AI-ON-Lab

Artificial Intelligence for Oncology

Fondazione IRCCS Istituto Nazionale dei Tumori di Milano

Luca Invernizzi, PhD

Bachelor of Science in Artificial Intelligence · 9 November 2026



One lab, five research groups

COORDINATION

Head of Lab



Arsela Prelaj, MD, PhD



Vanja Mišković, PhD

AI-ON-Lab

FACULTY

FOUNDERS



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Prof. Alessandra Pedrocchi



Prof. Filippo de Braud

Collaborators



Prof. Emilia Ambrosini



Prof. Marcello Restelli

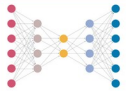


Prof. Pietro Pinoli



Prof. Mark Carman

Trustworthy multimodal AI tools







Alberto Ferrarin, Research Fellow



Rebecca Romano, MD



Cristina Licciardello, PhD student



Sara Ferri, Research Fellow

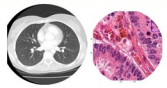


Ludovica Lerma, PhD student



Aditya Ravi AI specialist

Medical images group





Leonardo Provenzano, MD, PhD student



Valentina Bartolomeo, PhD, MD



Margherita Favali, PhD student



Aleksandra Zec, PhD student



Elisa Totis, AI specialist



Angelica Pagni, AI specialist



Beshoy Guirges, AI specialist

LLMs and Agents





Federica Corso, PhD Post-doc researcher



Laura Mazzeo, MD, PhD student



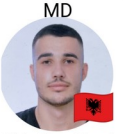
Vittoria Peppoloni, AI specialist



Giuseppe Leone, MD



Francesca Chite AI specialist



Kristian Perriu AI specialist

Multiomics



Luca Invernizzi, PhD Post-doc researcher



Ghazal Farhikhteh, PhD student



Cecilia Silvestri, MD

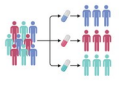


Arianna Rlgamonti, PhD student



Michela Francesconi PhD student

Ai in clinical trials





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One lab, five research groups

