

Mehdi Ghrabli, PhD Candidate

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Education

- 2023 – Present 📖 **PhD** in Physics-Informed Machine Learning for predictive maintenance, ENS Paris-Saclay. *Under the supervision of Ludovic Chamoin, Emanuel Aldea, and Mounira Bouarroudj.*
 - Research in time-series modeling, remaining useful life estimation, and physics-informed machine learning.
- 2021 – 2022 📖 **Master 2 MVA** (Mathématiques, vision, apprentissage), ENS Paris-Saclay. *Graduated with highest honors.*
- 2019 – 2022 📖 **Engineering degree** Applied mathematics, ENSTA Paris. Specialization in Optimization and Data Science. *Graduated with highest honors, 16.2/20 Grade.*
- 2017 – 2019 📖 **Preparatory class** Mathematics and physics, Institut préparatoire aux études d'ingénieurs Tunis (IPEIT).

Professional experience

- 2023 📖 **Freelance** Algorithmic trading based on a risk-return deep reinforcement learning algorithm.
 - Implemented a deep reinforcement learning agent for portfolio optimization, using a Markov decision process framework and recurrent neural networks to model financial time series.
- 2022 📖 **Research internship** Data-driven quantization of neural networks, Datakalab.
 - Modified network architectures such as YOLO and ResNet at the layer level to reduce model size while maintaining high accuracy on CIFAR-10, ImageNet, and custom datasets.
- 2021 📖 **Research internship** Statistical modeling for cross platform audience estimation, CREST-ENSAE.
 - Modeled cross-media user behavior by developing and implementing Poisson-based latent class models.

Awards and Distinctions

- 2024 📖 **Best Presentation Award** Doctoral students' day SATIE, ENS Paris-Saclay, France.
- 2019 📖 **Ranked First Nationwide** in the National Entrance Examination for Engineering Schools (Tunisia)

Skills

- Programming 📖 Python
- ML/DL 📖 PyTorch, TensorFlow, NumPy, Pandas
- Miscellaneous 📖 Optimization, Probabilistic modeling, Statistics, Dynamic Time Warping

Research publication

Journal Articles

- 1 Ghrabli, M., Aldea, E., Bouarroudj, M., & Chamoin, L. (2026). AI surrogate models for finite element simulation in lifetime predictions of power electronics modules. *Microelectronics Reliability*. Proposes surrogate machine learning models that accelerate finite element simulations by up to 10^6 times, using residuals for uncertainty estimation and active learning to optimize simulation selection.
- 2 Ghrabli, M., Bouarroudj, M., Chamoin, L., & Aldea, E. (2025b). Physics-informed Markov chains for remaining useful life prediction of wire bonds in power electronic modules. *Microelectronics Reliability*, 167, 115644. Introduces high-order physics-informed Markov chains for degradation modeling of power electronic modules using simulation and test-to-failure data, enabling cycle-by-cycle RUL estimation and extrapolation from experimental to real operating conditions.
[doi:https://doi.org/10.1016/j.microrel.2025.115644](https://doi.org/10.1016/j.microrel.2025.115644)

Conference Proceedings

- 1 Ghrabli, M., Aldea, E., Chamoin, L., & Bouarroudj, M. (2026). BED-Time: A DTW-Based Framework for Few-Shot Time Series Forecasting and Classification. *In preparation*. Introduces a DTW-based framework that models and forecasts warping paths for few-shot time series forecasting and data augmentation in classification.
- 2 Ghrabli, M., Bouarroudj, M., Chamoin, L., & Aldea, E. (2025a, October). Data-driven Metamodels for Failure Analysis of Power Electronic Modules. In *36th European Symposium on Reliability of Electron Devices, Failure Physics and Analysis (ESREF 2025)*. Demonstrates how surrogate AI models accelerate numerical simulations for failure analysis, enabling accurate but computationally intensive autoregressive failure prediction. Université de Bordeaux, ADERA, Bordeaux, France. Retrieved from <https://hal.science/hal-05323091>
- 3 Ghrabli, M., Bouarroudj, M., Chamoin, L., & Aldea, E. (2024). Hybrid modeling for remaining useful life prediction in power module prognosis. In *2024 25th international conference on thermal, mechanical and multi-physics simulation and experiments in microelectronics and microsystems (EuroSimE)* (pp. 1–9). Studies the validity of Paris' law for modeling crack growth in power electronic modules and proposes a hybrid model that uses Paris' law within its domain of validity and a data-driven adaptive polynomial model outside it. [doi:10.1109/EuroSimE60745.2024.10491493](https://doi.org/10.1109/EuroSimE60745.2024.10491493)

Teaching experience

2023-2024  **Teaching assistant** Mathematical & numerical tools for management, IUT de Sceaux, Université Paris-Saclay

Activities and training

- 2022  **Competitive programming** Ranked 34/97 in the competitive programming competition SWERC (South Western Europe Regional Contest).
- 2016  **Maths and logic** Top 20 in the Tunisian national exam of mathematics and participation in the training course organized by the Tunisian association of mathematics (ATSM).

Languages

- Arabic  Native
- English  Professional working proficiency: 985/990 TOEIC score
- French  Professional working proficiency