EuroHPC JU Information Day for AI on Supercomputers

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EuroHPC Joint Undertaking

Operational systems | Pre-exascale

LUMI Consortium (Coordinator CSC)
Kayaani, Finland

Cray EX, Hewlett Packard Enterprise
#3 Top500 (Nov 2023): **309.1** PFlops (LUMI-G)

AMD platform
- CPU: 64-core next-generation AMD EPYC™
- GPU: AMD Instinct™ (MI250X),

Leonardo Consortium (Coordinator CINECA)
Bologna, Italy

Atos BullSequana XH2000
#4 Top500 (Nov 2022): **238.7** PFlops (BOOSTER)

Intel/NVidia platform
- CPU: Intel Sapphire Rapids
- GPU: Nvidia custom Ambere (A100)

Operational systems | Petascale

Vega

Sustained performance:	**6,9 petaflops**
CPU:	AMD Epyc Rome
GPU:	Nvidia A100
TOP500 ranking:	#32 in EU; #106 globally (June 2021)
Vendor/model	Atos BullSequana XH2000
Operated by	IZUM, Maribor, Slovenia

MeluXina

Sustained performance:	**12,8 petaflops**
CPU:	AMD Epyc Rome
GPU:	Nvidia A100
TOP500 ranking:	#10 in EU; #36 globally (June 2021)
Vendor/model	Atos BullSequana XH2000
Operated by	LuxProvide, Bissen, Luxembourg

Karolina

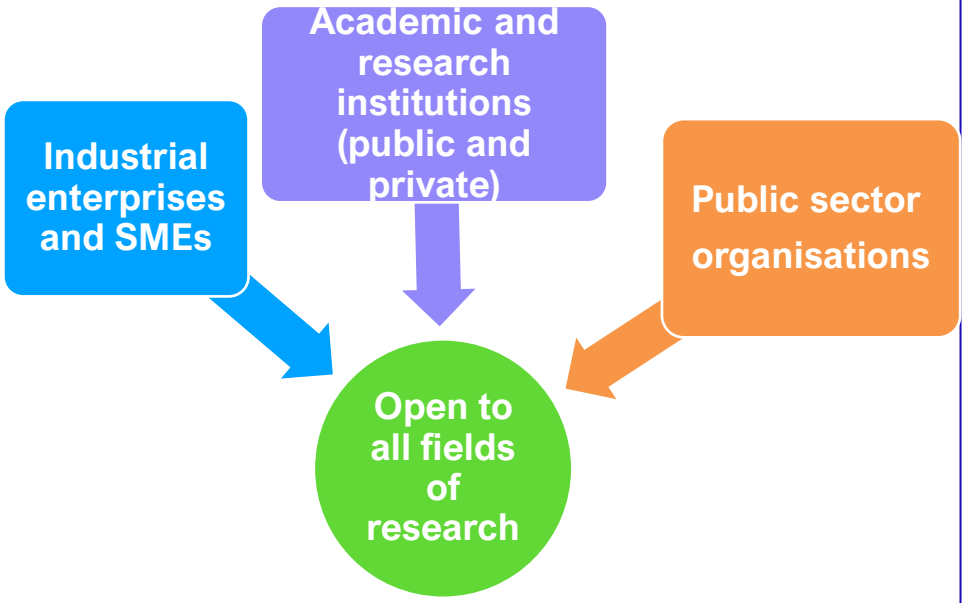
Sustained performance:	**9,13 petaflops**
CPU:	AMD Epyc Rome
GPU:	Nvidia A100
TOP500 ranking:	#20 in EU; #69 globally (June 2021)
Vendor/model	HPE Apollo 2000Gen10 Plus and Apollo 6500
Operated by	IT4I, Ostrava, Czech Republic