Multiomics



Luca Invernizzi, PhD
Post-doc researcher



Ghazal Farhikhteh,
PhD student



Cecilia Silvestri,
MD



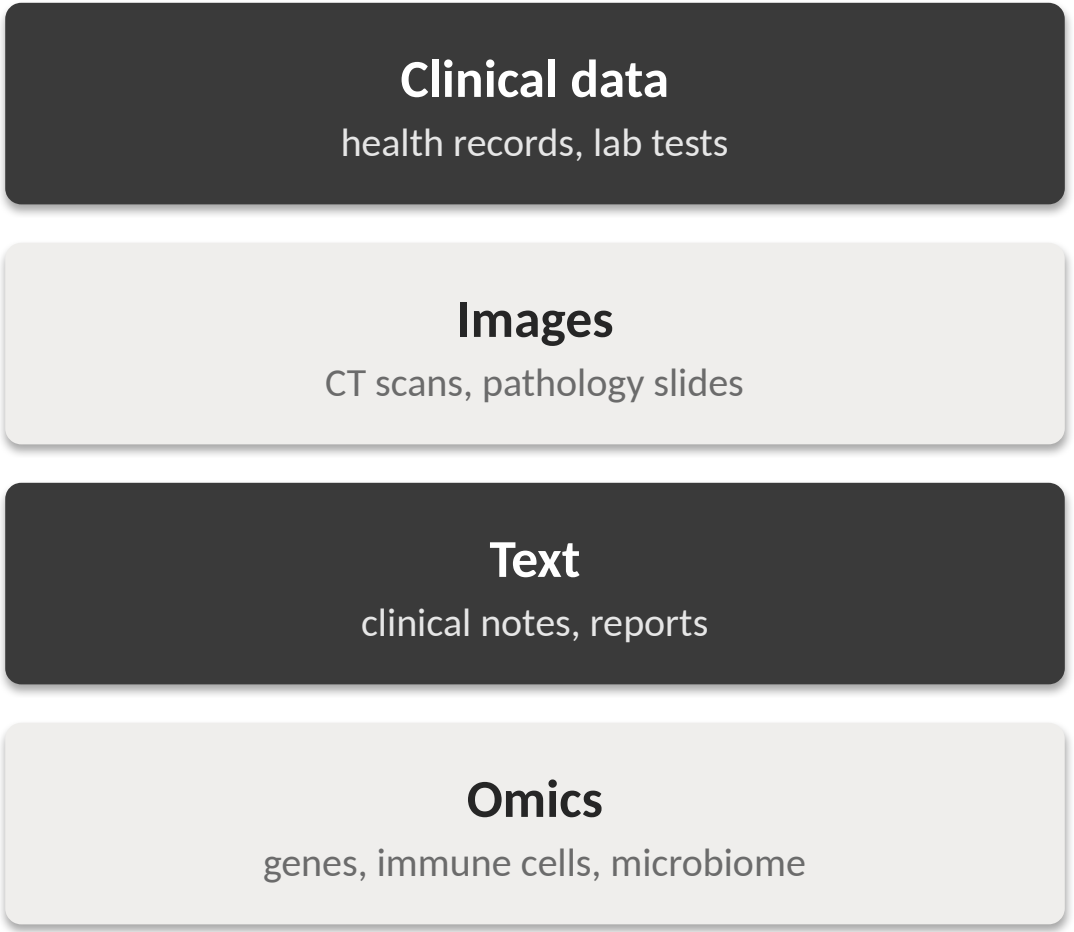
Arianna RIgamonti,
PhD student



Michela Francesconi
PhD student

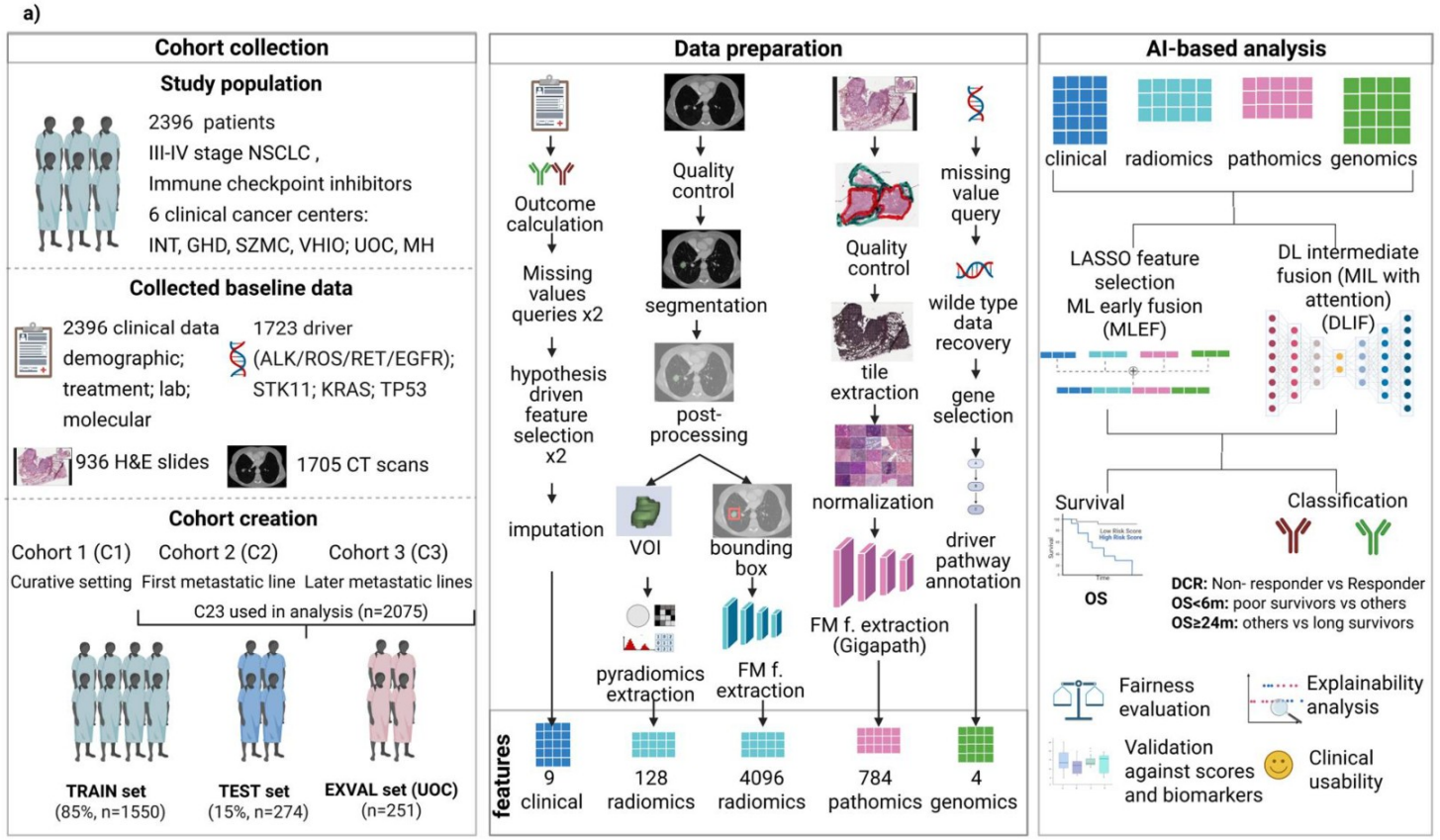
Who we are

- An **AI lab inside a cancer hospital**: Istituto Nazionale dei Tumori (INT), Milano
- Head of Lab: **Arsela Prelaj, MD, PhD**, medical oncologist
- Founded with faculty from **Politecnico di Milano**
- **30+ people**: engineers, computer scientists, physicians, biologists
- Goal: turn **real patient data** into AI tools that help doctors choose the right therapy



The data we work with

I3LUNG: multimodal AI to predict immunotherapy benefit



- **2,396 lung cancer patients** from 6 hospitals in Europe, the US and Israel
- **Four data types** combined: clinical records, CT scans, pathology slides, genomics
- Machine learning + deep learning fusion, with **explainability tested by real oncologists**
- **TAKEAWAY: Medical Data is messy**

Prelaj, Miskovic et al., medRxiv 2026, doi 10.64898/2026.01.16.25342913, Fig. 1a

Trustworthy multimodal AI tools

What we do

- **Multimodal models** that combine clinical data, images and omics
- **Explainability and fairness**: SHAP, counterfactuals, checking who the model works for
- Tools doctors can trust, e.g. **SHAP-Tales**: an on-premise LLM explains SHAP plots in plain language (NeurIPS 2026, WiML)

