

Nicolas Captier

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Education

- 2020 – 2024 ■ **Institut Curie & Paris Sciences et Lettres (PSL) University**, Paris, France.
PhD in Computer Science
- Supervisors: Irène Buvat & Emmanuel Barillot
 - Thesis title: *Multimodal analysis of radiological, pathological, and transcriptomic data for the prediction of immunotherapy outcome in Non-Small Cell Lung Cancer patients.*
- 2019 – 2020 ■ **Ecole Normale Supérieure (ENS)**, Paris-Saclay, France.
Master MVA (Mathematics, Vision, Learning), M.Sc. (with High Honors)
- Courses: *Statistical learning - Computational statistics - Reinforcement learning - Convex optimization - Optimal transport - Medical imaging - Neuroscience - Biostatistics - Bayesian Machine Learning*
- 2016 – 2020 ■ **Ecole polytechnique**, Palaiseau, France.
Diplôme d'ingénieur de l'Ecole polytechnique (Master degree, GPA: 3.81/4)
- Multidisciplinary scientific training - specialization in Applied Mathematics (numerical modelling - probability and statistics - optimization).
- 2013 – 2016 ■ **Sorbonne University**, Paris, France.
B.Sc. in Physics & B.Sc. in Mathematics

Experience

- 10/2020 – 06/2024 ■ **Institut Curie**, PhD student
- PhD funded by the PaRis Artificial Intelligence Research InstitutE (PRAIRIE)
 - Involved in the management of a multidisciplinary research project gathering medical doctors, biologists, and machine learning researchers (funded by Fondation ARC: 600,000 €)
 - Collected a novel multimodal cohort of lung cancer patients and carried out machine learning analyses for predicting immunotherapy response
- 04/2020 – 09/2020 ■ **Institut Curie**, Research Intern
- Supervisors: Irène Buvat & Emmanuel Barillot
 - Developed inference methods for unraveling associations between radiomic and transcriptomic features for lung cancer patients
- 04/2019 – 08/2019 ■ **Institute for Applied Mathematics, Bonn University**, Research Intern
- Supervisor: Anton Bovier
 - Developed and implemented a stochastic model for the interplay of melanoma cells and immune cells under immunotherapy
 - Prize of the "Mathematical Modeling and Biodiversity" Chair of Ecole polytechnique
- 06/2018 – 09/2018 ■ **Center of Pricing Excellence, Axa France**, Data Scientist
- Delivered a monthly competitive market analysis report (insurance market surveillance)
 - Carried out research about categorical data encoding for pricing
- 09/2016 – 04/2017 ■ **Gendarmerie Nationale (French national police force)**, Military Officer
- Carried out a project linked to mass murder prevention and security in sensitive areas in a departmental command unit
- 07/2015 – 08/2015 ■ **Lawrence Berkeley National Laboratory, USA**, Intern
- Developed a Raspberry Pi fire detection system attached to a drone (early detection of wildfires)

Publications & Patents

*Up-to-date list of publications via [Google Scholar](#)

Journal Articles

- 1 **N. Captier**, F. Orlhac, N. Hovhannisyan-Baghdasarian, M. Luporsi, N. Girard, and I. Buvat, "RadShap: An explanation tool for highlighting the contributions of multiple regions of interest to the prediction of radiomic models," *Journal of Nuclear Medicine*, 2024. [DOI: 10.2967/jnumed.124.267434](#).
- 2 N. Hovhannisyan-Baghdasarian, M. Luporsi, **N. Captier**, *et al.*, "Promising candidate prognostic biomarkers in [18F]FDG PET images: Evaluation in independent cohorts of non-small cell lung cancer patients," *Journal of Nuclear Medicine*, vol. 65, no. 4, 2024. [DOI: 10.2967/jnumed.123.266331](#).
- 3 **N. Captier**, J. Merlevede, A. Molkenov, *et al.*, "BIODICA: A computational environment for Independent Component Analysis of omics data," *Bioinformatics*, vol. 38, no. 10, 2022. [DOI: 10.1093/bioinformatics/btac204](#).

