

# Analýza biomedicínských obrazových dat

pomocí umělé inteligence a strojového učení  
v rámci infrastruktury Czech-BioImaging

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Spolufinancováno  
Evropskou unií



MINISTERSTVO ŠKOLSTVÍ,  
MLÁDEŽE A TĚLOVÝCHOVY

MUNI  
ICS

# Centre for Biomedical Image Analysis (CBIA)

- **Research**

- **Primarily: Development and benchmarking of algorithms for the analysis and synthesis of biomedical image data**
- **Secondarily: Employment of computers in the optimization and automation of biomedical image acquisition process**
- **Applications: prevention, diagnostics and therapy in oncology - describing the spatiotemporal behavior of cancer cells / tumor tissues under various conditions**
- **Main partial goals: Developing reliable and ideally automatic detection, segmentation, classification, tracking and quantification algorithms**
- **Approach: Combining machine learning and traditional image analysis approaches + developing algorithm/data/annotation quality evaluation workflows**

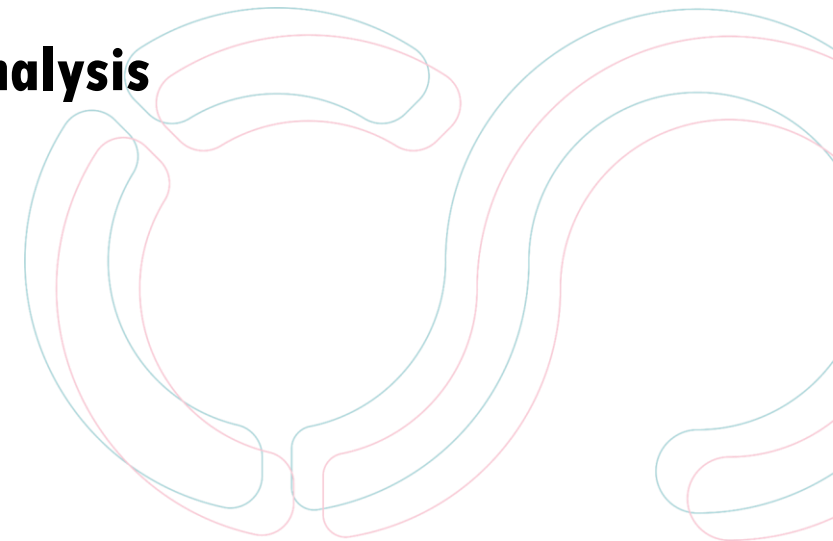
# Centre for Biomedical Image Analysis (CBIA)

- **Education**

- **Study Program Visual Computing / Study Field Image Processing**
- **B.Sc., M.Sc., Ph.D. theses in image processing  
(some of them in collaboration with companies)**
- **Courses / Tutorials / Summer Schools in Biomedical Image Analysis**