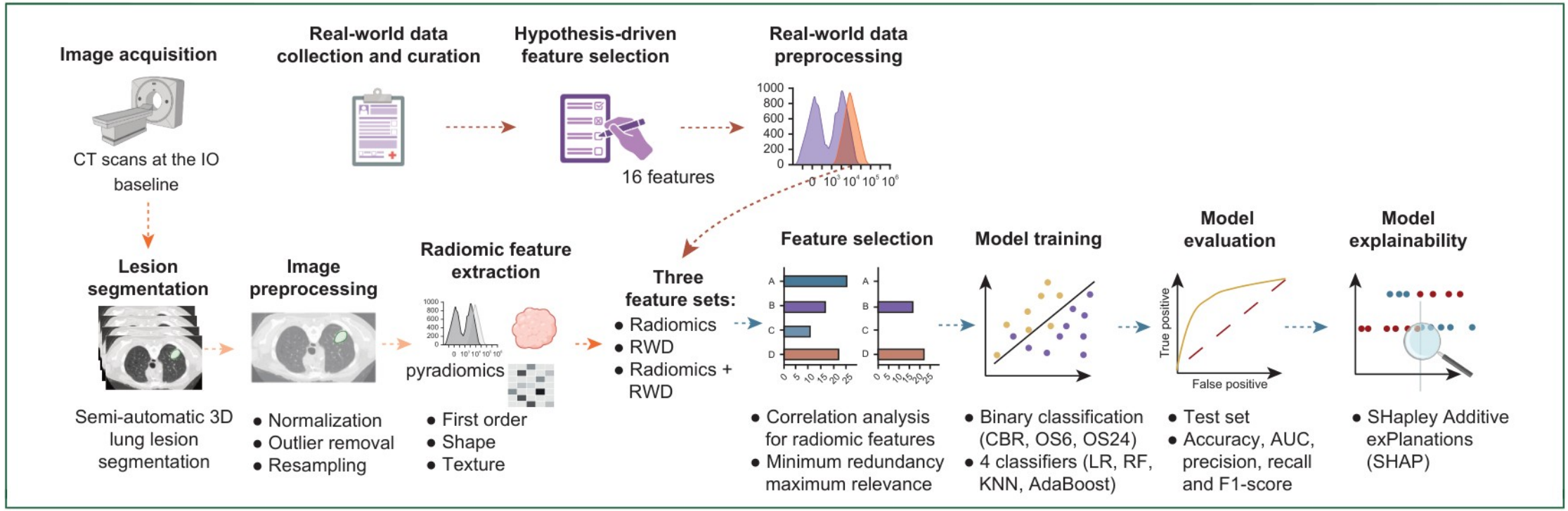
Example thesis topics

- **Application of TabPFN for Predictive Modeling Using Real-World Data in Lung Cancer Patients**
- **Stability of SHAP explanations in Lung Cancer prediction Models**

Topics change fast: come and ask us what is open now.

CONTACT **Vanja Mišković, PhD** · group leader and POLIMI professor

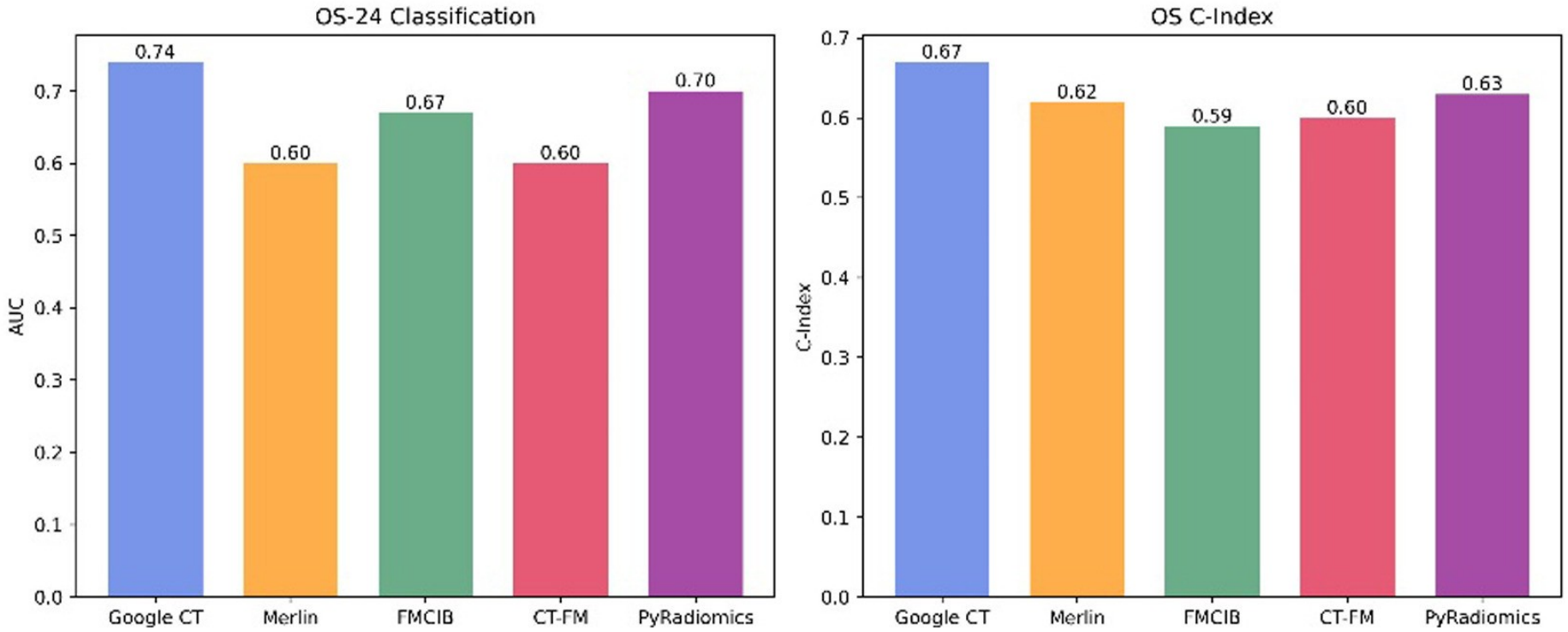
CT scans + clinical data beat today's biomarker



