlow, OpenCV, NPM (NumPy - Pandas - Matplotlib), etc.
Tools Linux, Git

Research Experience

Remote Research Assistant *Aachen, Germany*
RWTH Aachen University — Supervisor: Prof. Dorit Merhof and Reza Azad *2022 - 2024*
- Worked on Transformers, Diffusion models, and Implicit Neural Representations.

Remote Machine Learning and Computer Vision Researcher — *Montreal, Canada*

DGSculptor — *2021 - 2023*

- Worked on the "Ensemble Neural Representation Networks" paper and proposed a novel suboptimal ensemble architecture for Implicit Neural Representations (INRs).
- Worked on using Transformers for the image super-resolution task.

AI Researcher — *IUST, Iran*

AI and Control Lab — Supervisor: Prof. Saeed Shamaghdari — *2019 - 2021*

- Worked on "Fusion-Based 3D Shape Analysis in a Noisy Environment" project.

Computer vision Researcher — *Tehran, Iran*

University of Tehran— Supervisor: Prof. Mohammad Ali Akhaee, Associate Professor at the University of Tehran — *2019 - 2020*

- Worked on "Statistical and Semantic Analysis of Football Game" project.

Teaching Experience

CSC148 (Introduction to Computer Science) — *UofT, Canada*

CSC420 (Introduction to Image Understanding) (3 times) — *UofT, Canada*

Principles of Mechatronics — *IUST, Iran*

Spring 2021

Working Experience

CEO and Co-founder — *IUST, Iran*

AIR (Artificial Intelligence and Robotics) Center — *2020 - 2022*

- Teaching and mentoring Deep Learning, Machine Learning, and Python courses.

Professional Services

NeurIPS Conference Reviewer for NeurIPS 2024
MICCAI Conference Reviewer for MICCAI 2024
MedIA Journal Reviewer for Medical Image Analysis Journal
EAAI Journal Reviewer for Engineering Applications of Artificial Intelligence

Major Projects

Automatic Parallel Parking (Link, GitHub) — *INEF, Iran*

National Rahneshan Competitions — *2021*

- Implemented a parallel parking system that includes path planning, path tracking, and parallel parking.

Statistical and Semantic Analysis of Football Game (GitHub, Website) — *Tehran, Iran*

Supervisor: Prof. Mohammad Ali Akhaee — *2019 - 2020*

- Created the bird's eye view of the soccer field by predicting the homography matrix using GANs.
- Created a Telegram bot with PHP to collect voice data to create a voice spotting dataset.

Fusion-Based 3D Shape Analysis in a Noisy Environment Using Stereo Camera — *IUST, Iran*

Supervisor: Prof. Saeed Shamaghdari — *2019 - 2021*

- Proposed a fusion-based multi-stage approach that performs 3D shape analysis on vehicles to measure the amount of load protrusion.

Design, Simulation, and Construction of an Autonomous Vehicle with Environment Perception, Planning, and Control Capabilities — *IUST, Iran*

Supervisor: Prof. Saeed Shamaghdari — *Sep. 2021*

- Designed and built a toy self-driving car from scratch.

Autonomous Car Simulation Based on AVIS Engine (GitHub) — *FIRA, Iran*

FIRA World Cup Competitions — *Summer 2021*

- Developed an autonomous car having control and environment perception capabilities.