Adithya Ramesh

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EDUCATION

- **Dual Degree (B.Tech, M.Tech), IIT Madras** — Chennai, India
  Department of Engineering Design ; CGPA: 8.30 ; Minor in Systems Engineering — *Aug 2011 - Jun 2016*

PROFESSIONAL EXPERIENCE

- **Honeywell Technology Solutions Labs** — Bengaluru, India
  Engineer II - Research and Development, Aerospace Advanced Technologies — *Jun 2018 - Mar 2021*

  - Deep Reinforcement Learning
    - Studied important publications and followed latest trends in the area.
    - **Autonomous Navigation for UAVs using Deep RL**
      * Designed, developed a deep RL based autonomous navigation system for unmanned aerial vehicles (UAVs), in simulation.
      * The overall task is to navigate to a goal position in the shortest path, without colliding with obstacles, in an unknown environment. RL agent uses it's own position, the goal position and a $360°$ depth sensor as inputs and outputs which direction to move. A standard flight controller then controls the UAV to move a fixed distance in that direction and the process repeats.
      * Trained using Double DQN algorithm. Successful in $\sim 92\%$ of scenarios used in training. On unseen scenarios, successful in $\sim 72\%$ of cases.
    - **Multi Agent Co-operation using Deep RL**
      * Designed, developed deep RL based multi agent systems that can co-operate and execute a given task by learning how to communicate, in simulation. Eventual business use case targeted was urban air mobility.
      * The representative problem considered involves a 2D environment where two agents with partial but complementary information about a target must communicate, navigate to reach it simultaneously. One agent has a $360°$ depth sensor and the other has a $360°$ color sensor. The agents can communicate using discrete symbols and can move in discrete directions.
      * Trained using MADDPG algorithm. Successful in $\sim 99\%$ of scenarios used in training. On unseen scenarios, successful in $\sim 50\%$ of cases.
    - Developed the required simulations from scratch using Python. Procedurally generated random environment configurations for training and testing. Briefly worked with Airsim, an open source simulator for drones based on Unreal Engine.
    - Implemented the required RL algorithms from scratch using Pytorch - Double DQN, MADDPG as well as other algorithms used in intermediate experiments such as DQN, Recurrent DQN, A2C, ACKTR etc.
    - Performed systematic research involving several stages of experimentation in order to achieve final results. Experimented with different agent inputs, agent outputs, reward functions, network architectures, algorithm specific hyperparameters and algorithms themselves.
    - Developed novel methods to interpret learnt agent behaviours.
    - Experimented with different methods to speed up training such as parallelizing experience collection across multiple workers, natural gradient descent based on kronecker factored approximate curvature (KFAC), precomputing and storing observations offline by discretizing environment.

  - Point Cloud Segmentation
    - Designed, developed a deep neural network containing PointCNN layers to segment point clouds. It's main purpose was to preprocess depth data in multi agent RL experiments.
    - Based on the paper "PointCNN: Convolution on $\mathcal{X}$-Transformed Points".
    - Developed using a small, synthetic dataset of 2000 point clouds containing 3 classes. Accuracy of $\sim 99\%$.

- **LSTM based Speaker Verification**
  - Designed, developed, tested, deployed a LSTM based text-independent speaker verification model to authenticate users in a speech based building automation system.
  - Based on the paper "Generalized End-to-End Loss for Speaker Verification".
  - Developed using $\sim$ 2000 hours of audio from $\sim$ 6000 speakers. Accuracy of $\sim$ 91%.

Predible Health — Bengaluru, India
Deep Learning Engineer — *Sep 2017 - Jun 2018*

- **Lung Nodule Classification**
  - Developed CNNs to classify lung nodules detected in chest CT scans as benign or malignant. Accuracy of $\sim$ 90%.
- **Liver Tumour Segmentation**
  - Developed CNNs to segment liver, tumour and background in abdominal CT scans.

Self Employed — Chennai, India
Machine Learning Enthusiast — *Jun 2016 - Sep 2017*

- Learnt fundamentals of deep learning, reinforcement learning. Worked on representative problems in image classification e.g CIFAR 10, tabular RL e.g Grid World, Random Walk and deep RL e.g Open AI Gym environments such as Cart Pole, Breakout etc to gain an in-depth understanding of concepts.
- As a side project, conducted a robotics and hobby electronics course for high school students.

Airwood Pvt Ltd — Chennai, India
Intern — *Dec 2014 - May 2015*

- **Flight Controller for UAVs**
  - Worked towards developing a flight controller for quadrotors. Worked on state estimation algorithms to estimate quadrotor's state from noisy IMU data and PID based control algorithms to fly it.

PROJECTS

- **Mixed State Entanglement in Quantized Chaotic Systems** (Master's Thesis)
  - Studied the entanglement of the quantum coupled standard map under time evolution for initial states that are mixed, for different interaction strengths between the standard maps and different dimensions of the surrounding environment.
- **Mechatronics**
  - Built several mechatronic projects as a hobby - line follower, remote controlled car, homemade speaker, dimmer circuit for incandescent bulbs, automatic transmission for geared bicycles etc.

SKILLS

- **Operating Systems** - Linux, Windows
- **Programming Languages** - Python, C, C++
- **Deep Learning Libraries** - Pytorch
- **Scientific Computing** - Matlab, Mathematica
- **Version Control** - Git
- **Microcontrollers** - Arduino

RELEVANT COURSE WORK

- Deep Learning
- Reinforcement Learning
- Linear Algebra
- Optimization
- Classical Physics
- Modern Control Theory
- Design, Analysis, Control of Robotic Manipulators
- Mechatronic System Design

AWARDS AND SCHOLASTIC ACHIEVEMENTS

- Awarded the NTSE scholarship by NCERT, Government of India in 2007.
- Awarded the KVPY fellowship by Department of Science and Technology, Government of India in 2011.
- Secured All India Rank 2264 in IIT-JEE 2011 (out of 0.5 million candidates).
- Cleared qualifying stages and participated in the Indian National Physics Olympiad in 2011, Indian National Mathematics Olympiad in 2010 and Indian National Olympiad in Informatics in 2010.