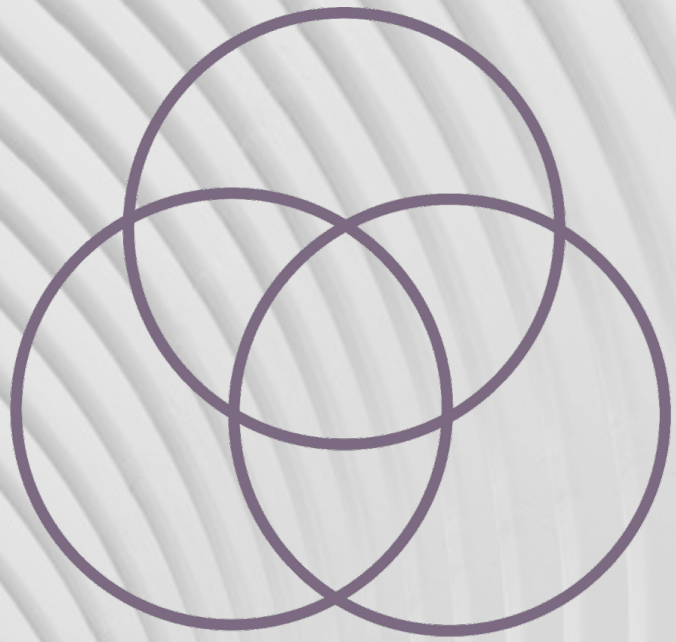

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AI Support of NCCs

Powering European AI with HPC – ISC 2024

Laura Morselli - CINECA (Italy)

NCCs – What are they?

AI Support of NCCs

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NCC = National Competence Centre
for HPC
and related technologies

- Single point of access in each country between stakeholders and national and EuroHPC systems
- 1 NCC per country
- Consortium members designated by national governments as HPC experts

NCCs – What are their objectives?

AI Support of NCCs

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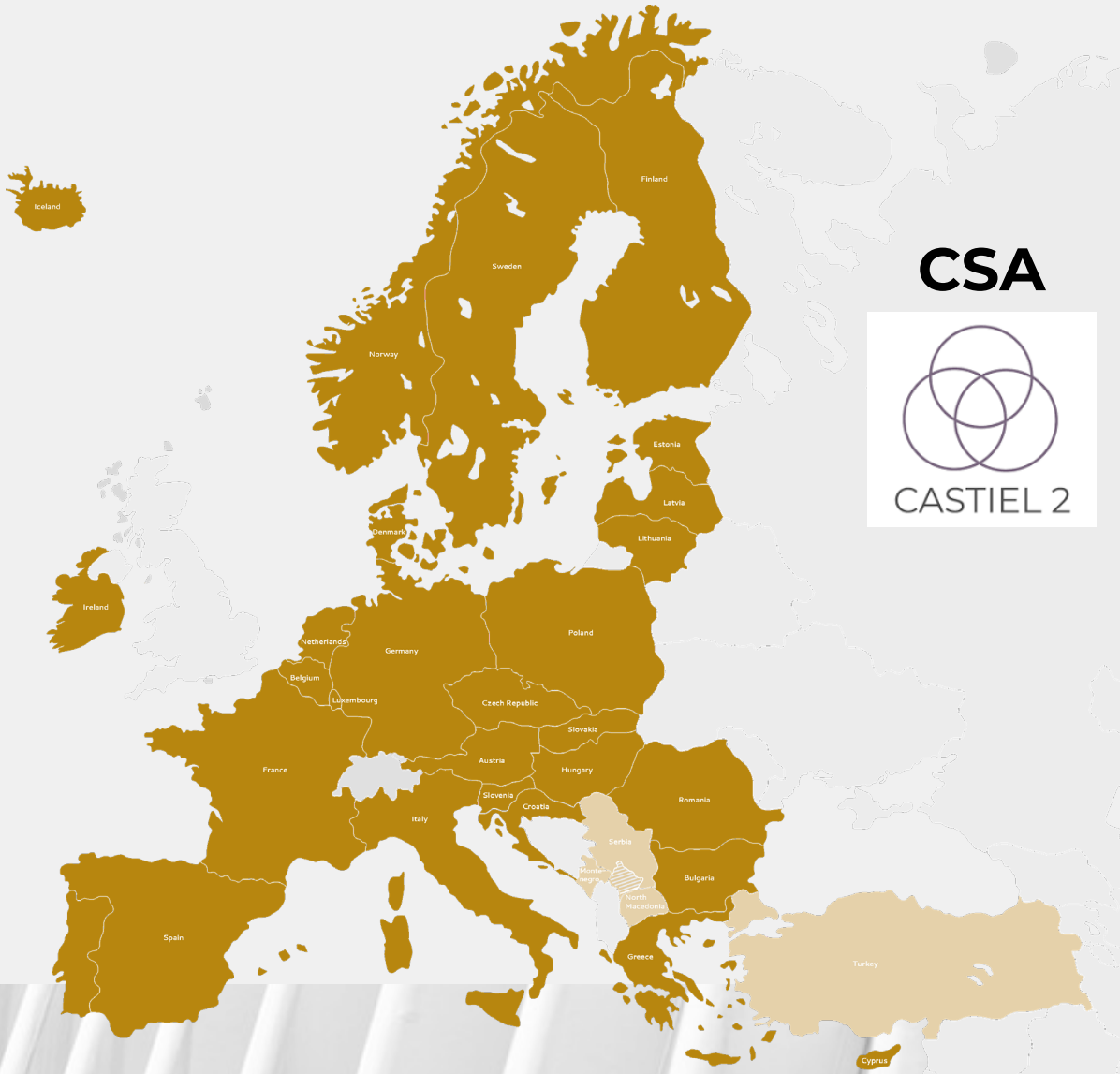
- **Facilitate** a broader uptake of HPC+ technologies and services by different target groups from academia & public administration to industry, with a focus on SMEs
- **Bridge** the existing HPC skills gaps and reach a similar level of HPC competences & services across Europe
- **Build** a strong European HPC ecosystem, ensure technological autonomy and competitiveness, and make Europe a world leader in supercomputing