- **375 patients** with advanced lung cancer treated with immunotherapy
- **Radiomic features** from CT scans + clinical data → classic ML classifiers + SHAP
- The combined model predicted 2-year survival better than **PD-L1**, the biomarker used in the clinic
- **TAKEAWAY: Models are not enough, data wrangling and rigorous approach are essential**

Provenzano, Favali et al., ESMO Real World Data and Digital Oncology 2025;10:100182, doi 10.1016/j.esmorw.2025.100182, Fig. 1

Foundation models vs hand-crafted radiomics on CT



- **553 public CT scans**: four pretrained CT foundation models vs **PyRadiomics** (the standard)
- Same ML on top; test on **110 unseen patients**: 2-year survival (AUC) and survival ranking (C-index)
- **Google CT** (pretrained on ~600k CTs) did best, **with no tumour segmentation needed**
- **TAKEAWAY:** Sometimes less is more

***Guirges**, Favali, Provenzano, … Prelaj, Miskovic. WCLC 2025, abstract MA06.07, J Thorac Oncol 2025;20(10):S79, doi 10.1016/j.jtho.2025.09.145*

Medical images

What we do

- **CT scans** and **digital pathology** (whole-slide images of tumour tissue)
- **Foundation models for CT**: benchmarking CT FMs to predict survival (Guirges et al., WCLC 2025)
- Radiomics and deep learning: segmentation, feature extraction, predicting response and survival

