Pranav Agarwal

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Research Interests

Reinforcement Learning | Lifelong Learning | Generative World Models | Interpretability | Autonomous Driving

Education

Mila, Quebec AI Institute — **Montréal, Canada**
Ph.D. in Computer Science — *Sept. 2022 – Sept. 2025*
Thesis: Efficient Reinforcement Learning with Improved Prior Modeling — *GPA: 4.13/4.3*

Mila, Quebec AI Institute — **Montréal, Canada**
M.Sc. in Computer Science — *Jan. 2022 – Aug. 2022*
Fast-tracked to Doctorate Programme. — *GPA: 4.09/4.3*

Indian Institute of Information Technology — **Guwahati, India**
Bachelors in Electronics and Communication Engineering — *Aug. 2015 – May 2019*
Graduated as Gold Medalist with Rank 1 — *GPA: 9.40/10.0*

Experience

Research Scientist Intern — **May 2025 – Aug 2025**
Wayve — *Vancouver, Canada*

- Improving offline Reinforcement Learning (RL) policies for intervention scenarios using better exploration strategies.
- Leveraging a learned reward model to optimize policy training efficiency and robustness using the GAIA world model.
- Evaluating various exploration techniques to address sparse reward conditions and improve generalization across tasks.
- Contributing to the broader goal of scalable, safe decision-making in embodied AI systems through model-based RL.

Research Intern — **Jan. 2022 – Aug. 2022**
CM Labs — *Montréal, Canada*

- Designed and implemented a framework leveraging self-supervised learning to automate the evaluation of excavator operators, enabling objective performance assessment.
- Integrated the framework as a custom reward function in the Vortex simulation environment, achieving automated excavator control using state-of-the-art Reinforcement Learning (RL) techniques.
- Optimized model performance by applying hyperparameter tuning, ensuring scalable deployment in training simulators.
- Validated the framework's effectiveness, contributing to advancements in operator training and autonomous construction equipment.

Research Assistant — **Aug. 2019 – Mar. 2021**
INRIA, RITS — *Paris, France*

- Developed and evaluated state-of-the-art Reinforcement Learning (RL) algorithms, including DDPG, TD3, and PPO, for autonomous driving tasks in simulated environments.
- Engineered an OpenAI Gym-compatible wrapper for the Carla simulator, enabling seamless integration and benchmarking of RL algorithms.
- Proposed and validated a novel curriculum-driven, multi-policy RL agent, achieving efficient learning of autonomous driving with sparse reward signals.

Research Collaborator — **May 2019 – April 2021**
INRIA, Flowers — *Paris, France*

- Curated and annotated the Egoshots dataset, enabling its use for benchmarking image captioning models.
- Developed and fine-tuned state-of-the-art Image Captioning (IC) algorithms, including YOLO, NOC, and DNOC, to generate descriptive captions for egocentric image datasets.
- Introduced and validated a novel evaluation metric, *Semantic Fidelity*, to assess diversity and contextual relevance in image captioning outputs.
- Collaborated on improving model interpretability and scalability for practical applications in egocentric vision systems.

Research Intern **May 2018 – July 2018**
Singapore University of Technology and Design *Singapore*

- Contributed to developing and analyzing the Eccentricity Convolutional Neural Network (ECNN), exploring its novel architecture for computer vision tasks.
- Conducted comprehensive performance evaluations of ECNN on large-scale datasets such as ImageNet and FaceScrub, benchmarking against established models like AlexNet.
- Identified strengths and limitations of ECNN in image classification tasks, providing insights for future architectural improvements.

