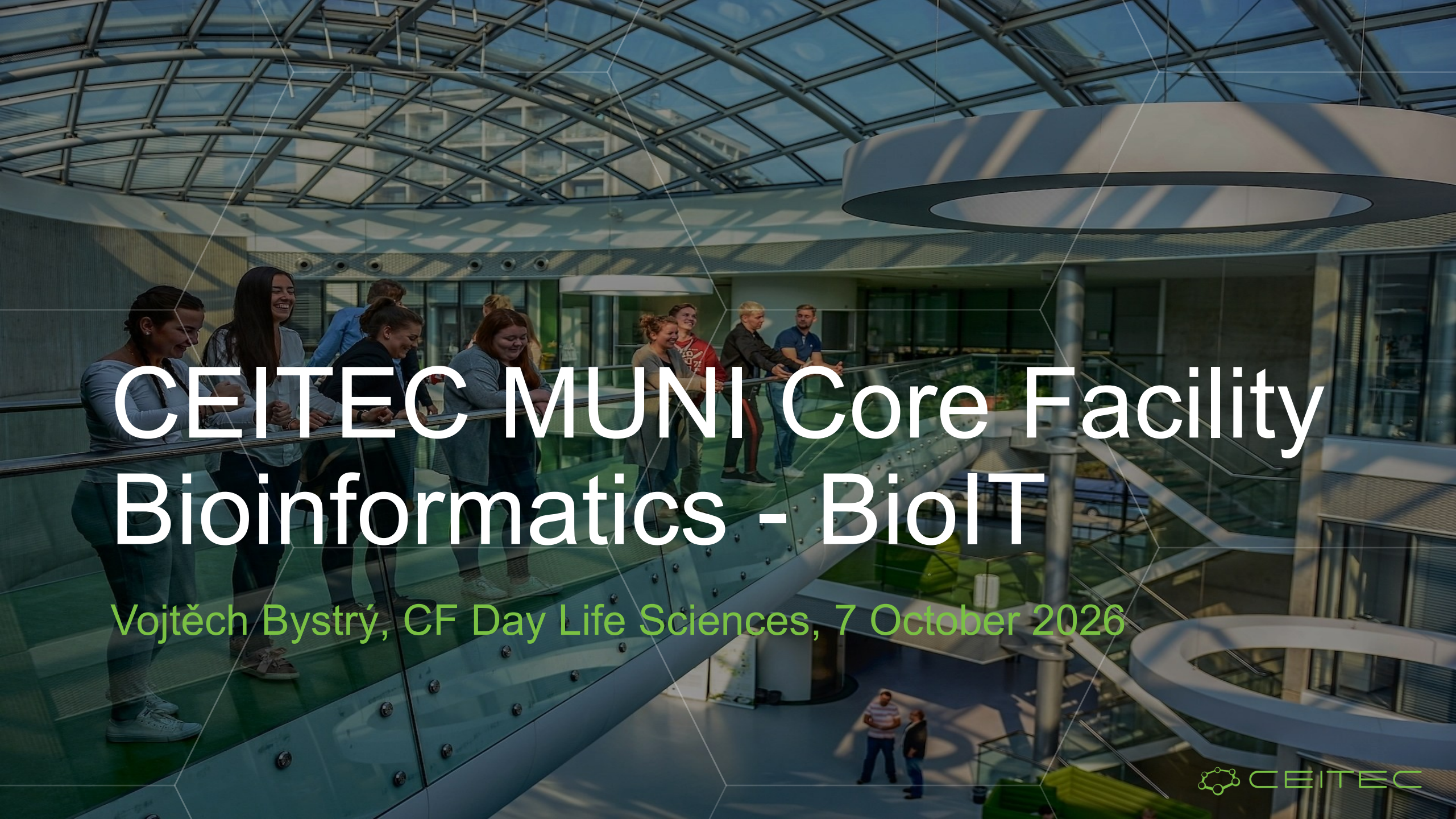
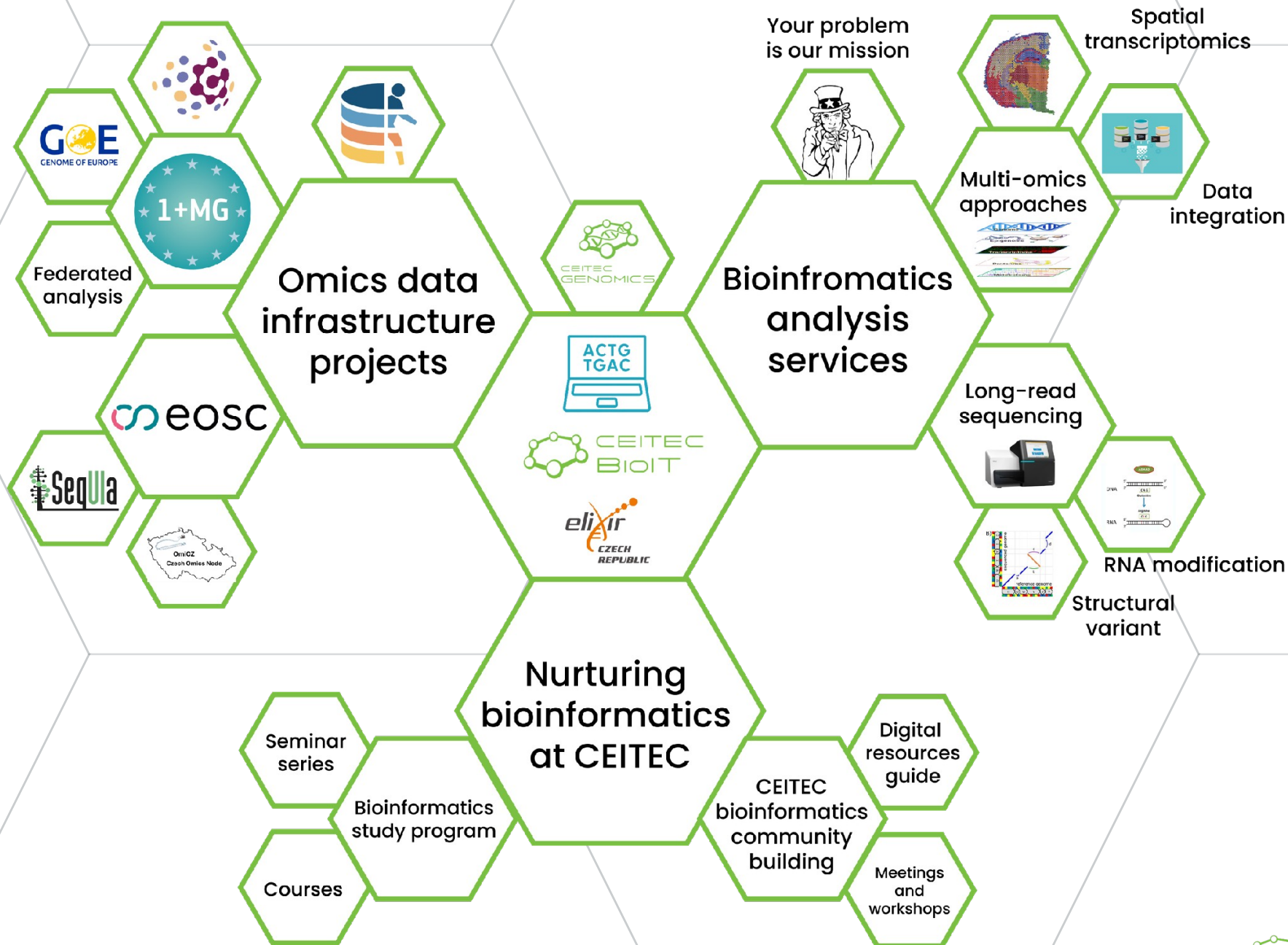




CEITEC MUNI Core Facility Bioinformatics - BioIT

Vojtěch Bystrý, CF Day Life Sciences, 7 October 2026



Nurturing bioinformatics at CEITEC

Seminar
series

Bioinformatics
study program

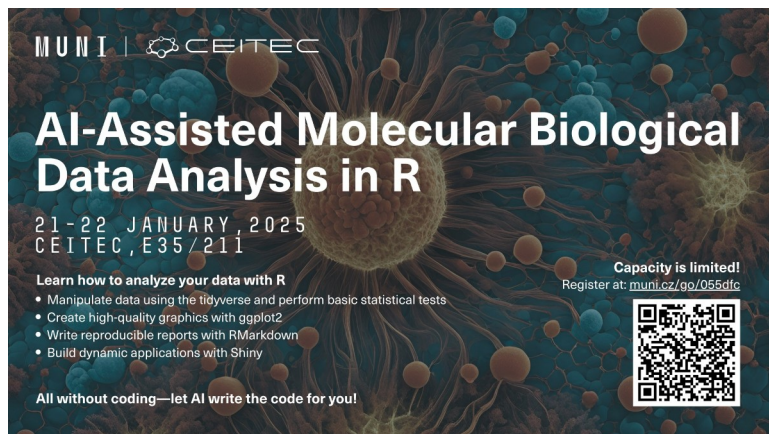
Courses

CEITEC
bioinformatics
community
building

Digital
resources
guide

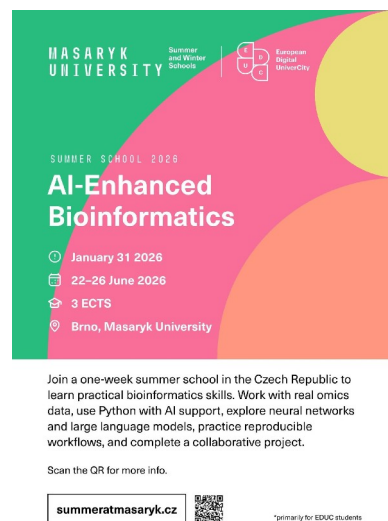
Meetings
and
workshops

AI in bioinformatics teaching



AI-Assisted Molecular Biological Data Analysis in R

CEITEC workshop, run 3× (2024–2025), ~30 participants each



AI-Enhanced Bioinformatics

EDUC Summer School, June 2026 – agentic AI for data analysis



C3790

AI-Assisted Bioinformatics Data Analysis in R

regular MUNI course

From one-off workshop to a standard part of the curriculum

CEITEC bioinformatics community

March

Inaugural meeting

Gathering information about needs, tools and computing resources across groups; agentic AI for data analysis

June

2nd meeting

Draft onboarding manual and project-organisation standard; data-organisation good practice

