+41 76-7211371
Lausanne, Switzerland
mohammad.johari@epfl.ch
mohammadjohari.github.io

# Mohammad Mahdi Johari

Machine Learning Researcher

## Education

**P.h.D in Machine Learning**, *Swiss Federal Institute of Technology Lausanne (EPFL) / Idiap Research Institute* 2020 — Present
**M. Sc. in Electrical Engineering**, *Sharif University of Technology* 2014 — 2016
**B. Sc. in Electrical Engineering**, *University of Tehran* 2010 — 2014

## Skills

**Technical** Python, PyTorch, PyTorch Geometric, TensorFlow, Git, LaTeX, MATLAB, VHDL, Verilog, C++, C#, HTML, Linux Shell, Java, 3D Computer Vision, Geometric Learning, Data analysis, Debugging and testing, Project management, Mathematics, User Interface Design

**Personal** Problem solving, Multitasking, Adaptability, Self-motivation, Time management, Communication, Research skills, Intercultural collaboration, Creativity, Attention to detail, Decision making

## Technical Experience

**GeoNeRF: Generalizing Neural Radiance Fileds for Novel View Synthesis (Research Assistant)** **2021 — 2022**
*Swiss Federal Institute of Technology Lausanne (EPFL) / Idiap Research Institute* *Switzerland*

- 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 (Research Assistant)** **2020 — 2021**
*Swiss Federal Institute of Technology Lausanne (EPFL) / Idiap Research Institute* *Switzerland*

- 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 (Data Scientist)** **2019 — 2020**
*Cafe Bazaar, website: cafebazaar.ir* *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 precise locating of paramount buildings in the navigation map.

**Automatic Image Colorization Using Artificial Intelligence (Research Assistant)** **2018 — 2020**
*Sharif University of Technology* *Iran*

- This research investigates 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 publishing two articles.

**Smart Home Package (Co-Founder and Software Engineer)** **2016 — 2018**
*Rmid (Griffin Smart Home), website: griffin-bms.com* *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** **2014 — 2016**

*Sharif University of Technology* *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** **2013 — 2014**

*University of 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 Signal Processing Lab (Lab Assistant)** **2013 — 2014**

*University of Tehran* *Iran*

- Implementing an analog to digital converter (ADC) and digital to analog converter (DAC) on DSP.
- Implementing FIR and IIR filters and Digital Spectrum Analyzer on DSP.
- Designing and Implementing Voiced/Unvoiced Detection on DSP Using Pitch Frequency detector.
- Designing and implementing Quantization algorithms (Uniform and Non-Uniform) on DSP for speech coding purposes.

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

*University of 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, 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: 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: 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 *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

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| Teaching Assistant for *Deep Learning* | Instructor: Prof. François Fleuret |
| Teaching Assistant for *Digital Communication Systems* | Instructor: Prof. Amir Masoud Rabiei |
| Teaching Assistant for *Digital Logic Design* | Instructor: Prof. Zainalabedin Navabi |
| Lab Assistant for *Digital Logic Design Lab* | Instructor: Prof. Zainalabedin Navabi |
| Teaching Assistant for *Probability and Statistics* | Instructor: Prof. Mohammad Mahdi Nayebi |

## Awards and Honors

- 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, 2014.
- Ranked **200th** among almost 400,000 participants in Nationwide Iranian Universities Entrance Exam (Konkur) in the field of Mathematics and Physics, 2010.