Alireza Kazemipour

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Education

K. N. Toosi University of Technology — Tehran, Iran
B.S. in Electrical-Control Engineering — Sep 2015–Sep 2020

- CGPA: 3.36/4.00, Last 20 Half courses' GPA: 3.30/4.00
- Thesis: "Continuous Control With Deep Reinforcement Learning"
- Demonstration of the superiority of different state-of-the-art Deep RL methods in Continuous Space settings compared to traditional Control approaches.

Razi High School — Tehran, Iran
Diplomas in Physics and Mathematics, GPA: 3.89/4.00 — Sep 2011–Sep 2015

Research Interests

- (Deep) (Multi-Agent) (Self-Play) Reinforcement Learning
- Computer Vision & Image Processing
- Robotics
- Deep (Unsupervised) (Semi-Supervised) Learning

Academic Projects

Neural Networks Without Frameworks

Implementation of different Neural Network configurations without using scientific frameworks. [Project page]

- Implemented different configurations and ideas involved in Deep Learning without using scientific frameworks like TensorFlow and PyTorch in: Python (with and without taking advantage of NumPy), CPP and Java.

Rainbow

Combining Improvements in Deep Reinforcement Learning. [Project page]

- Implemented the improvements (Prioritized Experience, Noisy Nets, Dueling Architecture, etc.) of the DQN paper to play the games of Pong and Boxing.

Proximal Policy Optimization Algorithms (PPO)

Policy Gradient methods that alternate between sampling data and optimizing a "surrogate" objective. [Project page]

- Implemented the PPO to solve 29/32 levels of the game of Super Mario Bros and to train simulated Ant and Walker2d robots to locomote.

Exploration by Random Network Distillation (RND)

Exploration based on intrinsic rewards (Novelty Seeking). [Project page]

- Implemented the RND (with the PPO backend) to solve the game of Montezuma's Revenge and the first level of the game of Super Mario Bros that both demand intelligent exploration and are sparse-reward environments.

Soft Actor-Critic (SAC)

Off-Policy Maximum Entropy Deep Reinforcement Learning with a Stochastic Actor. [Humanoid page] [MsPacman page]

- Implemented the SAC (as the state-of-the-art benchmark for Continuous Domain in RL) to train a Humanoid how to walk and also, implemented the discrete version of the SAC to play the game of MsPacman.

Diversity is All You Need (DIAYN)

Learning Skills without a Reward Function. [Project page]

- Implemented the DIAYN (with SAC backend) to train a Hopper robot, a Bipedal walker, and the notoriously hard MountainCar agent to learn useful and Diverse skills without supervision.

Twin Delayed Deep Deterministic Policy Gradient (TD3)

Addressing Function Approximation Error in Actor-Critic Methods. [Project page]

- Implemented TD3 to train Ant and Hopper robots to move forward correctly.

Sample Efficient Actor-Critic with Experience Replay (ACER)

An Actor-Critic DeepRL method with experience replay that is stable and sample efficient. [Project page]

- Implemented the ACER jointly with the A3C (Asynchronous Methods for Deep RL) method on the games of Space Invaders and Pong, and demonstrated improvements with respect to the sample efficiency metric.

Deep Deterministic Policy Gradient and Hindsight Experience Replay (DDPG and HER)

Using the DDPG to control continuously and the HER to mitigate the problem of sparsity of rewards. [Project page]

- Implemented the DDPG + HER to train a 7DOF manipulator to fetch, pick and place a box in a sparse-reward and multi-goal environment.

Tabular Reinforcement Learning

Fundamental Reinforcement Learning algorithms in tabular format to solve Taxi gym environment.

- Off-Policy Temporal Difference Learning (Q-Learning). [Project Page]
- State–action–reward–state–action (SARSA). [Project Page]
- Backward View of TD(λ) both by Q-Learning and SARSA. [Q(λ) Project Page] [SARSA(λ) Project Page]
- Combination of Q-learning and Q-planning (Dyna-Q). [Project Page]

Cycle GAN

Unpaired Image-to-Image Translation using Cycle-Consistent Adversarial Networks. [Project page]

- Implemented the Cycle GAN to produce fake horse images from real zebra images and vice versa.

Auxiliary and Deep Convolutional GANs

Using DCGAN to generate realistic-looking images and Auxiliary GAN to improve quality. [Project page]

- Implemented the DCGAN and the AUXGAN to produce images similar to the MNIST dataset.

Deep Dream and Style Transfer

Using the Deep Dream to visualize a CNN's layer output and the Style Transfer to transfer an image's style. [Project Page]

- Implemented the Deep Dream to visualize a mixture of five-layer outputs of the Inception-V3 model with frozen weights that had been obtained by being trained previously on the ImageNet dataset.
- Implemented the Style Transfer to transfer the style of the Last Supper image to an image of the Limmat River in Zurich by using the VGG19 model to extract and deploy the style.

Face Detection and Facial Expression Classification

The final project of Fundamentals of Computer Vision course. [Project Description]

- Face detection was accomplished by Cascade Detectors with Local Binary Pattern features, then the expression was categorized by a CNN.

Persian Digits Classification

Designing and preparing instructions of 13th lab of the Fundamentals of Computer Vision course.

