

João Pedro Do Valle Alvarenga

✉ joaaovalle@gmail.com
🐙 github.com/vallejp | 🌐 vallejp.github.io
🔗 caxin-audit.streamlit.app

Education & Research

- 2024–Present **PhD in Information Technology**, *Politecnico di Milano*, Italy
Research: End-to-End AI for Analyzing Complex Dynamical Processes.
Focus: Developing multi-task foundation models for non-linear dynamical systems. Extracting latent signals from high-dimensional, non-stationary data for cross-system generalization.
- 2022–2024 **Master's in Computational Physics**, *University of São Paulo*, Brazil
GPA: 4.0/4.0. Thesis: Patterns and pseudo-randomness in interactive maps. Developed methods for identifying deterministic patterns in chaotic data. Includes research exchange at Ghent University (Belgium) on GANs applied to the ergodicity of chaotic systems.
- 2017–2022 **Bachelor of Engineering Physics**, *UFSCar*, Brazil
GPA: 3.54/4.0. Undergraduate research focused on Cryptography and Pseudo-Random Number Generators (PRNG) based on non-linear maps.

Quantitative Engineering Projects

- Caxin Audit Forensic Portfolio Audit & RBSA Engine (Python) [\[Live App\]](#)
Institutional-grade transparency platform designed for forensic auditing of the Brazilian investment market.
- Factor DNA & RBSA:* Macro factor attribution to isolate Alpha from Beta and evaluate stock-picking skill via R-Squared and L1-Sparsity metrics.
- Risk Topology:* Contagion structure mapping using hierarchical dendrograms and Gini-based risk inequality to identify portfolio efficiency gaps.
- Stress & Liquidity:* 5,000-scenario Monte Carlo stress testing (ES 99%) and operational liquidity maps for exit cost and spread estimation.
- Statistical Validation:* Deflated Sharpe Ratio (DSR) and Probabilistic Sharpe Ratio (PSR) analysis to quantify backtest overfitting and skill-vs-luck probability.
- Dynamics & Asymmetry:* Regime-switching analysis (Mutant Beta) and tail-asymmetry ratios (Magnet Effect) to detect rising contagion zones in bear markets.
- Allocation Stability:* Scientific rebalancing frontier tracking passive momentum drift, Effective Number of Assets (ENA), and execution spreads.

Selected Publications

- 2025 **Valle, J.**, et al. "Forecasting chaotic time series: LSTM vs Transformer neural networks". *Chaos, Solitons & Fractals*. (Focus: Predictive architectures for non-linear signals).
- 2025 Salgarollo, E., **Valle, J.**, et al. "End-to-end AI to analyze dynamical processes." *Physica D*.
- 2022 **Valle, J.**, et al. "Chaotical PRNG based on composition of logistic and tent maps." *CSF*.

Skills

- Programming Python (Expert), C, MATLAB, Shell Scripting, Git/GitHub.
- Quant/ML FracDiff, ADF Testing, Foundation Models, Transformers, LSTMs, GANs, PyTorch, Scikit-learn.
- Scientific Computing Pandas, NumPy, SciPy, Matplotlib, Linux (HPC), Automated ETL Pipelines.

Awards & Languages

- Awards Silver Medal iGEM (2019), Chemistry Olympiad Bronze (2016), OBMEP Hon. Mention.
- Languages Portuguese (Native), English (Advanced), Italian (Intermediate), Spanish (Intermediate).