Preprints & under submission

- 1 **N. Captier**, M. Lerousseau, F. Orlhac, *et al.*, "Integration of clinical, pathological, radiological, and transcriptomic data improves the prediction of first-line immunotherapy outcome in metastatic non-small cell lung cancer," *Nature Communications* (in revision), 2024. [DOI: 10.1101/2024.06.27.24309583](#).
- 2 L. Rebaud, N. Capobianco, **N. Captier**, T. Escobar, B. Spottiswoode, and I. Buvat, "Similar performance of 8 machine learning models on 71 censored medical datasets: A case for simplicity," 2024.

Patent

- 1 **N. Captier** and I. Buvat, *Method for determining the influence of a plurality of regions of a medical image on a prediction model*, International Patent Application, PCT/EP2024/065126, 2024.

Research Activities

Talks

- 12/2022 ■ **Invited talk**, INSERM - JSPS Joint Seminar, Yamaguchi, Japan
Machine learning for integrating imaging, anatomo-pathological and omics data in cancer immunotherapy
- 09/2022 ■ **Invited talk**, Seminar of the Curie-Montsouris Chest Center (Thoracic Oncology Day), Paris, France
TIPIT project: Deciphering immunotherapy response in lung cancer using machine learning
- 11/2021 ■ **Contributed talk**, 3IA Doctoral Workshop, Toulouse, France
Stabilized-ica: A python package for stabilized Independent Component Analysis
- 10/2021 ■ **Invited talk**, IBOMAN Conference, Paris, France
Multimodal and integrative analysis of genomics, radiomics and clinical data for the prediction of response to immunotherapy in lung cancer
- **Tutorial**, Training School Radiomics and AI in Molecular Imaging, Vienna, Austria
Machine Learning with Orange

Poster Presentations

- 05/2024 ■ **Doctoral conference**, "AI for the Sciences", PSL University, Paris, France
Machine learning for integrating imaging, pathological and omics data to predict immunotherapy response in lung cancer
- 07/2023 ■ **Symposium**, "Artificial Intelligence in Biology and Health", Institut Pasteur, Paris, France
Predicting immunotherapy response in lung cancer using machine learning for integrating imaging, anatomo-pathological and omics data
 - Best Poster Award

Research Activities (continued)

- 06/2023 ■ **Conference**, Society of Nuclear Medicine and Molecular Imaging Annual Meeting, Chicago, USA
A new interpretation tool for highlighting the contribution of different regions of interest to the predictions of radiomic models
- 04/2023 ■ **Symposium**, "Signatures in cancer immunotherapy", Fondation ARC, Paris, France
Predicting immunotherapy response in lung cancer using machine learning for integrating imaging, anatomo-pathological and omics data

Software Development

- Python libraries [stabilized-ica](#) and [sica-omics](#) for applying ICA to omics data
- Python library [RadShap](#) for explaining multiregion predictive models
- Python library [nested_cross_val](#) for nested cross-validation
- Graphical User Interface [BIODICA](#) for non-coding application of ICA

Mentoring

- 09/2023 – 06/2024 ■ **Fanny Martin**, Research Engineer, Institut Curie
Analysis of spatial transcriptomic data (Visium) to understand immunotherapy response in non-small cell lung cancer
Co-supervision with Nicolas Servant and Emmanuel Barillot
- 04/2024 – 09/2024 ■ **Coline Druart**, Master Student, Paris Dauphine University, ENS
Exploration of transfer learning approaches with variational autoencoders to learn new transcriptomic features
Co-supervision with Emmanuel Barillot

Peer Review

Bioinformatics Advances - BMC Bioinformatics - Journal of Nuclear Medicine (JNM)

Skills

- Languages ■ French (Native) - English (Fluent - TOEFL score 105)
- Coding ■ Python (pytorch, scikit, pandas), R, Java, HTML, \LaTeX

References

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Dr. Thomas Walter

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