Bridging Borders: Advancing Translational Oncology Research through AI

EuroCC4SEE Workshop, May 20th, 2025

Stefan Milosevic, University of Cambridge |
BIO4 Campus Belgrade

Why Borders Still Exist in Cancer Research

Cancer doesn’t care about borders. So why do our research systems?

Translational oncology today is fragmented:

01 National borders limit clinical collaborations

02 Institutional silos slow down data integration

03 Regulatory systems aren’t built for AI

04 Underlining: Result: Up to 70% of patients fail first-line therapies. Over 85% of clinical trials miss their endpoints

Source: NIH, IQVIA

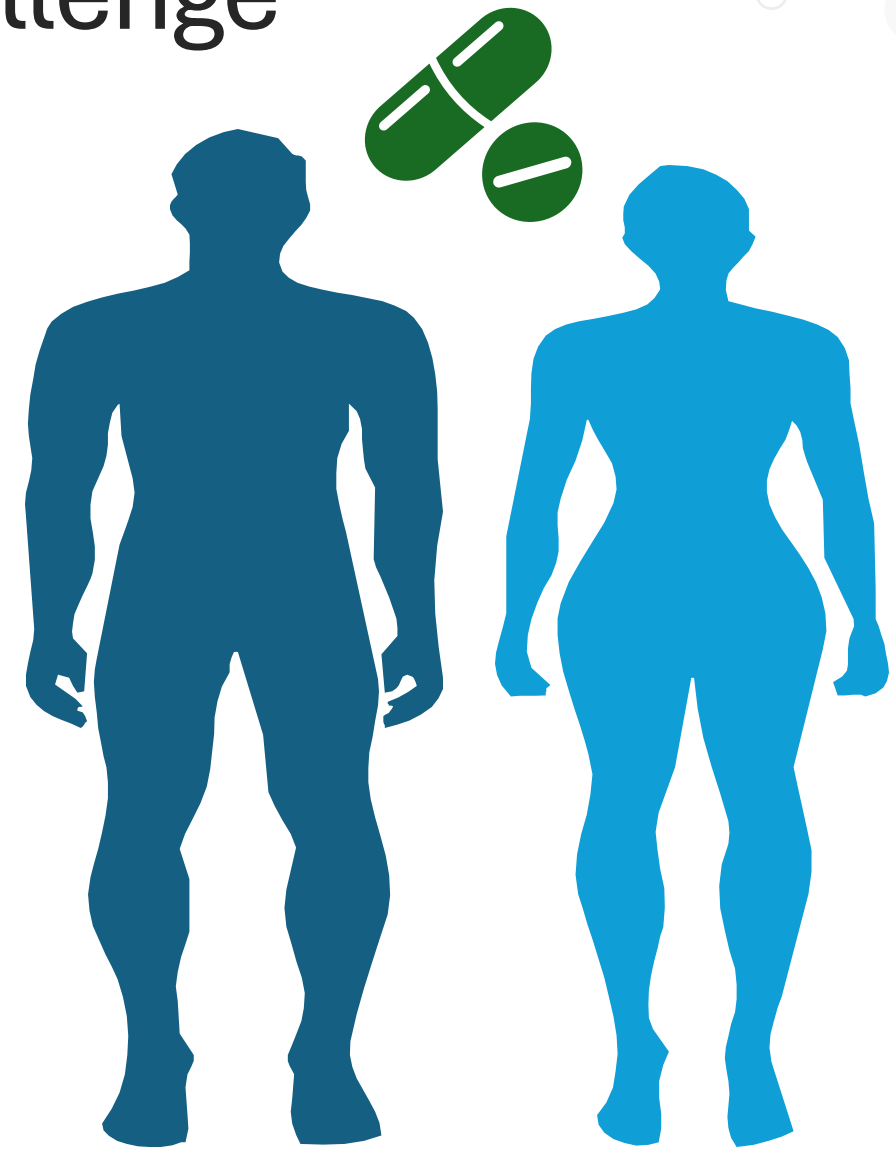
From Bench to Bedside: The Translational Oncology Challenge

