# Nikhil Vemgal

Nikhil-Vemgal — NikhilVemgal Portfolio

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## Education

- **M.Sc.** in **Computer Science, McGill University** and **Mila,** GPA: **4.0/4.0** — Montreal, Canada
  *Courses: Deep Learning, Reinforcement Learning, Applied Machine Learning* — *2021-2024*
- **B.Tech.** in **Computer Science, PES University,** GPA: **8.97/10.0** — Bengaluru, India
  *Courses: Natural Language Processing, Computer Vision, Artificial Intelligence, Linear Algebra & Statistics* — *2014-2018*

## Technical Skills

- **Programming Languages**: Python, C#, Java, R, C, SQL
- **Frameworks/ Tools**: PyTorch, Keras, Tensorflow, Numpy, Scikit-Learn, Scipy, Pandas, Azure DevOps, PowerBI, Tableau, LaTex, Slurm, Git, MySQL, MongoDB, Azure, GCP, Plotly, Matplotlib, Agile, Docker, CI/CD, .NET
- **Web Technologies**: Node.js, D3.js, Django, Flask, Javascript, RESTful APIs, ASP.NET, HTML, PHP

## Academic Research

**M.Sc. Thesis**, *Advised by* ***Prof. Doina Precup*** — Montreal, Canada

- Developed a method to enhance the mode discovery in **GFlowNets** for **drug discovery**.
- Integrated **Reinforcement Learning** techniques such as **experience replay** and **target network** into GFlowNets, showcasing improvements in mode discovery, convergence speed, and the quality of modes discovered.

## Professional Experience

**Software Engineer - Machine Learning**, ***Shell***, Bengaluru, India — July 2018 - Feb 2021

- Engineered an ensemble of **Bidirectional LSTM** classifiers in **Keras** for automated document classification and developed a web application using **Python Flask** and **JavaScript**.
- Developed and deployed containerized **RESTful APIs** with **Docker**, secured by **OAuth 2.0**, ensuring scalable solutions.
- Built and integrated a finance-focused **chatbot** using **C# .NET** into an **ASP.NET** web application, hosted on **Azure** with a **CI/CD** pipeline managed via **Azure DevOps**.
- Developed a real-time impact analysis **PowerBI dashboard** by leveraging chatbot usage data from **Azure Application Insights**, enhancing data-driven decision-making.

**Research Intern**, ***SymphonyAI***, Bengaluru, India — Jan 2018 - May 2018

- Developed a classifier using **XGBoost** to categorize breast cancer severity into five stages and created an interactive **dashboard** with **Plotly Dash** for visualizing patient data.
- Worked on a proof-of-concept project leveraging **Generative Adversarial Networks (GANs)** for facial attribute manipulation and image super-resolution.

**Data Science Intern**, ***Mantra Labs***, Bengaluru, India — May 2017 - July 2017

- Analyzed shopper satisfaction by implementing real-time expression tracking during retail visits, using **Convolutional Neural Networks (CNNs)** in **Python Keras** for expression classification and a Haar-like feature cascade for precise face detection.

**Intern**, ***KAnOE, PES University***, Bengaluru, India — May 2016 - Aug 2016

- Developed an **interactive data visualization** tool in **Python** to track entity frequency, location, and sentiment in news articles using **NLP** techniques, and created dynamic, data-driven graphs with **D3.js**.

## Projects

**Vision Transformer (ViT)**, *Course Project, Representation Learning*, — Feb 2022 - April 2022

- Built an image classifier using **ViT** in **PyTorch**, and conducted comparative experiments on Layer Normalization, exploring both Pre-LN and Post-LN configurations.

**Training RL agents on Hopper**, *Course Project, Reinforcement Learning*, — Mar 2022 - April 2022

- Implemented **policy gradient** algorithms in **PyTorch**, including **PPO**, **Actor-Critic**, **TRPO**, and **SAC**, for the Hopper task. Analyzed trade-offs between model capacity and sample efficiency for optimal algorithm selection.

**Diabetic Retinopathy Detection**, *Course Project, Computer Vision*, — Aug 2017 - Dec 2017

- Developed an algorithm in **Python** for diabetic retinopathy severity detection by counting microaneurysms, using **morphological operations** to extract blood vessels and microaneurysms from fundus images.

## Publications

- **Nikhil Vemgal**, Elaine Lau, Doina Precup, *An Empirical Study of the Effectiveness of Using a Replay Buffer on Mode Discovery in GFlowNets.* ***ICML Workshop 2023.***
- Elaine Lau, **Nikhil Vemgal**, Doina Precup, Emmanuel Bengio, *DGFN: Double Generative Flow Networks.* ***NeurIPS Workshop 2023.***