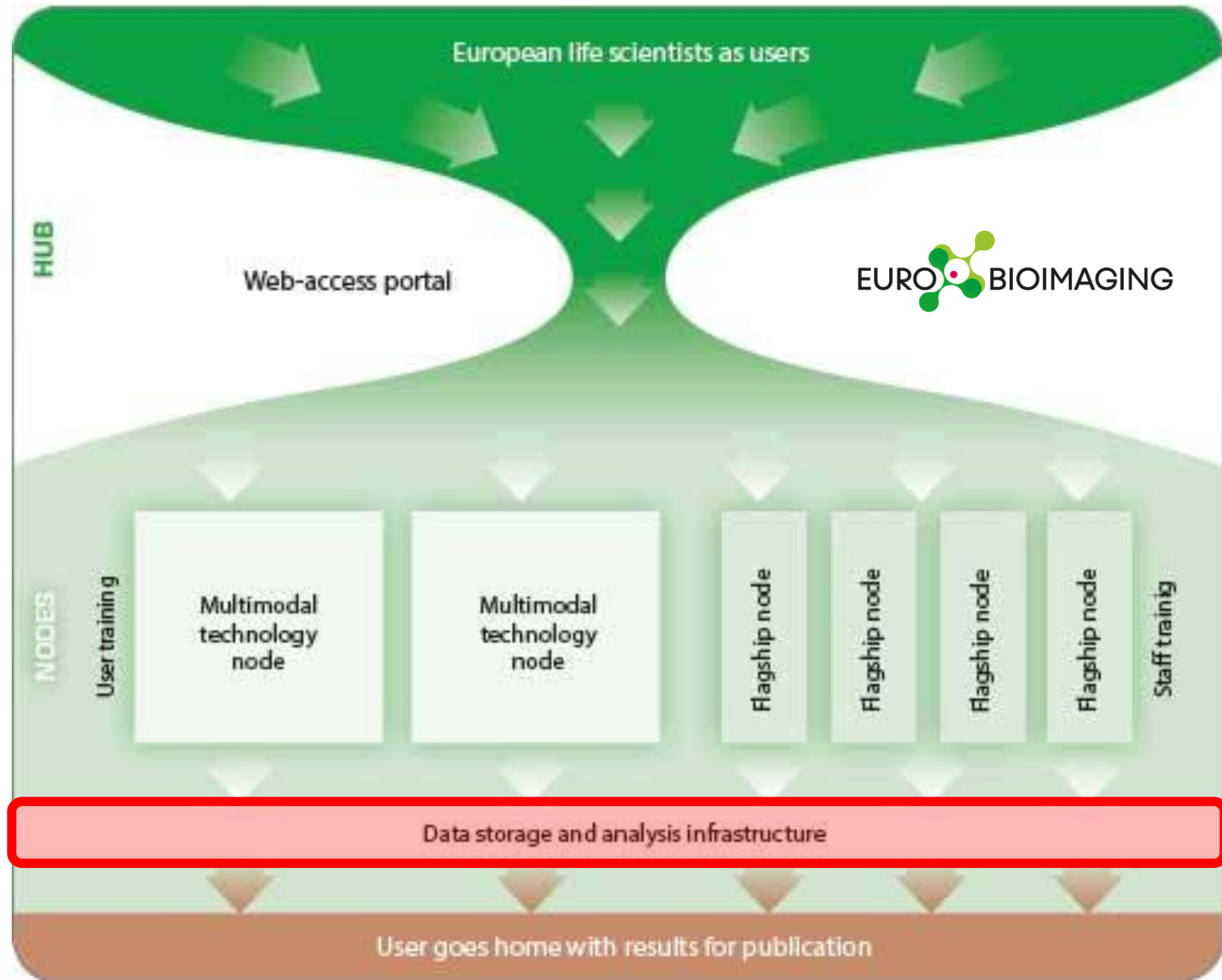
- **Services**

- **Providing biomedical image analysis services  
to biologists / medical doctors**
- **Part of the large research infrastructure:  
Czech-Biolmaging / Euro-Biolmaging network (since 2016)**



