Jorge Enciso

Machine Learning Engineer and Performance Engineer

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Education

Colegio Japonés Paraguayo Asunción, Paraguay
High School Diploma, Natural Sciences Track, GPA [10/10], Valedictorian Graduation Date Thesis [Nov 2023]

- Relevant Coursework: Advanced Mathematics, Physics, Mechatronics
- Honors Thesis: *"Niche Modeling with Deep Learning"*
  - Created an automated training pipeline to reconstruct species' spatial distributions from historical occurrence data.
  - Developed and benchmarked models for generalized distribution estimation (Neural Networks, Logistic Regression, Naive Bayes, SVM, Random Forest) and pseudo-absence generation (One-Class SVM, K-means Clustering).

Research Experience

Multi-modal modelling for Geophysical Forecasting Polars, Pandas, Pytorch
MHD-informed Multi-Modal Networks for Geomagnetic Forecasting October 2023 – May 2024

- Developed a multi-modal ML framework using data from LASCO, SDO, ACE, and DSCOVR to predict Dst index and magnetospheric boundaries.
- Engineered transformer-based architecture for satellite time series fusion; integrated MHD constraints into training dynamics.
- Led all aspects: data preprocessing, model design, CUDA kernel optimization, and evaluation.

Computer Vision for Astronomic instrumentation OpenCV, Scikit-Image, Pytorch
CorKit: A Framework for LASCO Coronagraph Calibration March 2024 – July 2024

- Developed an alternative pipeline (original: [**?**]) for automated image preprocessing and calibration of solar coronagraph data.
- Integrated physics-informed constraints to correct lens artifacts and vignetting in LASCO C2/C3 data.
- Implemented Partial CNN architecture [**?**]) from scratch and refactored it for the specific use case.

Statistical Mechanics informed Neural Networks NVIDIA Modulus, Pytorch, Polars, Pandas
Vlasov-Maxwell informed Operator Learning for Solar Wind Modeling October 2024 – Present

- Modeled solar wind's electron's anisotropic behavior using physics-informed machine learning.
- Incorporated statistical mechanics constraints into the governing equations.
- Designed custom Physics-Informed Neural Operators (PINOs) [**?**] tailored to the system.

Machine Learning for Celestial Mechanics NVIDIA Modulus, Pytorch, Numpy
PINNs for Celestial Mechanics: The Family of N-body problems December 2024 – Present

- Understanding chaotic systems with Physics informed Neural Networks [**?**].
- Enforced hamiltonian constraints of celestial mechanics through physics-informed Lagrangian optimization.
- Studied resonancy and periodic properties of the physical system.

Specialized Projects

LighTorch – Deep Learning Framework Lightning, Pytorch, Optuna, CUDA C++
Personal ML Framework Project 2024 – Present

- Wrapper over the Pytorch Lightning and plain Pytorch backends.
- Abstractions for supervised, self-supervised, and adversarial training.
- Multi-Objective optimization for Hyperparameter tuning with Optuna.
- More than 20 modules extending novel architectures, including the Partial Convolutions [**?**], Fourier Layers (including deconvolutions) [**?**], among others.
- Implemented additional architectures from scratch: Rotary Positional Encoding [**?**]; RMS Norm [**?**]; GLU Variants [**?**]; Multi Query Attention, Grouped Query Attention & Multi Head Attention [**?**].
- In progress: Low level optimizations for non-standard modules.

Fusion – IO-Aware Kernelized Training Compiler CUDA, C++, Pytorch
In Development 2024

- Design a programming language syntactically parallel as a machine learning standard.
- Create a new version of the forward-backward standard that exploits IO operation latency.
- Features include stream-aware optimization, prefetching graphs for latency hiding, and compatability with state-of-the-art frameworks.

Fourier is All You Need & Fourier Variational Autoencoders CUDA, C++, Pytorch
Machine Learning Architecture 2024

- Exploited mathematical properties of the Fourier Transform to accelerate Convolutional Neural Networks.
- Investigated the properties of the Fourier space in training scenarios.
- Designed UNet-Like variations for the Fourier Layer case [**?**] (implemented from scratch).
- Created a Fourier Layer alternative for UNet-Like autoencoders: Fourier Deconvolutional Layer.

