Guillaume Jaume

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RESEARCH INTERESTS

"You are cancer-free" – these words are the result of a complex clinical process involving the expertise of multiple pathologists and oncologists, whose knowledge is the fruit of decades of research into cell biology. My research focuses on the integration of artificial intelligence (AI) tools into the clinical and research aspects of pathology with two primary objectives: (1) advancing **representation learning of tissue** by developing large-scale generic-purpose foundation models for histology, and (2) incorporating AI tools in **drug development** for better drug safety assessment, toxicity detection, and safety biomarker discovery.

WORK EXPERIENCE

- **Harvard Medical School, Boston, United States** *May 2022 –*
  Post-doctoral research fellow, Mahmood Lab – Brigham and Women's Hospital
  Focus: AI for pathology: cancer diagnosis and prognosis, drug safety, and toxicity detection
  Collaborators: MIT, CMU, ETH, EPFL, UniBE

- **IBM Research, Zurich, Switzerland** *Dec 2017 - Feb 2022*
  Pre-doctoral researcher in the Cognitive Healthcare & Life Sciences group
  Focus: Computational pathology, Graph representation learning
  Collaborators: ETH, Mayo Clinic, CHUV, University Hospital of Zurich, University Hospital of Paris

- **EPFL, Lausanne, Switzerland** *Sep 2014 - Jun 2016*
  Teaching Assistant for multiple bachelor and master courses
  Focus: Supervise students in practicals, projects, and labs

- **CERN, Geneva, Switzerland** *June 2015 - Aug 2015*
  CERN Summer Student Program, High-Luminosity Large Hadron Collider
  Project: Development of 3D radio frequency measurement tools in EM cavities

EDUCATION

- **Ph.D. in Electrical Engineering** *Jan 2018 - Jan 2022*
  EPFL, Lausanne, Switzerland
  Thesis: Graph Representation Learning in Computational Pathology
  Advisors: Prof. Jean-Philippe Thiran; Dr. Maria Gabrani

- **Special student in Computer Science** *Jan 2018 - Jan 2021*
  ETH, Zurich, Switzerland

- **M.Sc. in Electrical Engineering** *Sep 2015 - Sep 2017*
  EPFL, Lausanne, Switzerland
  Thesis: A Cognitive Solution to Extract and Understand Information in Medical Forms

- **Erasmus exchange, Electrical & Computer Engineering** *Sep 2014 - June 2015*
  Heriot-Watt University, Edinburgh, United Kingdom

- **B.Sc. in Electrical Engineering** *Sep 2012 - June 2015*
  EPFL, Lausanne, Switzerland

PUBLICATIONS

Journals:

- A. Song et al., "Analysis of 3D pathology samples using weakly supervised AI," **Cell**, 2024

- A. Vaidya et al., "Examining Demographic Bias in Misdiagnosis by AI-Driven Computational Pathology Models," **Nature Medicine**, 2024

- M. Lu et al., "A Visual-Language Foundation Model for Computational Pathology," **Nature Medicine**, 2024

- R. Chen et al., "Towards a General-Purpose Foundation Model for Computational Pathology," **Nature Medicine**, 2024

- **G. Jaume*** et al., "Artificial Intelligence for Computational and Digital Pathology," **Nature Reviews Bioengineering**, 2023

- **G. Jaume*** et al., "Weakly Supervised Learning for Joint Whole-Slide Segmentation and Classification in Prostate Cancer," **Medical Image Analysis**, 2023

- **G. Jaume*** et al., "Hierarchical Graph Representations in Digital Pathology," **Medical Image Analysis**, 2021

In review:

- **G. Jaume** et al., "Towards a Foundation Model for Preclinical Drug Safety Assessment," 2024 [Journal]

- **G. Jaume*** et al., "AI-driven Discovery of Morphomolecular Signatures in Toxicology," 2024 [Journal]

- **G. Jaume*** et al., "Multistain Pretraining for Slide Representation Learning in Pathology," 2024 [Conference]

- S. Sahai et al., "BKVision: Automated Detection and Morphological Analysis of BK Virus in Renal Transplant Biopsies," 2024 [Conference]

- S. Sahai et al., "Guiding Multi-Instance Electron Microscopy Representations with Natural Language," 2024 [Conference]

Conferences:

- **G. Jaume*** et al., "Transcriptomics-guided Slide Representation Learning in Computational Pathology," **CVPR, Oral (Top 0.7% of submissions)**, 2024

- **G. Jaume*** et al., "Modeling Dense Multimodal Interactions Between Biological Pathways and Histology for Survival Prediction," **CVPR**, 2024

- A. Song et al., "Morphological Prototyping for Unsupervised Slide Representation Learning in Computational Pathology," **CVPR**, 2024

- A. Song et al., "Multimodal Prototyping for cancer survival prediction," **ICML**, 2024