# Euro-BioImaging

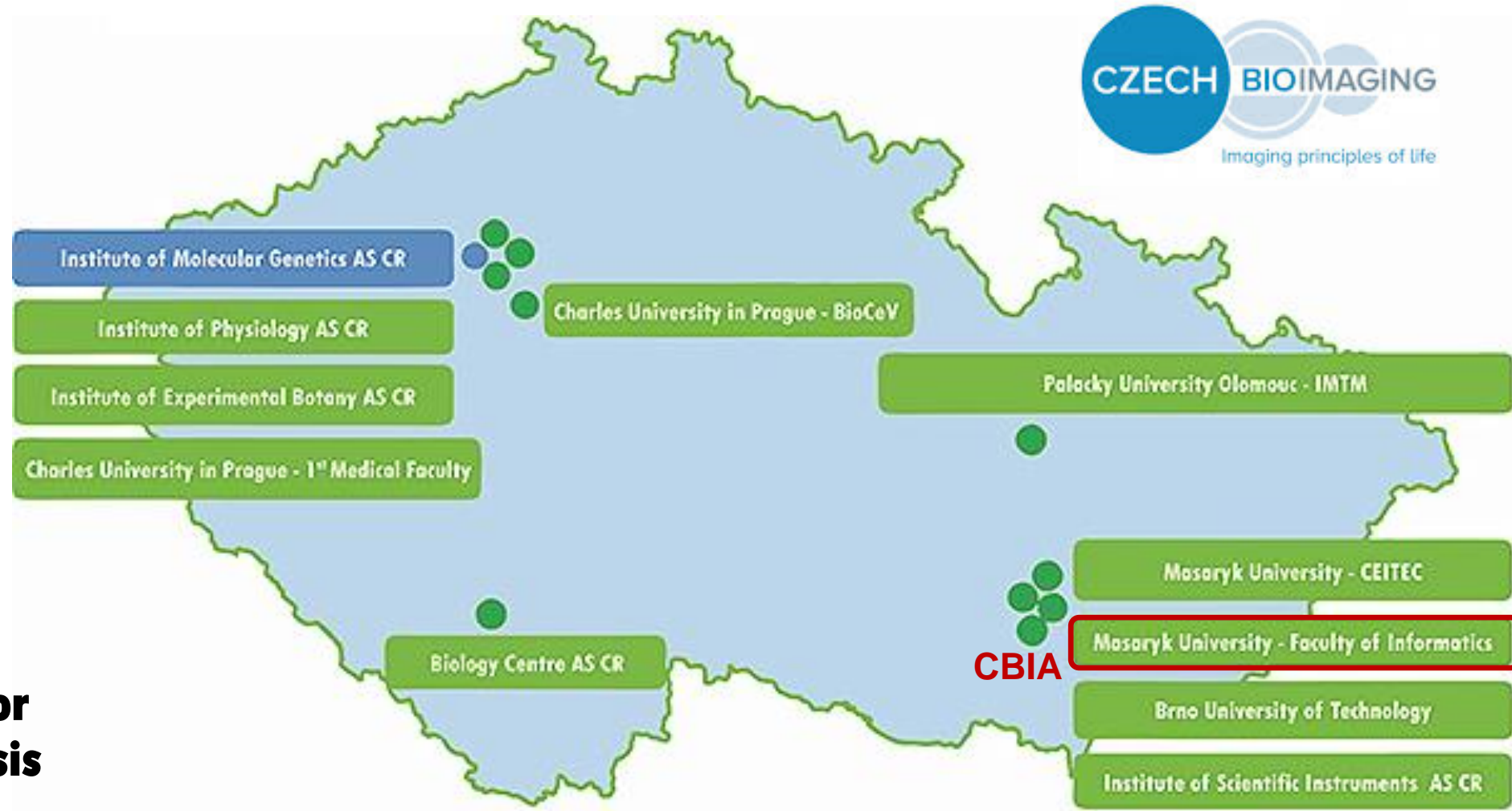
- **Main Concept**



# Czech-BioImaging

- **Partners**

- **CBIA: Responsible for data storage/analysis**



## EU Project TEF-Health

### Partners

#### GERMANY

Berlin	<b>CHARITÉ</b> , BPWT, VdTÜV, KI Park
Braunschweig	PTB
Erlangen	FAU
Heidelberg	EIT H SI GmbH