01 Translational oncology means converting lab breakthroughs into clinical treatments

02 But there's a "data chasm" between discovery and real-world deployment

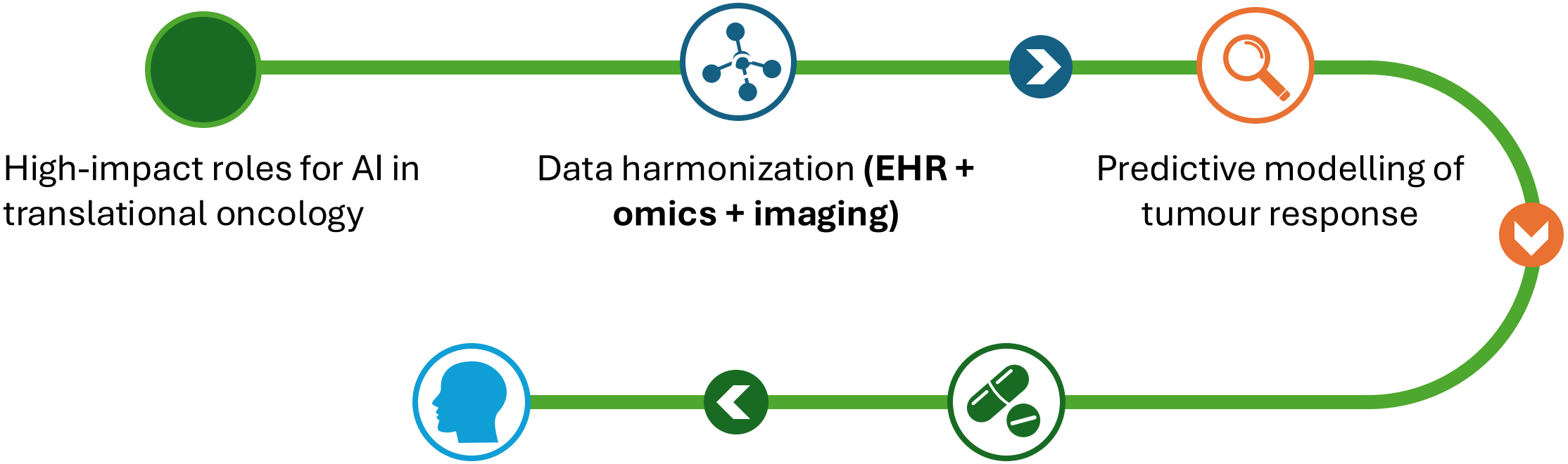
03 Genomics ≠ Clinical trials ≠ Imaging ≠ Real-world outcomes

04 Solution: What's missing? A common computational language across modalities and institutions



AI as the Bridge: Not a Silver Bullet, but a Shared Protocol

AI helps navigate complexity, **not replace** clinicians or researchers



UNIVERSITY OF CAMBRIDGE

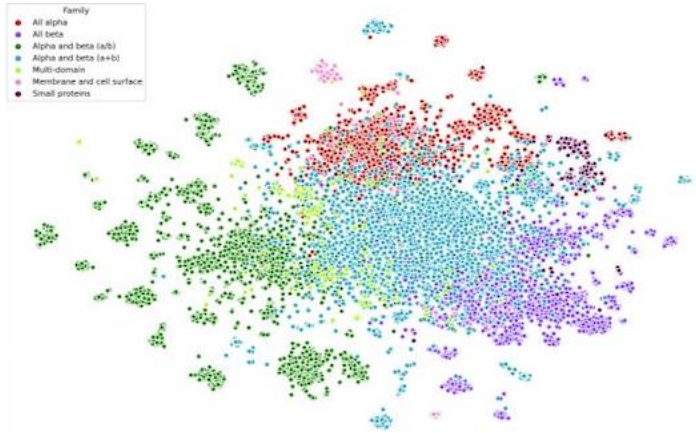
wellcome sanger institute

Cambridge Centre for AI in Medicine

scMultiGraph: single-cell Multiomic Modelling with Message Passing Graph Neural Networks

