

# HAMED DAMIRCHI

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## EDUCATION

### K. N. Toosi University of Technology

M.Sc. in Mechatronics Engineering (GPA: 18.36/20)

Thesis: Deep Multimodal Localization Subsystem for a Large-Scale CDPR

Tehran, Iran

Sep. 2018 – Sep. 2021

### Tabriz University

B.Sc. in Mechanical Engineering

Thesis: Sensor Fusion for Efficient Attitude Estimation

Tabriz, Iran

Sep. 2013 – Apr 2018

## PUBLICATIONS

- **H. Damirchi**, R. Khorrambakht, H. D. Taghirad, B. Moshiri, "[A Consistency-Based Loss for Deep Odometry Through Uncertainty Propagation](#)", IEEE International Conference on Robotics and Automation (ICRA), 2023 (Submitted)
- Ali Farajzadeh, **H. Damirchi**, H. D. Taghirad, "Action Capsules: Human Skeleton Action Recognition", 2022
- R. Khorrambakht, **H. Damirchi**, H. D. Taghirad, "[IMU Preintegrated Features for Efficient Deep Inertial Odometry](#)", tinyML Research Symposium, 2022
- S.A. Khalilpour, Rooholla Khorrambakht, **H. Damirchi**, H. D. Taghirad, Philippe Cardou, "[Tip-trajectory tracking control of a deployable cable-driven robot via output redefinition](#)", Multibody System Dynamics, 2021
- **H. Damirchi**, R. Khorrambakht, H. D. Taghirad, "[ARC-Net: Activity Recognition Through Capsules](#)", International Conference on Machine Learning and Applications (ICMLA), 2020
- **H. Damirchi**, R. Khorrambakht, H. D. Taghirad, "[Exploring Self-Attention for Visual Odometry](#)", 2020
- **H. Damirchi**, R. Khorrambakht, H. D. Taghirad, "[ARAS-IREF: An Open-Source Low-Cost Framework for Pose Estimation](#)", International Conference on Robotics and Mechatronics (Best poster paper award), 2019
- R. Khorrambakht, **H. Damirchi**, H. D. Taghirad, "[A Calibration Framework for Deployable Cable Driven Parallel Robots with Flexible Cables](#)", International Conference on Robotics and Mechatronics, 2019
- MRJ. Harandi, S. A. Khalilpour, **H. Damirchi**, H. D. Taghirad, "[Stabilization of Cable Driven Robots Using Interconnection Matrix: Ensuring Positive Tension](#)", International Conference on Robotics and Mechatronics, 2019

## RESEARCH INTERESTS

- Representation Learning
- Causal Learning
- Computer vision

## SKILLS

### Languages

- **English**: Fluent (TOEFL iBT: 114, Reading: 29, Listening: 30, Speaking: 27, Writing: 28)
- **Azeri, Persian**: Native

### Programming/Software

- **Languages**: Python, C, C++, Matlab
- **Development Platforms**: PyTorch, TensorFlow, Keras, Qt, ROS, GTSAM
- **Embedded Platforms**: Keil+HAL Libraries, Arduino
- **Developer Tools**: Git, Docker, Google Cloud Platform
- **CAD/CAM**: CATIA, SolidWorks, Altium Designer, Fusion 360

## RESEARCH EXPERIENCE

### Localization Stack for Safe Autonomous Vehicle Navigation

Researcher

ARAS Labs

2020-2022

- Proposed a consistency based loss function that considers both long-term and short-term uncertainty of odometry pipelines resulting in SOTA accuracy on visual odometry
- Evaluated the efficacy of various visual attention mechanisms on visual odometry networks with comprehensive ablations showing the necessity of self-attention in VO networks.

### Global Localization for a Large-Scale Cable Robot

Researcher (M.Sc. Thesis)

ARAS Labs

2018-2021

- Collected a dataset consisting of data from a BumbleBee stereo camera, four encoders, four force sensors, one downward facing monocular camera and an IMU
- The data from the encoders alongside the forward kinematics model of the robot is used to develop an accurate residual-based uncertainty-aware hybrid FK model.
- One stream of the camera images is used alongside the IMU readings to provide egomotion estimates. The result is fused with the data from the hybrid FK model to achieve global localization in an accurate and robust manner.

### Cryptocurrency Price Direction Forecasting

Researcher

ARAS Labs

2020

- Used historical data alongside sentiment analyses of Reddit and major news sources to predict the direction of the next-day price movement.
- Cross-modal attention based Transformer and RNN based pipelines were compared against classical time series forecasting methods such as SARIMAX.

### Universal End-Effector

Researcher

ARAS Labs

2019

- An end-effector for a 4-cable parallel robot was designed in order to house a sensor array and allow for data collection.
- A DAQ system was also devised where a node was mounted with each anchor point and the CAN protocol was used to transfer data from each actuator to the central system.

### Sensor Fusion for Efficient Attitude Estimation

Researcher (B.Sc. Thesis)

Tabriz University Robotics Group

2015-2018

- Evaluated the efficiency of different filter-based methods such as KF, EKF, UKF and the complementary filter in estimation of the attitude of an Inertial Measurement Unit.
- Efficient implementation of sensor fusion algorithms on resource-constrained embedded devices.

## TEACHING EXPERIENCE

2015, Tabriz University, Iran Teaching Assistant, Robotics, Faculty of Mechanical Engineering

2016, Tabriz University, Iran Tutor, Introduction to Robotics, Scientific Association of Mechanical Engineering Department

2017, Tabriz University, Iran Teaching Assistant, Robotics, Faculty of Mechanical Engineering

2017, Tabriz University, Iran Tutor, Programming with C++, Scientific Association of Mechanical Engineering Department

### NOTABLE GRADUATE COURSES

- Machine learning
- Data Fusion
- System Identification
- Control in Robotics
- Advanced Control
- Mechatronics
- Biomechatronics

### ONLINE COURSES

- Intro to Deep Learning Course Instructed by Prof. Hinton on Coursera
- Deep Learning Specialization Course Instructed by Prof. Ng on Coursera
- Introduction to Self-Driving Cars Course Instructed by Prof. Waslander on Coursera
- Deep Reinforcement Learning Course Instructed by Prof. Levine
- Introduction to Reinforcement Learning Course Instructed by Prof. Silver

## REFERENCES

### Prof. Hamid D. Taghirad

Faculty of Electrical Engineering

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### Prof. Mehdi Delrobaei

Faculty of Electrical Engineering

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### Prof. Mahdi Aliyari

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