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 a pipeline 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 using PyTorch and OpenCV; optimized modules for GPU acceleration.

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 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 through physics-informed training loss functions.
- Studied resonancy and periodic properties of the physical system.

Specialized Projects

LightTorch – Deep Learning Framework   Lightning, Pytorch, 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.
- More than 20 modules extending novel architectures, including Partial Convolutions, Fourier Layers, and Attention mechanisms, among others.
- 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   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.

Miscellaneous Projects

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

- Developed models to classify sleeping stages.
- Achieved state-of-the-art classification with 97% F1 Score.
- Implemented 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 and fined-tuned 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.
- Developed 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

Leadership & Experience

DDS.py — Asuncion, Paraguay
Founder, Teacher — July 2023 – December 2024
- Taught foundational programming (Python) and ML concepts to high school students.
- Developed and maintained a public learning roadmap on GitHub.

Mechatronics Teacher — Asuncion, Paraguay
Role — 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
Role — March 2023 – November 2024
- Taught lectures on classical mechanics and electromagnetism for physics olympiads.

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, Triton, PyTorch, Lightning, NVIDIA Modulus, Scikit-learn
Data Tools: Pandas, Polars, Matplotlib, Seaborn, PySpark, cudf, SQL