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François-Guillaume Lemesre

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EXPERIENCE

Machine Learning Engineer   Oct 2022 - Current
Huron Digital Pathology   St. Jacobs, Ontario, Canada
- Worked on algorithm research, neural network design, architecture, scaling, and performance optimisations for Huron Digital's Lagotto gigapixel image search system.
- Created and implemented deep learning models for gigapixel image segmentation and feature matching in PyTorch, TensorFlow, and ONNX, greatly improving accuracy over previously employed methods in Huron Digital's Lagotto and scanner software.
- Led a team of engineers and system administrators to design and implement Huron Digital's ML data pipeline, storage infrastructure, and internal network, responsible for hundreds of terabytes of data.

Research Assistant   May 2021 - Apr 2022
University of Waterloo   Waterloo, Ontario, Canada
- Research project supervised by Professor Marek Stastna. Work focused on computational methods for soliton wave behaviour in shallow-water conditions, using HPC resources from the University of Waterloo and Compute Canada. Project used a custom Navier-Stokes numerical solver written in MATLAB and C++.
- Secondary work on Alfvèn waves and computational problems in magnetohydrodynamics (MHD), with a particular focus on large-scale magnetohydrodynamics in the solar tachocline around the poles.

R&D Engineer   May 2021 - Oct 2022
Wakoma Inc.   Waterloo, Ontario, Canada
- Designed and implemented Wakoma's internal and client VPN infrastructure based on the WireGuard protocol, providing secure and resilient connectivity to hardware deployments servicing over 50,000 people.
- Worked on hardware design and validation (x86 and ARM platforms), and software development (Python) for the Nimble and Lokal projects in the Wakoma R&D team.
- The Nimble won the Best Overall Proof-of-Concept award at the 2021 IEEE Connecting the Unconnected Summit.

Software Analyst (Co-op)   Jan 2019 - Apr 2019
Thales Canada   Toronto, Ontario, Canada
- Research and development of multi-purpose autonomous train system in the Research and Technology (R&T) team.
- Worked on an object detection and classification algorithm using sensor fusion (radar, lidar, cameras) and statistical methods (Kalman Filtering), improving object detection confidence by 60% in bad weather conditions.
- Created and maintained Python tools for the treatment of sensor video and image data, and to manage multiple terabytes of sensor data.

SKILLS

Programming Languages: Python (numpy, pandas, scipy, numba), Golang, Rust, C, C++, R, Matlab
Tools & Technologies: PyTorch, TensorFlow, ONNX, JAX, OpenCV, AWS, Kubernetes, Docker, Git, Linux, ZFS, LaTeX
Spoken Languages: French, English

EDUCATION

Honours Bachelor of Science (BSc), Mathematical Physics   2022
University of Waterloo   Waterloo, Ontario, Canada
- Pure Mathematics Minor, Astrophysics Minor.
- Thesis title: The formation of internal solitary wave-like trains in the presence of viscosity. Supervised by Dr. Marek Stastna.
- Highlighted Courses: Machine Learning in Physics, Computational Physics, Quantum Theory 2 & 3, Introduction to Quantum Information Processing, General Relativity, Differential Geometry, Continuum Mechanics, Partial Differential Equations, Non-Euclidean Geometry, Groups & Rings.

PROJECTS

Deep learning insights into cosmological structure formation
Machine Learning Final Project (PHYS 449)
- Replicated and improved upon model from arXiv:2011.10577. Implemented full 3D CNN with skip connections and max pooling in order to investigate and improve model accuracy, especially for lower-mass dark matter halos. Original NN was in Tensorflow; our model is in PyTorch with CUDA acceleration.

Remine: Closing the loop for heavy metal waste   2020
Using metal-binding proteins for metal reclamation in mining wastewater.   Waterloo iGEM
- Developed a nonlinear fluid transport model and a metal-binding protein molecular dynamics model for a packed-column bioreactor in Python.
- Project received iGEM Gold Medal and Best in Category award at the 2020 iGEM competition in Boston, Massachusetts.

Rooting for Symbiosis   2019
Engineering herbicide tolerance in Rhizobia to reduce the need for nitrogen fertilizers.   Waterloo iGEM
- Developed 2D and 3D geochemical diffusion-advection-reaction fluid models in Python with MPI parallelisation for the flow, uptake, and degradation of herbicides in soy bean root systems.
- Project received the iGEM Silver Medal at the 2019 iGEM competition in Boston, Massachusetts.

Impact of Nuclear Processes on Stellar Structure
Stellar Astrophysics Final Project (PHYS 375)
- Simulated a stellar main sequence using the equations of stellar structure. Investigated modifications of the energy terms. Solved 5-dimensional boundary value problem using custom RK45 implementation in Python.