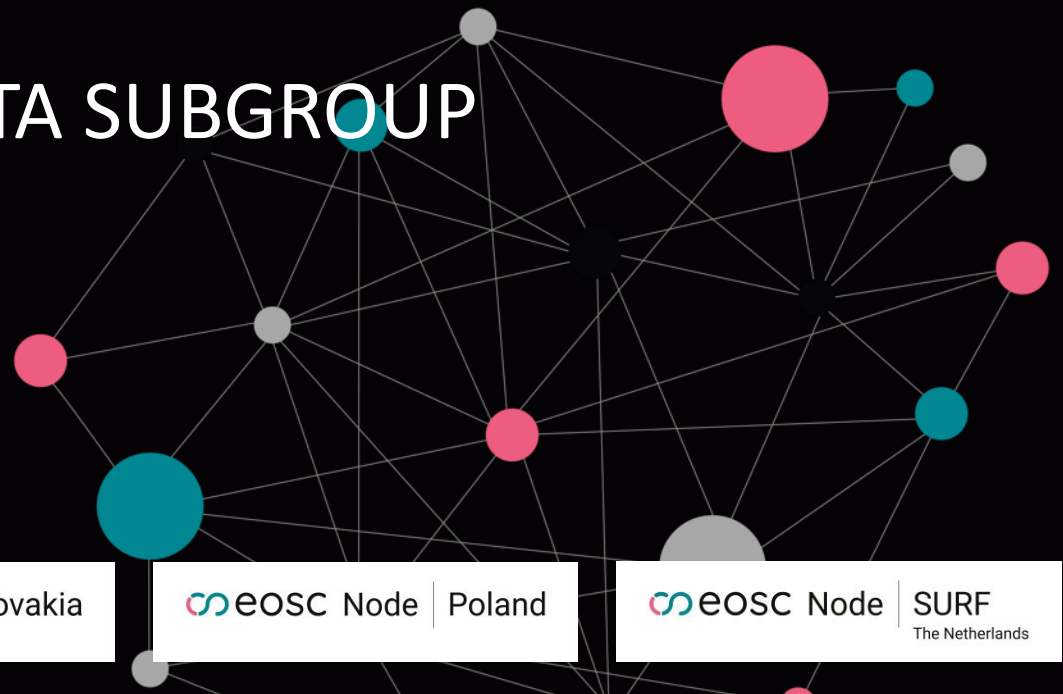
EOSC Node | BBMRI-ERIC
Health & Food

THE MCVAL USE CASE

AND THE EOSC SENSITIVE HEALTH DATA SUBGROUP



EOSC Node | BBMRI-ERIC Health & Food

EOSC Node | Italy

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RationAI

BioMedAI TWINNING

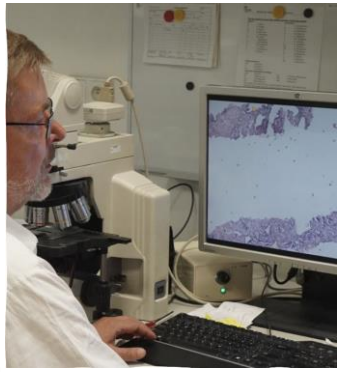
Med Uni Graz

MUNI Masaryk University

MO Masaryk Memorial Cancer Institute

AI assisted prostate cancer screening

MCVAL Background

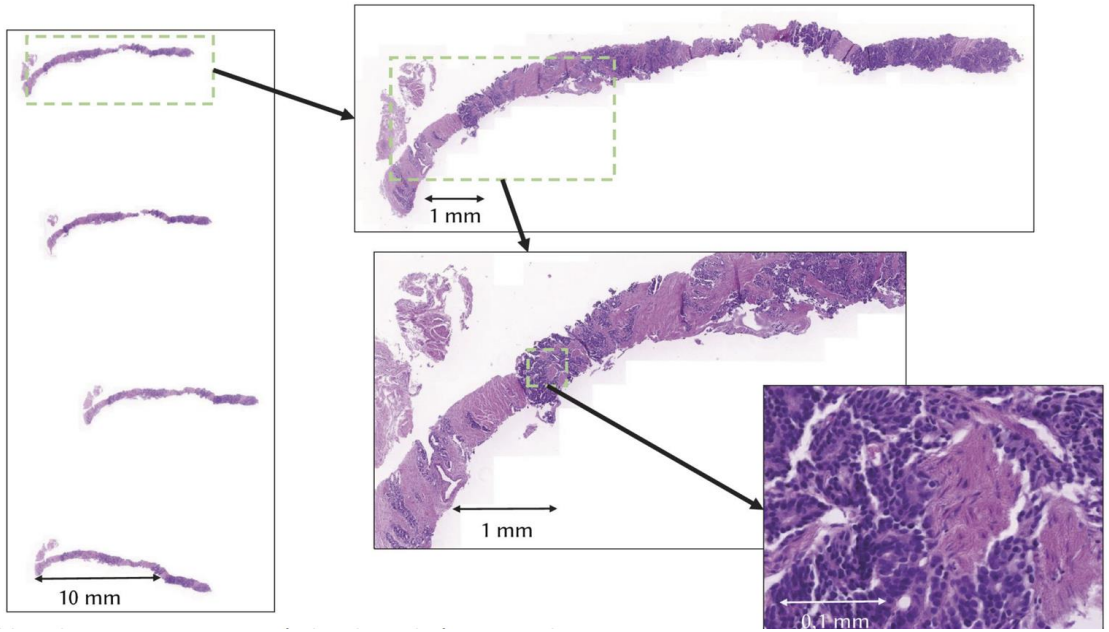


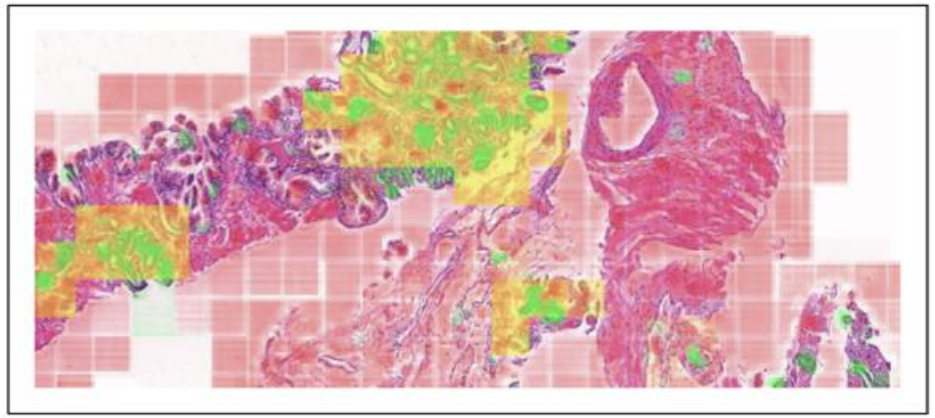
Manual whole slide image (WSI) screening

- Select region of interest
- Zoom into region
- Analyse selected region
- Repeat

AI assisted WSI screening

- Image segmentation
- Individual segment analysis
- Analysis summary of **all** segments
- Guide pathologist by highlighting segments of interest





Scientific challenge of AI model deployment in clinical setting

Hospital A wants to deploy AI model for prostate-cancer screening

AI model has previously been trained on data from hospital B

AI models do not generalize well to data acquired from new source

AI model must be validated and potentially adapted before deployment at hospital A

MCVAL vision and challenges

- MCVAL vision
  - Provide a service for the Multi-Centric VALidation of AI models for prostate cancer screening on sensitive health data in compliant frameworks
- Technical challenges
  - AI model and validation data must be transferred to secure computing environment via secure channel
  - AI models require tailor made computing environments which are often not available in secure computing infrastructures
- Legal and ethical challenges
  - Legal framework for transfer and processing of sensitive health data across multiple health institutions and countries does not exist
  - Framework for ethical use of sensitive health data across multiple health institutions and countries does not exist

