Mohammad Mahdi Johari

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Machine Learning Researcher

EDUCATION

P.h.D in Machine Learning, *Swiss Federal Institute of Technology Lausanne (EPFL)*   Feb. 2020 — June 2024
M. Sc. in Electrical Engineering, *Sharif University of Technology*   Sept. 2014 — Sept. 2016
B. Sc. in Electrical Engineering, *University of Tehran*   Sept. 2010 — Sept. 2014

SKILLS

Technical   Machine Learning, Deep Learning, Computer Vision, 3D Computer Vision, Computer Graphics, 3D Representation and Reconstruction, 3D Depth Estimation, Novel View Synthesis, Neural Radiance Fields, SLAM, Graph Analysis, Geometric Deep Learning, Python, PyTorch, PyTorch Geometric, TensorFlow, Git, LaTeX, MATLAB, VHDL, Verilog, C++, C#, HTML, Linux Shell, Java

Personal   Problem Solving, Multitasking, Adaptability, Self-motivation, Time management, Communication, Research skills, Intercultural collaboration, Creativity, Attention to details, Decision making, Project management

TECHNICAL EXPERIENCE

Machine Learning Engineer   **June 2024 — Present**

Apple   *Zurich, Switzerland*

- This research position involves applying recent advances in Deep Learning to address cutting-edge challenges in 3D computer vision and computer graphics for Apple Vision Pro.

Efficient 3D Face Representation for Real-Time Rendering (Research Internship)   **April 2023 — Nov. 2023**

Apple   *Zurich, Switzerland*

- This research introduces an occlusion-aware generalizable human face representation capable of view-dependent rendering. Exploiting both explicit and implicit 3D priors in a hybrid manner, the method generates high-quality 3D-consistent novel views while it is efficient enough to run in real-time on a high-end device.

ESLAM: Efficient Dense SLAM Based on Hybrid Representation of Signed Distance Fields (CVPR 2023)   **April 2022 — March. 2023**

Swiss Federal Institute of Technology Lausanne (EPFL), Idiap Research Institute   *Lausanne, Switzerland*

- Project page: https://www.idiap.ch/paper/eslam

- This research presents an efficient implicit neural representation method for Simultaneous Localization and Mapping (SLAM). ESLAM reads RGB-D frames with unknown camera poses in a sequential manner and incrementally reconstructs the scene representation while estimating the current camera position in the scene. We incorporate the latest advances in Neural Radiance Fields (NeRF) into a SLAM system, resulting in an efficient and accurate dense visual SLAM method.

GeoNeRF: Generalizing Neural Radiance Fileds for Novel View Synthesis (CVPR 2022)   **June 2021 — Feb. 2022**

Swiss Federal Institute of Technology Lausanne (EPFL), Idiap Research Institute   *Lausanne, Switzerland*

- Project page: https://www.idiap.ch/paper/geonerf

- This research presents a generalizable photorealistic novel view synthesis method based on neural radiance fields. The approach consists of two main stages: a geometry reasoner and a renderer. To render a novel view, the geometry reasoner first constructs cascaded cost volumes for each nearby source view. Then, using a Transformer-based attention mechanism and the cascaded cost volumes, the renderer infers geometry and appearance and renders detailed images via volume rendering techniques.

DepthInSpace: Monocular 3D Depth Estimation Using Structured-Light Camera (ICCV 2021)   Feb. 2020 — May 2021

Swiss Federal Institute of Technology Lausanne (EPFL), Idiap Research Institute   *Lausanne, Switzerland*

- Project page: https://www.idiap.ch/paper/depthinspace
- This research presents a self-supervised deep-learning method for depth estimation using a structured-light camera. The model first uses estimated optical flow from ambient information of multiple video frames as a complementary guide for training a single-frame depth estimation network. Utilizing optical flow, it also fuses the data of multiple video frames to get a more accurate depth map. Lastly, these more precise fused depth maps are used as self-supervision for fine-tuning a single-frame depth estimation network to improve its performance.

Semantic Segmentation of Aerial Images (Machine Learning Engineer)   June 2019 — Jan. 2020

Cafe Bazaar   *Tehran, Iran*

- As a member of the research team for the Balad application (a customized navigation app for Iran), I built a model upon Pyramid Scene Parsing Network (PSP Net) to carry out building roof segmentation utilizing aerial satellite images. The segmentation is beneficial in the precise locating of paramount buildings in the navigation map.

Automatic Image Colorization Using Artificial Intelligence (ICASSP 2020 and Neurocomputing 2020)   Oct. 2017 — May 2019

Sharif University of Technology   *Tehran, Iran*

- This research investigates the automatic colorization of gray-scale images. To accomplish the goal, a two-stage cycle-consistent architecture based on Generative Adversarial Networks (GAN) is proposed. The work resulted in the publishing of two articles.