Discoverer

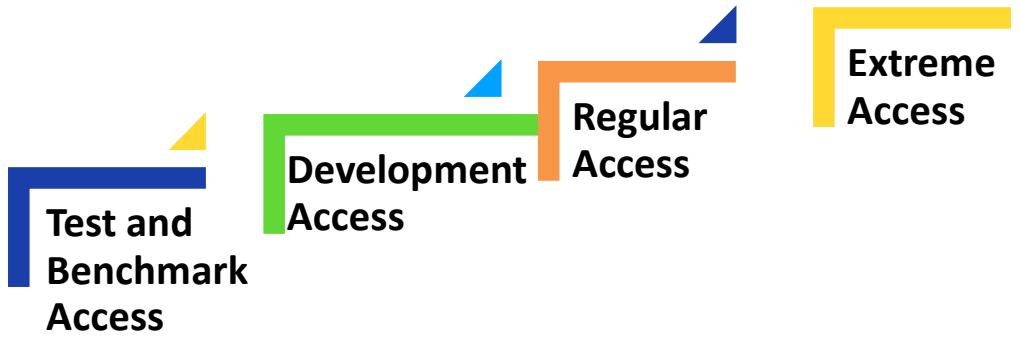
Sustained performance:	**4,45 petaflops**
CPU:	AMD Epyc Rome
GPU:	-
TOP500 ranking:	#27 in EU; #91 globally (June 2021)
Vendor/model	Atos BullSequana XH2000
Operated by	PSB consortium, Sofia, Bulgaria

Access to EuroHPC Supercomputers

WHO IS ELIGIBLE?



WHICH TYPES OF ACCESS EXIST?



- Special access*

WHAT ARE THE CONDITIONS FOR ACCESS?

Access is free of charge. Participation conditions depend on the specific access call that a research group has applied to. In general users of EuroHPC systems commit to:

- acknowledge the use of the resources in their related publications
- contribute to dissemination events
- produce and submit a report after completion of a resource allocation

GPU Node Hours Provided per Call type

Access type	GPU Node hours*	Duration
Benchmark access	Between 400 to 3000	3 months
Development access	Between 1000 and 10 000	6 or 12 months
Regular access	Up to 730 000	12 months
Extreme access	Up to 7.7 million	12 or 24 months

Node hours = Number of Nodes x Number of Cores per Node

Documentation on Current systems with GPU partitions

https://doc.vega.izum.si/ - VEGA
https://docs.it4i.cz/karolina/hardware-overview/ -Karolina
https://docs.lxp.lu/ - Meluxina
https://docs.lumi-supercomputer.eu/ - Lumi
https://leonardo-supercomputer.cineca.eu/hpc-system/ - Leonardo

EuroHPC Joint Undertaking

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Access to Our Supercomputers

EuroHPC Access Calls

List of EuroHPC calls for proposals for access to compute time on EuroHPC supercomputers.

Access Policy and FAQ

How to access our supercomputers?

Awarded Projects

List of projects which have been awarded computing time on the EuroHPC supercomputers.