MCVAL USE CASE

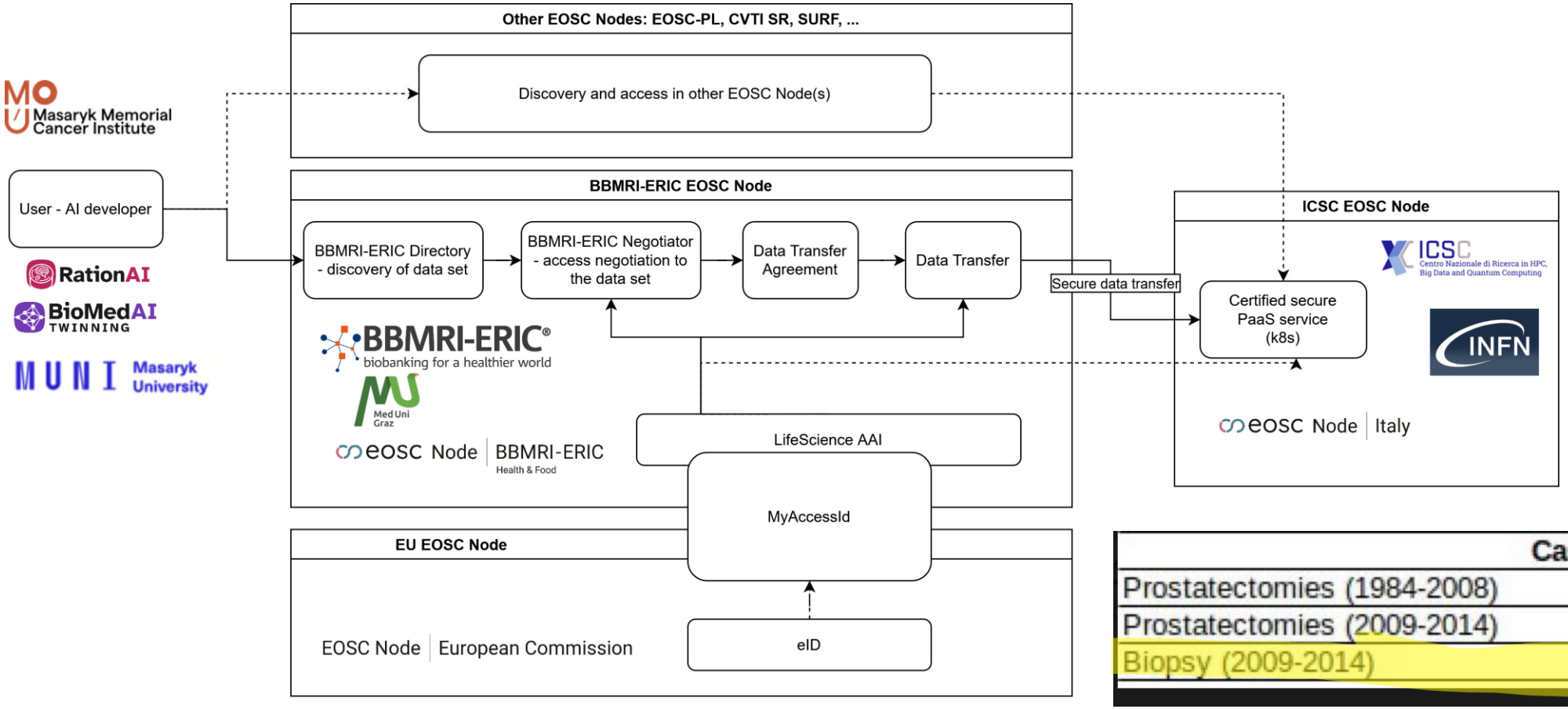
PARTICIPANTS AND ROLES

Roles – 36 experts involved!

- AI researcher
- Secure compute node
- Sensitive data provider
- AI validation service provider