München	TUM, FHG, EIT HEALTH EV

#### BELGIUM

Charleroi	<b>ISPPC</b> , CETIC, BIOWIN
Liège	WSL
Mol	VITO
Mons	MULTITEL
Namur	UNamur, POLEM

#### FRANCE

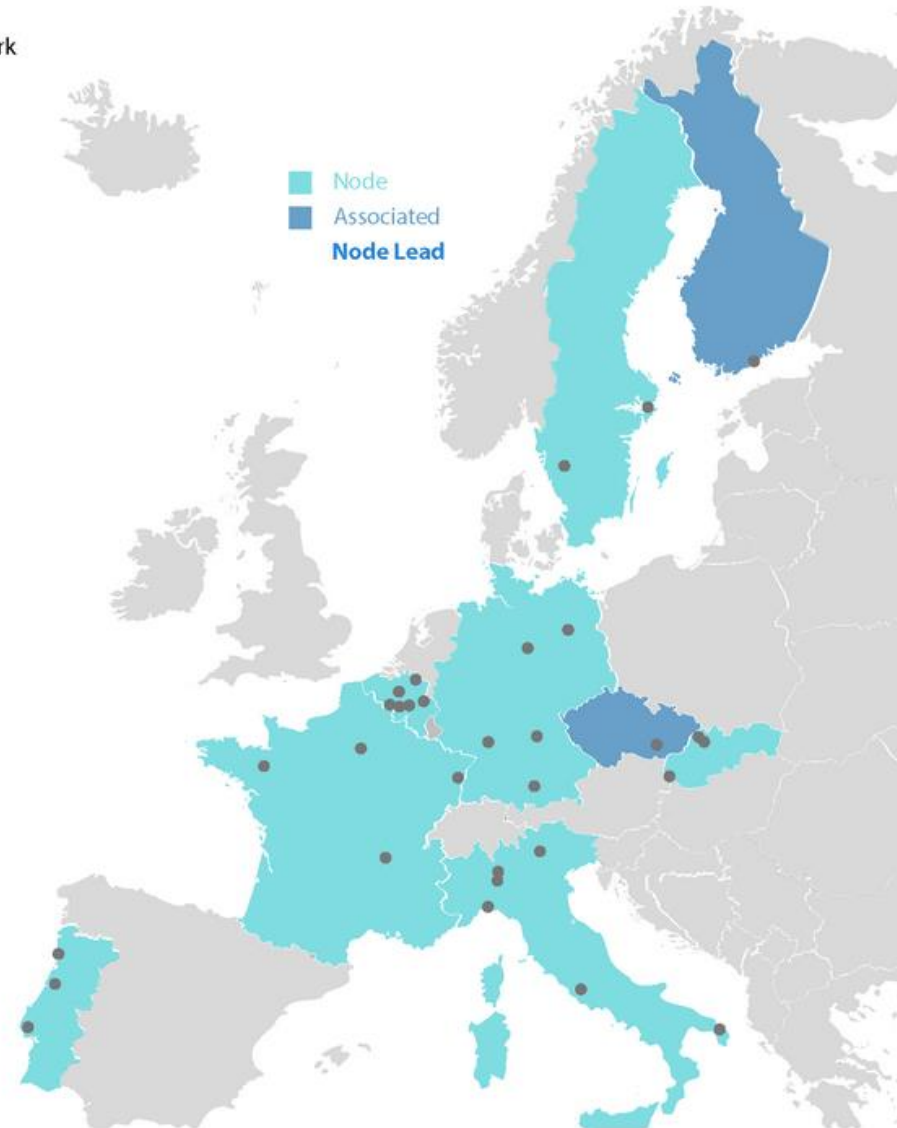
Grenoble	CHUGA, UGA
Lyon	HCL
Paris	<b>LNE</b> , CEA, EIT Health Fr, HDH
Rennes	CHU RENNES
Strasbourg	IHUS

