HAKIM BENKIRANE

AI Researcher

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SUMMARY

Conducting research at the intersection of artificial intelligence and oncology, focusing on the development of robust multimodal AI models for personalized medicine. Working in collaboration with the Gustave Roussy Institute – IHU PRISM, my research aims to enhance clinical decision-making by integrating diverse biomedical data sources, including clinical records, genomics, and spatial transcriptomics. Key areas of expertise include machine learning for healthcare, missing modality robustness and AI-driven knowledge transfer for oncology. My work contributes to optimizing treatment strategies by leveraging AI to extract actionable insights from complex multi-omics datasets.

SKILLS

Languages: Python, R, Java, SQL.

Technologies: Pytorch, Docker, Django.

Experience Backed Soft-Skills: Team Leading, Communication, Teaching, Project Proposal.

EDUCATION

10/2021 - 10/2024 **Post-Doctoral Researcher** — **CentraleSupelec**
Multimodal Integration for Precision Oncology. Part of the PRISM IHU, a collaboration between CentraleSupelec & Gustave Roussy Institute, leader in cancercare in Europe

10/2021 - 10/2024 **PhD in Data Science** — **Université Paris-Saclay**
Multimodal Integration of Histopathology Images and Multi-Omics Data for Precision Medicine: Thesis in collaboration between CentraleSupelec & Gustave Roussy Institute, leader in cancercare in Europe

9/2020 - 9/2021 **MsC in Applied Mathematics & Data Science** — **Université Grenoble Alpes**
Statistical Methods for Forecasting, Probabilistic Models, Model Approximations in High-Dimensions

9/2018 - 9/2021 **Engineering Degree in Applied Mathematics & Computer Science** — **Grenoble INP-Ensimag**
Object-Oriented Programming, Langage Theory, Information Theory, Financial Theory, Operational Research, Graph Theory

1/2020 - 6/2020 **Academic Exchange in probability** — **Imperial College London**
Stochastic Calculus, Markov Process, Survival Analysis, Mathematics for Business & Economy

COLLABORATION PROJECTS

9/2023 – 2/2024 **Counterfactual Analysis for High-Dimensional Data** — **Dana-Farber Institute**
- Collaboration with Dana-Farber Institute
- Data Science Project for Clinical Integration

1/2022 – Present **Multi-Omics Integration for Myelodysplastic Syndrome** — **Karolinska Institute**
- Collaboration with the biggest MDS consortium in Europe
- Using CustOmics for leveraging multi-source data

2/2021 – 2/2022 **Mutation Prediction for Marfan Syndrome** — **Bichat Hospital**
- Collaboration with the Marfan Reference Center.
- Lead Data Scientist for the conception of a web-app for medical use.

PUBLICATIONS

In Review **Multimodal CustOmics: A Unified and Interpretable Multi-Task Deep Learning Framework for Multimodal Integrative Data Analysis in Oncology**
H. Benkirane, M. Vakalopoulou, D. Planchard, J. Adam, K. Olaussen, S. Michiels, P.H. Cournède: In revision, PLoS Computational Biology

In Review **Novae: a graph-based foundation model for spatial transcriptomics data**
Q. Blampey, H. Benkirane, N. Bercovici, F. Andre, P.H. Cournede: In revision, Nature Methods

Conference Paper **Counterfactual Analysis for Digital Histopathology Slides Using Human Interpretable Features**
Benkirane, H., Vakalopoulou, M., Michiels, S., Cournède, P. H., & Lotter, W. (2024): Medical Imaging with Deep Learning

Full Article **CustOmics: A versatile deep-learning based strategy for multi-omics integration**
H Benkirane, Y Pradat, S Michiels, PH Cournède, PLoS Computational Biology 19 (3), e1010921

Full Article — **Hyper-adac: Adaptive clustering-based hypergraph representation of whole slide images for survival analysis**
H Benkirane, M Vakalopoulou, S Christodoulidis, IJ Garberis, S Michiels, PH Cournède, Machine Learning for Health, 405-418

Abstract — **Réseaux de neurones et intégration multi-omique pour la survie: quelles stratégies pour un meilleur apprentissage de représentation?**
H Benkirane, S Michiels, P Cournède, Revue d'Épidémiologie et de Santé Publique 70, S94-S95

INVITED TALKS

2025 — **AIMI Seminar** — **University of Texas Austin**
Multimodal CustOmics: A Unified and Interpretable Multi-Task Deep Learning Framework for Multimodal Integrative Data Analysis in Oncology

2024 — **Frontline Genomics Webinar**
Multimodal CustOmics: A Unified and Interpretable Multi-Task Deep Learning Framework for Multimodal Integrative Data Analysis in Oncology

2024 — **Data Science Departement Seminar** — **Harvard Medical School**
Multimodal Integration for Precision Oncology: Insights & Perspectives

2023 — **TIA Center Seminar** — **University of Warwick**
Multimodal CustOmics: A Unified and Interpretable Multi-Task Deep Learning Framework for Multimodal Integrative Data Analysis in Oncology

2023 — **Presentation DIU MMC** — **Institut Curie**
Intégration multi-omique pour la médecine de précision

IN-CAMPUS PRESENTATIONS

2025 — **L'IA pour la R&D clinique et enjeux technologiques associés** — **CentraleSupelec**
Intégration Multimodale pour la médecine de précision en oncologie

2024 — **UEL: IA pour le traitement des données de santé et du médicament** — **Faculté de Pharmacie de Paris-Saclay**
Intelligence Artificielle & Oncologie: Applications et Perspectives

2024 — **Summer School on Artificial Intelligence** — **CentraleSupelec**
Introduction to Generative AI: With Application to Natural Language Processing

TEACHING ASSISTANCE

2022-Present — **MSCDSBA1019 - Foundations of Machine Learning** — **CentraleSupelec & ESSEC Business School**
Machine Learning Course for the DSBA Master

2024 — **AI-CS1009 - M2 Mathematical foundations for Data Analysis and Management** — **CentraleSupelec & ESSEC**
Mathematical Foundation course for the AIDAMS Bachelor

2024 — **AI-CS1003 - M1 Applied Linear Algebra for Engineering** — **CentraleSupelec & ESSEC Business School**
Linear Algebra course for the AIDAMS Bachelor

2024 — **1IN3000 - Coding Week** — **CentraleSupelec**
Project Supervision: Game of Life

2023-Present — **3IF3010 - ApprAuto - Apprentissage automatique** — **CentraleSupelec**
Machine Learning course for the MsC AI

2022-Present — **1CC5000 - Statistique et Apprentissage** — **CentraleSupelec**
General Course on statistics