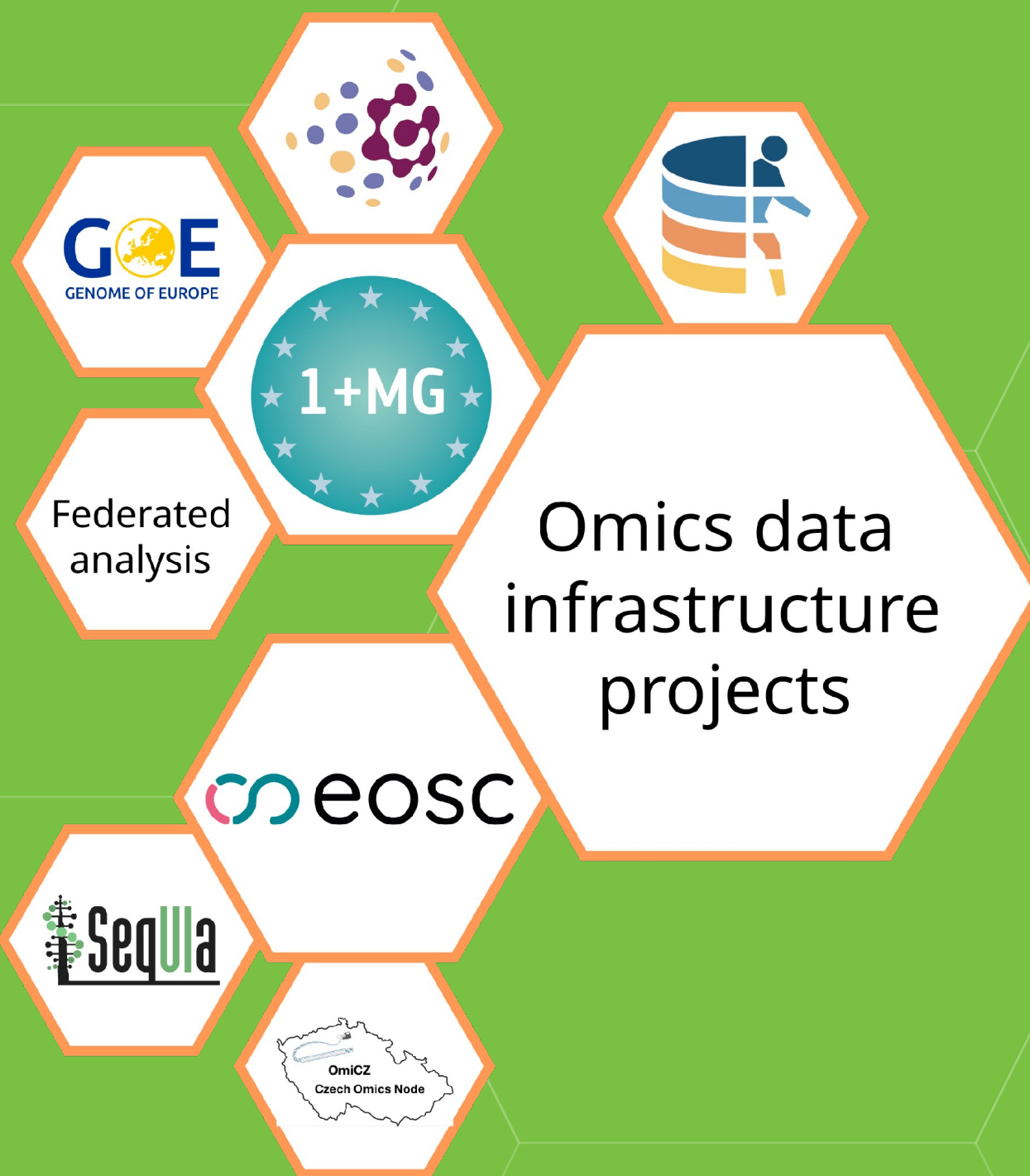
Ongoing

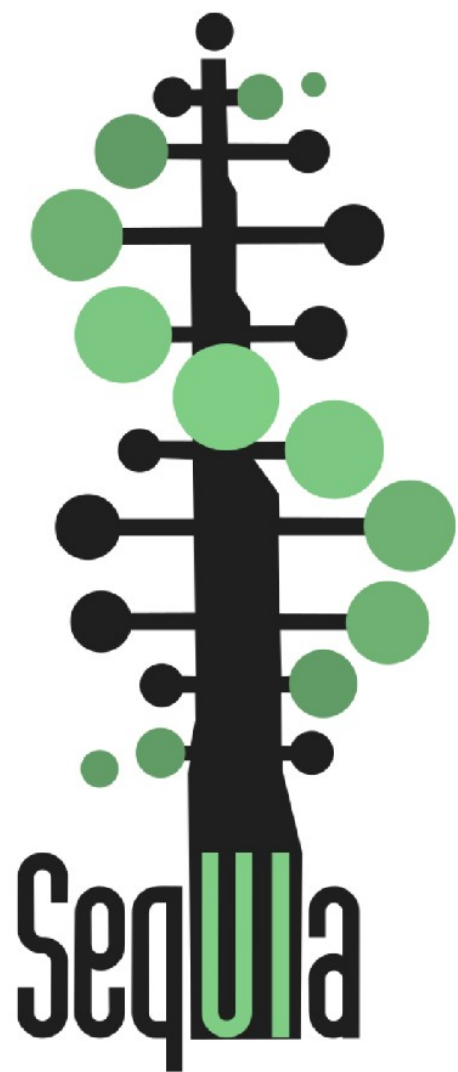
Shared resources

Guide to digital resources: MetaCentrum, CERIT Kubernetes, e-INFRA LLMs, MU and ELIXIR storage

Participants from Molecular Medicine, Plant Sciences, Neuroscience groups and core facilities

Next: regular meetings, forum, final manuals





Sequencing User Interface analytics

... your solution for genomic sequencing analysis

Software platform for GUI based next generation sequencing
data analysis



CEITEC



APPS DEV TEAM



CEITEC

OmiCZ – Czech Omics Node

European genomic data



National repository for omics data

Funded by OP JAK Open Science II · part of the ELIXIR CZ Human Data area

Open science



National Czech Programme



+ other research infrastructures



OmiCZ – scope

Application domains

- Molecular medicine – clinical diagnostics, precision medicine
- Agricultural & plant sciences
- Environmental studies

Data types

Sequencing

genomics, transcriptomics, epigenomics

Mass spectrometry

proteomics, metabolomics

First use case

Clinical diagnostic labs

- Direct deposition from sequencers
- Automated processing
- Interactive visualisation
- Controlled data access

GENERAL

Dashboard

Acquisition Runs

Transfer Queue

CONFIGURATION

Inst. Models

Instruments

SYSTEM

Containers

Logs

Settings

Changelog

Support

Dashboard

Gateway for pushing instrument data to S3

DATA ACQUISITION

28

active runs

ACQUISITION COMPLETE

39

awaiting upload

TRANSFER WORKFLOW

0

transferring / validating

FAILED

16

need attention

TRANSFER COMPLETE

40

transfer to tre

INSTRUMENTS

1/8

active

Acquisition Runs Status

Distribution across all runs



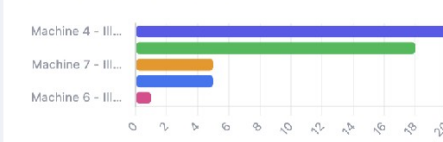
Activity

Runs created — last 14 days



By Instrument

Recent runs per instrument (last 50)



Recent Acquisition Runs

View all

RUN-00021
machine-1-shared

Transfer Complete

RUN-00020
machine-1-shared

Data Transfer Failed

RUN-00018
machine-1-shared

Data Acquisition

RUN-00017
machine-1-shared

Data Transfer Failed

RUN-00016
machine-1-shared

Data Acquisition

RUN-00015
machine-1-shared

Transfer Complete

Quick Links

All Acquisition Runs

Transfer Workflow

Transfer Queue

Transfer Workflow

Instruments

Config

Settings

System

Logs

System

16 runs need attention

Click to review and retry





European Genomic Data Infrastructure



GENERAL

Home

Datasets

My Requests

Dark mode

Support

MP Dr. Martin Proch...
Requester

Select dataset Dataset & workflow Request details **4 Submitted** 5 Contract 6 Get your passport

Access request Submitted

Czech PILOT Aggregated Allelic Frequencies - Requested by Dr. Martin Procházka

Waiting for a decision

Your request has been submitted to the dataset's committee. It moves on only once *every* member has decided — if all approve you'll get the contract, if anyone asks for changes you can edit and resubmit, and if anyone rejects it, it's closed. No action is needed from you right now.

2 of 3 committee members have decided so far — see below.

Committee decisions

2 of 3 decided · round 3

Waiting for 1 more member. The request only moves on once all of them have decided.

Dr. Alireza Dantism
Hasn't decided yet

Prof. Tomáš Dvořák
Approved · 9/28/2026, 1:23:32 PM

Dr. Eva Horáková
Approved · 9/28/2026, 1:24:31 PM

REQUEST DETAILS

Dataset Czech PILOT Aggregated Allelic Frequencies

Workflow Allele Frequency Query

Access window 9/28/2026 → 11/5/2026

ANSWERS

37 of 47 answered

YOUR REQUEST

Purpose

This is my Purpose ...

Variants or regions

Variants or regions *

Variants or regions *

Variants or regions *

Genome build GRCh38

Minimum allele count 43



Your problem
is our mission

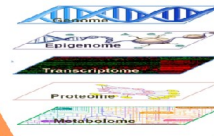


Spatial
transcriptomics



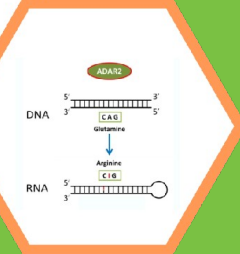
Data
integration

Multi-omics
approaches

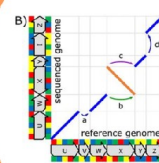


Bioinformatics
analysis
services

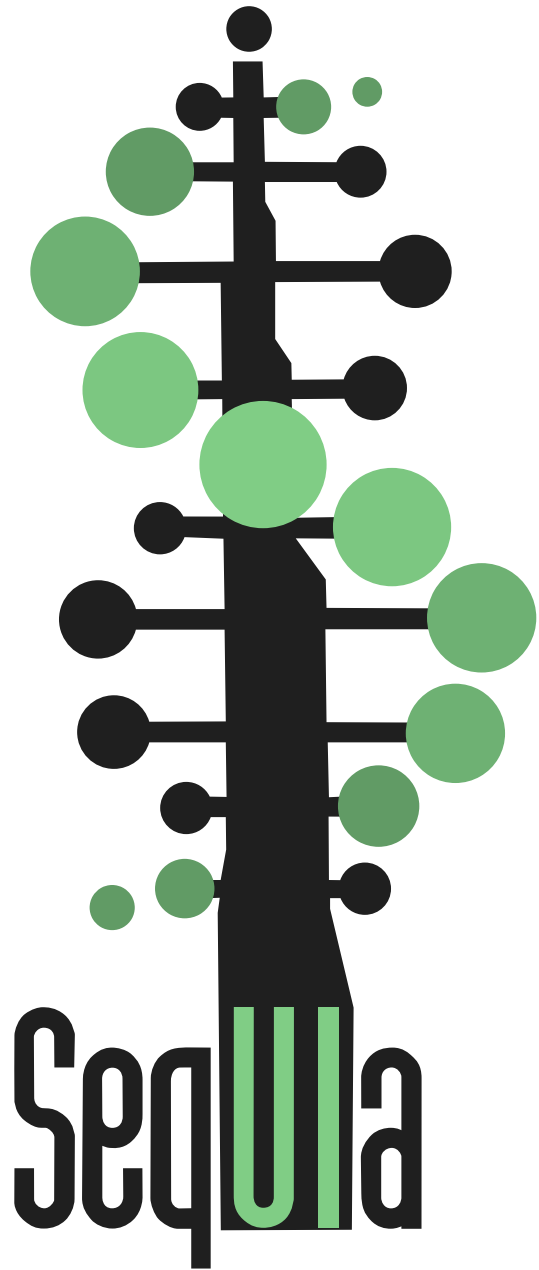
Long-read
sequencing



RNA modification



Structural
variant



new sequencers data processing



Bioinformatics

Issues Advance articles Submit ▼ Alerts About ▼

JOURNAL ARTICLE

SeqUIaSCOPE: multi-omics data integration platform for single-patient clinical oncology pathway exploration