#### ITALY

Genova	IGG, IIT
Lecce	INNOVAAL
Milano	POLIMI
Pavia	UNIPV
Povo	FBK
Roma	<b>ISS</b>

#### PORTUGAL

Coimbra	<b>IPN</b> , CHUC EPE
Lisboa	SPMS, InnoStars
Porto	CHSJ, HCP



#### CZECHIA

BRNO	<b>MU</b>	<b>CBIA</b>
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#### FINLAND

Helsinki	<b>HUS</b> , METROPOLIA, HELSINGFORS
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#### SLOVAKIA

Bratislava	UK BA, STUBA
Martin	<b>UHM</b>
Zilina	UNIZA

#### SWEDEN

Boras	RISE
Stockholm	<b>KI</b>

#### PAN-UE

Brussels	EBRAINS
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AI Alignment, Safety and Trust Standards & Quality Control Certification & Testing Education & dissemination

EU co-funding from 1/2023

December 10, 2024

<https://www.tefhealth.eu/>

# Centre for AI in Oncology

- **Partners**



**MO**  
Masaryk Memorial  
Cancer Institute



**FAKULTNÍ  
NEMOCNICE  
BRNO**



**FAKULTNÍ  
NEMOCNICE  
U SV. ANNY  
V BRNĚ**



**DCB**  
Actuaries and Consultants



**B | R | N | O**

**Coordinator Link to large research infrastructures**



**CBIA**  
CENTRE FOR BIOMEDICAL  
IMAGE ANALYSIS



**CZECH BIOIMAGING**  
Imaging principles of life

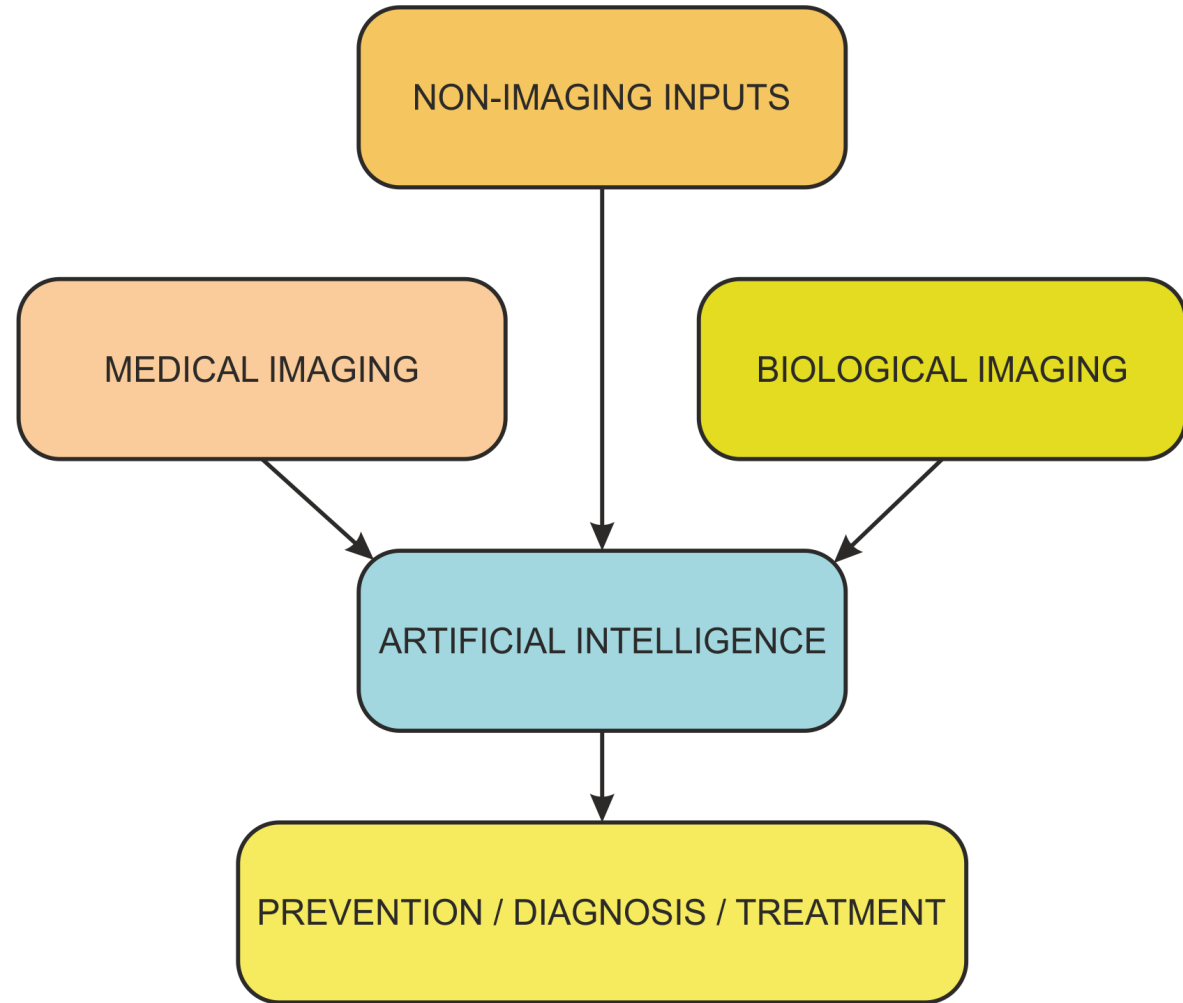
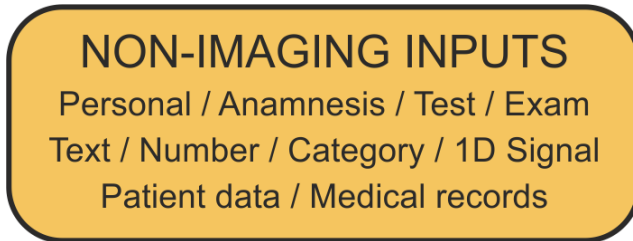


**BBMRI.cz**



# Centre for AI in Oncology

- **Concept / Inputs**
- **Added value by joining**
  - **Medical imaging**
  - **Biological imaging**
  - **Non-imaging inputs**