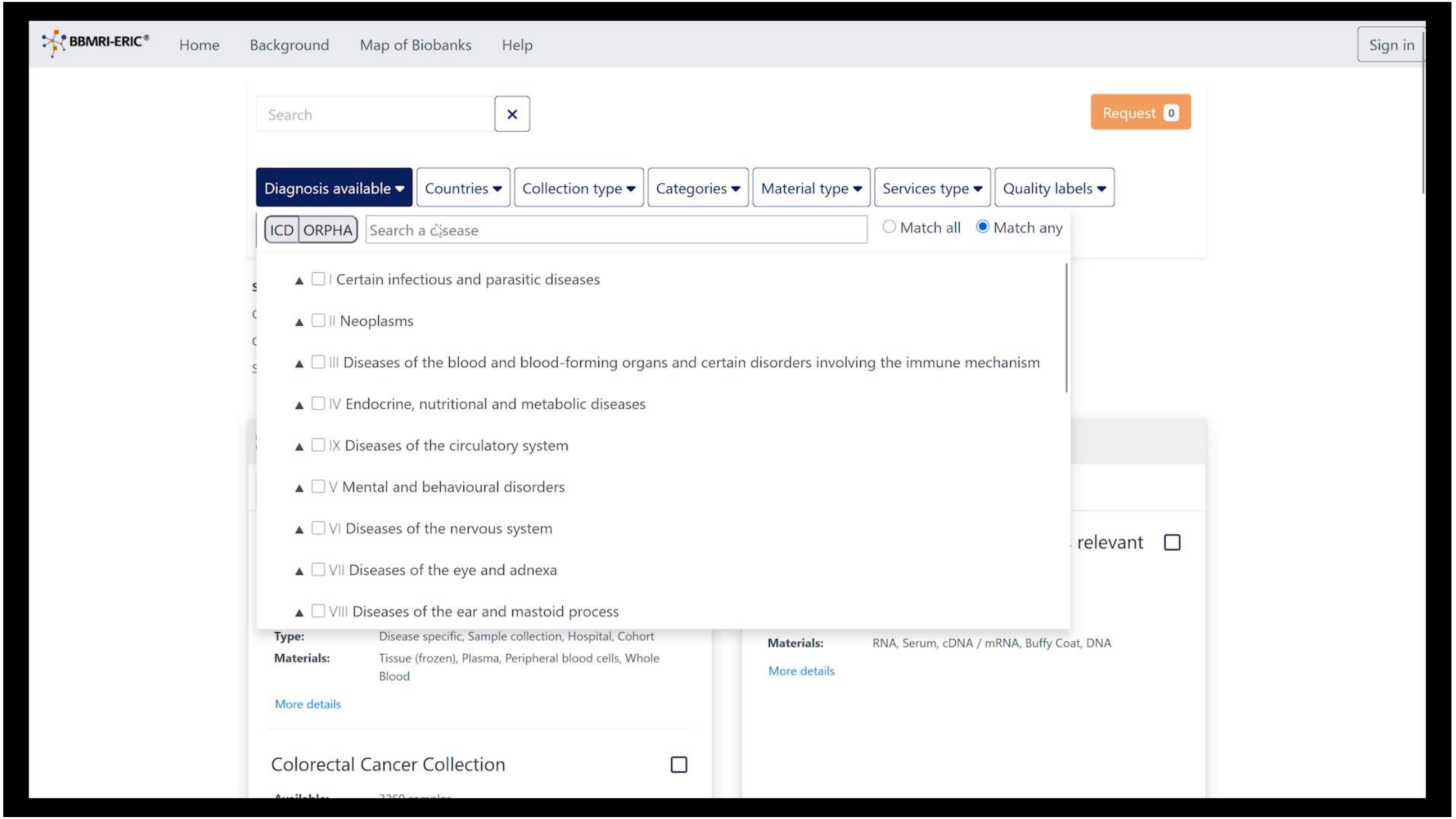
Participants

- MMCI/MU
- ICSC/INFN
- MUG
- BBMRI-ERIC



	Cases	Slides
Prostatectomies (1984-2008)	5525	104335
Prostatectomies (2009-2014)	794	28.786
Biopsy (2009-2014)	331	11.193

MCVAL demo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ICD
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Match all
Match any
I Certain infectious and parasitic diseases
II Neoplasms
III Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism
IV Endocrine, nutritional and metabolic diseases
IX Diseases of the circulatory system
V Mental and behavioural disorders
VI Diseases of the nervous system
VII Diseases of the eye and adnexa
VIII Diseases of the ear and mastoid process
relevant
Type: Disease specific, Sample collection, Hospital, Cohort
Materials: Tissue (frozen), Plasma, Peripheral blood cells, Whole Blood
More details
Materials: RNA, Serum, cDNA / mRNA, Buffy Coat, DNA
More details
Colorectal Cancer Collection

