# Essakine Amer

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## Summary

I am a dedicated mathematics major student at ENS Paris-Saclay; I am deeply passionate about exploring diverse mathematical fields.

## Education

**ENS Paris Saclay**                                                                                                     *Paris, France*

M2 MVA (Mathematics, Vision, Learning)                                                                                   *2024 - 2025*

  Courses: *Reinforcement Learning, ,Theory of Deep Learning, Convex optimization, Computer vision, Generative models, LLM, Graphs in ML, Random matrix theory, Géométrie et espaces de formes.*

**ENS Paris Saclay**                                                                                                     *Paris, France*

M1 Jacques Hadamard Track, with High Honors.                                                                             *2023 - 2024*

  Courses: *Advanced Algebra, Advanced Probability, Geometry, Dynamical Systems, Information Theory, Topological Data Analysis, Image Processing, Statistics, Optimization.*

**ENS Paris Saclay**                                                                                                     *Paris, France*

Bachelor's in Mathematics, with Very High Honors.                                                                        *2022 - 2023*

  Courses: *Algebra, Fourier Analysis and signal processing, Ordinary Differential Equations, Probability 1, Topology, Complex Analysis,Partial Differential Equations.*

**Lycée al Zahrawi**                                                                                                     *Rabat, Morocco*

Preparatory Class for Engineering Schools (MP*)                                                                          *2020 - 2021*

## Academic Experience

**Tübingen AI Center**                                                                                                   *Tübingen, Germany*

Research Internship

Supervisor: Dr. Claire Vernade.                                                                                          *May 2025 - October 2025*

- Surveyed risk-sensitive RL and best-policy identification; identified open problems and gaps in existing guarantees.
- Established information-theoretic sample-complexity lower bounds with unavoidable exponential dependence on horizon and risk parameter; characterized scaling with state–action size.
- Designed a KL-based exploration strategy that plans in an estimated MDP within a KL confidence set; provided theoretical finite-time guarantees.

**CentraleSupélec**                                                                                                     *Paris, France*

Junior Assistant                                                                                                         *September 2024 - Present*

- Conducting Mathematics Exercise Sessions for 2nd-Year Bachelor Students (O.G.E.) - CentraleSupélec x McGill.

**University of Cambridge**                                                                                              *Cambridge, United Kingdom*

Research Internship

Supervisor: Dr. Angelica Aviles Rivero.                                                                                  *April 2024 - August 2024*

- A comprehensive review and benchmark of various methods in Implicit Neural Representations (INRs), detailing these approaches, their mathematical properties, and the underlying motivations.
- Drawing on general sampling theory, we introduce WIREN (Walsh Implicit Neural Network), which employs the inverse Fourier transform of Walsh functions as its activation function.
- An article 'Where Do We Stand with Implicit Neural Representations? A Technical and Performance Survey' is accepted at the TMLR journal.

**ENS Paris Saclay**                                                                                                     *Paris, France*

Introductory Research Internship

Supervisors: Argyris Kalogeratos, Xavier Cassagnou.                                                                      *April 2023 - July 2023*

- Introduction to the fields of Machine Learning and Deep Learning, along with a foundational overview of their concepts.
- Improved and adapted the Spatio-Temporal Graph Convolutional Network (STGCN) algorithm for energy consumption prediction in France compared to classical methods.

## Publications

Where Do We Stand with Implicit Neural Representations? A Technical and Performance Survey

  Amer Essakine, Yanqi Cheng, Chun-Wun Cheng, Lipei Zhang, Zhongying Deng, Lei Zhu, Carola-Bibiane Schönlieb, Angelica I. Aviles-Rivero

  *Transactions on Machine Learning Research* (Feb. 2025). 2025

## Projects

**RL model for HIV patient treatement**  *ENS Paris Saclay, France*

January 2025

- **Designed and implemented a reinforcement learning agent** to optimize structured treatment interruption strategies in HIV therapy, based on deterministic non-linear equations modeling immune system dynamics, achieving a perfect score in the class evaluation.

**Kernel methods for dna classification**  *ENS Paris Saclay, France*

Mars 2025

- **Implemented from scratch** multiple kernel methods to classfiy dna sequences including the Mismatch kernels, Substring kernels, Convolutional Kitchen Sinks as well as kernel algorithms : Kernel SVM/Kernel PCA

**Plug-and-Play Gibbs sampling**  *ENS Paris Saclay, France*

Mars 2025

- **Implemented and tested** the PnP-GS algorithm to solve inverse problems and compared it to state-of-the-art denoising method : Diffusion Posterior Sampling.

## Skills

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|---|---|
| **Programming** | Python (Pandas, NumPy, SciPy, Scikit-learn, PyTorch, TensorFlow, JAX), OpenCV/torchvision + CUDA, Hugging Face Transformers, OpenAI Gym + Stable Baselines3, CVXPy/SciPy.optimize,Matplotlib/Seaborn/Plotly, LaTeX/Markdown, Linux shell |
| **Soft Skills** | Time management, Teamwork, Problem solving, Documentation. |