[Kateřina Jurásková](#) ✉, [Petra Pokorná](#), [Kristián Kováč](#), [Nicolas Blavet](#), [Anna Molíková](#), [Martin Demko](#), [Vojtěch Bystrý](#)

Bioinformatics, Volume 42, Issue 9, September 2026, btag630,

<https://doi.org/10.1093/bioinformatics/btag630>

Published: 20 August 2026 **Article history** ▼

PUDU – microbiome profiling for everyone

PUDU (Pipeline for Universal Diversity Unveiling): an accessible end-to-end workflow for taxonomic profiling and ecological visualization of environmental microbiomes across amplicon, shotgun, and long-read sequencing

Medaglia-Mata A, Rojas-Rodríguez P, Bystrý V, et al. Frontiers in Bioinformatics 6 (2026) · doi:10.3389/fbinf.2026.1909327

One pipeline, three data types

- 16S amplicon (short-read)
- Shotgun metagenomics
- Full-length 16S long reads

Built for users without bioinformatics support

- Snakemake + Conda, one YAML config
- Runs on a standard workstation or HPC
- PUDUVisR Shiny app for diversity analysis

github.com/amedagliamata/PUDU_pipeline

Results: high-impact collaborations

60

papers acknowledging the CF
2022–2025

27

papers co-authored by CF staff
2022–2025

Molecular Cancer

- Thyroid hormone receptor beta signaling is a targetable driver of prostate cancer growth
Fesiuk et al., Mol Cancer 2025
- Cell-autonomous IL6ST activation suppresses prostate cancer development via STAT3/ARF/p53-driven senescence
Sternberg et al., Mol Cancer 2024
- JUN mediates the senescence associated secretory phenotype and immune cell recruitment to prevent prostate cancer progression
Redmer et al., Mol Cancer 2024
- KMT2C methyltransferase domain regulated INK4A expression suppresses prostate cancer metastasis
Limberger et al., Mol Cancer 2022



ceitec_brno



CEITEC_Brno



CEITEC



CEITEC -
Central European
Institute of Technology

Thank you for your attention! Questions?

core.facility@ceitec.muni.cz

ceitec.eu/core-facilities/

MUNI
SPORT

MUNI SPORT Lab(s)

Faculty of Sports Studies



Laboratory of Sport Performance Analysis

- 🔗 The primary research interests in our laboratories are to determine:
 - 🔗 the limits of the acute responses and chronic adaptations to exercise.
 - 🔗 variety of physiological systems and fitness parameters.
 - 🔗 person's cardiovascular, respiratory, and metabolic responses to physical activity as well as assess an individual's balance, flexibility, and power.
- 🔗 The overall aims of our focus are to investigate determinants of:
 - 🔗 sports performance at elite and recreational level
 - 🔗 health effects of exercise on human body



Laboratory of Exercise Physiology



- portable high resolution spiroergometry system with Breath-by-Breath technology.
- The system allows a complete medical analysis of the functionality of a person's lung, heart and metabolism at rest and under stress.

Laboratory of Muscle Strength Assessment

- 🔗 measuring and improving human performance in the clinic, athletic training room, and research laboratory.
- 🔗 4 resistance modes (isokinetic, isotonic, isometric, and passive), and numerous reports to meet the measurement and exercise needs of today's clinicians and researchers.
- 🔗 includes isolated patterns covering the shoulder, elbow, wrist, hip, knee, ankle, and back.



Laboratory of Motion Analysis



- Force plates can be used to characterise biomechanical processes such as walking, running or jumping, for example, for performance diagnostics in sport, for clinical analyses or in research.
- Force plates contains piezoelectric sensors that measure the forces in the three main axes: the vertical, the horizontal and the transverse direction.
- To answer specific questions in research or to analyse the movement of the centre of mass.*

Laboratory of Bone Densitometry and Body Composition Analysis

- high accuracy and precision, the DXA whole body scan is a more comprehensive way to measure body composition than methods like calipers, hydrostatic weighing, Bioelectrical Impedance Analysis (BIA), or Bod Pod
- f.e. Bone mineral density in elite athletes: the effect of body composition and long-term exercise



Laboratory of Physical Therapy



- evaluation the physiological and pathological movement of an individual based on a kinesiological analysis.
- The laboratory serves both - for teaching practical seminars and also for research.
- Our students and researchers use this lab to measure data for their final Theses or larger research projects.

Laboratory of Sport Performance Analysis

🕒 Increase performance

- 🕒 Adapt training based on test results and strengthen the “weak” spots
- 🕒 Plan individual recovery phases when needed
- 🕒 Select the fittest athletes for the next game
- 🕒 Set references and benchmarks

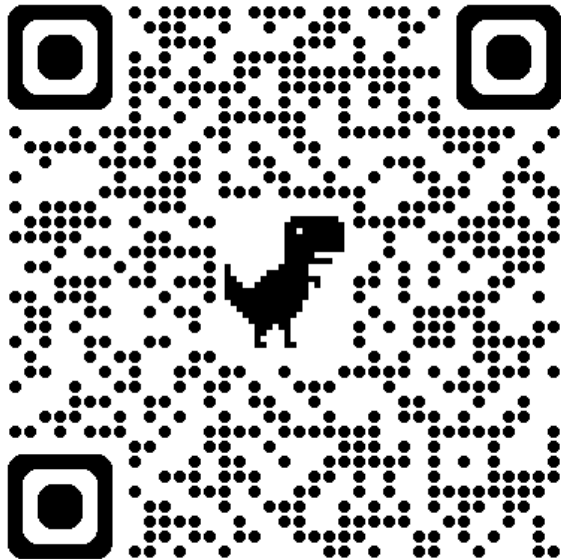
🕒 Prevent injuries

- 🕒 Prevent injuries by monitoring performance
- 🕒 Adapt rehabilitation based on test results
- 🕒 Make fast and safe return-to-play decisions by comparing test results to the former level or a reference.
- 🕒 Establish successful rehab concepts to reduce costs of rehabilitation for your valuable assets

Contacts

- Commercial offer to the public:

 <https://www.fsps.muni.cz/sportlab>



- Mgr. Tomáš Kalina, Ph.D.

- Head of MUNI SPORT Lab

- tkalina@fsps.muni.cz

- lab@fsps.muni.cz

- Mgr. Ivan Struhár, Ph.D.

- Vice-dean for strategy and development FSpS MU

- struhar@fsps.muni.cz



CEITEC MUNI Core Facility MAFIL – Multimodal and Functional Imaging Laboratory

Michal Mikl, CF Day Life Sciences, 7 October 2026

MAFIL overview

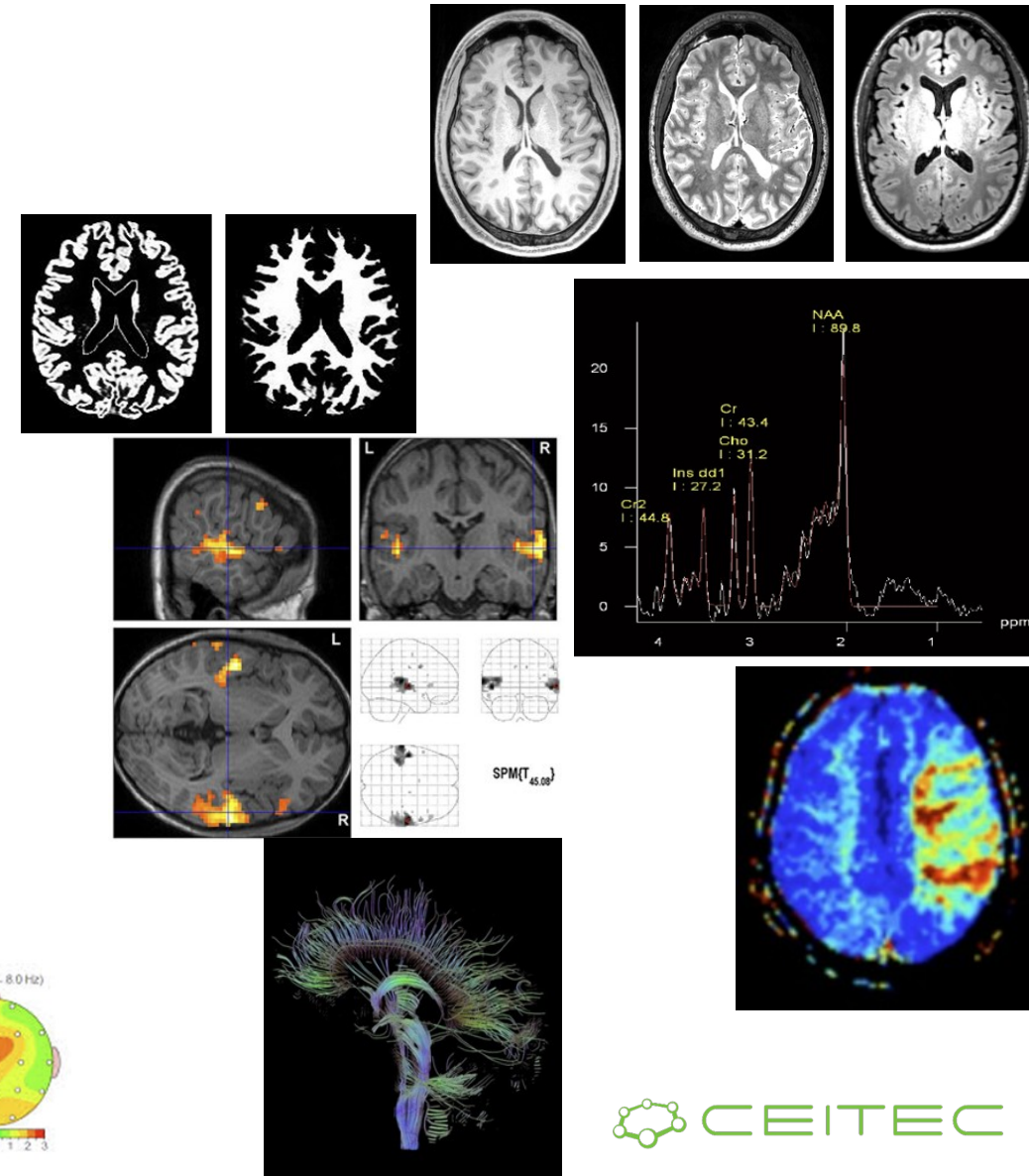
Overview and equipment

- Focused on human medical imaging (mainly neuroscience)
- Magnetic Resonance Imaging and Spectroscopy
 - Two 3T MR scanners
 - Specific equipment for fMRI studies
 - Hyperscanning with simultaneous use both scanners
- Electrophysiological techniques
 - Both standalone labs and simultaneous measurements in MRI, EEG
 - Including techniques for brain stimulation

