Nikhil Barhate

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Education

2022 – 2024 **University of Colorado Boulder**,
Master of Science in Computer Science.

2017 – 2021 **University of Mumbai**,
Bachelor of Technology in Electronics Engineering GPA : 9.09 / 10.00.

Experience

Sep 2021 - May 2022 **Research Visitor**, **Mila - Quebec AI Institute**
Supervisors: Anirudh Goyal and Prof. Yoshua Bengio.

- Research in deep learning mechanisms to retrieve information from external dataset for accelerating online learning in Deep Reinforcement Learning algorithms.

Dec 2020 - Jun 2021 **Research Intern**, **Video Analytics Lab, Indian Institute of Science**
Supervisors: Jogendra Nath Kundu and Prof. R. Venkatesh Babu.

- Developed methods to incorporate edge detection and domain confusion in Deeplab-v2 architecture to induce domain invariant features for Domain Adaptation in Semantic Segmentation and explored Adversarial Domain Search methods for style transfer.

May 2019 - Jul 2019 **Machine Learning Intern**, **Skinzy**.

- Implemented *Auto-Encoders* and data augmentation techniques using *Generative Adversarial Networks (GANs)* to obtain pretrained model for transferring useful features to the skin disease classifier for improved performance.
- The overall accuracy increased by 4%, while also reducing overfitting significantly.

Dec 2017 - Mar 2018 **Software Engineering Intern**, **VPS Techub**.

- Designed and implemented backend web services like *CRUD*, attendance and payment logger for a website using *laravel MVC framework*.
- Implemented the UI and backend of a desktop application using *Java Swings*.

Projects

Min Decision Transformer **[GitHub Link]**.

- Implemented an offline reinforcement learning algorithm (Decision Transformer) and reproduced results on MuJoCo control environments using the D4RL dataset.

Learning Multi-Level Hierarchies with Hindsight **[GitHub Link]**.

- Implemented a *Hierarchical goal-based Reinforcement Learning algorithm* (Hierarchical Actor Critic) as described in the paper, *Learning Multi-Level Hierarchies with Hindsight*, in *PyTorch*.
- *Modified OpenAI gym environments to render* states with sub-goals produced by the agent.
- Reproduced results on the Mountain Car and Pendulum OpenAI gym environment.

Proximal Policy Optimization **[GitHub Link]**.

- Implemented a minimal version of clipped objective *Proximal Policy Optimization* reinforcement learning algorithm for OpenAI gym environments in *PyTorch*.
- Reproduced results on several standard reinforcement learning environments.

Deterministic Generative Adversarial Imitation Learning **[GitHub Link]**.

- Formulated a training procedure based on *Generative Adversarial Networks (GANs)* for offline imitation learning to improve sample efficiency.
- The algorithm worked for the Bipedal Walker environment with varying success.

Twin Delayed DDPG **[GitHub Link]**.

- Implemented the deterministic *Value-Based Reinforcement Learning* algorithm described in the paper, *Addressing Function Approximation Error in Actor-Critic Methods*, to reproduce results on the *Roboschool (PyBullet) and Box2d* gym environment simulators.

Character level language modelling with RNNs **[GitHub Link]**.

- Implemented and trained a minimalist version of Char-RNN for character level language modelling using Multi-layer Recurrent Neural Networks (LSTM) in PyTorch.

Coursework Projects

Jun 2020 - Dec 2020 **Offline Imitation Learning using Contrastive Methods**,
Supervisor: Prof. Rajendra G. Sutar.

- Developed an efficient offline imitation learning algorithm based on GANs.
- Implemented the preliminary algorithm in *PyTorch* and trained it on *Google Colab*.

May 2019 - Jul 2019 **Regularization in Deep learning methods for Diabetic Retinopathy**,
Supervisor: Prof. Rajendra G. Sutar.

- Improved Generalization in Deep Learning based systems for diabetic retinopathy detection using transfer learning and autoencoder regularization.
- Implemented the proposed algorithm in *PyTorch* and carried out tests on *Google Colab*.

Publications

May 2021 **Offline Imitation Learning for Robotic Control using Contrastive Methods**,
Nikhil Barhate, Sahil Bhave, Prathamesh Dalvi, Rajendra G. Sutar,
IEEE International Conference on Communication, Information and Computing Technology (ICCICT 2021).

Oct 2020 **Reducing Overfitting in Diabetic Retinopathy Detection using Transfer Learning**,
Nikhil Barhate, Sahil Bhave, Rugved Bhise, Rajendra G. Sutar, Deepak C. Karia,
IEEE International Conference on Computing, Communication and Automation (ICCCA 2020).

Skills

Languages	Python, C/C++, SQL
Frameworks	PyTorch, NumPy, Keras, OpenCV
Utilities	Linux, Git, Docker, SLURM, SSH, Jupyter Notebook

Coursework

Database Management Systems	Data Structures and Algorithms	Operating Systems*
Computer Organization and Architecture	Micro-Architectures	Embedded Systems
Signals and Systems	Analog Electronics I & II	Computer and Communication Networks
Electromagnetic Engineering	VLSI Design	Power Electronics
Probability and Random Variables	Linear Algebra	Multivariable Calculus
Big Data Computing*	Machine Learning*	Deep Learning for Computer Vision*
Deep Reinforcement Learning*	Geometric Deep Learning*	Deep Unsupervised Learning*
High Performance Computing"	Data Mining"	

* ≡ Online " ≡ Ongoing