NCCs – Where and when?

AI Support of NCCs

- **EuroCC** (1/9/2020- 31/12/2022)
  - 33 NCCs established in participating countries (EU + associated countries)
- **EuroCC 2** (1/1/2023-31/12/2025)
  - 32 NCCs supported & further developed in participating countries (EU + associated countries)



CSA

NCCs – What do they do?

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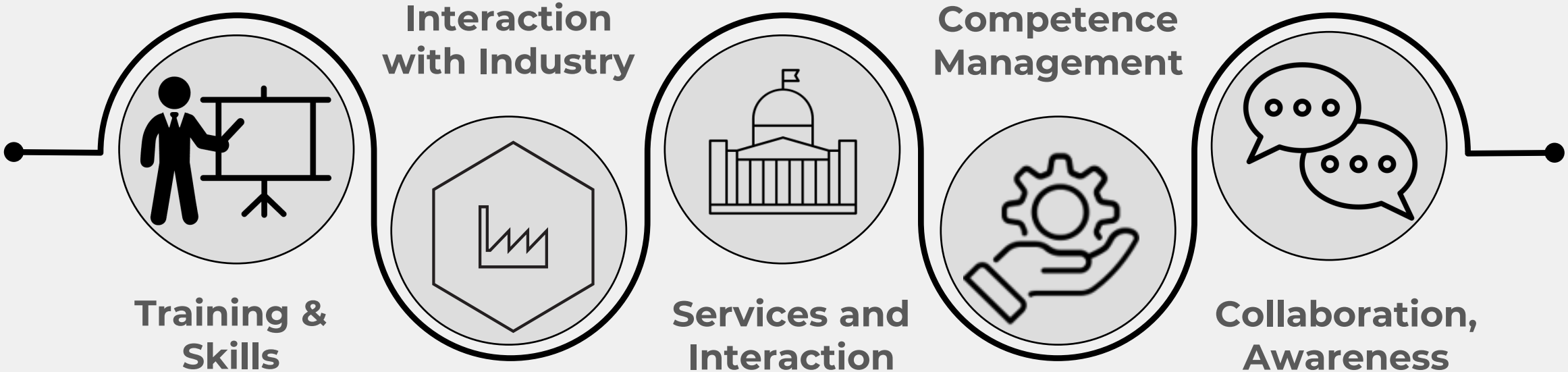
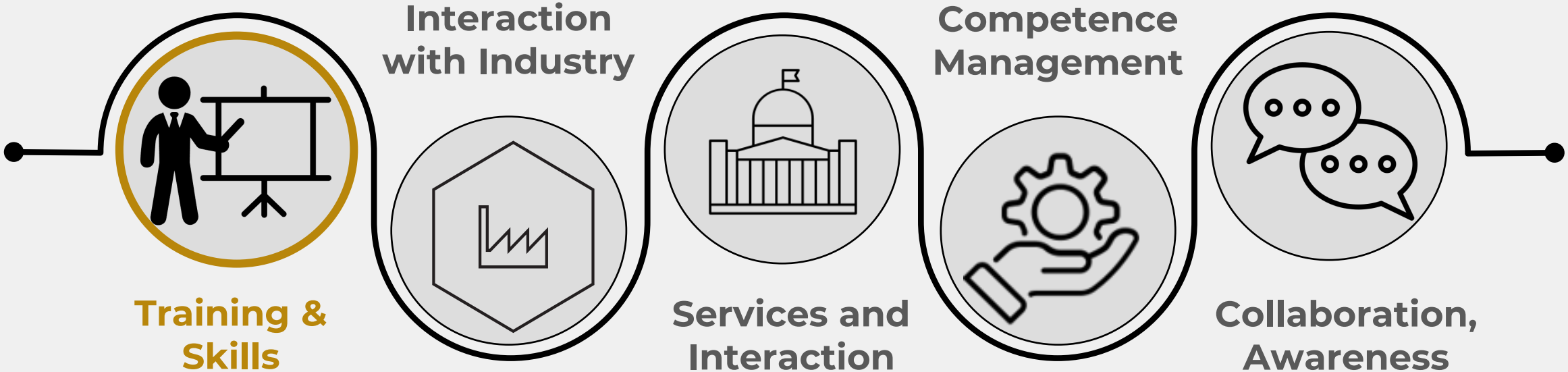