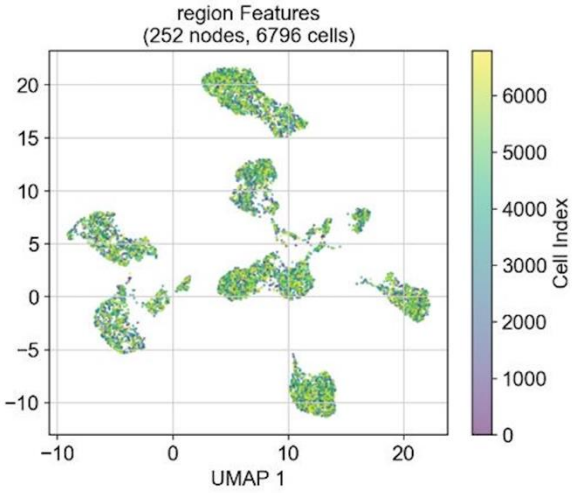
Problem?

- Genomics data are often analyzed in silos-chromatin accessibility and gene expression separately



Result:

- Amongst the first of the graph neural network models to **connect multiomic data** at single-cell resolution
- Achieved high predictive accuracy across a set of variable genes



Broader implication:

- Modelling regulatory gene networks dynamically- essential for understanding therapy response and disease mechanisms

From *scMultiGraph* to Real-World AI Barriers

My thesis clarified:

STANDARDIZATION

Lack of **standardized architectures** for multiomic data integration

ACCESS

Limited access to **high-quality, diverse training data**

CLINICAL VALIDATION

Disconnection between **academic modelling** and **clinical validation**

Next… **How do we deploy this in real-world cancer settings-ethically and scale it properly?**

BRaIn-MOD *(Brain Response and Infiltration Modeling through Omics and Dynamics): Digital Twin Modeling of Glioma Evolution and Therapy Response*

УНИВЕРЗИТЕТ У БЕОГРАДУ
МЕДИЦИНСКИ ФАКУЛТЕТ
UNIVERSITY OF BELGRADE
FACULTY OF MEDICINE

Stanford | MEDICINE

BIO4 Campus will be home to a multidisciplinary set of tenants, creating and **ideal ecosystem for innovation**

Oncology Across BIO4 - A Shared Domain

Oncology is not a separate pillar at BIO4; rather, it's a cross-cutting domain worked on across multiple tenant institutions

Key Projects & BIO4 Tenants

- **IMGGE**
  DNA repair and genome stability (BRCA2-related)
  Targeting vulnerabilities in HR-deficient cancers
- **Faculty of Medicine + IORS (Institute for Oncology and Radiology of Serbia)**
  Biomarker discovery in rectal cancer
  Personalized treatment pathways through EU collaboration
- **IMI**
  Anti-inflammatory diets during breast cancer therapy
  Linking nutrition, clinical outcomes, and ML models
- **IBISS + Faculty of Chemistry**
  Novel hybrid anticancer compounds
  Designed to reduce toxicity and overcome drug resistance

BIO4 enables these projects to intersect through AI and infrastructure, without creating artificial silos