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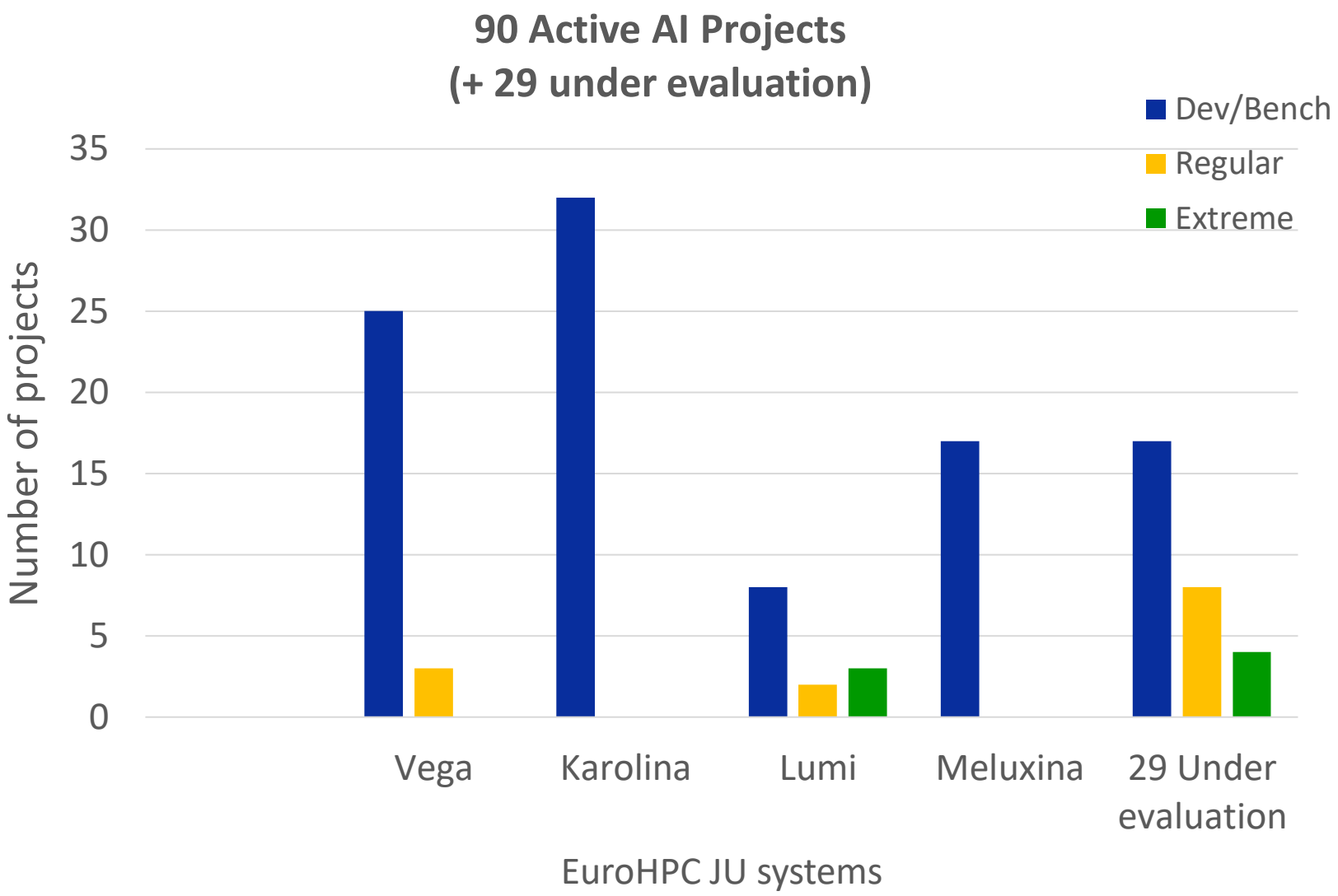
https://eurohpc-ju.europa.eu/access-our-supercomputers/eurohpc-access-calls_en

Film produced by ENCCS

AI Applications per System by August 2023

(42 of 119 are LLM applications)



Expert Support

EuroHPC JU Hosting Entities

IZUM Institut informacijskih znanosti, Maribor

VSB TECHNICAL UNIVERSITY OF OSTRAVA | IT4INNOVATIONS NATIONAL SUPERCOMPUTING CENTER

LUX PROVIDE high-performance computing center

CSC

SOFIA TECHPARK

CINECA

HPACC Minho Advanced Computing Center

BSC

And more….

33 EuroCC National Competence Centres across Europe

EURO NETHERLANDS

EURO²

EURO BELGIUM

CCFR CENTRE DE COMPÉTENCE HPC.HPDA.IA

roNCC

HPC.MK EuroCC @North Macedonia

EURO CZECHIA

EUROCC PORTUGAL

EuroCC SPAIN

EURO MONTENEGRO

ESTONIAN HPC COMPETENCE CENTER

EUROCC ITALY HPC Competence Center

ENCCS

EURO Greece

EURO SLING

EURO LUXEMBOURG

EURO LIETUVA

EURO SuperS

EURO TRUBA Turkish Science e-Infrastructure

HRVATSKI CENTAR KOMPETENCIJA ZA HPC

EURO AUSTRIA

HPC @hu Competence Centre

EURO EuroCC_Ireland

EURO SLOVAKIA

NARODOWE CENTRUM KOMPETENCJI HPC

And more….