Miscellaneous Projects

Rapid Eye Movement Detection Pytorch, Pandas, Numpy, Scikit-Learn
Sleeping stages classification 2024

- Implemented Recurrent Neural Networks to classify sleeping stages.
- Achieved state-of-the-art classification with 97% F1 Score (Residual GRU model).
- Deep Recurrent Neural Networks and Attention-based architectures.

SADI A.I. Pytorch, OpenCV
Security AI 2024

- Developed foundational models to classify and recognize threats.
- Trained state-of-the-art Computer Vision models (YOLO, YOLO-NAS).
- Real-Time face detection, threat detection, face recognition, and individual detection.

Sketcher A.I. Pytorch, OpenCV
Art AI 2024

- Created foundational pipeline to create sketches from images.
- Implemented state-of-the-art style-transfer mechanisms.

Awards & Recognitions

- Silver Medal – National Math Olympiad (8th/9th Division), Paraguay, 2020
- Bronze Medal – National Math Olympiad (10th/11th/12th Division), Paraguay, 2021
- Gold Medal – Regional Physics Olympiad (Advanced Level), Paraguay, 2022
- Silver Medal – National Physics Olympiad (Intermediate Level), Paraguay, 2022
- National Delegate – Ibero-American Physics Olympiad, 2022

- Honorable Mention – NASA Space Apps Challenge Paraguay, 2023
- 2nd Place in Technology – Marie Curie National Science Fair, 2023
- 2nd Place - 1st National Stratospheric Platforms Contest, 2023

Experience

DDS.py Asuncion, Paraguay July 2023 – December 2024

- Taught foundational programming (Python) and ML concepts to high school students.
- Developed and maintained an alternative learning roadmap on GitHub.
- An introductory to advance course on deep learning, and an introduction to ML performance engineering.

Mechatronics Teacher Asuncion, Paraguay March 2024 – November 2024

- General purpose progamming (C++, Python) lectures for High School students.
- Taught Networking (OSI Model, TCP/UDP communication), Astronomy software design patterns (NASA Software Engineering book), serial protocols (USB, I^2C, etc).
- Taught programming paradigms: Object Oriented Programming (OOP) and Functional programming.

Physics Teacher Asuncion, Paraguay March 2023 – November 2024

- Taught lectures on classical mechanics and electromagnetism for physics olympiads.

Oym Systems Group S.A. Asuncion, Paraguay
ML & Devops Engineer - Research Team July 2024 – Present

- Develop cloud infrastructure pipelines for ERP software scalability.
- Created LLM pipelines with Retrieval Augmented Generation (RAG) and Low Rank Adaptation (LoRA) for fine-tuning.
- Refactoring monolithic architectures into dockerized microservices.
- Implemented Kubernetes Operators for horizontal and vertical scalability.
- Proposed Continuous Integration and Deployment Git operations.

Certifications

Stanford University: Machine Learning: `https://www.coursera.org/account/accomplishments/specialization/certificate/VNCPL4MXPB5A`
IBM AI Engineernig: `https://www.coursera.org/account/accomplishments/specialization/certificate/JEYSUHXTCYU5`
Jovian: Zero to GANs with Pytorch: `https://jovian.com/certificate/MFQTQMZXGM`
Duoling English Test: `https://certs.duolingo.com/vc54x03gh7zcprnd`

Skills

Languages: Spanish (Native), English (Fluent), Portuguese (Basic), Japanese (Basic)
Programming: C++, CUDA C++, Python, Rust, Bash, Lua
Scientific: Deep Learning, Numerical Optimization, Compiler Design, Geospatial ML, Remote Sensing, Data Fusion
ML Tools: CuDNN, CUDA Toolkit, Tensor RT, Triton, PyTorch, Lightning, NVIDIA Modulus, Scikit-learn, Transformers
Data Tools: Pandas, Polars, Matplotlib, Seaborn, PySpark, cudf, SQL
Devops: Docker, Istio (Service mesh), Nginx, Helm, Kubernetes, Argo CD, NVIDIA NIM, Prometheus, Grafana, Loki Grafana