

# MOHAMMAD REZA HEYDARI

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🔗 google scholar

## EDUCATION

### M.Sc. in Electrical Engineering

Sharif University

Control systems major

📅 Sep. 2018 – Sep. 2021

- Cumulative GPA: **18.80/20** (4/4)
- A Comparison of Basal Ganglia and Prefrontal Cortex in Value Learning

### Bachelor in Electrical Engineering

Sharif University

Control systems major

📅 Sep. 2014 – Sep. 2018

- Cumulative GPA: **18.70/20** (3.96/4)

## PUBLICATIONS

- (Work in progress) **M. Reza Heydari**, MohammadAli Kheirkhah, Okihide Hikosaka, and Ali Ghazizadeh. "Prefrontal cortex signals value category of objects during learning while basal ganglia encodes variability in learned values"
- **Heydari, M. Reza**, Saber Salehkaleybar, and Kun Zhang. "Adversarial orthogonal regression: Two non-linear regressions for causal inference." *Neural Networks* 143 (2021): 66-73.
- Mottaghi, A., Behdin, K., Esmaeili, A., **Heydari, M.**, & Marvasti, F. (2017). OBTAIN: Real-Time Beat Tracking in Audio Signals. *arXiv preprint arXiv:1704.02216*.

## RESEARCH EXPERIENCE

### The role of the SNr and vIPFC in visual value learning in the macaque brain

Ghazizadeh's Neuroscience Lab

Sharif University

📅 Jun. 2019 – Sep. 2021

- Proposed a novel approach based of reinforcement learning literature to determine the perceptual value of good/bad fractals.
- Analyzed the neural/behavioural relationship of two brain regions SNr and vIPFC (electrophysiology) and compared the learning trends.

### Development of a model for causal inference in gene regulatory network

Learning and Intelligence Lab

Sharif University

📅 Jan. 2018 – Sep. 2019

- Proposed a new neural network for regression tasks with a minimax-type loss function similar to GANs, that minimizes the mutual information between residual and regressors.

### Real-time beat tracking in audio signals

Advanced

Communication Research Institute

Sharif University

📅 Sep. 2016 – Mar. 2017

- Employed spectrograms and novelty curves to detect real-time periodic onsets (beats) in songs. Specifically, my task involved recognizing online periodic local peaks in the novelty curve. To achieve this, I developed a heuristic method that determines the optimal size of a window in which only one local peak exists.

## HONORS AND AWARDS



### 5<sup>th</sup> Place

3<sup>rd</sup> International Conference on Signal Processing (ICOSP), Florence, Italy



### Membership

Iran's National Elites Foundation (INEF)



### Honorary Admission for Master

exempted from entrance exam, Sharif University



### 1<sup>st</sup> and 2<sup>nd</sup> Place

in bachelor and master control systems major among 24 and 15 students, Sharif University



### 12<sup>th</sup> and 8<sup>th</sup> Place

among 171 bachelor and 143 master students in EE dep., Sharif University



### 23<sup>rd</sup> Place

Iranian university entrance exam (Konkur) among 225,000 participants

## SKILLS

### Personal Trait

Hard-working

Self motivated

Learn fast

Intuitive

### Python

Threading

AsyncIO

Sysv-IPC

Selenium

Tensorflow (1, 2)

Pytorch

OpenCV

Pandas

Django

Celery

Rest-Framework

FastAPI

SQLAlchemy

AMQP

Redis

Plotly

Dash

PyQT

TKinter

Pydantic

PyCrypto

### Infrastructure and Utilities

Unix/Bash

Redhat OpenShift

Postgres

MySQL

Sentry

Redis

RabbitMQ

Git/Gitlab

Slate Docs

### Electrical Engineering

Verilog

Assembly

Altium Designer

PLC

RaspberryPi B4

stm8/32

ROS

### Flutter

Material Design

Provider

Dio

# ACADEMIC PROJECTS

## Image to latex

Deep learning course project

📅 Spring 2019

- The conversion of images of mathematical formulas to LaTeX code was accomplished using a combination of innovative methods, which led me to secure the first place among 50 participants. The list of methods employed includes: CNN inception (pre-trained in enc-dec task) - a clustering based PCA - Transformer with a new positional encoding (pre-trained via SkipGram method)

## Simulating Q-learning, Actor-Critic, and TD-lambda in maze task

Advanced topics in neuroscience course project

📅 Spring 2019

## Beta travelling wave detection and visualization in cortex

Advanced topics in neuroscience course project

📅 Spring 2019

## Designing controller and compensator for the Gasifier

Multiple-input multiple-output course project

📅 Fall 2018

## EMG sensor design

📅 Summer 2020

- Designed and implemented analog and digital parts of 6 EMG real-time sensors with Raspberry Pi B4 for rehabilitation of arm and wrist. Real-time random forest classifier for pose estimation.

# INDUSTRIAL ACTIVITIES

## Senior back-end developer

**Toman payment**

📍 Tehran, Iran

📅 Jan. 2022 – Dec. 2022

- Implemented the Settlement service (instant checkout) between banks and the other businesses like Snapp! and AbanTether.
- Used Django, FastAPI, and bare Python for different parts of micro-services that communicate with RabbitMQ on Redhat OpenShift.

## Co-Founder and technical lead

**Cardano trader**

📍 Tehran, Iran

📅 Jun. 2019 – Nov. 2021

- A Startup for applying AI and ML methods to the Tehran Market.
- Collected whole market tick data at all times. Utilized Umap and HDBScan for time-dependent clustering of various symbols.
- Applied various ML and DL methods to classify the positive/negative trend of the price across different time frames, including Random Forest, CNN, RNN, and Transformer network.

## Intern

**School of cognitive sciences, IPM**

📍 Tehran, Iran

📅 Aug. 2020 – Feb. 2021

## Intern

**R&D unit of MECO, MAPNA holding**

📍 Karaj, Iran

📅 Jun. 2018 – Aug. 2018

## Intern

**R&D unit of CROUSE, automotive part manufacturer**

📍 Karaj, Iran

📅 Jun. 2017 – Aug. 2017

Secure Storage

Bot Toast

FI Chart

**C/C++ basic libraries and concepts**

**Matlab and Simulink for signal and system analysis**

# LANGUAGES

Persian

● ● ● ● ●

English

● ● ● ● ●

TOEFL 99 (R 30, L 24, S 23, W 22)

# TEACHING EXPERIENCE

AI introduction

**TA**

Sharif University

📅 Spring 2023

Advanced Neuroscience

**TA**

Sharif University

📅 Spring 2020

Modern Control

**TA**

Sharif University

📅 Spring 2020

Deep Learning

**TA**

Sharif University

📅 Fall 2019

Linear Control Systems

**LA**

Sharif University

📅 Fall 2018 & Fall 2017

Probability and Statistics

**TA**

Sharif University

📅 Spring 2017

Digital Circuits and Lab

**LA**

Sharif University

📅 Fall 2016

National Physics Olympiad

**LA**

📍 Tehran, Iran

📅 Fall 2015

# RESEARCH INTERESTS

**Neuroscience (learning, vision, motor)**

**Machine learning (rl, time-series, vision)**

**Brain machine interface**

**Signal processing and code implementation**