- K. Thandiackal et al., "Differentiable Zooming for Multiple Instance Learning on Whole-Slide Images," **ECCV**, 2022

- **G. Jaume*** et al., "Quantifying Explainers of Graph Neural Networks in Computational Pathology," **CVPR**, 2021

- **G. Jaume*** et al., "Learning Whole-Slide Segmentation from Inexact and Incomplete Labels using Tissue Graphs," **MICCAI**, 2021

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*denotes co-first authorship

Book chapters:

- **G. Jaume*** et al., "Graph Representation Learning & Explainability in Breast Cancer Pathology: Bridging the gap between AI and Pathology Practice," Artificial Intelligence as applied in Human Pathology, Editor: R. Huss, World Scientific, 2021

Additional publications:

- **G. Jaume** et al., "Incorporating Context for Superior Cancer Prognosis", **Nature Biomedical Engineering**, *News and Views*, 2022

- **G. Jaume***, et al., "Embedding Space Augmentation for Weakly Supervised Learning in Whole-Slide Images," **ISBI**, 2022

- N. Brancati et al., "BRACS: A Dataset for BReAst Carcinoma Subtyping in H&E Histology Images," **Databases**, 2022

- **G. Jaume*** et al., "HistoCartography: A Toolkit for Graph Analytics in Digital Pathology," **MICCAI-W**, 2021 *(Best Software Paper Award)*

- **G. Jaume*** et al., "HACT-Net: A Hierarchical Cell-to-Tissue Graph Neural Network for Histopathological Image Classification," **MICCAI-W**, 2020 *(Best paper award)*

- **G. Jaume*** et al., "Towards Explainable Graph Representations in Digital Pathology," **ICML-W**, 2020 *(Best paper award)*

- **G. Jaume** et al., "edGNN: A simple and powerful GNN for labeled graphs," **ICLR-W**, 2019

- **G. Jaume** et al., "Image-Level Attentional Context Modeling Using Nested-Graph Neural Networks," **NeurIPS-W**, 2018

LIBRARY & DATASETS

- **HistoCartography**: A collection of image-to-graph translation and state-of-the-art graph algorithms for facilitating interpretable entity-based analysis in digital pathology [Code]

- **BR**e**A**st **C**arcinoma **S**ubtyping (**BRACS**): A large cohort of H&E stained histopathological images for automated breast cancer diagnosis [Website]

- **FUNSD**: A dataset for Form Understanding in Noisy Scanned Documents [Website]

PATENTS

- A. Foncubierta-Rodriguez, P. Pati, **G. Jaume**, K. Thandiackal, "Processing multimodal images of tissue for medical evaluation," 2022

- P. Pati, **G. Jaume**, K. Thandiackal, A. Foncubierta-Rodriguez, M. Gabrani, "Registration Free Multimodal Digital Pathology," 2021

- P. Pati, **G. Jaume**, A. Foncubierta-Rodriguez, M. Gabrani, "Interpretation of whole-slide images in digital pathology," 2021

- **G. Jaume**, A. Foncubierta-Rodriguez, M. Gabrani, "Extracting structured information from a document containing filled form images," 2019

- **G. Jaume**, A. Foncubierta-Rodriguez, M. Gabrani, "Method and system for extracting information from an image of a filled form document," 2019

AWARDS

- Nominated for the EPFL Doctorate Award   *Jan 2022*
- IBM Outstanding Technical Achievement and Innovation Award   *May 2021*
  "Intelligent and quantitative immunostaining of tumor tissue sections"

- IBM First Invention Plateau   *June 2021*
- Best Paper Awards:
  - MICCAI, Computational Pathology (COMPAY) Workshop   *Sep 2021*
  - MICCAI, Graphs in Biomedical Image Analysis Workshop   *Oct 2020*
  - ICML, Computational Biology Workshop   *July 2020*