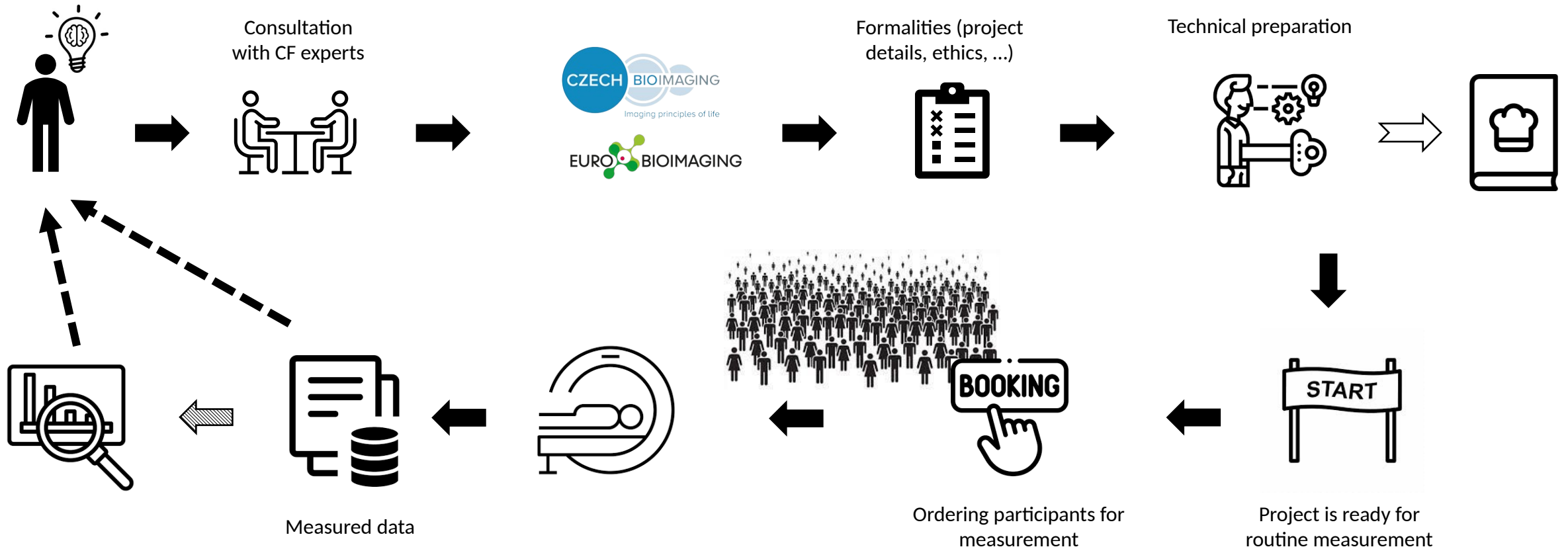


Services

- **Structural MRI images** (T1-weighted, T2-weighted, PD, T2-flair, ...)
- **Morphometric studies** (e.g. Voxel Based Morphometry - VBM)
- **MR spectroscopy**
- **fMRI** (functional Magnetic Resonance Imaging)
- **Hyperscanning** (dual fMRI with two participants in two scanners measured simultaneously)
- **Real-time fMRI neurofeedback**
- **Simultaneous EEG-fMRI**
- **Perfusion MRI and Diffusion MRI** (DTI, DKI, ...)
- **Electrophysiological recordings in RF shielded lab**



User access and project lifetime



User characteristics

- Most frequent users' scientific domains (Neuroscience – 90%, Biomedical and electrical engineering – 5%, Oncology – 3%, Other disciplines 2%)
- Users' geographic provenience: 97% from CZ (Brno, Olomouc, Hradec Kralove, Ostrava, Prague), then Slovakia, Poland, United Kingdom, Neetherland, Canada, Brazil, Spain, ...

Example of user (project) topics

Project	User and collaborating institutions	Modalities
Spatial audio processing in autism	FN Brno – Children hospital	MRI, EEG
Mnemonic distortion of social networks in the medial temporal lobe	Universitat Jaume, Spain	MRI
Systematic multimodal analysis of knee ligaments	Trauma hospital Brno	MRI
Functional imaging and neurophysiological biomarkers of cognitive and sensory deficits in multiple sclerosis	CEITEC MU + Brno hospitals	MRI, EEG, eye-tracking
A lifetime with language: the nature and ontogeny of linguistic communication	CEITEC MU	MRI, EEG, NIBS
Quantitative imaging MR parameters as course predictors non-myelopathic degenerative cervical spinal cord compression: a longitudinal study.	FN Brno	MRI
Exposure to Urban Environments: Urban Stress and Its Biomarkers	MU Recetox	MRI, EEG
Perceiving through the language lens: an interdisciplinary multimodal neuroimaging approach to the study of linguistic influences on visual perception	University of Amsterdam	MRI, EEG

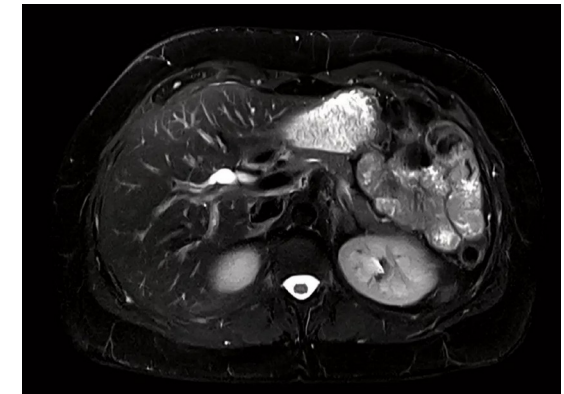
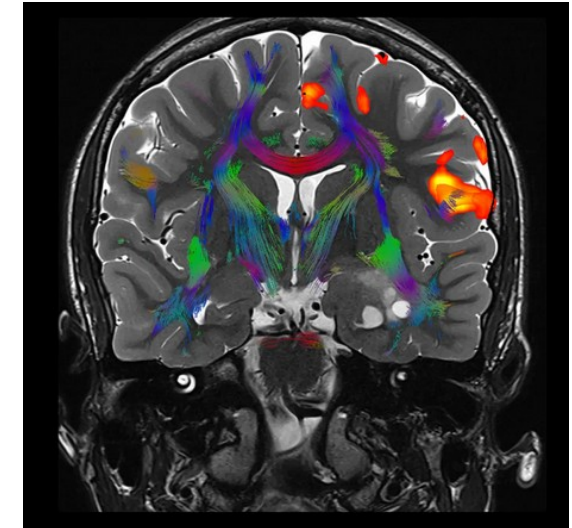
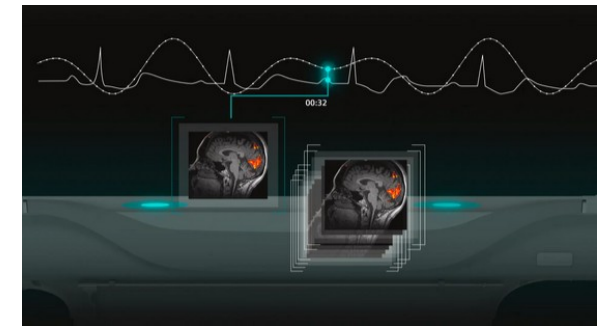
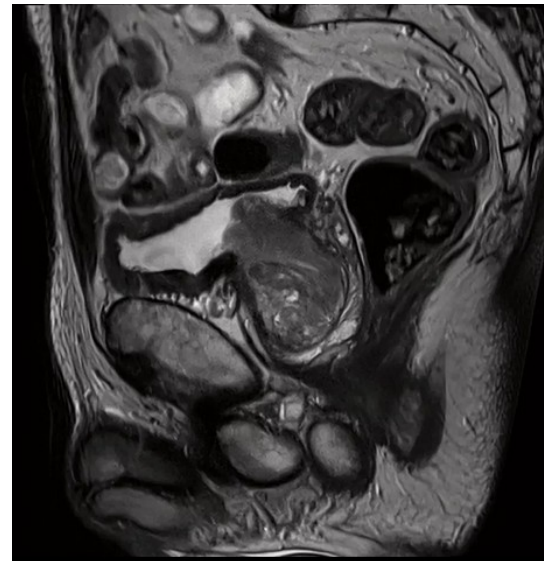
Acknowledgement text – Czech-Biolmaging

- **Preferred version:** „We acknowledge the core facility **MAFIL** supported by the Czech-Biolmaging large RI project (LM2023050 funded by MEYS CR) for their support with obtaining scientific data presented in this paper.“
- **Short version:** „We acknowledge the core facility **MAFIL** supported by MEYS CR (LM2023050 Czech-Biolmaging).“

MAFIL news

Equipment

- Upgrade of one Prisma MR scanner to Cima.X
 - New biomatrix technology (built-in sensors, improved coil sensitivity, optimized excitation, ..)
 - New gradient system and new software
 - Improved acquisition speed, data quality, pushing-up limits in DWI and other methods



Equipment

- Noninvasive brain stimulation devices
 - FUS (focused ultrasound) stimulator
 - LOOPit - system for advanced electric stimulation techniques
- MRI/fMRI equipment
 - LCD screen
 - Audio communication device
- Renewal of data storage and computational servers



Data management – FAIR and open data

- Involvement in EOSC CZ OS II
 - Building of repository MINDR-CZ for medical image and data and physiological signals
- Publication of datasets
 - Experience with existing repositories, several published neuroimaging datasets
 - Experience with data descriptor paper
- Involvement in COST Action INDoS (Improving Neuroimaging data for sharing)



Test-retest accelerated single-echo and multi-echo fMRI dataset for reliability and reproducibility assessment

Michal Miki, Petr Hlušík, Ema Marta Lorková, Martin Gajdoš, et al. (2026). Test-retest accelerated single-echo and multi-echo fMRI dataset for reliability and reproducibility assessment. OpenNeuro. [Dataset] doi: doi:10.18112/openneuro.ds008792.v1.0.1

Added: 8. 9. 2026 (25 days ago)

OpenNeuro Accession Number: **ds008792**

DATASET SIZE: **1945.98 GB**



Complex multi-echo fMRI dataset: New strategies in processing of multi-echo data

Miki Michal, Kovarova Anezka, Gajdos Martin, Marecek Radek, et al. (2025). Complex multi-echo fMRI dataset: New strategies in processing of multi-echo data. OpenNeuro. [Dataset] doi: doi:10.18112/openneuro.ds006926.v1.0.0

Added: 11. 11. 2025 (11 months ago)

OpenNeuro Accession Number: **ds006926**

DATASET SIZE: **313.99 GB**



Multi-echo simultaneous multislice fMRI dataset: Effect of acquisition parameters on fMRI data

Miki Michal, Kovarova Anezka, Gajdos Martin, Marecek Radek, et al. (2023). Multi-echo simultaneous multislice fMRI dataset: Effect of acquisition parameters on fMRI data. OpenNeuro. [Dataset] doi: doi:10.18112/openneuro.ds004499.v1.0.4

Added: 16. 2. 2023 (over 3 years ago)

OpenNeuro Accession Number: **ds004499**

DATASET SIZE: **152.67 GB**



Upcomming Events



CEITEC

MACHINE LEARNING IN PROCESSING AND ANALYSIS OF NEUROIMAGING DATA

8 October 2026

CEITEC MU, E35/145
University Campus, Brno

This workshop will introduce various applications
of machine learning for processing and/or analysis
of neuroimaging and electrophysiological data

The event is organized to coincide with the international
fMRI workshop in Olomouc, which begins on the afternoon
of the same day. Travel between Brno and Olomouc is to
be arranged individually.