NCCs – What do they do?

AI Support of NCCs



Just some examples!

NCCs – AI Support: Training

Laura Morselli, CINECA

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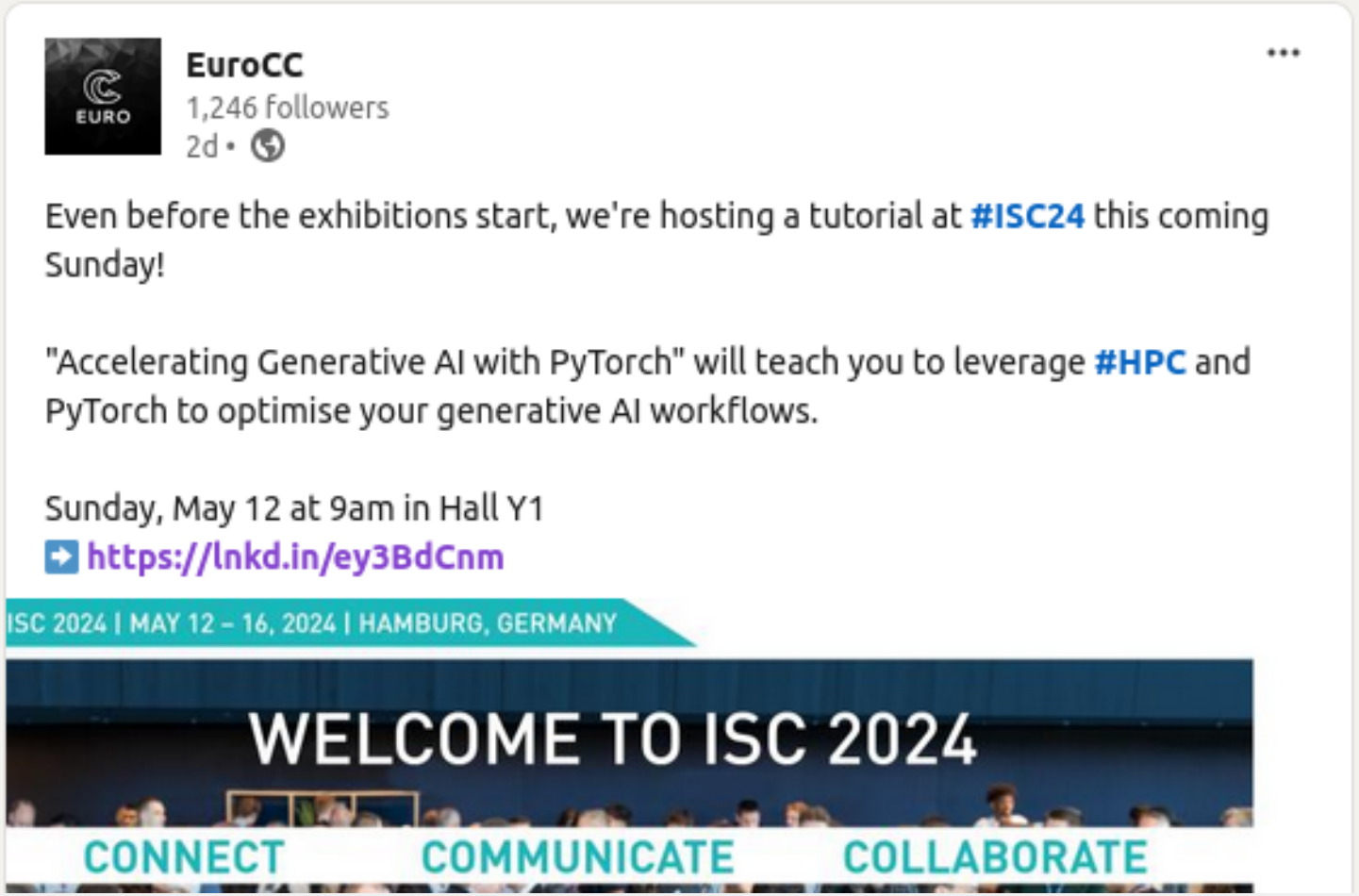

