2026 summer call PhD selections

AVAILABLE POSITIONS

Principal Investigator	CLAUDIO TRIPODO
Institute of Affiliation	IFOM ETS – The AIRC Institute of Molecular Oncology

PROJECT INFO	
Title of the proposed project:	Predicting cancer evolution from AI-powered histopathology
Short description of the project	This project will investigate whether routine histopathology can be used to reconstruct the biological organization of cancers and anticipate their possible evolution. Tissue morphology reflects the spatial distribution of malignant populations and the selective interactions they establish with immune, stromal and vascular compartments. However, these features are commonly reduced to descriptive categories or used to predict predefined molecular biomarkers. The project will develop AI approaches capable of learning morphological representations of tumor subclonal organization, regional interactions and tissue states associated with invasion, immune escape, metastatic competence and treatment adaptation. Spatial and molecular profiling will provide the biological reference required to interpret these representations and connect morphology with the underlying cellular and molecular programs. Colorectal cancer will serve as the principal model because of its marked molecular and spatial heterogeneity, while selected tumor types will be used to establish the generalizability of the framework. The project will also explore whether the organization observed in an initial tissue sample can support the generation of patient-specific scenarios describing how tumor regions and subclonal populations may change during progression or under therapeutic pressure. The long-term goal is to transform histopathology from a static representation of disease into a source of interpretable models of cancer organization, evolutionary potential and response, providing a foundation for predictive digital pathology and future tumor digital twins.
Main research area for the project	Computational pathology and artificial intelligence
Second research area for the project	Cancer evolution and spatial biology
3 key words for the project	AI histopathology, Spatial evolution, Tumor ecosystems

*Duplicate the table if you have more than a project to describe.

LAB INFO	
Main topic/s of the lab	1. Spatial and temporal determinants of tumor heterogeneity, plasticity and evolution 2. Tumor–host interactions, stromal remodeling and immune-niche organization 3. Digital pathology and spatial multi-omics for predictive cancer modelling

Short description of the lab activity	The Advanced Pathology Laboratory investigates how the spatial organization of malignant, immune, stromal and vascular populations shapes cancer progression and response to therapy. The group integrates experimental and quantitative pathology, tumor immunology, cellular biology, digital pathology and spatial multi-omics to study cancer within its native tissue context. Its research focuses on the topographical organization of tumor subpopulations, tumor–stroma interfaces, immune exclusion and regulatory niches, extracellular-matrix remodeling and the emergence of invasive or metastatic tissue states. Routine histopathology is combined with multiplex imaging, in situ molecular assays, spatial transcriptomics and computational image analysis to connect tissue architecture with cellular programs and functional mechanisms. The overarching goal is to identify spatial principles of cancer behavior and convert them into interpretable pathology biomarkers and predictive models of tumor evolution and therapeutic response.
Recent bibliography	1. Palamidessi A, Frittoli E, Corada M, Martini E, Barzaghi L, Milanese C, et al. Mechano-metabolic feedback connects tissue fluidity to mitochondrial DNA-dependent immunity in breast cancer. Nat Commun. 2026;17(1):6374. doi: 10.1038/s41467-026-71795-0. 2. Caire R, Bordo R, Zanconato F, Panciera T, Audoux E, Contessotto P, et al. A 3D morphogenetic blueprint for metastatic outgrowth in breast cancer. Cell. 2026;189(12):3701-3718.e30. doi: 10.1016/j.cell.2026.03.009. 3. Cancila V, Bertolazzi G, Chan AS, Medico G, Bastianello G, Morello G, et al. Aggressive B cell lymphomas retain ATR-dependent determinants of T cell exclusion from the germinal center dark zone. J Clin Invest. 2025;135(18). doi: 10.1172/JCI187371. 4. Vitiello PP, Rousseau B, Chilà R, Battuello P, Amodio V, Battaglieri V, et al. Cisplatin and temozolomide combinatorial treatment triggers hypermutability and immune surveillance in experimental cancer models. Cancer Cell. 2025;43(7):1296-1312.e7. doi: 10.1016/j.ccell.2025.05.014. 5. Zhang X, Venkatachalapathy S, Paysan D, Schaerer P, Tripodo C, Uhler C, Shivashankar GV. Unsupervised representation learning of chromatin images identifies changes in cell state and tissue organization in DCIS. Nat Commun. 2024;15(1):6112. doi: 10.1038/s41467-024-50285-1. 6. Liu M, Bertolazzi G, Sridhar S, Lee RX, Jaynes P, Mulder K, et al. Spatially-resolved transcriptomics reveal macrophage heterogeneity and prognostic significance in diffuse large B-cell lymphoma. Nat Commun. 2024;15(1):2113. doi: 10.1038/s41467-024-46220-z. 7. Frittoli E, Palamidessi A, Iannelli F, Zanardi F, Villa S, Barzaghi L, et al. Tissue fluidification promotes a cGAS-STING cytosolic DNA response in invasive breast cancer. Nat Mater. 2023;22(5):644-655. doi: 10.1038/s41563-022-01431-x. 8. Hoppe MM, Jaynes P, Shuangyi F, Peng Y, Sridhar S, Hoang PM, et al. Patterns of oncogene coexpression at single-cell

	resolution influence survival in lymphoma. Cancer Discov. 2023;13(5):1144-1163. doi: 10.1158/2159-8290.CD-22-0998. 9. Amodio V, Lamba S, Chilà R, Cattaneo CM, Mussolin B, Corti G, et al. Genetic and pharmacological modulation of DNA mismatch repair heterogeneous tumors promotes immune surveillance. Cancer Cell. 2023;41(1):196-209.e5. doi: 10.1016/j.ccell.2022.12.003. 10. Sladitschek-Martens HL, Guarnieri A, Brumana G, Zanconato F, Battilana G, Xiccato RL, et al. YAP/TAZ activity in stromal cells prevents ageing by controlling cGAS-STING. Nature. 2022;607(7920):790-798. doi: 10.1038/s41586-022-04924-6.
Group composition	Main group members at IFOM: 1 Principal Investigator, 1 Staff Scientist, 1 Postdoctoral Fellow, 1 Physician Scientist, 1 PhD student, 1 Research Technician and 1 Undergraduate Student.
Institutional page link	www.ifom.eu
Lab website link	https://www.ifom.eu/en/cancer-research/research-labs/research-lab-tripodo.php
Social media links	https://www.linkedin.com/company/ifom https://twitter.com/IFOMresearch https://www.instagram.com/ifom_milan/