RAIHAN SERAJ

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RESEARCH INTEREST

- Reinforcement Learning.
- Machine Learning and Pattern Recognition in Computer Vision.

EDUCATION

McGill University *Jan.2017-Present*
MEng. in Electrical& Computer Engineering
CGPA: 3.81
Thesis: Deep Policy Gradient methods in Partially Observable Markov Decision Processes.

- Graduate Courses:Machine Learning, Optmisation and Optimal Control,Reinforcement Learning, Applied Machine Learning, Intelligent Robotics,Reinforcement Learning, Stochastic Control and Markov Decision Processes

Islamic University of Technology (IUT) *Dec.2011-Dec. 2015*
BSc. in Electrical& Electronic Engineering
Thesis(Project):Breast Cancer Classification using Logistic Regression with dynamic sigmoid function
Overall GPA: 3.89.

- Final year courses:Control System Engineering,Discreet Mathematics and Numerical Analysis, Digital Signal Processing.
- Third year: Average GPA 3.91 with 80% and above in Data Structures and Algorithms,Microprocessor Assembly Language,Peripherals and Microprocessor Based Design.
- Second Year: Average GPA 3.95(Ranked 4^{th}) with 80% and above in Engineering Mathematics IV, Signals and Systems
- Independent Online Courses: Machine Learning(Stanford Online, Coursera),Introduction to Artificial Intelligence(Udacity), Linear Algebra(MIT OpenCourseWare)

GCE A Level and O Level(MasterMind School) *Sep.2009-July 2011*
A Level: 3 A*s and 2 As
O Level: 8As

SCHOLARSHIPS AND AWARDS

- Mitacs Accelerate Fellowship
- Graduate Excellence Fellowship at McGill.
- Wining team of the Brac Manthan award for e-health category.
- Recipient of the merit based scholarship for top performers at IUT entrance exam.
- Recipient of the Daily Star award for top performers at GCE O and A-levels.

RESEARCH EXPERIENCE

Aerial Technologies March.2018-Present
Research Intern

- Worked on deep learning algorithms for passive wifi localisation, using wifi CSI data.

Systems and Control Lab Center for Intelligent Machines(CIM) Dec.2017-Present
Research Assistant *McGill University*

- Devised policy gradient algorithms for large scale Partially Observable Markov Decision Processes using finite state controllers.

Department of Biomedical Physics and Technology Dec. 2015-Dec.2016
Research Engineer (Software Development) *University of Dhaka, Bangladesh*

- Worked on learning algorithms to automatically classify QRS complexes to detect acceptable ECG traces.
- Developed a personal computer based telemedicine system with integrated diagnostic equipment like stethoscope, respiration monitor that use internet for live (real time) data transfer.
- Worked on software development for automatic frequency domain analysis to identify neurological disorder from evoked EMG responses.
- Developed software both in java and android platform for a 12 lead computerized ECG machine that allows near real time data transmission to and from remote areas.
- Developed software for Computerized Dynamic Pedograph System that carry out automatic analysis of pixel values using foot pressures and perform linear plot with pixel values against instant pressure values.

IUT Innovation Lab Feb. 2014- Nov. 2015
Research Assistant *Islamic University of Technology, Dhaka*

- Worked towards developing an embedded security system using arduino and raspberry pi interfaced with sensors that was integrated in a concrete to build a smart concrete systems for homes.
- Worked towards developing an android software using the concept of delay tolerant network capable of handling delayed request for online news paper during lack of network infrastructure.
- Developed a quad-copter with a team to work as an air borne extension providing bird's eye view of a wireless controlled rover capable of sending live video stream.
- Developed a device using twitter api,arduino and raspberry pi that is capable of remotely switching and regulating any 220V ac devices using the internet.

PROJECTS

- **Evaluation of Value-based and Policy-based methods in Dynamic Multi Drug Therapies for HIV Treatment:** Performed a detailed analysis of value based and policy based methods for Reinforcement Learning algorithms in order to learn optimal STI strategies using a set of trajectories generated during clinical trials of different STI protocols.
- **Value iteration Algorithms for POMDPs:** Outline the challenges of performing value iteration algorithms for POMDPs, the project involved a critical analysis of existing value itertation algorithms that exploits the PWLC structure of the value functionm,using belief state as the information state.
- **Soft Trust DDPG:** Worked on devising a trust region interpretation for Deep Deterministic Policy gradient algorithms. The proposed architecture allowed the use of regularization for deterministic policies in different continuous control tasks.

- **Reinforcement Learning in Multiagent Swarms:** An adapted version of conventional single agent RL algorithm was applied for swarm robotics. The RL algorithms that have been applied in the context of swarms adapting to different target distribution, the work was further extended to incorporate hierarchical reinforcement learning architecture.
- **ICLR Reproducibility Challenge:** Analysed the reproducibility of deep reinforcement learning algorithms for ICLR 2017 Reproducibility challenge. The aim of this project was to deeply investigate the reproducibility of papers submitted at ICLR 2017. The project involved analysing the proposed algorithm and validating the results and proposiong methods to tackle the problem of reproducibility in Deep Reinforcement learning algorithms.
- **Construction of Russian Dialogue Corpus:** A construction of a Russian dialogue corpus was done, which includes a wide range of speaker and provided a rich dataset suitable for training data driven network for dialogue systems. The different learning algorithm for training dialogue system was applied to this dataset and their performances were analyzed.
- **Unifying On-Policy and Off-Policy Learning in TD Learning and Actor Critic Methods:** Combined the stability of On-Policy TD learning with the efficiency of Off-Policy Learning and proposed a unified approach where the control algorithm either uses on-policy sampled action or off-policy samples depending on the amount of exploration. The idea has been further extended to Actor Critic methods and Q(σ) algorithm with eligibiity traces.
- **Reinforcement Learning**: Examined the convergence and performance of value iteration, policy iteration and multistep bootstrapping algorithms for different MDPs and POMDPs along with the proof of convergence of these algorithms.
- **Analysis of regularized logistic regression and kernel function**: Analysed the performance of kernelized logiistic regression for objective automatic assessment of rehabilitative speech treatment in Parkinson's disease.
- **Analysis of convergence of BFGS and Conjugate gradient**: Studied the implementation and convergence of a wide optimisation techniques for the optimization of unconstrained functions. A detail analysis of convergence of BFGS, Conjugate gradient and Newton's algorithm with back tracking line search was done on Rosenbrock function.
- **Finger tip SPO2 meter**: Worked with on board analog SPO2 sensor for measuring the oxygen content in blood. The data collected is then displayed in real time in an android device.
- **Modified Stethoscope:** Worked towards a modified version of an analog stethoscope that would provide visual feedbacks during blood pressure measurements.

POSITIONS OF RESPONSIBILITY

International Journals for Computers and Applications Feb. 2018- May. 2018
Reviewer

· Reviewed the journals along with the editorial board, that was submitted to IJCA 2018.

IEEE IUT Student Branch Jan. 2015- Dec. 2015
President

· Worked with a team and organized various events, competition, seminars and played an active role in boosting the profile of the student branch.

Islamic University of Technology Jan. 2014- Nov. 2014
Mentor

· Assisted first year undergraduate students with courses and provided tutorials in mathematics and circuit analysis.

PROGRAMMING LANGUAGE AND SKILLS

- Strong experience with Java, C programming, Matlab, Julia,Python
- Android development with eclipse and java
- Game development with unity
- Sound knowledge with Assembly languages, Linux operating systems
- Implementation of algorithms and data structures in java
- Implementation of machine learning algorithm in Matlab,R,Python

REFERENCES

Available upon request