Publications

- **Interpreting Large Language Models' Personality through Critical Event Analysis**
  Pranav Agarwal, Ioana Ciucă
  ICML Workshop (Actionable Interpretability), 2025
  Keywords: Interpretability, LLMs, Evaluation
- **Continual Reinforcement Learning**
  Under Review, 2025
  Keywords: Reinforcement Learning, Continual Learning, Robotics
- **Learning to Play Atari in a World of Tokens**
  Pranav Agarwal, Sheldon Andrews, Samira Ebrahimi Kahou
  International Conference on Machine Learning (ICML), 2024
  Keywords: Reinforcement Learning, Transformers, Deep Learning, World Models
- **TPTO: A Transformer-PPO based Task Offloading Solution for Edge Computing**
  Niloofar Gholipour, Marcos Dias de Assuncao, **Pranav Agarwal**, Rajkumar Buyya
  IEEE ICPADS (29th International Conference on Parallel and Distributed Systems), 2023
  Keywords: Edge Computing, Transformers, Reinforcement Learning
- **Empowering Clinicians with MeDT: A Framework for Sepsis Treatment**
  Aamer Abdul Rahman, **Pranav Agarwal**, Vincent Michalski, Rita Noumeir, Samira Ebrahimi Kahou
  NeurIPS Workshop (Goal-Conditioned Reinforcement Learning), 2023 — **Spotlight Presentation**
  Keywords: Healthcare AI, Transformers, Deep Reinforcement Learning
- **Transformers in Reinforcement Learning: A Survey**
  Pranav Agarwal, Aamer Abdul Rahman, Pierre-Luc St-Charles, Simon JD Prince, Samira Ebrahimi Kahou
  ACM Computing Surveys (Under Review), 2024
  Keywords: Transformer Architectures, RL Applications
- **Automatic Evaluation of Excavator Operators Using Learned Reward Functions**
  Pranav Agarwal, Marek Teichmann, Sheldon Andrews, Samira Ebrahimi Kahou
  NeurIPS Workshop (Reinforcement Learning for Real Life), 2022
  Keywords: Robotics, Reinforcement Learning, Reward Learning
- **Sparse Curriculum Reinforcement Learning for Autonomous Driving**
  Pranav Agarwal, Pierre De Beaucorps, Raoul De Charette
  arXiv preprint, 2021
  Keywords: Self-Driving Vehicles, Curriculum Learning, Reinforcement Learning
- **Egoshots: Ego-Vision Dataset and Semantic Fidelity Metric for Image Captioning**
  Pranav Agarwal, Alejandro Betancourt, Vana Panagiotou, Natalia Díaz-Rodríguez
  ICLR Workshop (Machine Learning in Real Life), 2020
  Keywords: Computer Vision, Dataset Creation, Captioning Models
- **Learning to Synthesize Faces Using Voice Clips for Cross-Modal Biometric Matching**
  Pranav Agarwal, Soumyajit Poddar, Anakhi Hazarika, Hafizur Rahaman
  IEEE TENSYMP (Region 10 Symposium), 2019
  Keywords: Multimodal Learning, Voice-Face Correlation, Generative Models

Academic Activities

- **Conference Reviewer**:
  - Machine Learning: ICLR, ICCV
  - Graphics: SIGGRAPH
  - Robotics: ICRA, IROS, IEEE Robotics and Automation Letters (RA-L)
  - Intelligent Systems: IEEE SII

Technical Skills

- Python (Expert: NumPy, SciPy, Pandas), C++ (STL, Boost), MATLAB
- Embedded: ROS/ROS2, Arduino, Raspberry Pi
- Frameworks: PyTorch (Lightning, TorchScript), TensorFlow (Extended, Serving)
- Tools: Keras, OpenCV, scikit-learn, MLflow, Weights & Biases
- Autonomous Vehicles: CARLA, Vortex Studio
- Robot Learning: NVIDIA Isaac Gym, MuJoCo, Gazebo
- Visualization: Matplotlib, Seaborn, Plotly
- DevOps: Git, Docker, Jenkins, Linux (Ubuntu, CentOS)
- Cloud: AWS EC2/S3, Google Colab, Jupyter Notebooks

Relevant Courses

- **Mathematics**: Linear Algebra, Multivariate Calculus, Probability, Statistics, Numerical Methods
- **Computer Science**: Algorithms, Data Structures, OS, Computer Architecture, C/C++ Systems Programming
- **Robotics & AI**: Reinforcement Learning, Optimal Control, Robot Learning, Autonomous Systems
- **Machine Learning**: Deep Learning (Transformers, CNNs, RNNs), Medical AI, Computer Vision, MLE
- **Certifications**: Deep Learning (Coursera), AWS ML, NVIDIA DLI Robotics, ROS Professional

Awards

- **Academic Excellence**:
  - President's Gold Medal for highest GPA in graduating class
  - Merit Certificate: Top 0.1% nationwide in Standard XII exams (full marks)
  - Quebec Exemption from International Master's Fees
- **Research & Innovation**:
  - ETS Substance Research Dissemination Scholarship ($1000)
  - Mitacs Accelerate Fellowship for Graduate Studies
  - Best Technology Award, Vibrant Gujarat 2019 (Government of India)
- **Leadership & Extracurricular**:
  - Winner, ElectroWarFare (Intra-College Techno Fest, IIIT Guwahati)
  - Silver Medalist, YUVAAN Cricket (Intra-College Sports Fest, IIIT Guwahati)