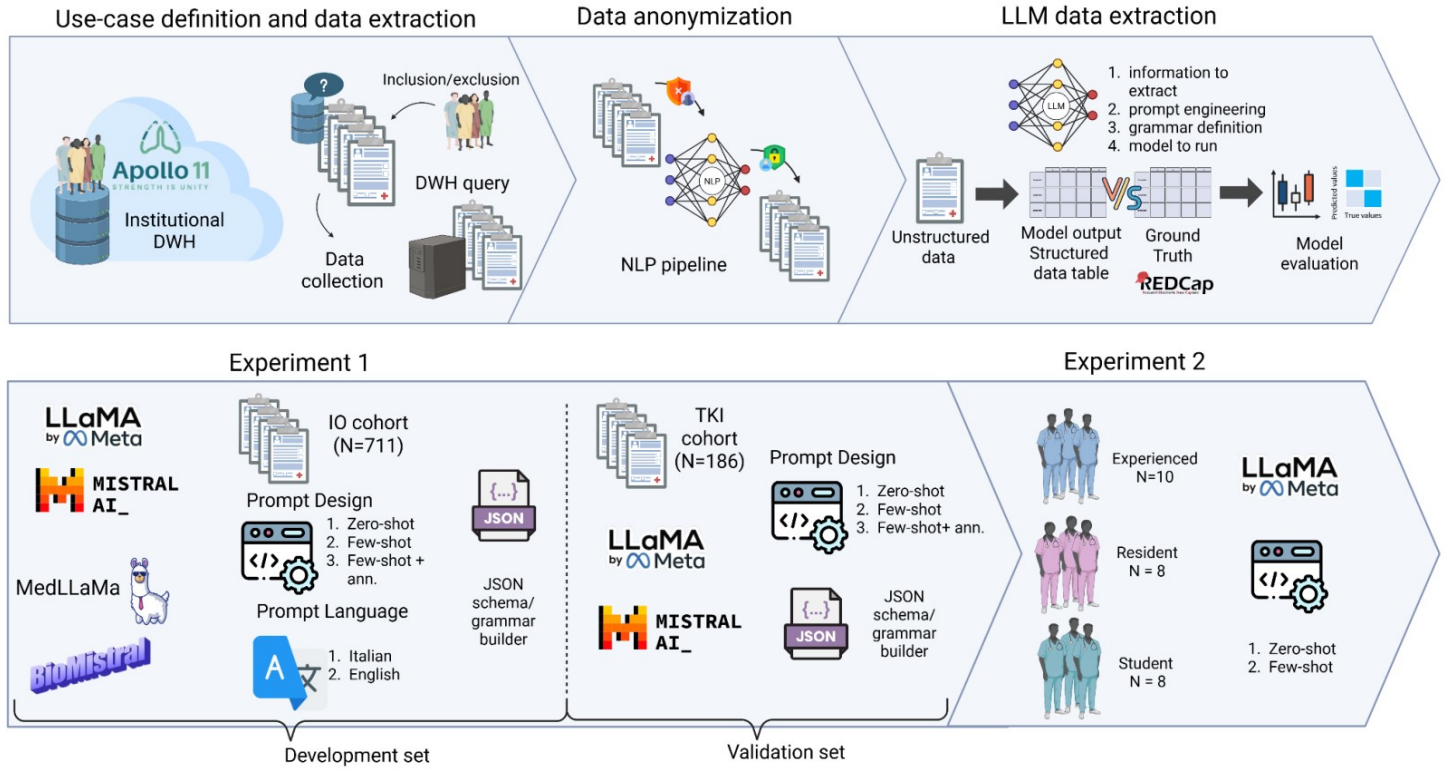
Example thesis topics

- **Automatic segmentation of lung tumor in CT scan: biomedparse**
- **Immunotherapy prediction for NSCLC using CT scans**

Topics change fast: come and ask us what is open now.

CONTACT **Leonardo Provenzano, MD and Margherita Favali, PhD** · group leaders

Small local LLMs read clinical notes



- **Open LLMs running inside the hospital** (LLaMA, Mistral…): patient data never leaves INT
- They turn free-text Italian clinical notes into **structured data** for research
- 26 doctors wrote prompts: **clinical expertise + few-shot examples** make extraction more reliable
- **TAKEAWAY: Expert input is a very valuable resource**

*Corso, **Peppoloni**, Mazzeo et al., Communications Medicine 2026 (preprint: medRxiv doi 10.1101/2025.10.16.25337917), Fig. 1*

LLMs and Agents

What we do

- **LLMs deployed on-premise** to extract information from clinical records
- **Clinical trial matching**: an LLM matches patients to open trials and explains why
- **AI agents** that coordinate several tools inside a hospital