# Centre for AI in Oncology

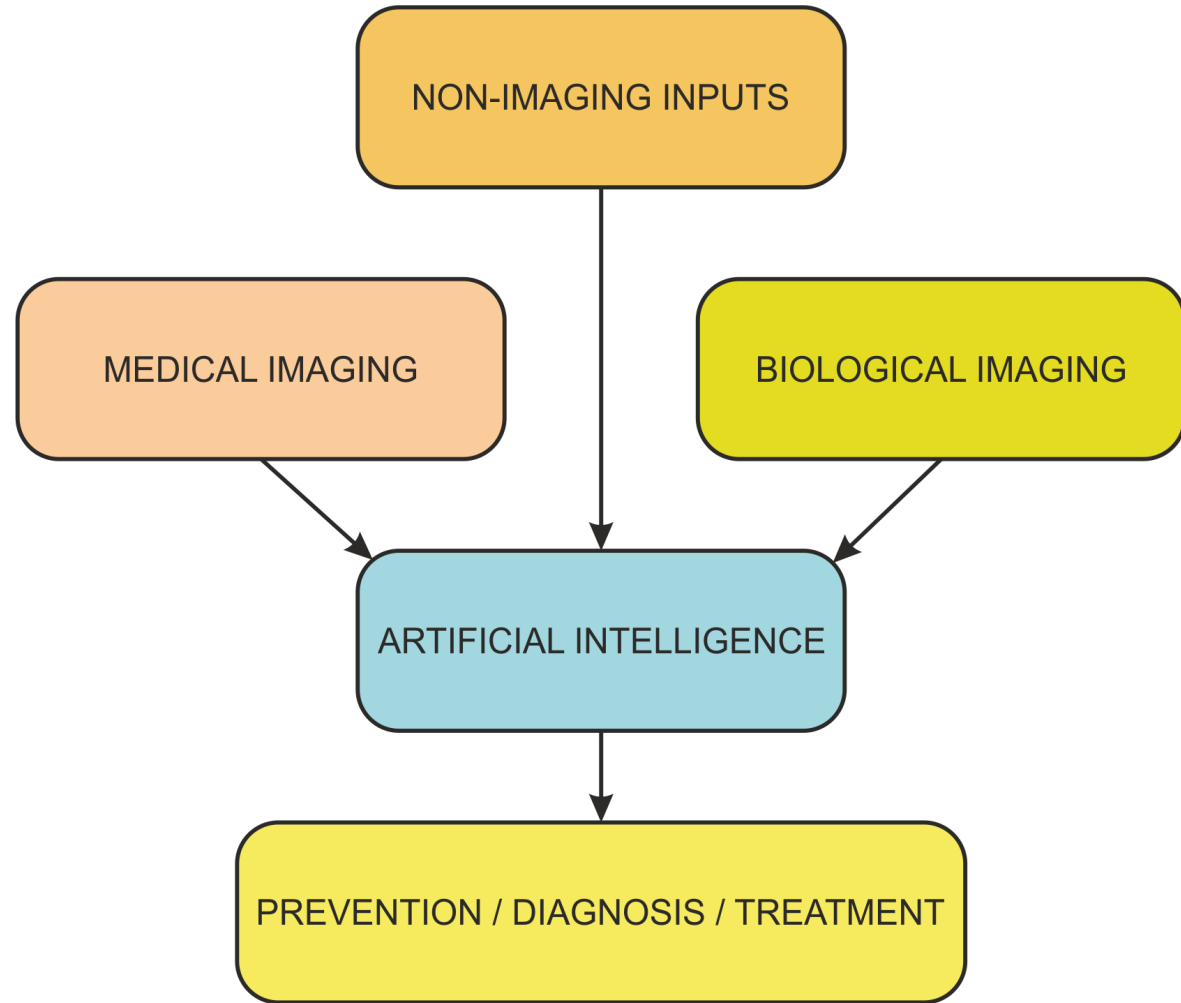
- **Outputs**
- **What is it good for**
  - **Complex analyses**
  - **General findings / know-how**
  - **Basis for decisions**
  - **Personalized care**