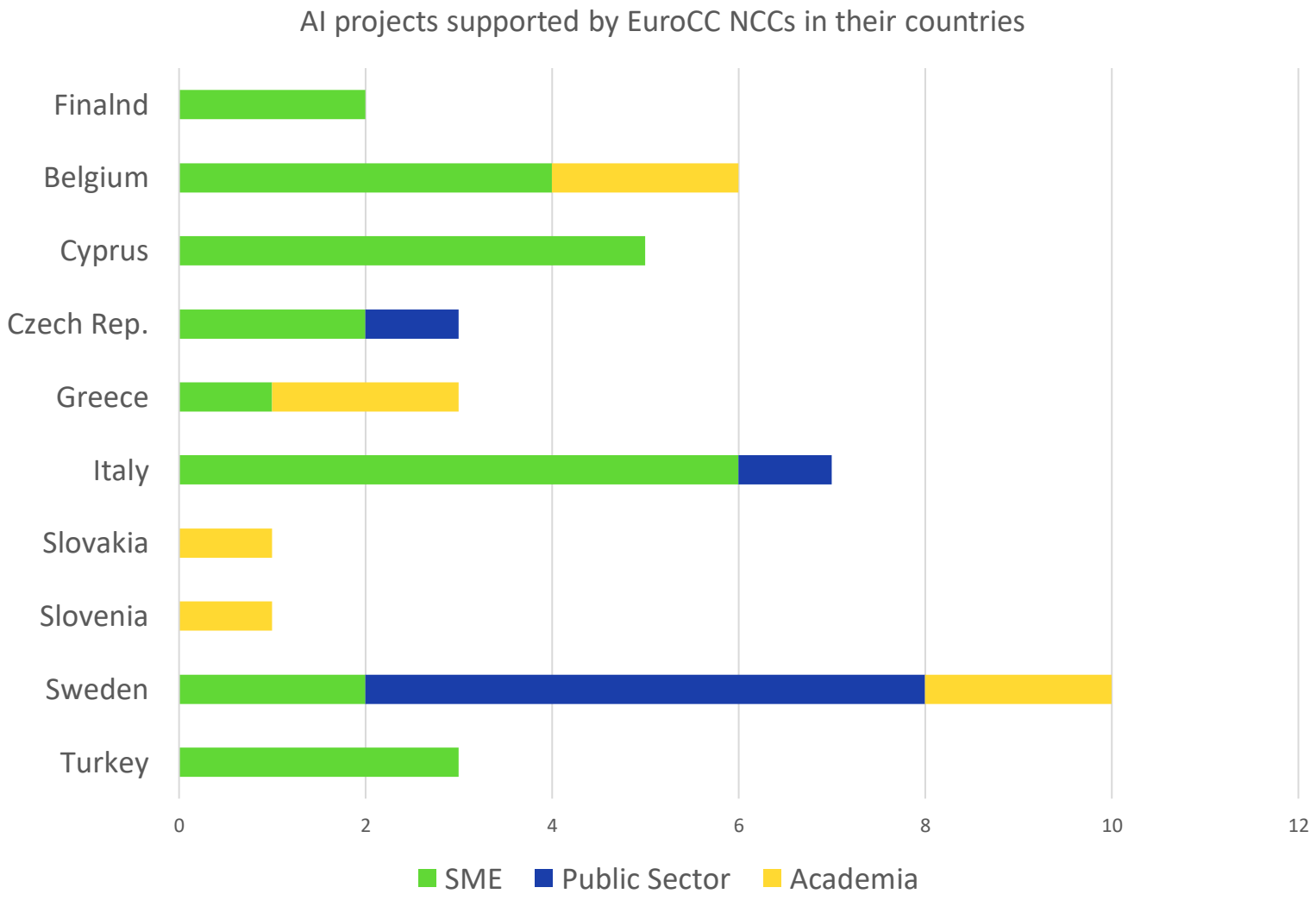
Support @ EuroHPC JU Hosting Entities

Centre	Projects	FTEs	Software & Tools	Training
CINECA	91	2*	PyTorch, Tensorflow, Keras, NetKet, Jax, Keras, Caffe, OpenCV, Weights&Biases, Tensorboard, Torchmetrics, Torchtext, Torchvision, Transformers, LLama, OpenGPT-X, Xgboost, Horovod, Deepspeed, Dm-tree, Lightning-bolts, Onnx, Pyarrow, Scikit-learn, Scipy, Spacy, Ray, Megathron	✓ Introduction to Machine and Deep Learning ✓ Fundamentals of Deep Learning ✓ Fundamentals of Deep Learning for Multi-GPUs ✓ Fundamentals of Deep Learning for Multiple Data Types ✓ Fundamentals of Deep Learning for Computer Vision ✓ Practical Deep Learning course ✓ Data Science and Deep Learning with Python ✓ Data science with R ✓ Introduction to Deep Learning and TensorFlow ✓ Seasonal School of Computer Graphics for Cultural Heritage: AI and Cultural Heritage
IT4I	99	10		
CSC	14	3		