EURO NETHERLANDS

EURO²

EURO²

EUROCC ITALY
HPC Competence Center

NCCs – AI Support: Training

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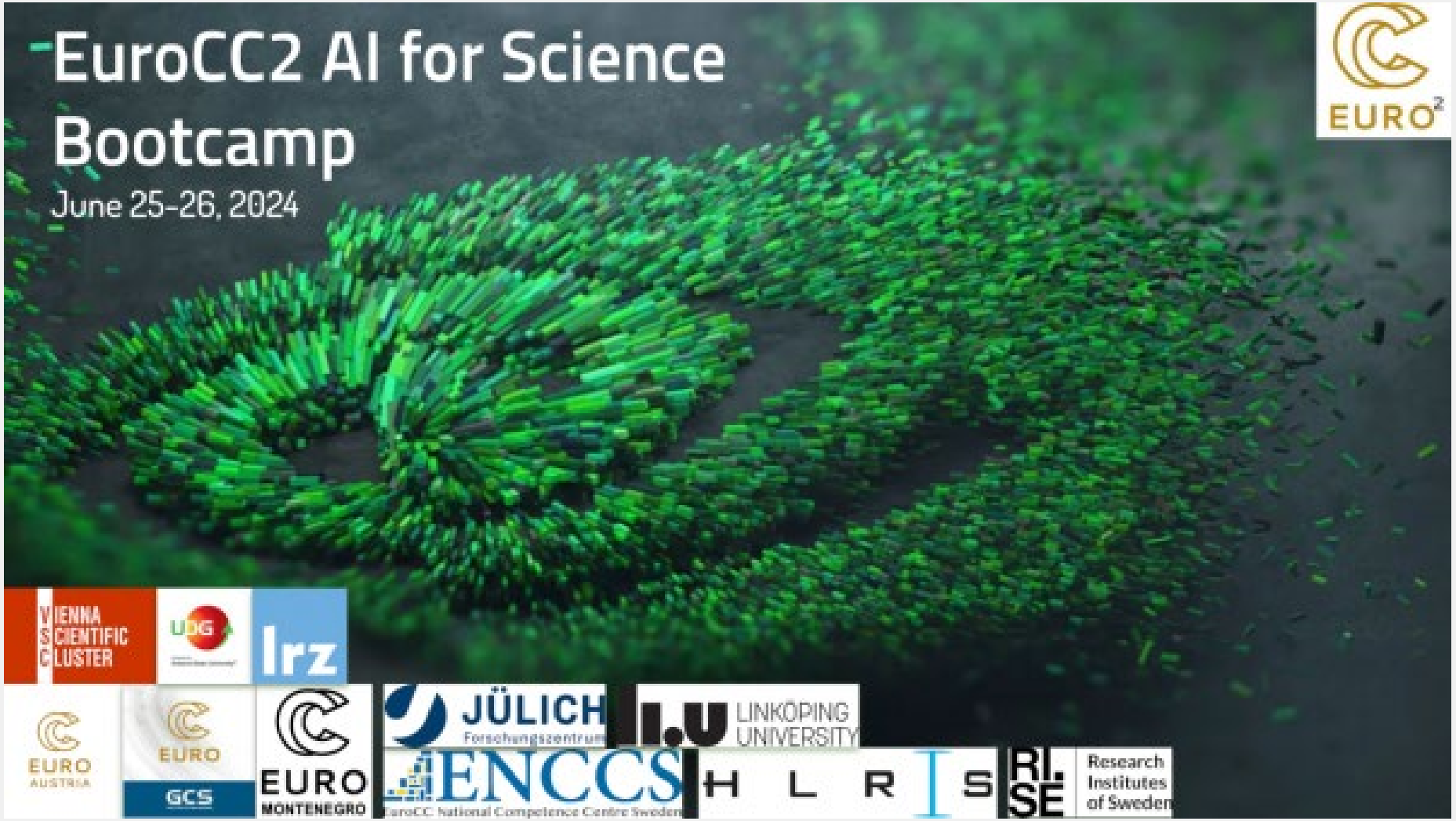

NCCs – AI Support: Training

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Accelerating Generative AI with PyTorch – Training Event (2024)

Date: Friday, 19 April 2024

Location: Richard Cooper Seminar Room, Fresnel Building, Athalassa Campus, The Cyprus Institute

This is not a hybrid event. In-person attendance is required.