PREVENTION / DIAGNOSIS / TREATMENT

Personalized patient care

Predisposition / Cancer type / Grade / Response

Recommendations / Therapy options / Expectations



# Centre for AI in Oncology

## • Three Pillars of Biomedical Imaging: Breaking Down Barriers



**Physician**



**Computer Scientist**



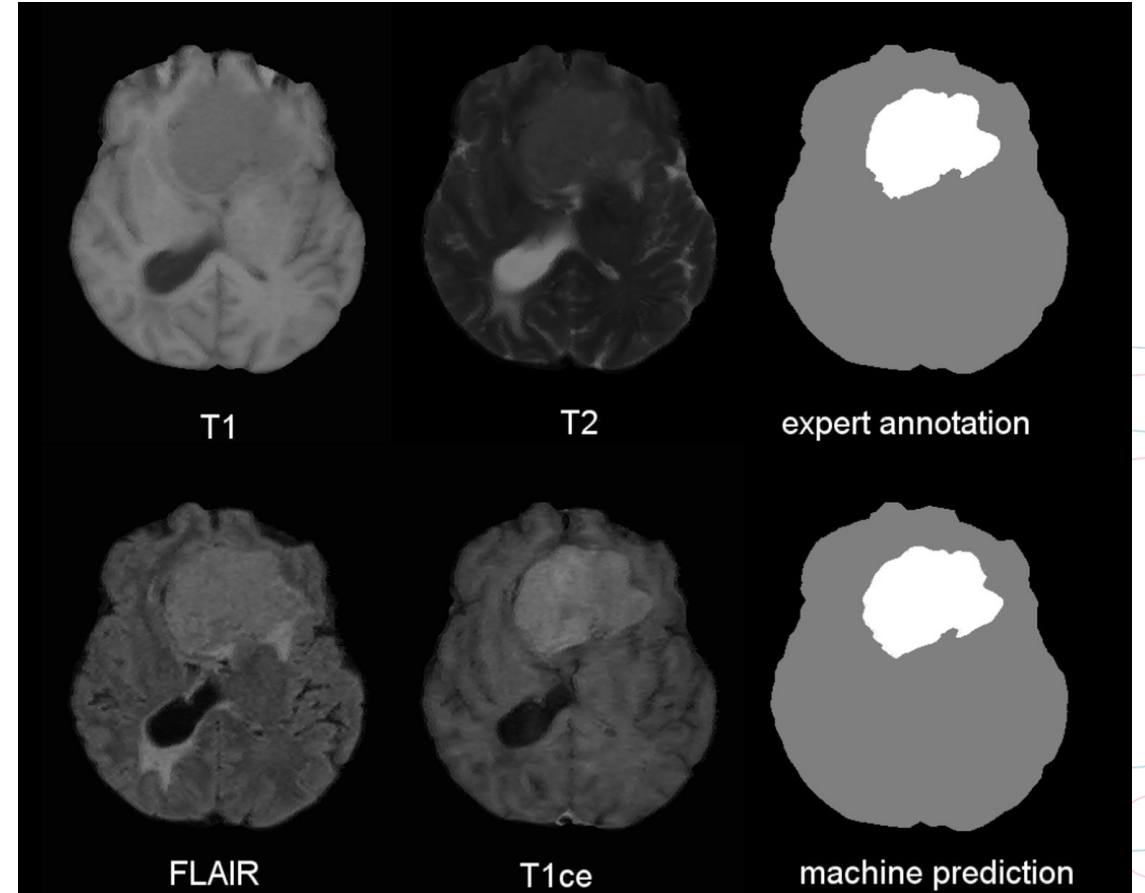
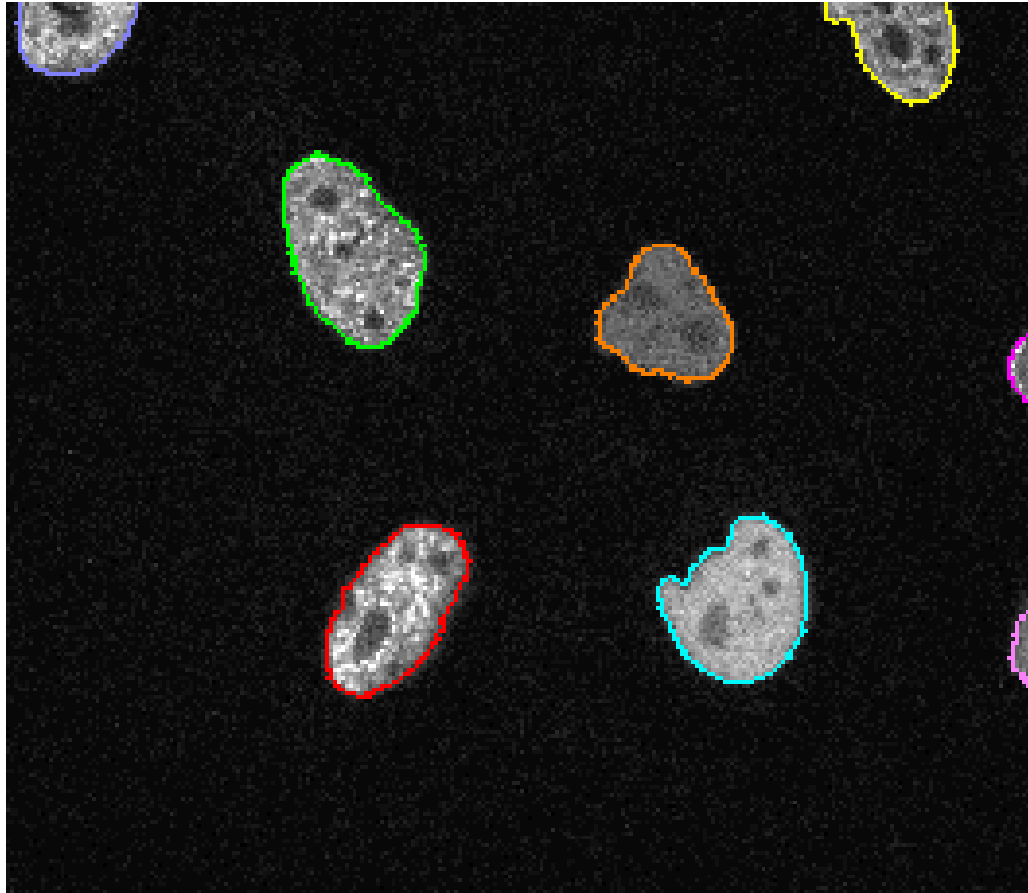
**Biologist**

<https://all-free-download.com>

- Barriers:**
- Language**
    - technical terms
  - Legal**
    - sensitive data
  - Technical**
    - data transfer and storage
  - Time**
    - experts too busy
  - Motivation**
    - why to change status quo