https://eurohpc-ju.europa.eu/supercomputers/our-supercomputers_en

Support @ your country by EuroCC NCCs

- https://www.eurocc-access.eu/about-us/meet-the-nccs/

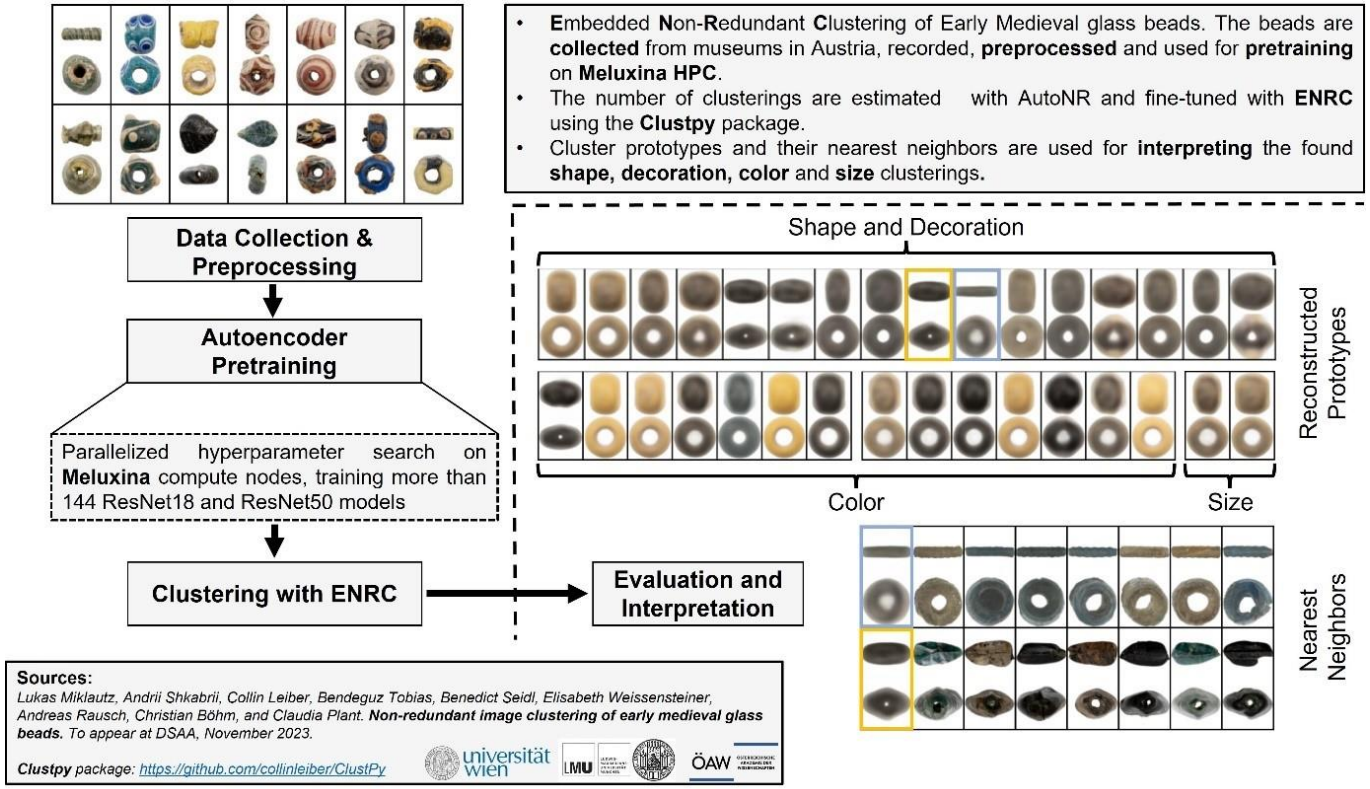


EuroCC Training on AI

- ✓ High Performance Data Analytics in Python
- ✓ Data Analysis and Plotting in Python with Pandas
- ✓ Advanced Deep Learning with Transformers
- ✓ Megatron Bootcamp
- ✓ Training on HPDA for climate data with the Ophidia framework
- ✓ Upscaling AI with Containers
- ✓ Applications of AI for Predictive Maintenance
- ✓ Applications of AI for Anomaly Detection
- ✓ Fundamentals of Deep Learning for Multi-GPUs
- ✓ Efficient multi-GPU and multi-node execution of AI applications and frameworks
- ✓ AI for Industry
- ✓ AI on Supercomputers
- ✓ AI for Industry: Advance level