Speakers:

Mr. Christodoulos Stylianou, Research Engineer (CaSToRC, The Cyprus Institute)
Mr Ivan Gentile, Data Scientist (IFAB - NCC Italy)
Dr Charalambos Chrysostomou, Associate Research Scientist (CaSToRC, The Cyprus Institute)

Description:

The tutorial aims to provide optimization techniques for Llama, a foundational Large Language Model (LLM) based on the Transformer Architecture, analogous to the GPT series. Noted for their human-like text generation capabilities, these models encounter challenges regarding efficiency and scalability due to their complexity and computational demands. The session intends to augment the operational efficiency of these models through PyTorch-native optimization strategies, including model compilation, GPU quantization, speculative decoding, and tensor parallelism. Participants will have the chance to evaluate the proposed optimizations in real-time on a real supercomputer. These methods seek to significantly reduce inference times and optimize resource usage, thus expanding the advanced models' applicability across various computational frameworks and research initiatives.

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Programme de formations gratuites en HPC, HPDA, IA et Quantique organisées par le Centre de Compétence CC-FR, dans le cadre du projet EuroCC.

Le Centre de Compétence CC-FR organise des formations gratuites destinées aux industriels et académiques qui souhaitent renforcer leurs connaissances théoriques et pratiques dans le domaine du HPC, HPDA IA et Quantique.

Découvrez le programme du Centre CC-FR 2024 et inscrivez-vous !

+ 9-11/12/24 : Formation HPC Parallélisme multi-architecture avec la bibliothèque C++, CRFACS, Toulouse
+ 2-6/12/24 : Formation IA Intelligence artificielle pour la simulation en physique, CERFACS, Toulouse
+ 27-28/11/24 : Formation HPC Modèles de programmation parallèle : MPI, OpenMP, CERFACS, Toulouse
+ 07-10/10/24 : Formation IA Apprentissage machine pour la science des données, CERFACS, Toulouse
+ 01-12/07/24 : Formation HPC Gray Scott School, CC-FR & LAPP, Annecy

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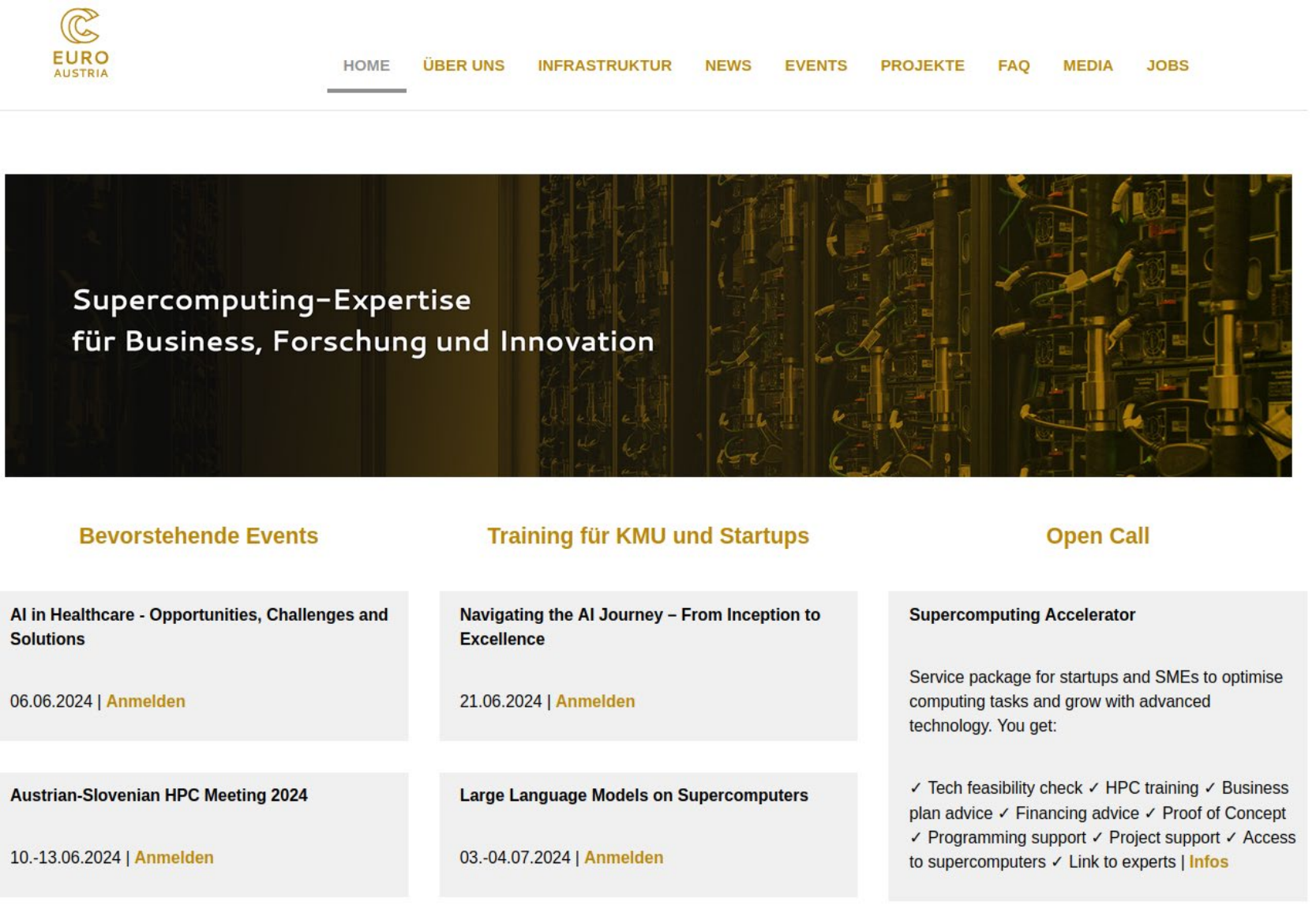

