Sophia Yazzourh | CV

Institute of Mathematics of Toulouse, France
sophiayazzourh@gmail.com • sophiayazzourh.github.io
French & Moroccan

Doctor in Applied Mathematics, specialized in Machine Learning applied to medical data.

Recently graduated with a PhD from the *Institute of Mathematics of Toulouse* (IMT), I had worked on reinforcement learning applied to treatment sequences for patients with chronic diseases. I had also obtained an engineering degree from the *Institut National des Sciences Appliquées* (INSA) of Toulouse in applied mathematics.

Research interests: Reinforcement Learning, Precision Medicine, Dynamic Treatment Regimes, Bayesian Support Vector Machine, Preference Learning.

Academic Experience & Education

PhD in Applied Mathematics — **IMT (FR)**
Decision Algorithms in Medical Research — *September 2021 - October 2024*
"Reinforcement Learning and Bayesian Outcome-Weighted Learning for Precision Medicine. Integration of medical knowledge into decision algorithms."
Supervised by Nicolas Savy (IMT) and Philippe Saint Pierre (IMT) in collaboration with the *University of North Carolina* (UNC) at Chapel Hill, USA, including work with Michael Kosorok and Nikki L.B. Freeman.

Engineering Degree, Master's Level — **INSA Toulouse (FR)**
Specialization in Applied Mathematics & Statistics — *September 2014 - June 2021*
- Machine Learning, High-Dimensional and Deep Learning, Artificial Intelligence Frameworks (NLP, Reinforcement Learning).
- Innovation and Research Project on modeling a quantitative variable in the context of logistic regression using interpolation splines.

Erasmus — **NTUA (GR)**
Hosted by the Departments of Mathematics and Computer Science — *September 2016 - January 2017*
European exchange program undertaken during the first semester of my third year in the Bachelor's program at the *National Technical University of Athens* (NTUA).

Professional Experience

Apprenticeship in Big Data & AI for Space Activities — **Thales Alenia Space**
Research and Development in Artificial Intelligence — *January 2020 - June 2021*
- Development of a Python library of algorithms for anomaly detection, applied to the space domain.
- Implementation and adaptation of Active Anomalies Discovery methods on time-series signals: anomaly detection within the framework of Active Learning, particularly the integration of user feedback into algorithms such as Isolation Forest or SVM.

Technical expertise: Python, PCA, Isolation Forest (IF), SVM, Autoencoders, ROC Curves, GIT, Docker, Flask API.

Apprenticeship in management and industrial processes — **Thales Alenia Space**
Project Management — *October 2019 - January 2020*
Focus on information transmission and tool coherence through to the maintenance phase.
Technical expertise: Life cycle of space ground segment projects and associated tools.

- **Master's Internship, GALILEO Mission Segment** — **SOGETI HIGH TECH, Capgemini Group**
  Integration and Validation — *July 2019 - September 2019*
  - Integration of a prototype element.
  - Data and flow analysis of connected components within the Mission and Uplink Control Facility (MUCF).
  - Analysis of the European Space Agency's specifications, preparation, and implementation of test scenarios within the assembly team.

  Technical expertise: Knowledge of the GALILEO Ground Segment and its Global Operation.

Grants

- **Doctoral Grant from the French Ministry of Higher Education, Research, and Innovation**
  Three-year doctoral grant awarded through a competitive selection process.

Publications

- **Submitted:**
  - Sophia Yazzourh (IMT), Nicolas Savy (IMT), Philippe Saint Pierre (IMT), and Michael Kosorok (UNC). *Medical Knowledge Integration into Reinforcement Learning Algorithms for Dynamic Treatment Regimes*, International Statistical Review, 2024. arXiv preprint arXiv:2407.00364.
- **On-going publications:**
  - Sophia Yazzourh (IMT) and Nikki L. B. Freeman (Duke). *Bayesian Outcome Weighted Learning.* In preparation for Biostatistics. arXiv preprint arXiv:2406.11573.
  - Sophia Yazzourh (IMT), Nicolas Savy (IMT), Philippe Saint Pierre (IMT), and Michael Kosorok (UNC). *Rewards Construction Based on Preference Learning for Dynamic Treatment Regimes.*
- **Manuscript:**
  Sophia Yazzourh, *"Reinforcement Learning and Bayesian Outcome-Weighted Learning for Precision Medicine. Integration of Medical Knowledge into Decision Algorithms."*, Doctoral Manuscript, University of Toulouse, prepared at the University of Toulouse III - Paul Sabatier, 2024.

