Available in September 2026
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Sacha Durain

PhD candidate - Dynamics & Scientific machine learning

Professional Summary

PhD Candidate in dynamical systems and SciML, developing interpretable, uncertainty-aware models from experimental tests and numerical simulations. With 3+ years of industry experience, I drive end-to-end scientific machine learning workflows, translating complex experimental and simulation data into high-fidelity predictive models.

Core Skills

Machine learning & AI: SciML, unsupervised, supervised, computer vision and uncertainty (PyTorch, Scikit-learn)
Numerical simulation: FE modeling for dynamics and thermal analysis (ANSYS, Abaqus, HyperMesh)
Data analysis & visualization: NumPy, Pandas, Matplotlib, Seaborn, Plotly
Programming: Python, Matlab, Bash
Languages: French (native), English (C1)

Experience - Research

PhD Candidate 2023–Present
LaMcube & *LAMIH* | Lille & Valenciennes, France

Thesis objective: Build predictive and explainable models for brake squeal with experimental and numerical data

- Conducted multimodal data acquisition during braking tests and from a reduced-order dynamic FE model, including measurement uncertainty quantification.
- Built and benchmarked machine-learning surrogate models for braking dynamics including regression models, sequence forecasting (RNN family), deep ensembles/MC, and SHAP interpretability.
- Developed and released an open-source end-to-end semantic segmentation workflow for brake pad material from SEM and optical images, leveraging pseudo-labeling (unsupervised learning) and Transformer-based transfer learning.
- Disseminated results through 2 conferences (CSMA, CFM) and 1 journal article (MSSP).

Teaching 2023–Present
Polytech Lille & *INSA Hauts-de-France* | Lille & Valenciennes, France

- *Dynamics & signal processing:* Taught system dynamics and signal processing including experimental modal analysis, Fourier transforms, filtering, and dynamic simulations.
- *Matlab programming:* Supervised automation of finite element simulations, optimization, and data analysis projects.

Experience - Industry

Simulation/Design Engineer Apprentice 2020–2023
Alstom | Petite-Forêt, France

- Contributed to industrial railway product development through mechanical simulation/design and data analysis, supporting design, validation, and cost estimation activities.
- Collaborated with cross-functional and international teams across multiple sites worldwide.

Mechanical engineering Intern May 2021 – Aug 2021
Canray | Bursa, Turkey

- Performed test-simulation correlation for railway components using mechanical testing and nonlinear FE analyses.
- Supported quality follow-up and led technical exchanges with the client.

Education

PhD candidate - Dynamics & Scientific machine learning 2023–Present
University of Lille | Lille, France

- Title: "Friction-induced vibrations: experiments and modeling of triggering conditions using enriched interface parameters." Supervised by Prof. P. Dufrenoy and Prof. M. Massa.

Engineering degree - Mechanical simulation 2018–2023
INSA Hauts-de-France | Valenciennes, France

- Relevant coursework: Optimization, Finite Element Methods, Programming, Dynamics, Numerical Methods