DANIEL ESTEVEZ-MOYA

Ph.D. Candidate in Physics

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EXPERIENCE

Ph.D. Researcher

Max Planck Institute for the Physics of Complex Systems

2021 – Present | Dresden, Germany

- Reservoir computing for short-term forecasting of chaotic dynamical systems, supervised by Holger Kantz.
- Developed the dendrocycle topology, Expected Forecast Horizon metric, and sagitta-based time-discretization scheme.
- Built and published **ResDAG**, a GPU-accelerated reservoir computing library for PyTorch.

Lecturer

Universidad de La Habana, Physics Faculty

2017 – 2025 | Havana, Cuba

- Mathematical Analysis I & II, Numerical Analysis, Computational Methods for undergraduate Physics and Mathematics students.

M.Sc. Researcher

Universidad de La Habana

2018 – 2020 | Havana, Cuba

- Synchronization and bifurcation phenomena in coupled nonlinear oscillators and the circle map.

PROJECTS

ResDAG

github.com/El3ssar/ResDAG

A modern, GPU-accelerated reservoir computing library for PyTorch with a clean, modular API. Built for researchers and practitioners who need fast, flexible, and production-ready Echo State Network models.

TSDynamics

github.com/El3ssar/TSDynamics

A Python package for defining and simulating continuous and discrete dynamical systems, including time-delay equations and maps.

RESEARCH INTERESTS

Reservoir computing, Echo State Networks, chaotic time-series forecasting, nonlinear dynamics, network topology, stochastic processes, and principled machine learning at the intersection of dynamical systems theory and recurrent neural networks.

SKILLS

Python | Bash | Julia | Rust | PyTorch | JAX | Keras | TensorFlow | Scikit-Learn | Pandas | NumPy | SciPy | Optuna | Matplotlib

Git | GitHub Actions | Docker | PyPI Publishing

LANGUAGES

Spanish ●●●●●

English ●●●●●

AWARDS

National Prize, Cuban Academy of Sciences
Computing at the edge of chaos in coupled nonlinear systems, 2023

Relevant Prize, University Forum
Visualization of massive data using Hilbert curves, Universidad de La Habana, 2015

EDUCATION

Ph.D. in Physics

Max Planck Institute for the Physics of Complex Systems

2021 – Present

Machine Learning for prediction of chaotic temporal dynamics.

M.Sc. in Mathematical Sciences

Universidad de La Habana

PUBLICATIONS

Journal Articles

- E. Estevez-Rams, D. Estévez Moya, and H. Kantz, "Pattern production and community emergence in the minority game," 2026, To appear. DOI: 10.2139/ssrn.5186135.
- R. Peña-Mendieta, A. Mesa-Rodríguez, **D. Estevez-Moya**, J. R. de la Horra, E. Estevez-Rams, and H. Kantz, "Trajectory classification through Freeman's curve encoding and entropic analysis," *Journal article*, 2025, 2025.
- **D. Estevez-Moya**, E. Estevez-Rams, and H. Kantz, "Complexity and transition to chaos in coupled Adler-type oscillators," *Physical Review E*, vol. 107, p. 044 212, 2023. DOI: 10.1103/PhysRevE.107.044212.
- K. Garcia-Medina, **D. Estevez-Moya**, and E. Estevez-Rams, "Damage spreading and information distance in cellular automata," *Chaos, Solitons & Fractals*, 2022. DOI: 10.1016/j.chaos.2022.112518.
- K. Garcia-Medina, **D. Estevez-Moya**, and E. Estevez-Rams, "Stability and transition in continuously deformed cellular automata," *Revista Cubana de Física*, vol. 37, 2020.
- E. Estevez-Rams, **D. Estevez-Moya**, K. Garcia-Medina, and R. Lora-Serrano, "Computational capabilities at the edge of chaos for one dimensional systems undergoing continuous transitions," *Chaos*, vol. 29, p. 043 105, 2019. DOI: 10.1063/1.5091998.
- E. Estevez-Rams, A. Mesa-Rodriguez, and **D. Estevez-Moya**, "Complexity-entropy analysis at different levels of organisation in written language," *PLOS ONE*, vol. 14, no. 4, e0214863, 2019. DOI: 10.1371/journal.pone.0214863.
- E. Estevez-Rams, **D. Estevez-Moya**, and B. Aragón-Fernández, "Phenomenology of coupled nonlinear oscillators," *Chaos*, vol. 28, p. 023 110, 2018. DOI: 10.1063/1.5007747.
- E. Estevez-Rams, **D. Estevez-Moya**, Y. Martinez-Camejo, D. Gomez-Gomez, and B. Aragon-Fernandez, "Hilbert curves in two dimensions," *Revista Cubana de Física*, 2017.

Conference Proceedings

- K. García-Medina, **D. Estevez-Moya**, E. Estevez-Rams, and R. B. Neder, "Emergent behavior and computational capabilities in nonlinear systems: Advancing applications in time series forecasting and predictive modeling," in *Conference Proceedings*, 2025.
- D. Estévez-Moya, E. Estévez-Rams, and H. Kantz, "Echo state networks for the prediction of chaotic systems," in *Progress in Artificial Intelligence and Pattern Recognition (IWAIPR 2023)*, ser. Lecture Notes in Computer Science, vol. 14335, Springer, 2023, pp. 119–128. DOI: 10.1007/978-3-031-49552-6_11.

Preprints

- R. Peña-Mendieta, A. Mesa-Rodríguez, E. Estevez-Rams, **D. Estevez-Moya**, and D. Kunka, "Trajectory analysis through entropy characterization over coded representation," Preprint, arXiv:2405.03693, 2024. [Online]. Available: https://arxiv.org/pdf/2405.03693.

2018 – 2020

Specialization in Probability and Statistics.

B.Sc. in Mathematics

Universidad de La Habana

2013 – 2017

Thesis: The Minority Game through information theory.