- ✓ AI basics
- ✓ Practical Deep Learning workshop
- ✓ "AI for Science" NVIDIA Bootcamp
- ✓ Workshop on High-performance Data Analytics
- ✓ AI as a Tool for Change
- ✓ Advanced Deep Learning with Transformers
- ✓ Introduction to Deep-Learning
- ✓ Creative AI Webinar

https://www.eurocc-access.eu/services/training/

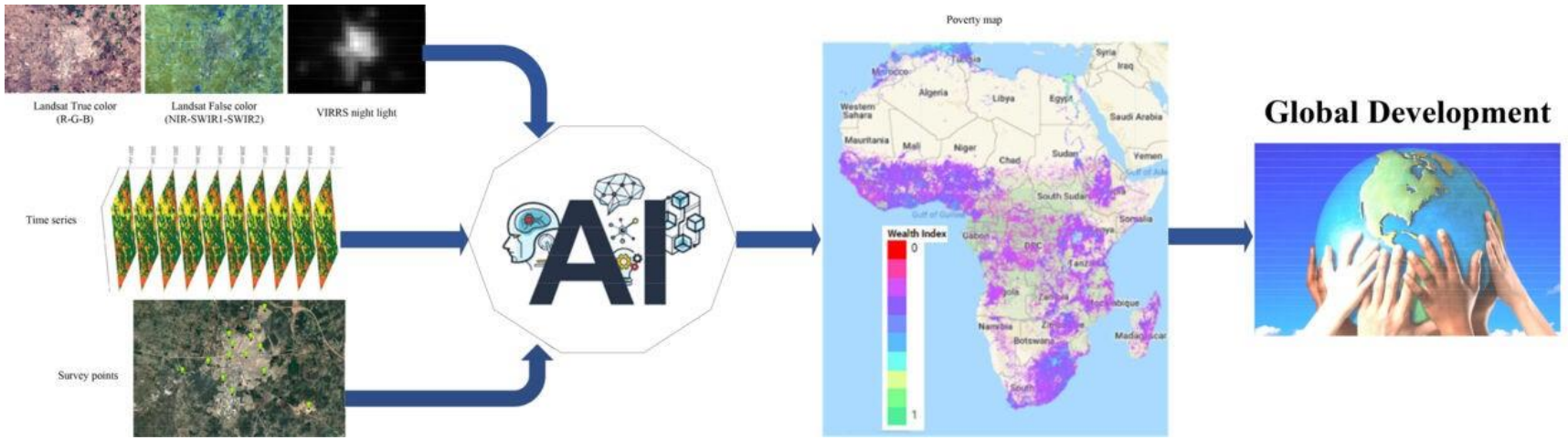
AI to Cluster Medieval Glass Beds - MeluXina



Glass beads are among the most common grave goods in the early Middle Ages, and their number can be estimated in the millions. The colour, size, shape, production technique and decoration of the beads that are discovered in burial sites contain much information that is relevant for historians regarding social customs, trade routes and production networks.