Talks

- **10th edition of the Southern Statistical Conference** *(University of Toulouse III - Paul Sabatier, Toulouse, June 18, 2024) "Bayesian Outcome-Weighted Learning."*
  Presentation selected based on abstract.
- **Student Seminar of the Institute of Mathematics of Toulouse** *(University of Toulouse III - Paul Sabatier, Toulouse, June 6, 2024) "Introduction to Reinforcement Learning."*
  Introduction to reinforcement learning for decision-making, mathematical formalism, key algorithms, and research directions.
- **55th Statistical Days of the French Statistical Society in Bordeaux** *(University of Bordeaux, Bordeaux, May 27, 2024) "Rewards Construction through Preference Learning for Reinforcement Learning Models Applied to Dynamic Treatment Regimes."*
  Presentation selected based on abstract.
- **Presentation to the PhairLab research team (Michael Kosorok)** *(UNC, Chapel Hill, April 21, 2023) "Integration of Medical Knowledge into Reinforcement Learning for Dynamic Treatment Regimes."*
  Presentation of my ongoing research.
- **Poster session at the Statistics and Optimization Seminar at IMT** *(IMT, Toulouse, December 6, 2022) "Integration of Medical Expertise into Reinforcement Learning Models Applied to Dynamic Treatment Strategies."*
  Presentation of my poster for an internal seminar on Statistics for Biology and Health.

- **Toulouse Day "Statistics for Biology" at the National Institute for Agricultural, Food, and Environmental Research (INRAE)** *(INRAE, Toulouse, November 15, 2022) "Reinforcement Learning: Application to Adaptive Treatment Strategies."*
  Presentation during a day of exchanges among Toulouse-based researchers on "Statistics for Biology."

Teaching & Pedagogical Projects

- **PhD Student and Teaching Assistant in Mathematics at the University Institute of Technology in Mechanical Engineering** *(2021-2024)*
  - Led tutorials and practical sessions for undergraduate students (all Bachelor's levels).
  - Taught courses and tutorials in English for the English-speaking track.
  - Developed and translated course materials, tutorials, and practical exercises into English.
- **Volunteer at the Ouverture Rencontres Évolution Association (ORE)** *(2014-2021)*
  - Provided tutoring in mathematics, science, and French for students from 6th grade to senior high school.
  - Developed and delivered a beginner's course in Python programming and algorithms.

Academic commitment

- **Organizer of the Student Seminar at IMT** (2022-2024): Bi-monthly organization of seminars for PhD and post-doctoral researchers, social events, and creation of posters.
- **Member of the organizing and scientific committee of the 10th Journées Statistiques du Sud**: Collaborative groups conducting workshops in the south of France, organized around mini-courses and presentations.
- **Member of the Scientific Outreach Project "Déclics" in High Schoolsl** (2022-2024): Engaging in science communication through discussions and presentations to promote science and my research career among students.
- **Member of Scientific Societies**: French Statistical Society, Artificial Intelligence Research Group.
- **President of the Student Association of the Mathematics Department at INSA Toulouse** (2019-2020).

Interests

- **Handball Player** :
  - Club, National 3 level: Alongside my studies and since the age of 8, I train 3 times a week and play a match every weekend.
  - University: Participated in the French University Championships in 2015, 2016, 2017, 2018, and 2019.
- **Head of the Handball Section and Captain of the Women's Team at INSA** (2016-2019).
- **Treasurer of the INSA Sports Association** (2016-2017).

Additional Skills

- **Programming Languages:** Python, LaTeX, R, Matlab, Java, C, C++.
- **Development Tools:** Git, Docker, Google Cloud.
- **Foreign Languages:** English, German (Limited professional proficiency), Chinese (Limited professional proficiency), and Greek (Basic knowledge).