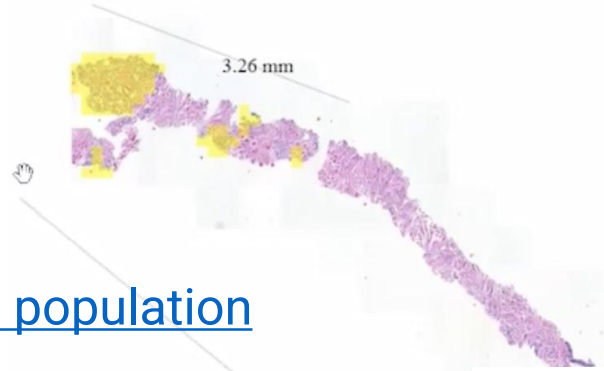
Developments and Achievements

- Ethics vote
  - MMCI – approval for use of AI model and the overall use case
  - MUG – approval for use of data
- Contractual framework
  - Data transfer agreement
    - With MUG
  - Data processing agreement
    - With ICSC
- Interconnecting infrastructure
  - Integration of MyAccessId into LifeScience Login/AAI

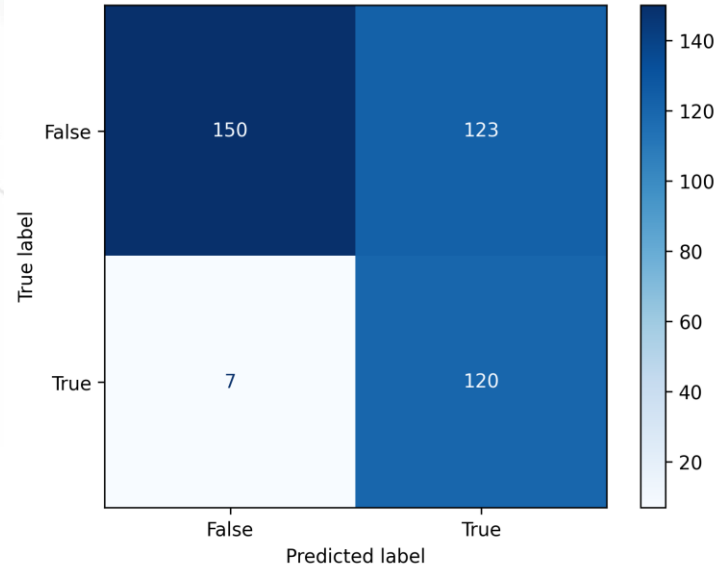
- Compute infrastructure
  - Provision of resources complete
  - Permission management almost complete
  - Kubernetes is deployed in the ISO27001 infra – transition from IaaS to PaaS
  - Deployments of AI pipelines

=> Blueprint for Sensitive Health Data subgroup

Achievements



- Prostate cancer in Austria [is 141 cases/100,000 population (below EU average of 154)]
  - Medical University Graz handles about 220 cases/year on average – the AI model would assist in speeding up diagnostics of these
- Small-scale pilot given the limited time when the resources became available
  - Test set: 400 WSIs from 40 patients from Graz (12% of Graz biopsy data set cases – which did not have slide-level annotations – had to be annotated by a senior pathologist)
  - Explainability of individual results provided very good match to pathologist's assessment – building trust for the clinical process
  - Also unexpected immuno-stainings where classified correctly
- The work paves initial steps to expansion of a model used in routine diagnostics at Masaryk Memorial Cancer Institute (CZ) to AT and abroad (possibly PL, SK, NL and others via other EOSC Nodes in the future).

