

# 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 memory retrieval and trajectory modeling for deep reinforcement learning.
  - Created a dataset of multi-task trajectory embeddings.
  - Implemented a cross attention mechanism to retrieve trajectory embeddings and incorporate retrieved information into an online reinforcement learning agent (PPO agent).
- Dec 2020 - Jun 2021 **Research Intern, Video Analytics Lab, Indian Institute of Science**  
*Supervisors: Jogendra Nath Kundu and Prof. R. Venkatesh Babu.*
- Research in unsupervised domain adaptation for semantic segmentation in computer vision.
  - 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.

## 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 and Implemented a training procedure based on Generative Adversarial Networks (GANs) for offline imitation learning to improve sample efficiency.

## 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.

## 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 Bhawe, 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 Bhawe, 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