NCCs – AI Support: Training

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Home Events HPC for Industry Documents The TRUBA Initiative NCC Services Contacts

EuroCC 2 – Trainings

Events › EuroCC 2 – Trainings

Please click for information about training organized within the scope of EuroCC 2 Project.

20.03.2023	EuroCC 2 – Dialogues in the Midst: Mapping the Protein Landscape with Metadynamics
26.12.2023	EuroCC 2 – Matreials Modeling with Quantum Espresso
22.12.2023	EuroCC 2 – From Natural Language to Database Query: Large Language Models and Recent Developments
19.12.2023	EuroCC 2 – Training: Computational Fluid Dynamics: A Guided Exploration of CFD on TRUBA Systems

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NCC Slovakia

EURO National Supercomputing Center

A practical introduction to natural language processing →

A gentle introduction to AI →

Umelá inteligencia/Strojové učenie

Umelá inteligencia používa metódy strojového učenia a zaoberá sa tvorbou systémov riešiacich komplexné úlohy ako je rozpoznávanie či klasifikácia, napr. v oblastiach spracovania obrazu alebo spracovania písaného textu či hovoreného jazyka, alebo plánovania či riadenia na základe spracovania veľkých objemov dát.

Názov kurzu (meno lektora)	Popis	Registrácia (počet prihlásených)
Praktický úvod do spracovania prirodzeného jazyka (tba)	Spracovanie prirodzeného jazyka je odvetvie umelej inteligencie, ktoré sa zaoberá interakciou medzi počítačmi a ľuďmi	
Jemný úvod do AI (Miroslav Reiter)	Tento kurz je navrhnutý tak, aby poskytol súhrnný a prístupný prehľad základných konceptov AI, strojového učenia a na	6. 3. 2024 (55/55) 9:00 - 13:30