MUNI | CEITEC

EDUCATIONAL COURSE NEUROIMAGING: Mapping the Function and Structure of Brain

4–6 November 2026

CEITEC Masaryk University, E35/145
University Campus, Brno

- fMRI data processing and analysis
- Electrophysiological data analysis
- Morphometric methods for functional brain mapping
- Diffusion imaging
- Animal MRI study specifics

REGISTRATION IS NOW OPEN!
muni.cz/go/51ce03



CEITEC MAFIL **EURO BIOIMAGING** **CZECH BIOIMAGING**



ceitec_brno



CEITEC_Brno



CEITEC



CEITEC -
Central European
Institute of Technology

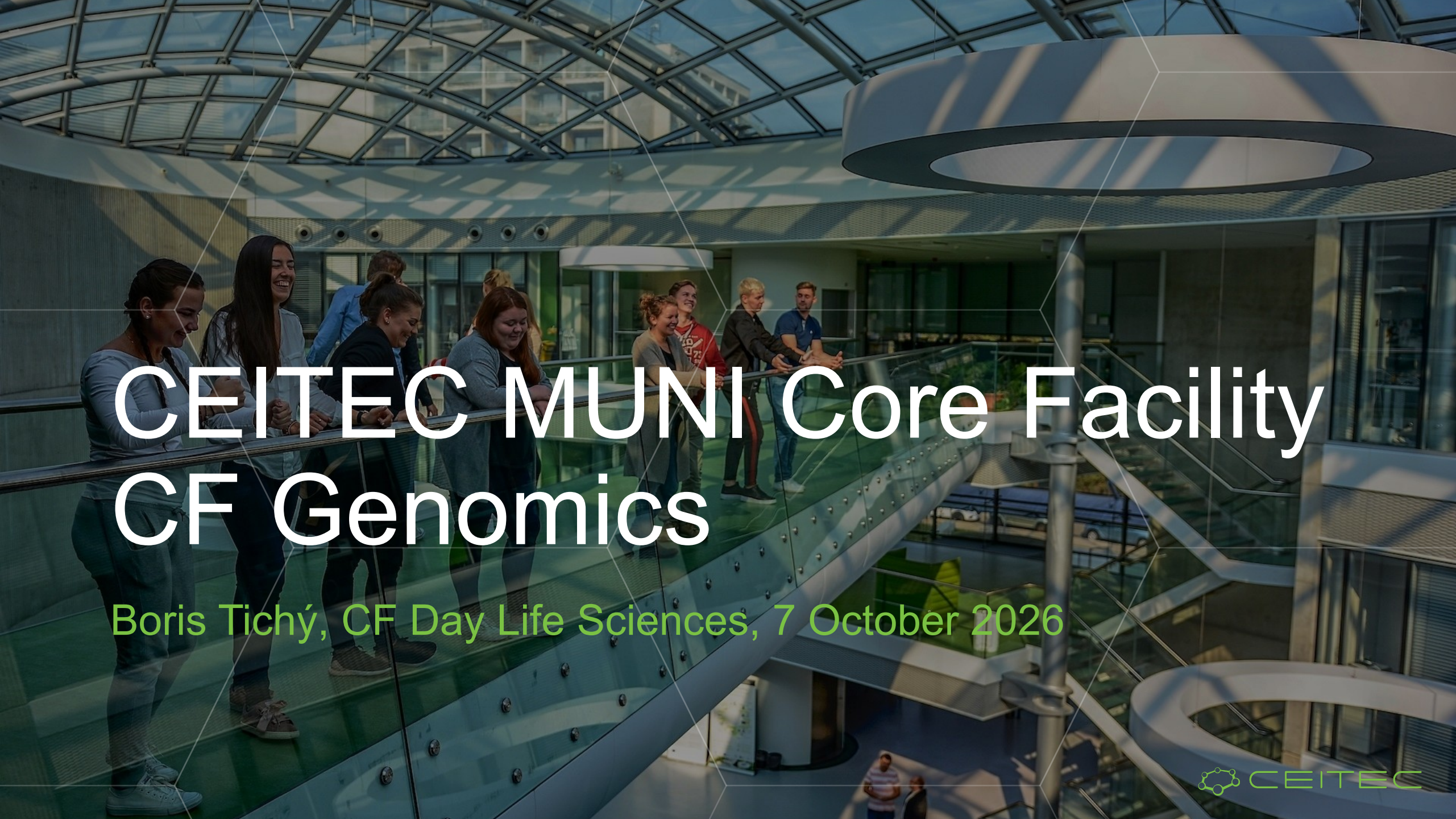
Thank you for your attention! Questions?

core.facility@ceitec.muni.cz

ceitec.eu/core-facilities/



CEITEC



CEITEC MUNI Core Facility CF Genomics

Boris Tichý, CF Day Life Sciences, 7 October 2026

CF overview and news

Moving from E35 to BPH

planned for November
genomics and flow-cytometry

New instrumentation

ONT Promethion24

ElementBio VITARI

Nabsys OhmX

Single-cell instrumentation



New instrumentation

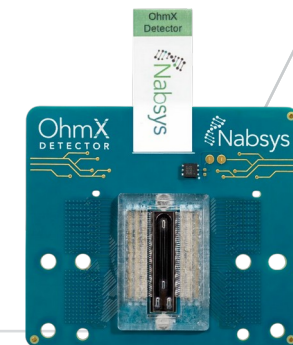
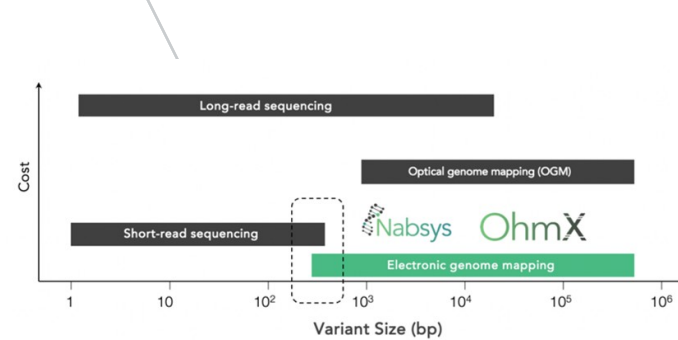
ONT PromethION24

high-throughput nanopore sequencer



Nabsys OhmX

electronic genome mapping



New instrumentation

Element Biosciences **VITARI**

mid/high-throughput short-read sequencer

very low per base/per read cost

5B read-pairs/run, ~800M /lane, 2x150, 2x75

WES, RNA-Seq sequencing cost 500-1000 CZK

human WGS 4000-5000 CZK



New instrumentation

Single-cell instrumentation

10X Chromium X

3'RNA , 5'RNA, scATAC+multiomics, fixed cells (probe based – human, mouse)

BD Rhapsody HT Xpress

3'RNA, scATAC, **CITE-Seq**, Ig/TCR, multiomics

Atrandi Flux

DNA amplicons, RNA + amplicons, custom assays

Illumina Single Cell 3' RNA

3'RNA



CF services

NGS library preparation

DNA – WGS, WES, amplicons, long-reads

RNA – 3'RNA, RNA-Seq, full-length cDNA

single-cells

Sequencing

short-read - AVITI, VITARI (MGI, Illumina)