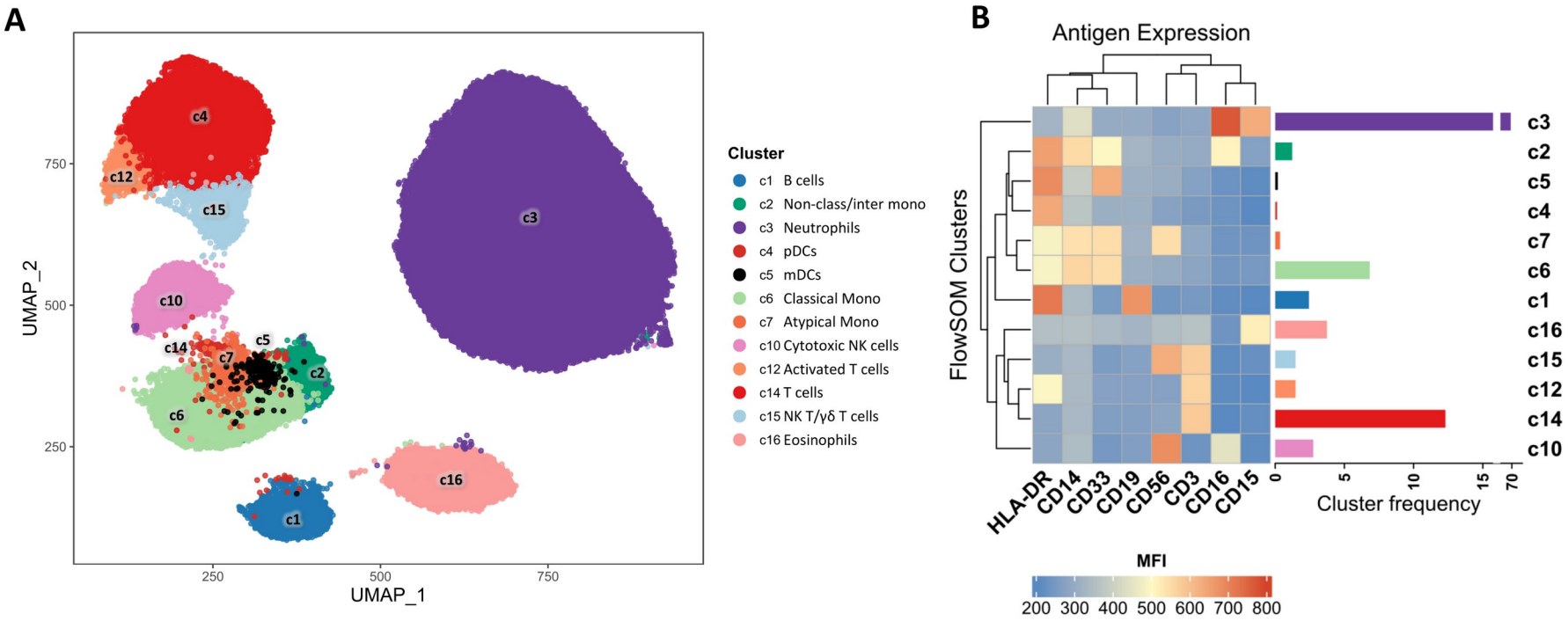
Example thesis topics

- **Validation of an LLM-Based Patient–Trial Matching Framework Using Real-World Clinical Data**
- **User Friendly Platform for Cancer Timeline Extraction and Treatment Response Inference using LLMs**

Topics change fast: come and ask us what is open now.

CONTACT **Federica Corso, PhD** · group leader

Multiomics: what the blood tells us about immunotherapy



- **PEOPLE trial**: lung cancer patients treated with immunotherapy (pembrolizumab)
- Several layers per patient: **immune cells, gene expression, gut microbiome**
- **Multi-omics integration** (MOFA, DIABLO, SNF) to find patients that can avoid chemotherapy
- **TAKEAWAY: Out work has potential to have real impact on patients**

Invernizzi et al., under submission

Multiomics

What we do

- Data from **molecular biology**: gene expression, genomics, immune cells, microbiome
- **Integration** of omics layers with clinical data
- **Biomarker discovery** for immunotherapy: lung cancer, mesothelioma

Example thesis topics

- **Application of Transcription FM (Bulkformer) to Real World Mesothelioma Data**
- **Multi-omic Deep Learning Models (TMO-Net) Robustness to Ablation**

Topics change fast: come and ask us what is open now.

CONTACT **Luca Invernizzi, PhD** · group leader · Luca.Invernizzi@istitutotumori.mi.it

Working with us

Meetings in English

International team: Italy, Albania, Serbia, Iran, India, Australia…

We have experience with paperwork

We have hosted many thesis students and know the university–INT agreements and internship forms

Real, sensitive patient data

Privacy rules (GDPR, ethics approvals): data stays inside INT. You learn to work the way real healthcare AI works

Doctors next to you

Your model answers a real clinical question, and you get feedback from the people who would use it

Interested? Come and talk to us

Trustworthy multimodal AI	**Vanja Mišković**	
Medical images	**Leonardo Provenzano**	
LLMs and Agents	**Federica Corso**	
Multiomics	**Luca Invernizzi**	Luca.Invernizzi@istitutotumori.mi.it

Send: a short CV + two lines on what you would like to work on

Topics change fast: ask what is open now · Thank you!