Uday Karan Kapur

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Education

Université de Montréal - MILA   Montréal, Quebec, Canada
Master of Science in Computer Science, 4.12/4.30 GPA   *Sep 2023 - Sep 2025*
- **Selected Coursework:** Representation Learning (A+), Fundamentals of Machine Learning (A+), Reinforcement Learning and Optimal Control (A), Links between Vision and Language (A), Data Science (A)

Vellore Institute of Technology   **Chennai, Tamil Nadu, India**
Bachelors of Technology in Computer Science and Engineering, 8.65/10.0 GPA   *Jul 2016 - Sep 2020*
- **Selected Coursework:** Natural Language Processing, Machine Learning, Applied Linear Algebra, Statistics, Databases, Parallel and Distributed Computing, High Performance Computing, Data Structures & Algorithms

Experience

MILA - Quebec Artificial Intelligence Institute   **Montréal, Canada**
Graduate Research Assistant   *Jan 2025 - Present*
- Working with Prof. Aaron Courville on multi-agent reinforcement learning and LLM negotiations.

HomePorter   **Montréal, Canada**
Machine Learning Engineer   *May 2024 - Nov 2024*
- Developed and deployed a classifier based on SBERT to analyze transcripts and categorize statements related to home repairs. Leveraged NLP techniques and tools, including Pandas, PyTorch, and Hugging Face Transformers, resulting in a 35% improvement in the F-score.
- Developed a Retrieval-Augmented Generation (RAG) system to generate effective and efficient reports summarizing conversations about home repairs. Experimented with MPNet for retrieval and LLaMA-3.1-8B for report generation, optimizing efficiency and relevance.

Peritus.ai   **New Delhi, India**
Software Engineer   *Jun 2021 - Jun 2023*
- Built a full-featured analytics dashboard using React, TypeScript, Next.js, HTML, and CSS. The interactive and user-friendly interface allows efficient visualization, interaction, and analysis of community data.
- Assumed responsibility for the authentication service, implementing robust security features with Java Spring Boot and Kotlin. Additionally, played a role in optimizing NGINX to enhance system performance and security.
- Demonstrated effective leadership and management skills while working with a diverse, globally distributed team across various timezones and nationalities, ensuring smooth collaboration and coordination.

Projects

Day-ahead and Intraday self-scheduling for energy storage using Approximate Dynamic Programming
- This project aimed to automate the energy bidding process in the German market by utilizing reinforcement learning with function approximation to improve efficiency over traditional tabular methods. We used a Multi-NFQCA approach with separate networks for day-ahead and intraday markets, where the output of the day-ahead network served as the input to the intraday network and vice-versa. The code can be found on Github.

LLM Augmented LLMs
- This project aimed to create a composition of a larger base LLM and augment its existing capabilities with a smaller anchor LLM. The LLMs were connected with each other using trainable cross attention layers while the weights of the LLMs themselves were kept frozen. We used Zephyr 1.6B as a base LLM and fine tuned GPT-2 and CLIP encoder as anchor LLMs.

Portfolio Optimization using HRP-Black Litterman
- This project aimed to create an optimal portfolio of 50-100 S&P 500 stocks by integrating Hierarchical Risk Parity with the Black-Litterman model, developed during the McGill FIAM Hackathon 2024. We constructed a diversified long-short portfolio to achieve balanced risk exposure and enhance potential returns. The code can be found on Github.

Technical Skills

Languages: Python, C++, Java, Kotlin, Typescript, Shell, SQL, HTML5, CSS
Technologies/Frameworks: React.js, Java Spring Boot, Apache Airflow, PyTorch, JAX, Tensorflow, Keras, LLMs
Developer Tools: Git, Docker