long-read – ONT

Spatial OMICS

10X Xenium, AVITI24, STOmics

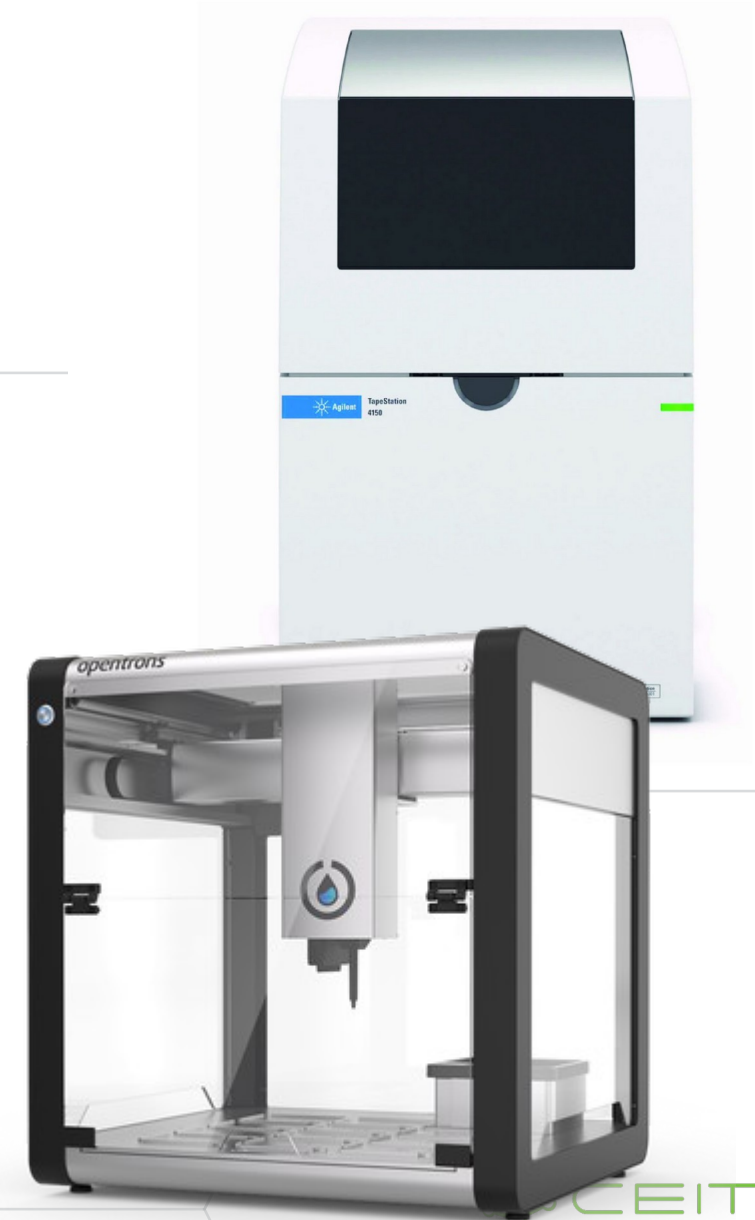
Flow cytometry

standard or spectral analysers

cell-sorting

Other

electronic/optical genome mapping

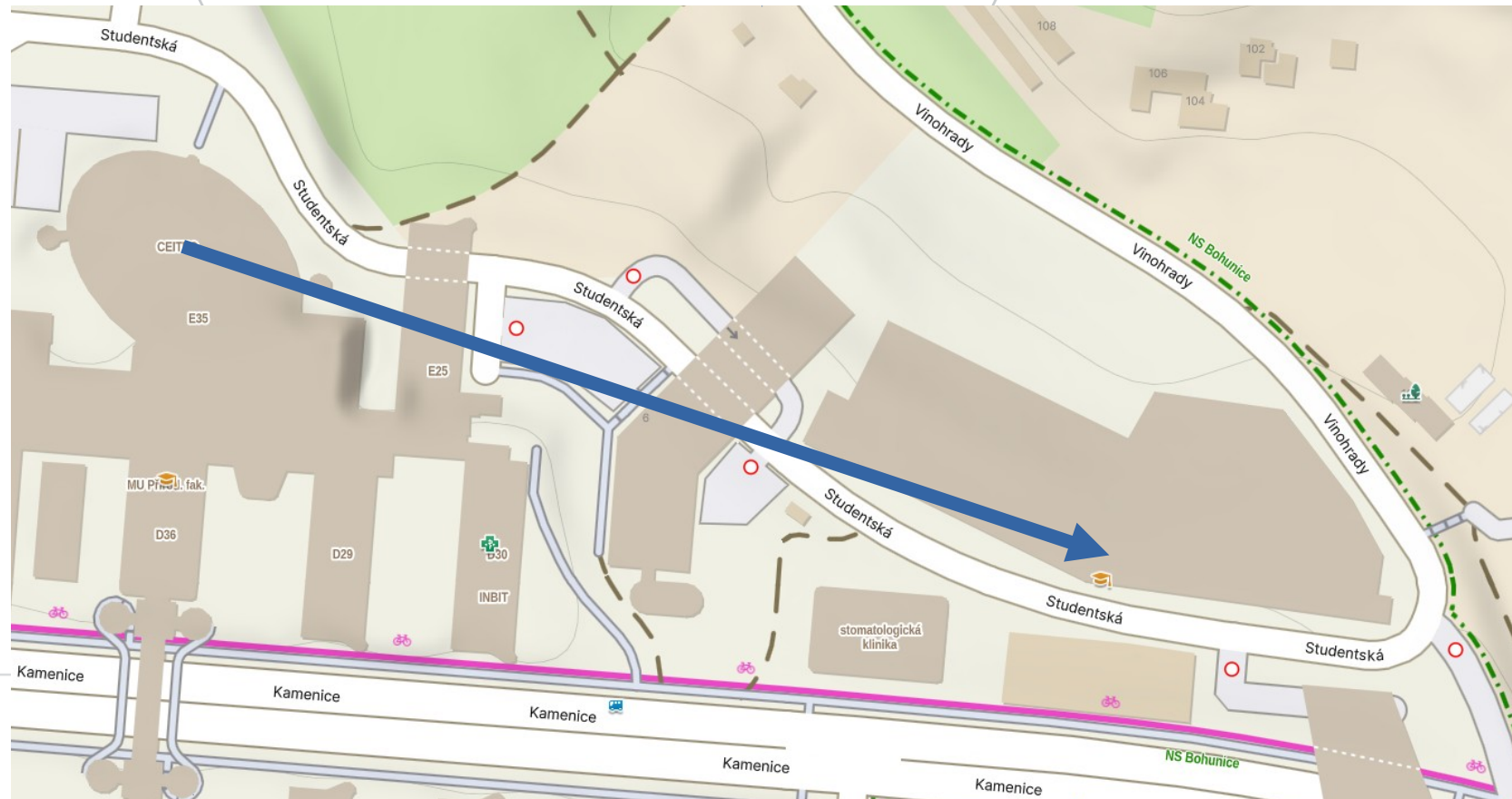


Contacts, acknowledgement

cfg.ceitec.cz

cfg@ceitec.muni.cz

BioPharmHub MUNI
Studentská 13
Building **G-61**, 3rd floor



NATIONAL CENTER
FOR
MEDICAL GENOMICS

„We acknowledge the CF Genomics and the CF Bioinformatics supported by the NCMG research infrastructure (LM2023067 funded by MEYS CR) for their support with obtaining scientific data presented in this paper.“

Contacts, acknowledgement

cfg.ceitec.cz

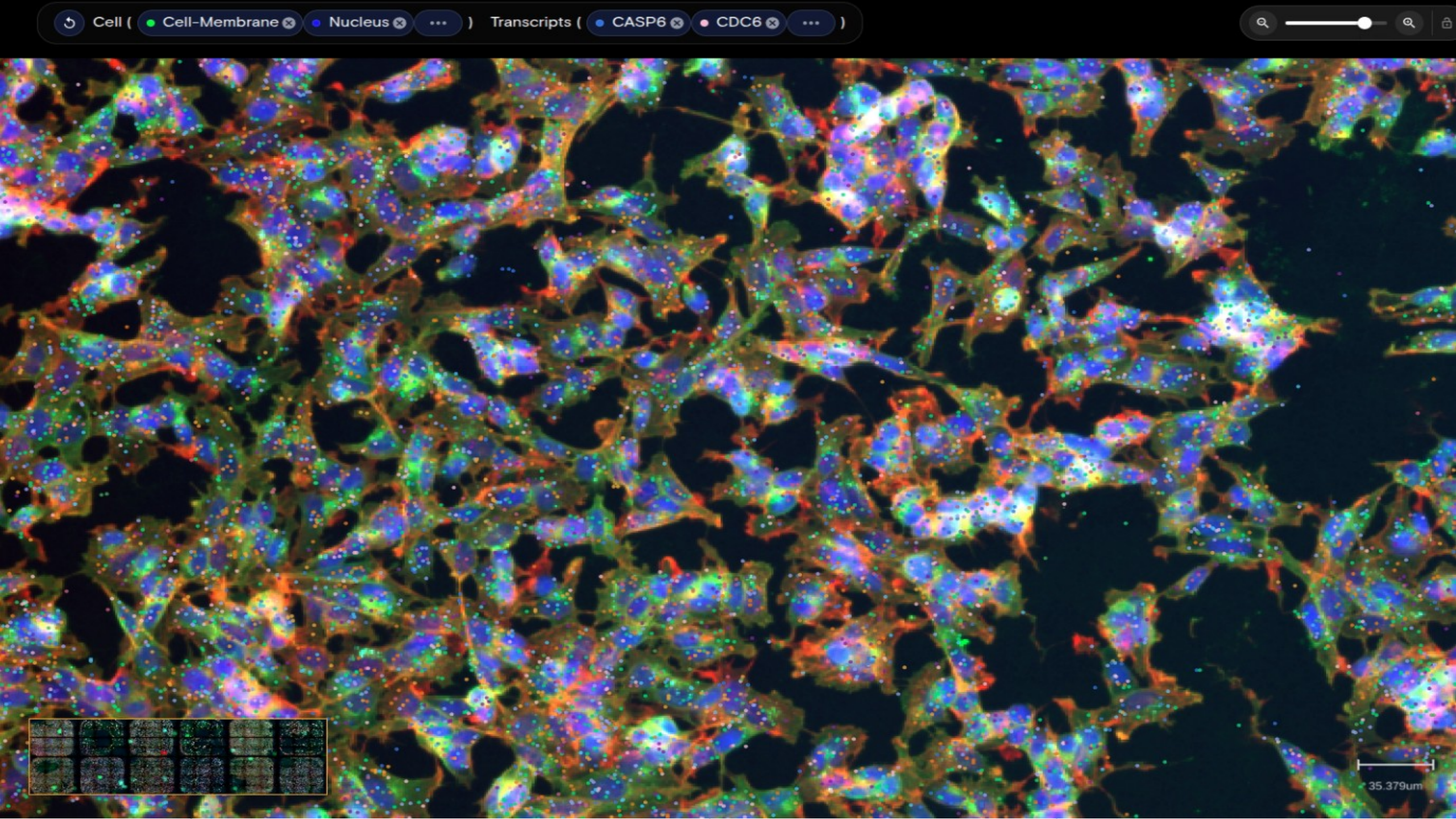
cfg@ceitec.muni.cz

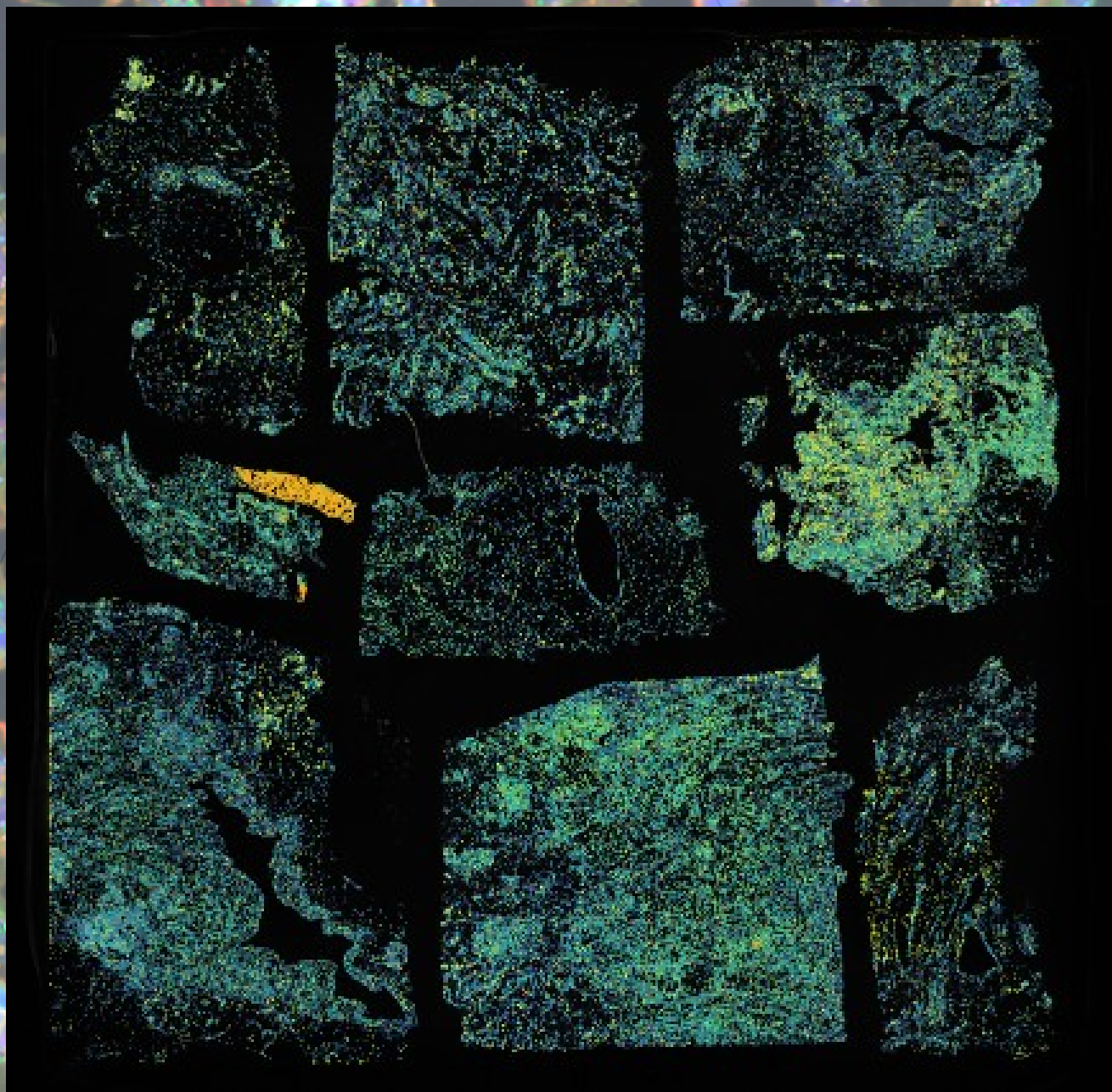
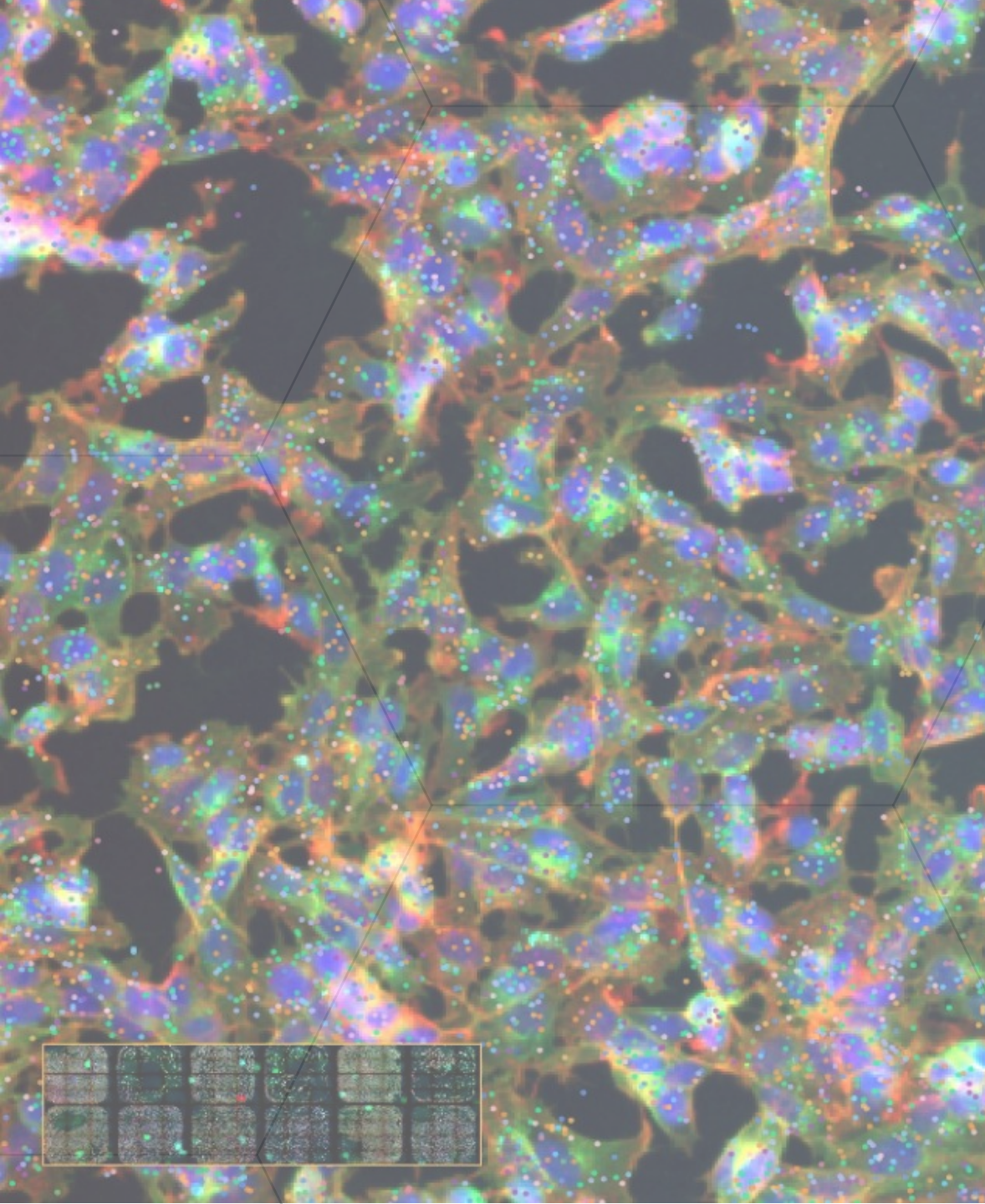
BioPharmHub MUNI
Studentská 13
Building **G-61**, 3rd floor