A research group from the University of Vienna sought to improve and validate the accuracy of existing deep embedded non-redundant clustering methods to find different informative ways to categorise the glass beads.

AI for Poverty Mitigation - Karolina



A research group from the University of Gothenburg wanted to better understand the distribution of global poverty historically and geographically. To do this, they set out to train deep-learning models to predict health and living conditions using satellite images.

The research group used TensorFlow on the EuroHPC JU Karolina supercomputer in the Czech Republic to address their project and successfully implement their observations.

The new data gathered will allow scholars to examine the causal effects of foreign aid on the likelihood of impoverished communities overcoming poverty. This, in turn, will enhance the alignment of development and aid initiatives with the challenges they aim to address.

Using EuroHPC Vega System by the Swedish National Archives

EuroHPC Joint Undertaking

Vega for training and inference

- Training the SATRN-model on Vega enabled us to increase the scale of the resized images going into the model, thereby improving accuracy for handwritten text, which generally requires more information than printed text
- Running 9 million images thorugh the pipeline on VEGA took roughly 90 node-hours
- At a hit-rate of 90% this project saves us about 700000 euros in manual labor costs, and the indexing database gets created a lot quicker

Riksarkivet

Adapting AI-technology for use in archives

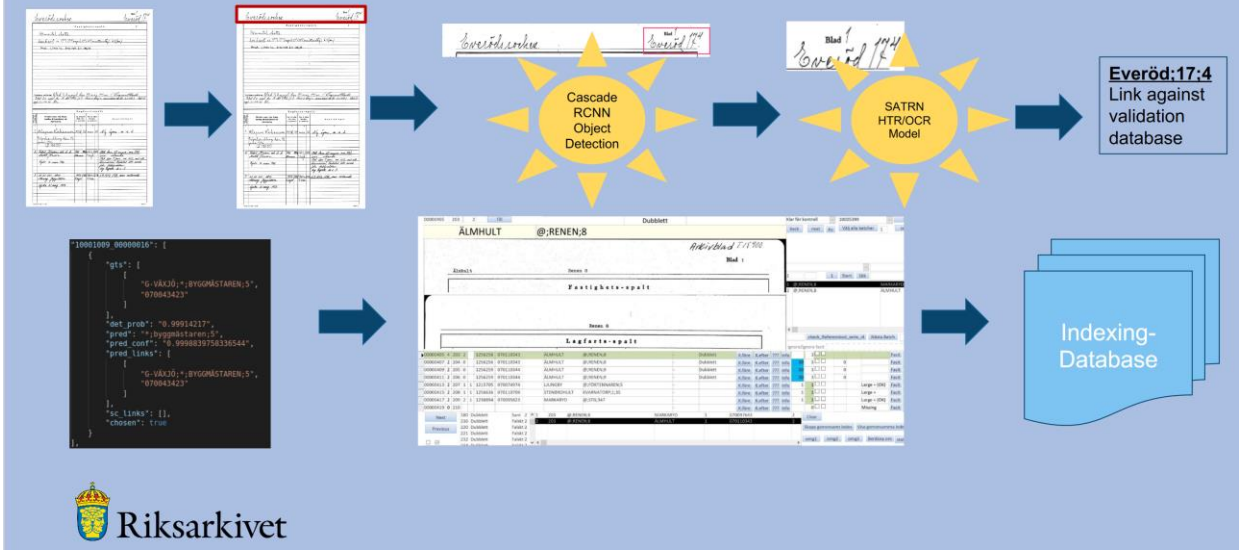
- Image segmentation models
- Text-recognition

Make scanned images searchable

384 000 GPU core hours (Development Access, VEGA)

Riksarkivet

The Property Record Indexing Pipeline



Riksarkivet

Thank you!

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Questions?

https://eurohpc-ju.europa.eu @EuroHPC_JU EuroHPC Joint Undertaking