- Utilized Linear and RBF Support-Vector Machines, K-Nearest Neighbors, and Random Forest methods to classify images of handwritten Persian digits.

UAV Geo-Localization

Using Convolutional Neural Networks to estimate GPS coordinates.

– Utilized Feature Matching technique between the downward view of an Unmanned Aerial Vehicle and patches of a previously provided map with known GPS coordinates so that, matching is performed via Cosine Similarity of features that are produced by the last Convolutional layer of the ResNet50 model.

Line Detection

Task in the Kn2C Robotics Lab.

– Utilized pure Computer Vision techniques like Contour Approximation Methods, Image Filtering and Histograms on an embedded system (Odroid-XU4) of a drone to detect a colorful line in the downward view, navigating to follow a specific path autonomously.

Collision Avoidance

Task in the Kn2C Robotics Lab.

– Utilized pure Computer Vision techniques without any external aid of Depth Cameras or Laser Scanners to navigate a drone autonomously through some obstacles (poles) without any collisions.

Academic Experience

26th International Computer Conference, Computer Society of Iran [Homepage]

Lecturer — Mar 2021

– Presented some recent Deep RL advances and challenges associated with Deep RL algorithms' implementations. [slides]

Fundamentals of Computer Vision Course [Homepage]

Teaching Assistant — Feb 2015–Jul 2020

– Designed and prepared instructions of 13th lab (Machine Learning session) of the course and moreover, was responsible to evaluate and grade 20% of students based on their performance in each lab of the course.

– Instructor: Dr. Behrooz Nasihatkon

Signals and Systems Course

Head Teaching Assistant — Sep 2019–Feb 2020

– Was Responsible to design and arrange assignments and weekly reporting of students' outcomes.

– Instructor: Dr. Maryam mohebbi

KN2C Robotics Team [Homepage]

Research Assistant — Sep 2017–Sep 2019

– Computer Vision and A.I researcher at the Micro Aerial Vehicle section.

– Supervisor: Dr. Hamid D. Taghirad

Awards and Honors

- Ranked within the **top 4%** in Iran's National Master Computer Engineering Exam among 13,000 participants.[1] 2021
- Ranked within the **top 4%** in Iran's National Master Computer Science Exam among 2,500 participants.[2] 2021
- **3rd place** in The RoboCup Iran Open Competitions in the Unmanned Aerial Vehicle League. [link] 2018
- **6th place** in The RoboCup Asia-Pacific Competitions in the Unmanned Aerial Vehicle League. [link] 2018
- Ranked within the **top 0.8%** in Iran's National Bachelor University Exam among 252,000 participants. 2015

[1] **Evaluated Courses**: *Calculus, Statistics and Probability Theory, Theory of Languages and Automata, Signals and Systems, Data Structures and Design of Algorithms, Foundations of Artificial Intelligence, Computer Architecture, Digital Systems, Digital Electronics, Operating Systems, Computer Networks, Databases*

[2] **Evaluated Courses**: *Foundations of Mathematical Sciences, Foundations of Matrices and Linear Algebra, Data Structures, Design of Algorithms, Foundations of Theory of Computation, Foundations of Logic and Set Theory, Discrete Mathematics, Foundations of Combination*

Online Courses

- **Designing, Visualizing and Understanding Deep Neural Networks** May 2021
  CS W182 / 282A at UC Berkeley
- **Deep Reinforcement Learning** Mar 2021
  CS 285 at UC Berkeley
- **Algorithms Specialization**[3] [Certificate] Sep 2021
  Stanford | Online on Coursera
- **Reinforcement Learning Specialization** [Certificate] Mar 2021
  University of Alberta on Coursera
- **Improving Deep NNs, Hyperparameter Tuning, Regularization, and Optimization** [Certificate] May2021
  DeepLearning.AI on Coursera
- **Neural Networks and Deep Learning** [Certificate] Dec 2020
  DeepLearning.AI on Coursera

Languages

- **Farsi:** Native
- **English:** Professional Proficiency
  - **TOEFL:** 104 (Reading:24 Listening: 29 Speaking: 25 Writing: 26)
  - **GRE (General):** Analytical Writing Assessment: 3.5 Verbal Reasoning: 154 Quantitative Reasoning: 160

Technical Skills

- **Programming Languages:** Python, C/C++, Bash, VHDL, Java (Familiar)
- **Libraries:** PyTorch, TensorFlow, Keras, Gym, NumPy, Scikit-learn, OpenCV
- **Engineering Software:** MATLAB and Simulink, ISE - Xilinx
- **Frameworks:** Qt, ROS
- **Version Control Systems:** Git
- **Linux Distros:** Ubuntu

❗References, further information, and proofs are available upon request.

[3] **Projects**: *Karatsuba's algorithm, Counting number of Inversions in an Array, Quick Sort, Randomized Contraction algorithm to compute the Min Cut, TwoSum Problem, Dijkstra, Kosaraju's algorithm, Median Maintenance, Greedy Clustering, Greedy Job Scheduling, Huffman Coding, Knapsack, Prim's algorithm for the MST problem, Maximum-Weight Independent Set, 2-SAT, BellmanFord, Travelling Salesman with Heuristic approach*