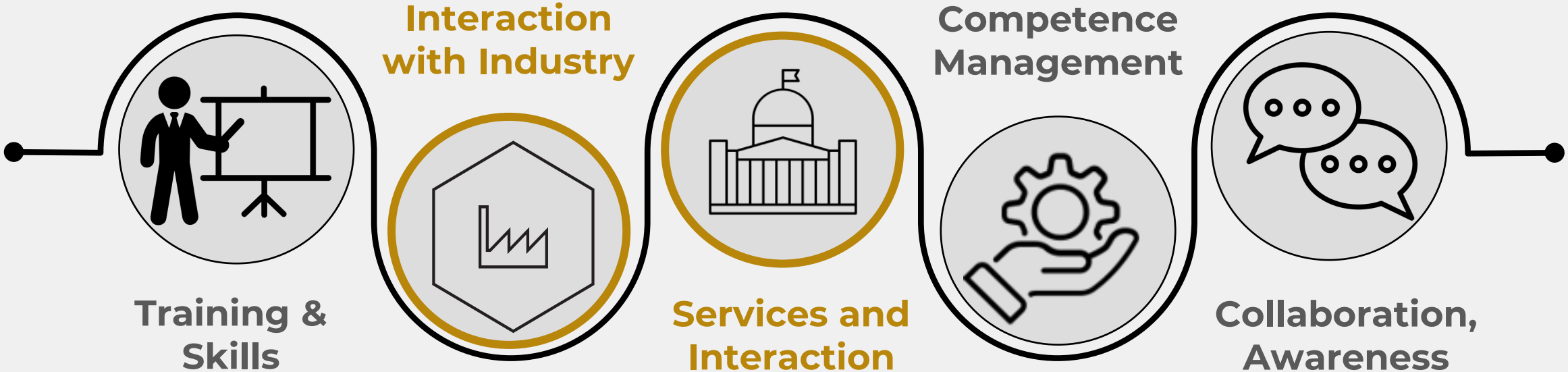
Python

Python je interpretovaný, interaktívny, open-source programovací jazyk. Python beží na mnohých variantoch Unixu, na Macu a Windowse (súčasťou kurzu bude inštalácia na vašom systéme). Pre absolvovanie kurzu je potrebné mať k dispozícii vlastný notebook (s ľubovoľným operačným systémom podporujúcim Python).

Názov kurzu (meno lektora)	Popis	Registrácia (počet prihlásených)
Datamining a Parsovanie v Pythone (Miroslav Reiter)	Tento kurz je navrhnutý tak, aby poskytol základný pohľad do techník a nástrojov potrebných pre e	10. 4. 2024 (55/55) 9:00 - 13:30
Základy programovacieho jazyka Python	Python je open-source, objektovo-orientovaný, vysoko úrovňový programovací jazyk.	

NCCs – What do they do?

AI Support of NCCs



Just some examples!

Creative

Tengr.ai

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Tengr.ai revolutionizes the creative industry using Komondor

Challenges & Solution

Create a **solution that is competitive wrt American providers** while following the privacy-by-design philosophy that does not have gender or racial bias. It needs to easily "forget" styles if there are copyright claims for parts of the training dataset.

Benefits

- Enable everyone to express their creative freedom
- Easy-to-use and accessible image generation
- Multilingual and multicultural, without racial or gender bias

Full story:

*"KIFÜ enabled this project through **Komondor HPC**; without their help and support, **the Tengr.ai project would not stand a chance in this highly competitive and fast-paced environment**."*

Peter W. Szabo, Founder and researcher @Tengrai Artificial Intelligence kft.

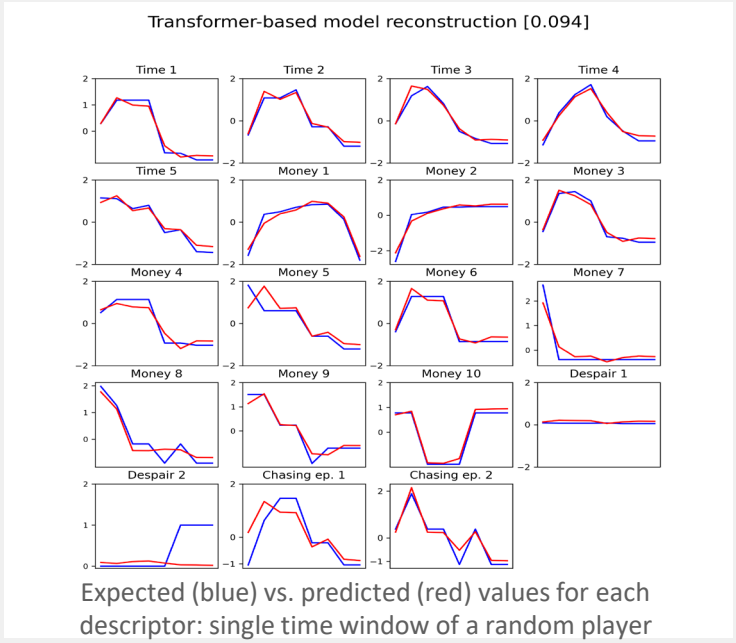
HPC @hu Competence Centre

Anomaly Detection in Time Series: Gambling prevention using Deep Learning

Challenges & Solution

Unsupervised autoencoder model was used to **detect anomalies in the dataset generated by online casino players,** consisting of time series of 19 derived features such as net loss / gain, cash deposits / withdrawals in a sliding time window.

Training model with more than 100k trainable parameters and gigabytes of data greatly benefited from utilizing GPU-accelerated HPC facility (Devana).