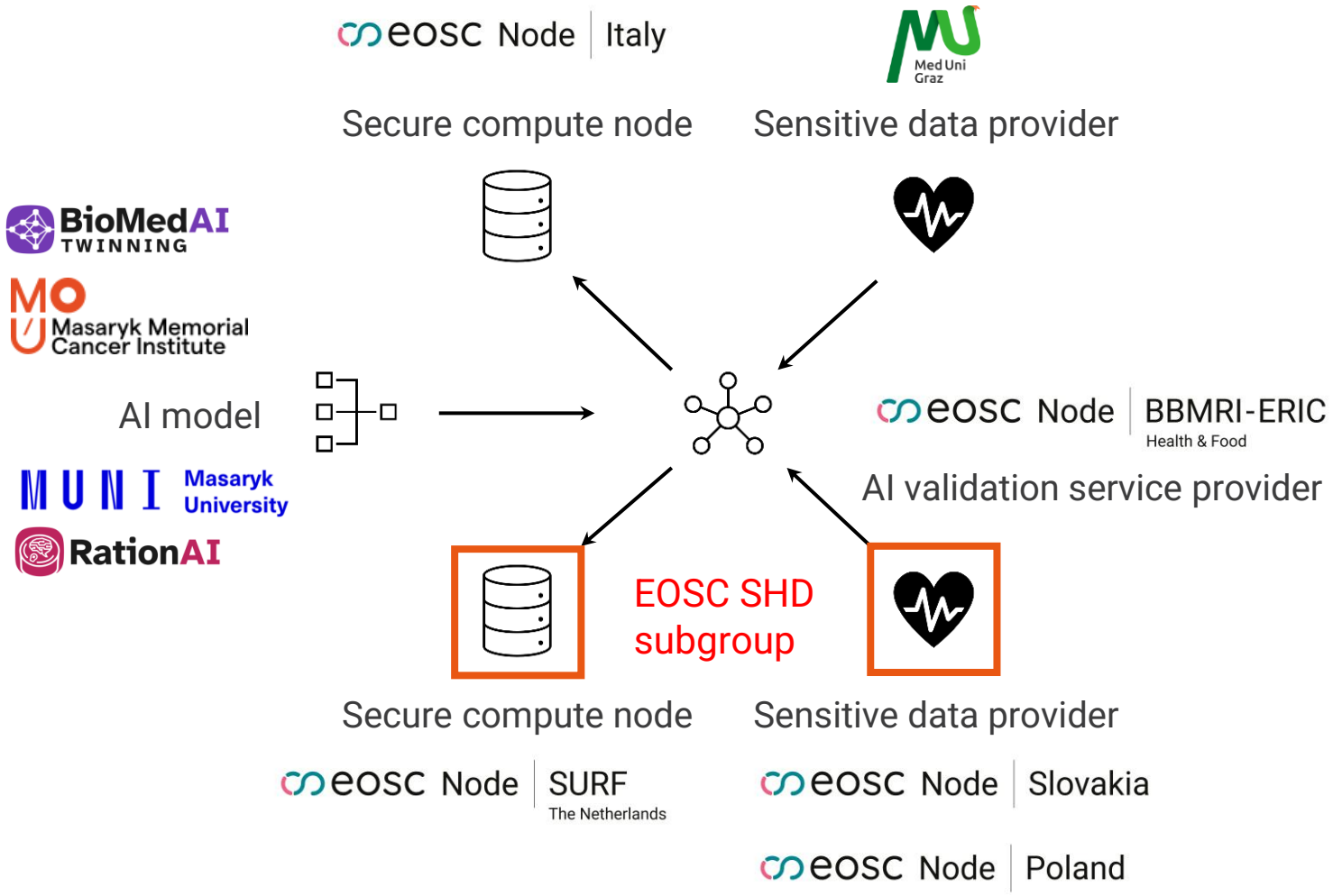


Note: false positive results are high because of the strict optimization for keeping false negatives as low as possible. The model is designed to assist pathologist in the screening process, where false positives are eliminated by the clinician.

How do MCVAL and the EOSC Federation benefit from each other?

- Successfully tested the AI model on testing data set from Graz – 400 WSIs
  - Positive results esp. for foundational model, paving way to expansion from locally used AI model to a product usable at different institutions
- Contributions of the EOSC Federation to MCVAL
  - EU wide network of AI and medical experts
  - EU wide clinical health data resources and computing infrastructures for AI model validation, represented in the EOSC SHD subgroup
  - Ability to authenticate using eID
- Contributions of MCVAL to the EOSC Federation
  - Simplified access to sensitive health data for AI researchers and clinicians
  - Legal framework for exchange of sensitive health data across health organizations and countries
  - Blueprint for compliant computing infrastructure for processing of sensitive health data

Scaling up MCVAL: the EOSC Sensitive Health Data subgroup



- MCVAL will be extended with
  - Data from EOSC-SK and EOSC-PL
  - Compute resources from EOSK-SURF
- Future vision:
  - Catalogue of sensitive health data for AI model validation
  - Catalogue of secure computing infrastructures for AI model validation (Computing resources and Services)
  - Implement AI model validation workflows in common workflow management system at multiple EOSC nodes

Thank you for your attention and Thank you to all the highly committed contributors in the MCVAL use case and the SHD subgroup!

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