

# Sophia Yazzourh | CV

Institute of Mathematics of Toulouse, France

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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**  
July 2019 - September 2019  
*Integration and Validation*
  - 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

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

## Publications

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- **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](https://arxiv.org/abs/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](https://arxiv.org/abs/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

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- **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

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- **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

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- **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 Schools** (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

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- **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

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- **Programming Languages:** Python,  $\text{\LaTeX}$ , 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).