MOHAMMAD REZA HEYDARI

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EDUCATION

Master in Electrical Engineering — Sharif University

Control systems major — Sep. 2018 – Aug. 2021

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

Bachelor in Electrical Engineering — Sharif University

Control systems major — Sep. 2014 – Jul. 2018

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

PUBLICATIONS

- (eLife review) **Heydari, Mohammad Reza**, Mohammad Ali Kheirkhah Ravandi, Okihide Hikosaka, and Ali Ghazizadeh. "Prefrontal cortex signals value category while basal ganglia represent learned values in value learning." bioRxiv (2023): 2023-11.
- **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 vlPFC 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 vlPFC (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

- **5th Place**
  3rd 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*
- **1st and 2nd Place**
  in bachelor and master control systems major among 24 and 15 students, *Sharif University*
- **12th and 8th Place**
  among 171 bachelor and 143 master students in EE dep., *Sharif University*
- **23rd Place**
  Iranian university entrance exam (Konkur) among 225,000 participants

SKILLS

Personal Trait

Industrious, Self-motivated, Quick learner, Creative thinker

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

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 | Fl Chart

C/C++ basic libraries and concepts

Matlab and Simulink for signal and system analysis

LANGUAGES

Persain ●●●●●

English ●●●○○

TOEFL 99: R 30, L 24, S 23, W 22
GRE: Q 168, V 144, AW 4

TEACHING EXPERIENCE

AI introduction — TA

Iran Uni. of Sci. and Tech. (IUST) — 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, sensorimotor)
Machine learning (rl, time-series, vision)
Brain machine interface
Signal processing and code implementation