Smart Home Package (Co-Founder and Software Engineer)   Nov. 2016 — Sept. 2017

Griffin Smart Home   *Tehran, Iran*

- Designing and developing Android (Java) and IOS (Objective-C) applications to control the smart home package via local WiFi network, SMS, Internet, or a scheduled plan. The package includes Light Controller (Dimmer or Switch), Automatic Door Opener, Surveillance Camera Controller, RGB Light Controller, Thermostatic Controller, Global IR Remote Controller, and Safety Sensor Controller (Gas, Smoke, and Motion Sensors).

M.Sc. Thesis (IRS 2016)   Sept. 2014 — Sept. 2016

Sharif University of Technology   *Tehran, Iran*

- This research aims at designing a platform to classify various airborne objects based on their micro-Doppler effects of the echo signal. Numerous statistical features based on the Recurrence Plot are extracted and fed to a Multi-class Support Vector Machine classifier. The features are claimed to be robust against natural movements, direction, and aspect angle of the objects.

B.Sc. Thesis   Sept. 2013 — Sept. 2014

University of Tehran   *Tehran, Iran*

- This research addresses the problem of locating smartphones in an indoor environment by measuring the received power from available WiFi access points. The problem is solved in a semi-supervised fashion. As such, the data is fit into a multivariate Gaussian mixture model in order to exploit unlabeled data, which is abundantly available after the classifier is learned.

Digital Logic Design Lab (Lab Assistant)   **Sept. 2012 — Sept. 2013**

University of Tehran   *Tehran, Iran*

- Implementing several digital instruments on FPGA, such as a Digital Function Generator, a Digital Voltmeter, and a Digital Oscilloscope utilizing a VGA monitor.

Publications

- Johari, Mohammad Mahdi, Camilla Carta, and François Fleuret. "ESLAM: Efficient Dense SLAM System Based on Hybrid Representation of Signed Distance Fields." *Proceedings of the IEEE International Conference on Computer Vision and Pattern Recognition (CVPR)*. 2023. URL: https://www.idiap.ch/paper/eslam.

- Johari, Mohammad Mahdi, Yann Lepoittevin, and François Fleuret. "GeoNeRF: Generalizing NeRF with Geometry Priors." *Proceedings of the IEEE International Conference on Computer Vision and Pattern Recognition (CVPR)*. 2022. URL: https://www.idiap.ch/paper/geonerf.

- Johari, Mohammad Mahdi, Camilla Carta, and François Fleuret. "DepthInSpace: Exploitation and Fusion of Multiple Video Frames for Structured-Light Depth Estimation." *Proceedings of the IEEE/CVF International Conference on Computer Vision (ICCV)*. 2021. URL: https://www.idiap.ch/paper/depthinspace.

- Johari, Mohammad Mahdi, and Hamid Behroozi. "Context-aware colorization of gray-scale images utilizing a cycle-consistent generative adversarial network architecture." *Neurocomputing* 407 (2020): 94-104.

- Johari, Mohammad Mahdi, and Hamid Behroozi. "Gray-Scale Image Colorization Using Cycle-Consistent Generative Adversarial Networks with Residual Structure Enhancer." *ICASSP 2020-2020 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. IEEE, 2020.

- Johari, Mohammad Mahdi, and Mohammad Mahdi Nayebi. "Robust airborne target recognition based on recurrence plot quantification of micro-Doppler radar signatures." *17th International Radar Symposium (IRS)*. IEEE, 2016.

Reviewing Experience

- Reviewing one paper for *ACM Transactions on Graphics*, 2023.

- Reviewing four papers for *International Conference on Computer Vision and Pattern Recognition (CVPR)*, 2023.

- Reviewing one paper for *Imaging Science Journal*, 2022.

- Reviewing one paper for *IEEE Transactions on Image Processing*, 2021.

- Reviewing one paper for *International Conference on Computer Vision and Pattern Recognition (CVPR)*, 2020.

Teaching Experience

Teaching Assistant for *Fundamentals in Statistical Pattern Recognition* (2023)   Instructor: Dr. Sébastien Marcel
Teaching Assistant for *Deep Learning* (2021 and 2022)   Instructor: Prof. François Fleuret
Teaching Assistant for *Probability and Statistics* (2016)   Instructor: Prof. Mohammad Mahdi Nayebi
Teaching Assistant for *Digital Communication Systems* (2014)   Instructor: Prof. Amir Masoud Rabiei
Lab Assistant for *Digital Logic Design Lab* (2013 and 2014)   Instructor: Prof. Zainalabedin Navabi

Awards and Honors

- Nominated for the 2024 Thesis Distinction award (top 8%) for my doctoral thesis at EPFL.
- Ranked **1st** in The 19th National Scientific Olympiad for University Students in Electrical Engineering Field, 2014.
- Ranked **4th** among all the Electrical Engineering students of University of Tehran
- Received a fellowship for Graduate Studies at Sharif University of Technology, in 2014.
- Ranked **200th** among almost 400,000 participants in the Nationwide Iranian Universities Entrance Exam (Konkur) in the field of Mathematics and Physics, 2010.