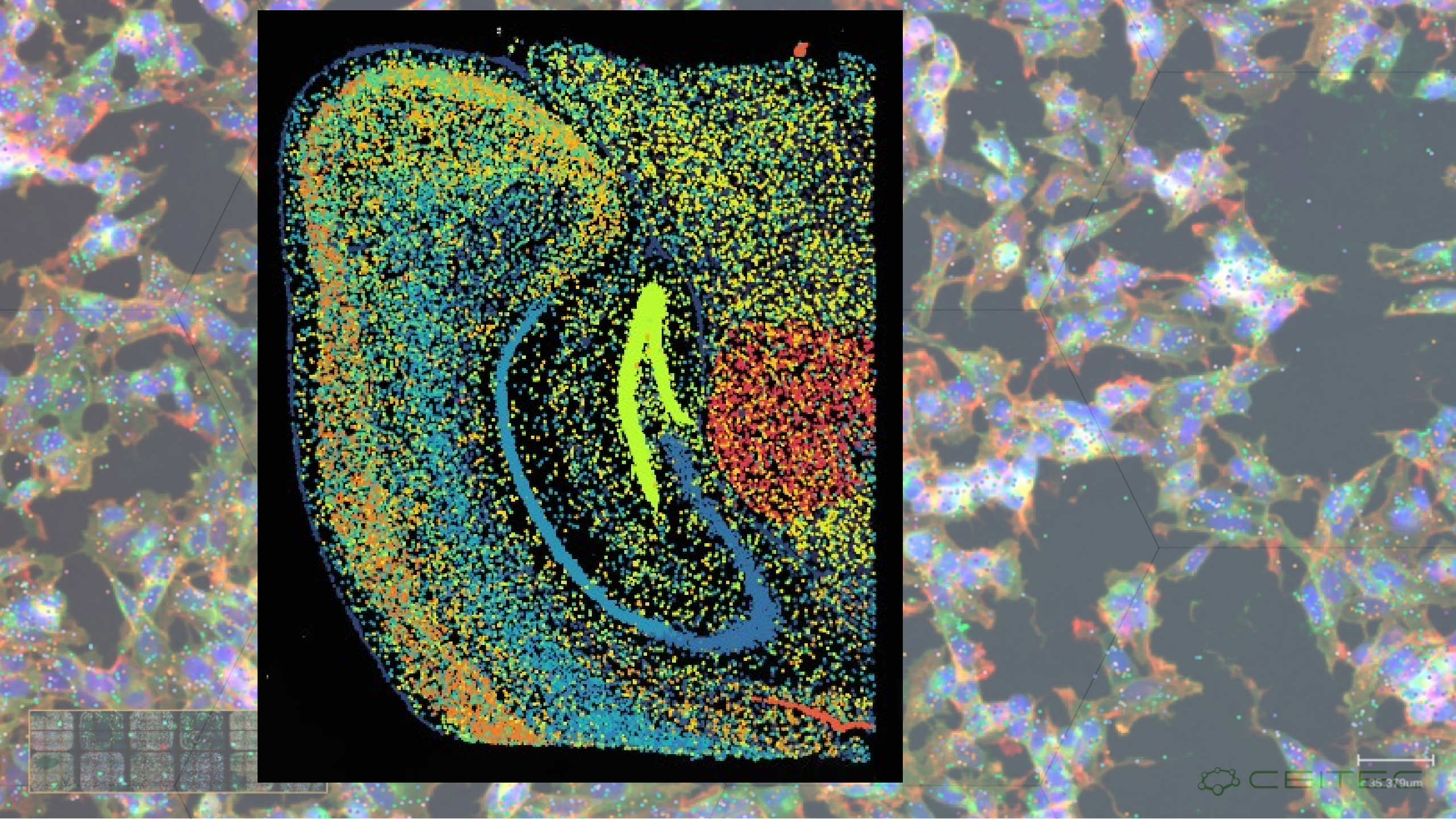


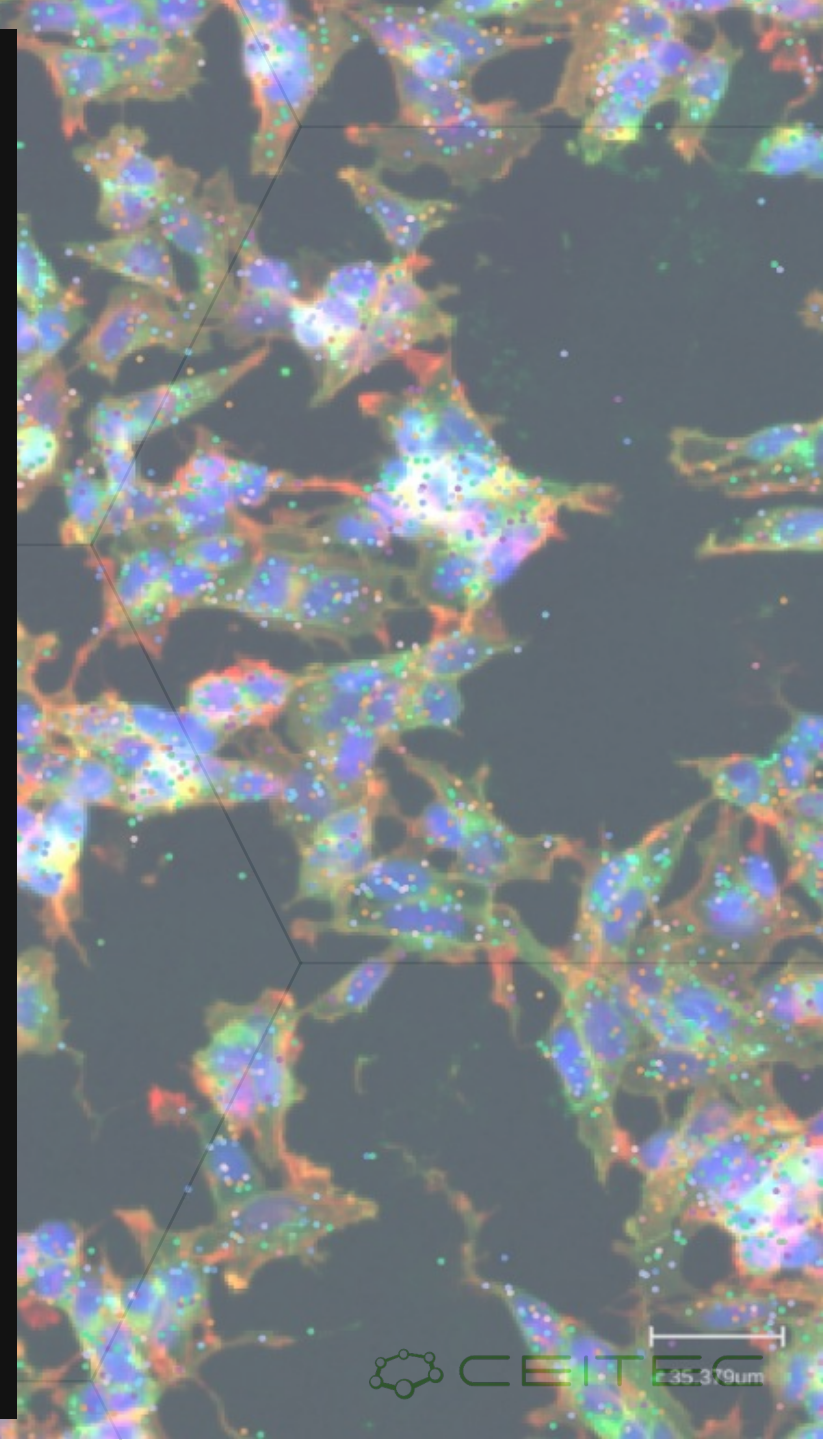
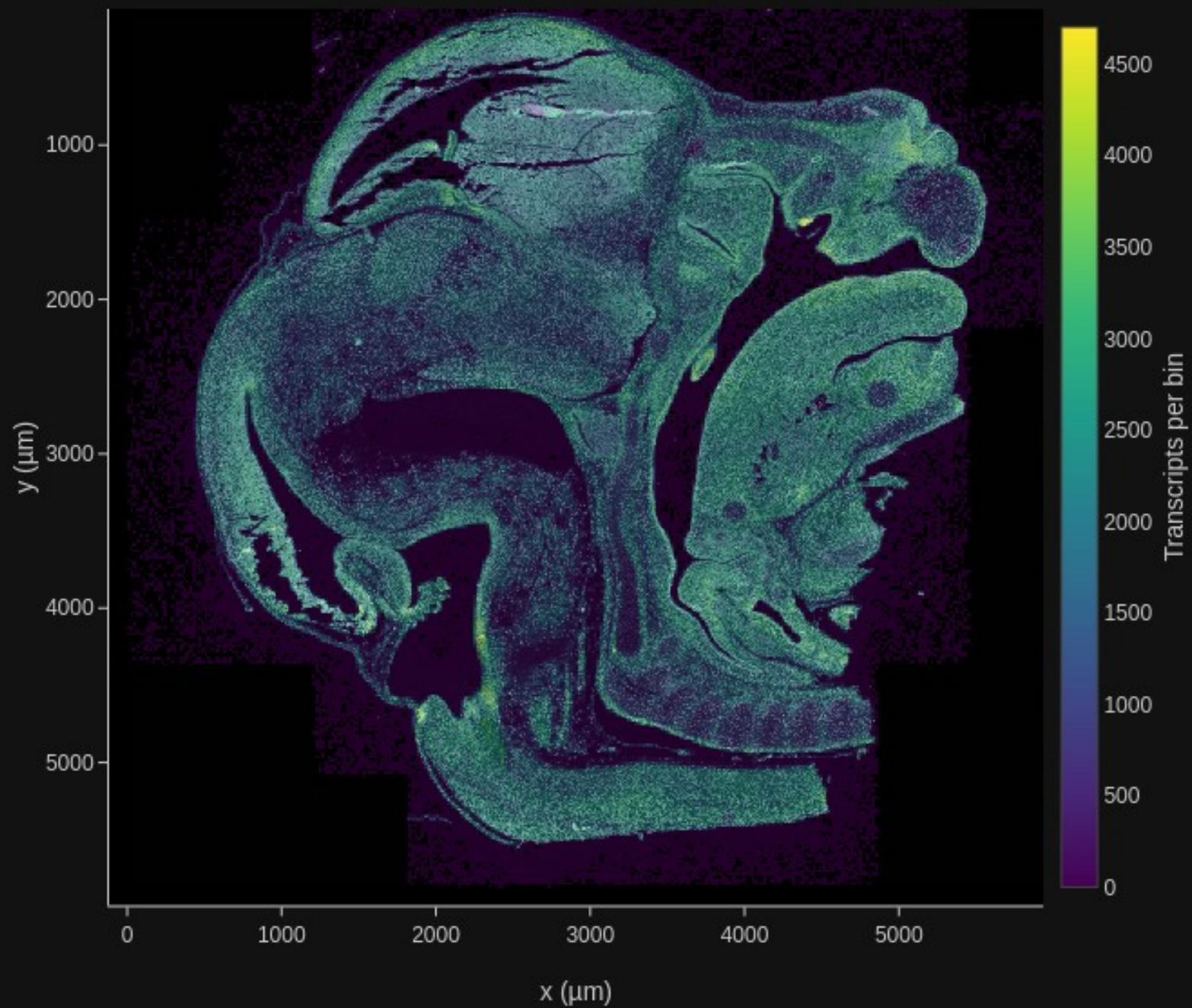
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MEDICAL GENOMICS