COMMUNITY SERVICE

- **Reviewer:**
  - *Journals:* Nature Communications, IEEE Transactions on Medical Imaging, Science Translational Medicine, Medical Image Analysis, British Journal of Cancer
  - *Conferences:* CVPR, ECCV, MICCAI
- **Workshop co-organizer:**
  - AI4Health Summer School, *Paris*   *July 2023*
    "Weakly supervised classification of whole-slide images"
  - IEEE International Symposium on Biomedical Imaging (ISBI), *Kolkata*   *March 2022*
    "BRIGHT: BReast tumor Image classification on Gigapixel HisTopathological images"
  - American Medical Informatics Association (AMIA), *San Diego*   *Nov 2021*
    "Workshop on Explainable Multimodal AI in Cancer Patient Care"
  - Applied Machine Learning Days (AMLD), *Lausanne*   *April 2021*
    "Building Interpretable AI for Digital Pathology"
- **Selected talks:**
  - MIT, *Boston* – Guest lecturer, MIT-6.S915   *Jan 2024*
    "Slide Representation Learning in Computational Pathology"
  - PariSanté Campus, *Paris* – Keynote speaker, AI4Health Summer School   *July 2023*
    "Deep Learning for Pathology Image Analysis"
  - University of Bern, *Bern* – Invited by Prof. Inti Zlobek   *July 2023*
    "Latest trends in Computational Pathology"
  - UC Berkeley, *Berkeley* – Invited by Prof. Iain Carmichael   *Nov 2022*
    "A Tour of Computational Pathology: Methods and Applications"
  - Dana-Farber Cancer Institute, *Boston* – Invited by Prof. Eliezer Van Allen   *Sep 2022*
    "Interpretable Deep Learning in Computational Pathology"
  - Tissue Image Analytics Centre, *Warwick* – Invited by Prof. Nasir Rajpoot   *Oct 2021*
    "HistoCartography: Graph representations and models in Computational Pathology"
  - Charité University Hospital, *Berlin*   *Oct 2021*
    "Graph Representations and Models in Digital Pathology"
  - PathAI, *New York*   *July 2021*
    "Weakly-Supervised Learning for Whole-Slide-Image Segmentation"
  - Harvard Medical School, *Boston* – Invited by Prof. Faisal Mahmood   *July 2021*
    "A Graph Network Tour of Computational Pathology"
  - Lausanne University Hospital (CHUV), *Lausanne*   *May 2021*
    "Computational Pathology: Building Interpretable AI at Scale"
  - Swiss Digital Pathology Consortium (SDiPath), *Bern*   *Jan 2021*
    "Graph Representation Learning & Explainability in Computational Pathology"
  - Computer Research Institute of Montreal (CRIM), *Montreal*   *Nov 2020*
    "Deep Learning on Graphs: An Overview"

PRESS COVERAGE

- **Harvard Medical School News & Research**: Researchers Design Foundation AI Models for Use in Pathology [Link]

- **Imaging Technology News**: Mass General Brigham Announces Development of AI Foundation Models to Advance Pathology [Link]

- **Mass General Brigham Newsroom**: Mass General Brigham Researchers Develop AI Foundation Models to Advance Pathology [Link]

STUDENT SUPERVISION

- Isabella Polles, *PhD internship – Politecnico Milano*   *Spring 2024*
  "Expression-guide Representation Learning of Histology Images"

- Paul Doucet, *Master's thesis –ETH Zurich*   *Spring 2024*
  "A Dataset for Pan-tissue Morphological and Molecular Analysis"

- Thomas Peeters, *Master's thesis – EPFL*   *Spring 2023*
  "Understanding Morphomolecular Signatures in Drug Safety Studies"

- Lukas Oldenburg, *Master's thesis – RWTH Aachen University* (ML engineer)   *2023*
  "Aligning Transcriptomics and Histology for Few-Shot Learning in Computational Toxicologic Pathology"

- Imaad Zaafar, *Summer internship – UCL*   *Summer 2022*
  "Embedding Space Augmentation with Generative Models"

- Valentin Anklin, *Master's thesis – ETH Zurich* (Software engineer at Google)   *Autumn 2020*
  "Learning Segmentation in Histology from Inexact and Incomplete Labels using GNNs"

- Lauren Alisha Fernandez, *Master's thesis – ETH Zurich* (ML engineer)   *Autumn 2019*
  "Cell-graph Networks for Representation and Grading of Histopathology Images"

- Atul Kumar, *Master's thesis – EPFL* (PhD candidate at UniGe)   *Autumn 2019*
  "Learning to generate Scene Graphs from Images and vice-versa"

- Martin Svatos, *Research internship – Uni Prague*   *Spring 2019*
  "Mind the Logit Gap: Incomparable Tasks in Continual Learning"

- Maria Halushko, *Research internship – Uni Kyiv* (Software engineer at AWS)   *Autumn 2018*
  "Text Detection in Noisy Scanned Documents"

REFERENCES

- Prof. Faisal Mahmood   faisalmahmood@bwh.harvard.edu
  Associate Professor, Harvard Medical School, Boston

- Prof. Jean-Philippe Thiran   jean-philippe.thiran@epfl.ch
  Full Professor, EPFL, Lausanne
  Director of Institute of Electrical and Microengineering, EPFL, Lausanne

- Prof. Long Phi. Le   long.le@mgh.harvard.edu
  Assistant Professor, Harvard Medical School, Boston
  Director, Computational Pathology, MGH, Boston
  Director, Technology and Development Center for Integrated Diagnostics, MGH, Boston

- Prof. Drew F. K. Williamson   drew.williamson@emory.edu
  Assistant Professor, Emory School of Medicine, Atlanta