2025 ASCO® ANNUAL MEETING

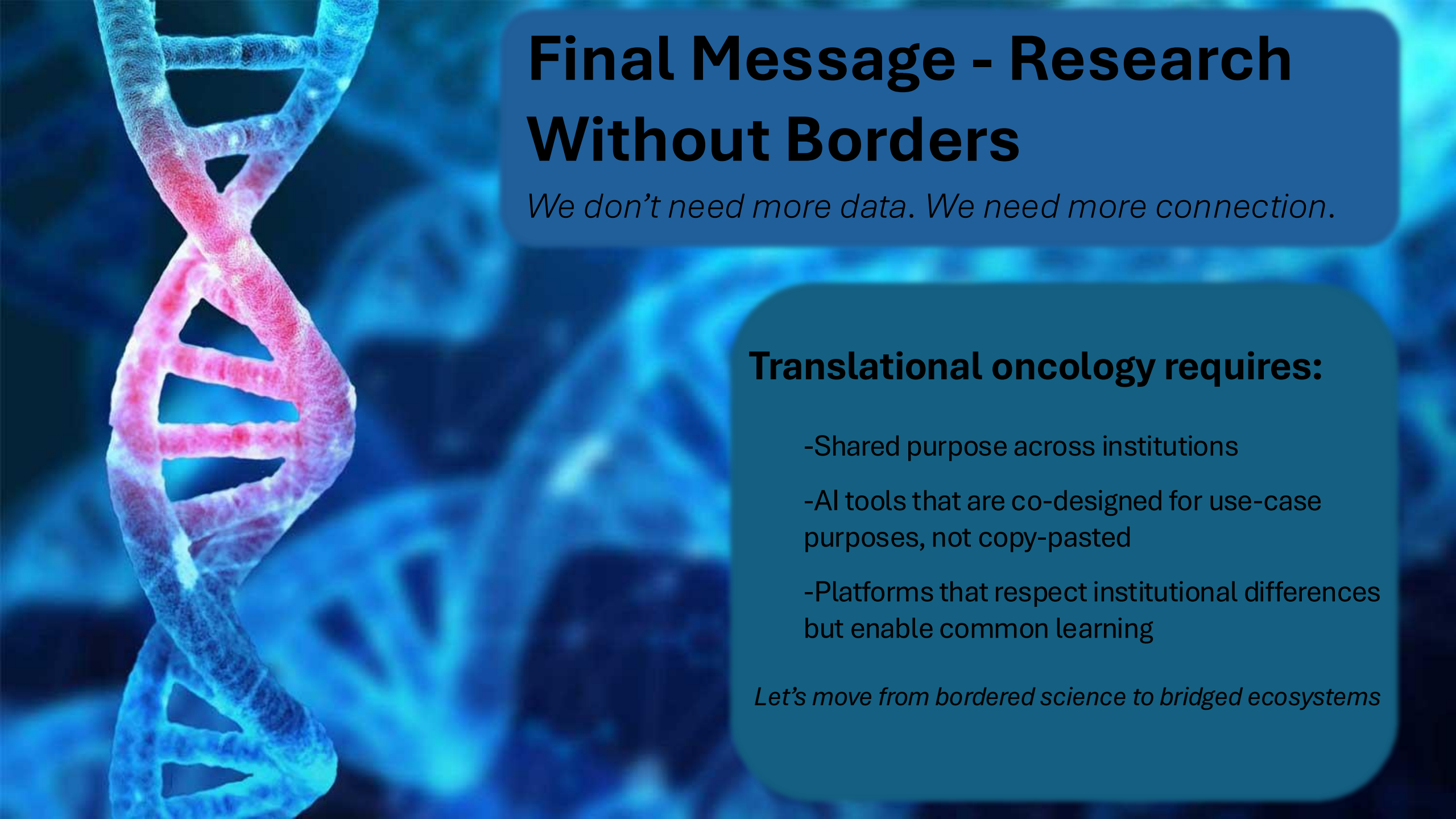
ASCO 2025 - Serbia's Presence in Oncology & AI

I will represent BIO4 Campus at this year's ASCO Annual Meeting 2025

Oncology projects from our BIO4 tenants

AI use cases in immunology, rare disease modelling, and drug delivery

Objective: Position Serbia not just as a consumer of oncology AI, but as a co-developer and global partner



Final Message - Research Without Borders

We don’t need more data. We need more connection.

Translational oncology requires:

-Shared purpose across institutions

-AI tools that are co-designed for use-case purposes, not copy-pasted

-Platforms that respect institutional differences but enable common learning

Let’s move from bordered science to bridged ecosystems