# Anurag Jain

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## EXPERIENCE

**Undergraduate AI/ML Researcher** April 2025 - Present
*University of Alberta, AB.*

- Conducting undergraduate research focused on enhancing AI-driven strategies for trick-taking card games involving imperfect information.
- Leveraging advanced machine learning techniques, including reinforcement learning and generative modeling, to simulate game scenarios and optimize existing AI decision-making capabilities.
- Analyzing extensive gameplay datasets to refine policies, effectively addressing uncertainty and strategic complexity within complex environments.

**Machine Learning Intern.** January 2025 - April 2025
*PCL Construction, Edmonton, AB.*

- Developed ML models analyzing BIM data to predict spatial relationships (Training Acc: 98.21%, Test Acc: 95.17%).
- Implemented Python data preprocessing workflows (Pandas, IFCOpenShell).
- Created graph-based probabilistic models (Train F1: 0.92, Test F1: 0.81), validating effectiveness with 692 training and 288 testing true positives.
- Predicted spatial connections accurately (692 true positives in training, 288 in testing), supporting efficient construction planning.

**Software Developer Intern** May 2024 - August 2024
*PaySpaze, San Francisco, USA*

- Developed and deployed **two cross-platform Flutter applications** for iOS and Android.
- Implemented secure **digital authentication** methods, managing **end-to-end development** from design to deployment.

## EDUCATION

**University of Alberta,** *Edmonton, Alberta, CANADA* Expected Graduation: 2026

- Bachelor of Science - Computing Science, Specialization
- Coursework: **Artificial Intelligence, Machine Learning,** Deep Learning, Reinforcement Learning, Data Science, Supervised Learning, Unsupervised Learning, Visual Recognition.

## PROJECTS

**Vision Transformer (ViT) and Image Captioning with GPT-2** September 2024

- Implemented a **Vision Transformer (ViT)** for **CIFAR-10** image classification, achieving **over 80% test accuracy** with custom training pipelines using data augmentation, cosine learning rate scheduling, and early stopping.
- Developed an **image captioning system** combining a pre-trained ViT as vision encoder and **GPT-2** as text decoder to generate natural language captions for the **Flickr8k** dataset.
- Fine-tuned Huggingface Transformer models using PyTorch, achieving a **BLEU score of 0.06**, effectively bridging image features and text generation.

**Object Detection and Semantic Segmentation on MNIST** October 2024

- Built and trained a **UNet-based model** for **object detection** and **semantic segmentation** on noisy, overlapping digit images.
- Achieved **94% accuracy**, **82% Intersection over Union (IoU)** for detection, and **75% segmentation pixel accuracy** on test sets.
- Tuned hyperparameters and optimized model performance on **Google Colab GPUs**, handling class imbalance and visual occlusions robustly.

**Generative Models on FashionMNIST** November 2024

- Designed and evaluated **VAE**, **DDPM**, and **DDIM** models from scratch to generate **class-conditioned FashionMNIST images**.
- Achieved up to **86% classification accuracy** on generated samples using a pre trained classifier, meeting rigorous quality targets.
- Implemented training pipelines with model checkpointing, data padding to **32×32**, cosine noise scheduling, and gradient clipping for stable training.
- Leveraged **U-Net architectures** for noise prediction in diffusion models and employed **sinusoidal embeddings** for time-step encoding, improving sample diversity and realism.

## TECHNICAL SKILLS

**Programming Languages**: **Python,** C++, MySQL, Assembly, CSS, Dart, Flutter, HTML, Java, JavaScript, React Native.
**Tools & Technologies**: **Matplotlib**, **SciKit-Learn TensorFlow**, **Scipy**, **PyTorch**, OpenCV, CUDA and cuDNN, Pandas, Auth0, Figma, Google Colab, RISC-V.