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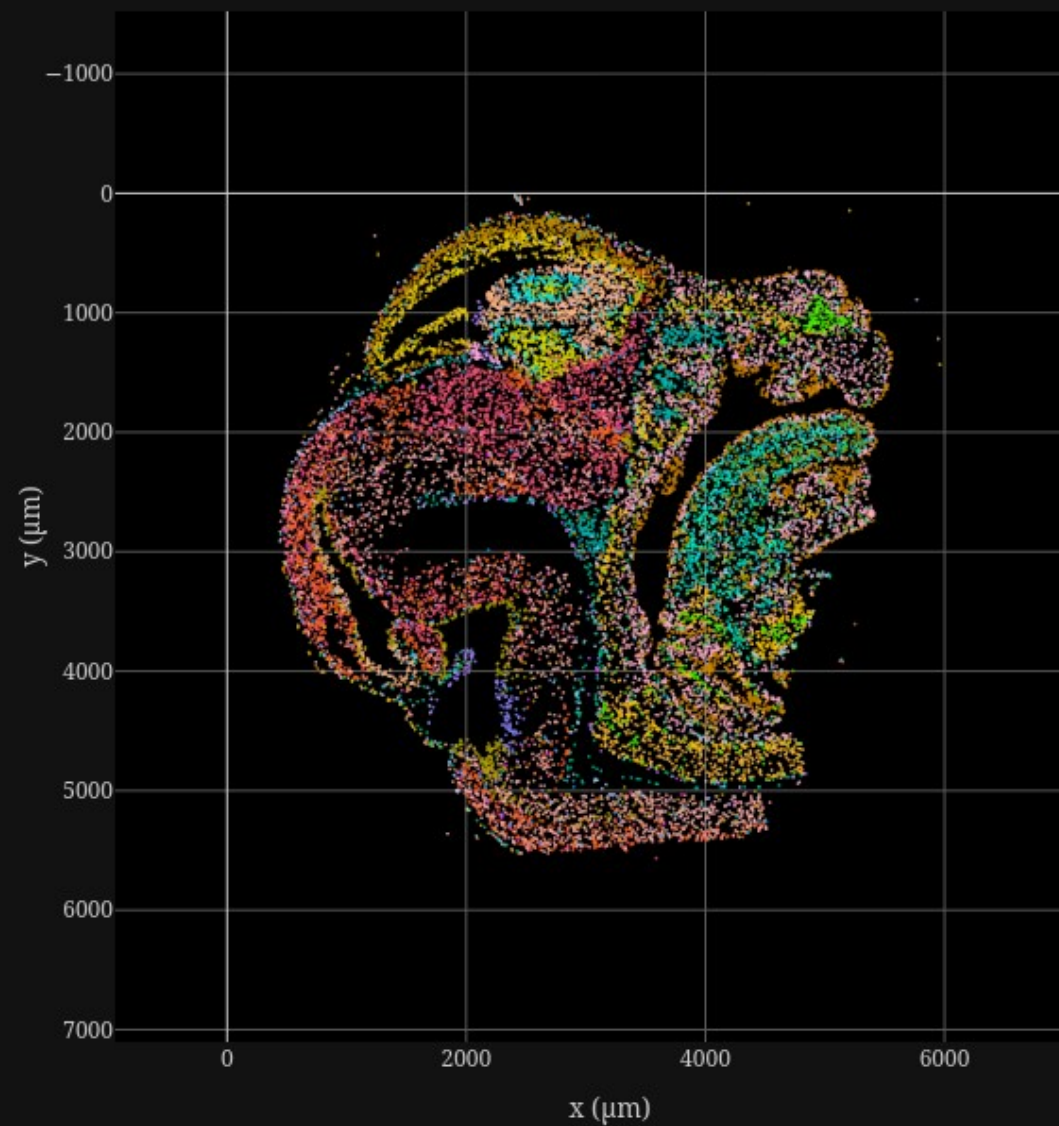




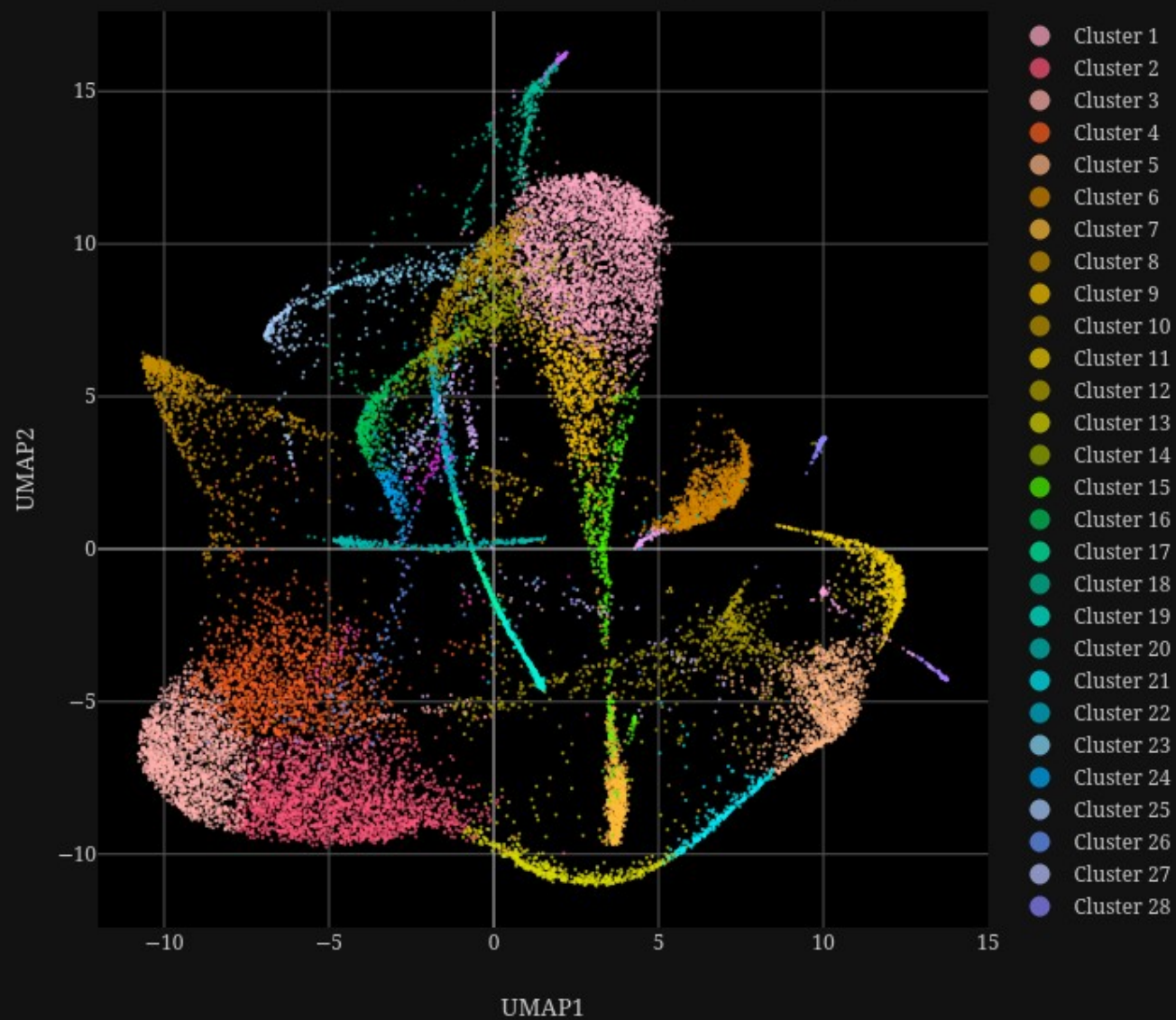




Cell Coordinates Colored by Clustering



UMAP Projection of Cells by Clustering





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Central European
Institute of Technology

Thank you for your attention! Questions?

core.facility@ceitec.muni.cz

ceitec.eu/core-facilities/



CEITEC