# Centre for AI in Oncology

- **Examples of biological (cell) and medical (brain) image analysis tasks**



# Centre for AI in Oncology

- **Example of 3D organoid segmentation and visualization**

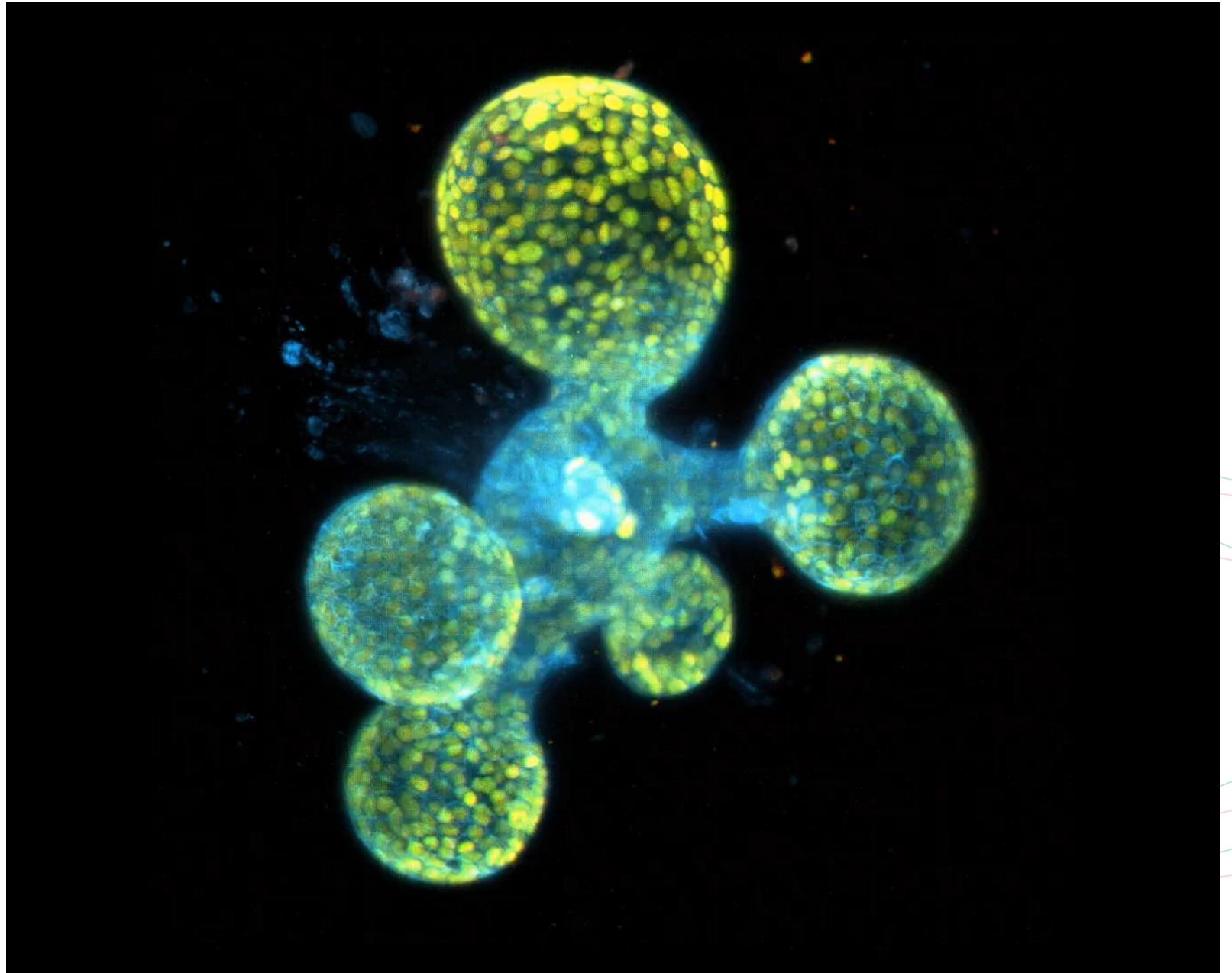
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**December 10, 2024**



# EOSC Open Science I + II Projects

- **OS I: One of the four pilot repositories: Biological Imaging (in collaboration with Czech-BioImaging)**
- **OS II BHF+SENSI: Medical Imaging Repository (in collaboration with Czech-BioImaging)**
- **OS II BHF+SENSI: Tools/Services for both Bio and Med Repositories**
- **OS II AI: Support of AI-based Image Analysis/Synthesis/Benchmarking for both Bio and Med Repositories (ideally incl. testbed/sandbox support)**

# Děkuji za pozornost

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<https://cbia.fi.muni.cz>



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CENTRUM