Jean–Sébastien (JS) Dandurand

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EDUCATION

Carnegie Mellon University
Master of Science, Machine Learning — Sep 2025 – Jan 2027 (Expected)
University of Toronto
Honours Bachelor of Science, Computer Science and Mathematics (**4.0 Cumulative GPA**) — Sep 2021 – May 2025

EXPERIENCE

Graduate Research Assistant — May 2025 – Present
Carnegie Mellon University | CUBE Lab | *Supervised by Dr. Laszlo Jeni*

- Designing benchmark frameworks to evaluate **multimodal large language models (MLLM)** in high fps video understanding tasks

Undergraduate Research Intern — September 2023 – May 2025
University of Toronto | embARC Research Group | *Supervised by Dr. Nandita Vijaykumar*

- Co-authored **Retri3D** (ICLR 2025 Spotlight), pioneering a framework for text-based retrieval of 3D neural scenes (Neural Radiance Fields, 3D Gaussian Splatting) by leveraging **vision-language models**. Achieved **84.95% retrieval accuracy** (P@1) on the LERF dataset, outperforming baselines by up to 58.6%, while reducing storage overhead by 10,000× and enabling millisecond-scale queries
- Co-authored **TuneShift-KD**, achieving up to **13.5% improved accuracy** on specialized tasks (e.g. Python code generation) by automating knowledge transfer between LLMs using perplexity-based synthetic data, **without access to original training datasets**
- Researched **dynamic 3D Gaussian Splatting** by leveraging optical flow models, achieving a **6x speedup** in training time compared to state-of-the-art iterative methods (manuscript in preparation for ICLR 2026)

Machine Learning Engineer Intern — May 2024 – January 2025
EmMea Inc.

- **Developed a physics-informed neural network (PINN) framework** for multiphase emission flow modeling, achieving **4.15–14.3% phase fraction error** (vs. 7.18–33.51% in CFD) while reducing simulation runtime by **90%** (3 hrs vs. 24–38 hrs) through embedded Navier-Stokes equations and adaptive loss balancing.
- **Developed hybrid Self-Regressive Runge-Kutta (SR-RK) PINN architecture** for applications in emission modelling, integrating implicit Runge-Kutta time-stepping and self-regressive training, enabling stable 3D advection-diffusion modeling with **80% less training data** and 10× faster convergence than CFD solvers.
- **Optimized training workflows** via Adam-LBFGS hybrid optimization and GPU parallelization, slashing per-simulation compute costs by 50% while maintaining >95% accuracy across stratified/dispersed flow regimes.
- **Validated framework** against experimental data and ANSYS Fluent benchmarks, demonstrating PINN superiority in real-time emission monitoring applications with **22% higher accuracy** in transitional flow pattern prediction.

PUBLICATIONS

- Yushi Guan, Daniel Kwan, **Jean-Sebastien Dandurand**, Xi Yan, Ruofan Liang, Yuxuan Zhang, Nilesh Jain, Nilesh Ahuja, Selvakumar Panneer, Nandita Vijaykumar. “Retri3D: 3D Neural Graphics Representation Retrieval” *International Conference on Learning Representations (ICLR) Spotlight.* 2025**.** [Project Page]

- Anonymous Author(s). “TuneShift-KD: Knowledge Distillation and Transfer for Fine-tuned Models” *Under Review, Conference on Neural Information Processing Systems (NeurIPS)*. 2025.

- Henry Qi Jin, Willow Liu, **Jean-Sebastien Dandurand**. “Physics-Informed Machine Learning for Multiphase Emission Measurement” *Society of Petroleum Engineers (SPE) Gas & Oil Technology Conference (GOTECH).* 2025. [Abstract]

TECHNICAL SKILLS

Languages: Python, C/C++, CUDA, Java, SQL
Frameworks: PyTorch, TensorFlow, PyTorch Lightning, OpenCV, Pandas, NumPy, ScikitLearn, Matplotlib, NLTK
Developer Tools: Linux, Git, Docker, Weights & Biases, Jupyter Notebook