Expected (blue) vs. predicted (red) values for each descriptor: single time window of a random player

Benefits

- Help betting and online casino providers mitigate negative consequences for players, which is in line with European trends in risk management.
- Real-time problem gambling detection using AI and Big Data thanks to HPC.

*"The accelerated module of the **HPC system Devana** allowed us to test several approaches to prevention of pathological online gambling. Powerful GPU accelerators were of great value in training and fine-tuning of sophisticated AI models."*

Martin Varmus, CEO@Codium, ltd.

Full story:

Languages technology

LUISA TRANSLATION AGENCY

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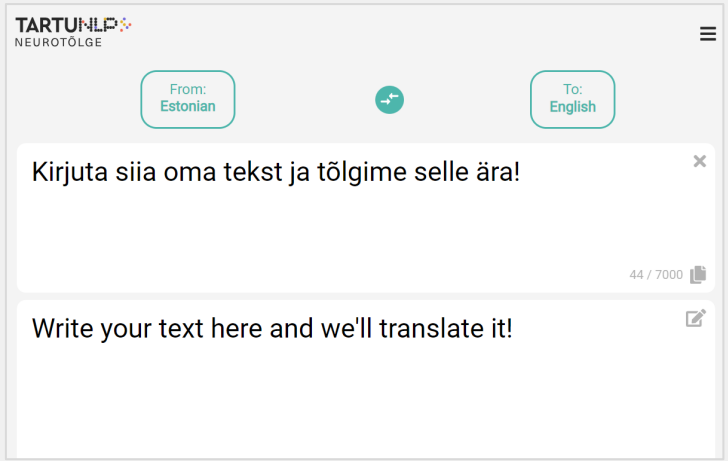
Machine Translation Post-Editing

Challenges & Solution

Design a **custom-made machine translation system to reduce the time of translations**. As the company had no previous experience neither in NLP nor in ML, they collaborated with the TartuNLP team. Training of the machine translation model was conducted by using **University of Tartu HPC centre's Rocket cluster**.



Benefits

- Neural machine translation systems were built for 4 language pairs and several text domains
- The company enjoyed lower deployment costs and did not have to worry about maintaining their own hardware
- The innovative translation tool helps to save valuable time and human resources

*"Thanks to rapid advances in the technology and our extensive translation memory, **we are able to offer our clients machine translations with post-editing** in a range of language combinations and on a range of topics."*

Anna Räbokon, Customer Relations Manager @Luisa Tõlkebüroo OÜ

Full story:

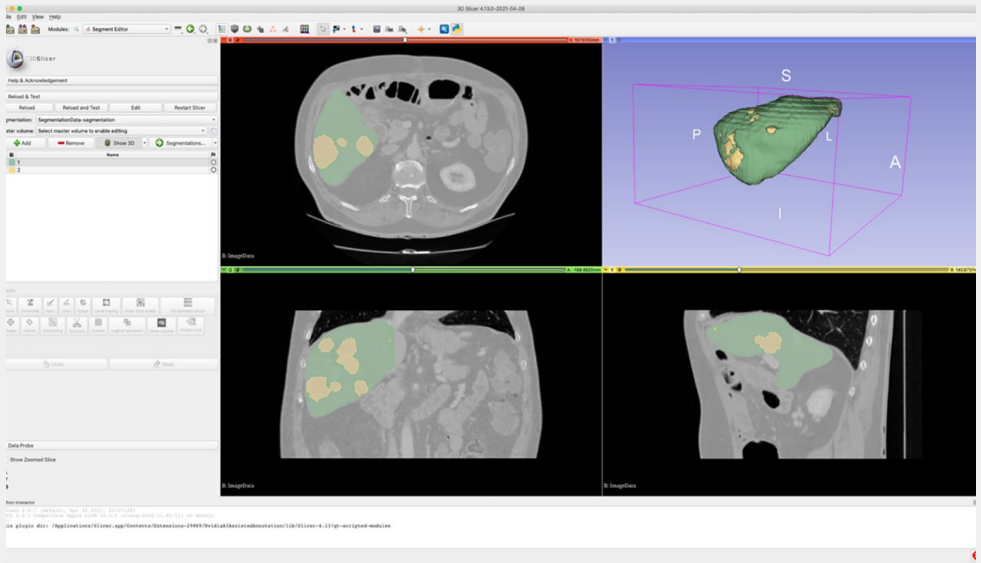
EURO ESTONIA

Medical Image Processing

Challenges & Solution

Deploy and test a tool providing **remote automatic tissue segmentation** from patient image data obtained from computed tomography or magnetic resonance imaging.

The automated segmentation process can be applied to specific tissues of real interest to the physician, and the resulting model can be further used to **plan healthcare tailored to the individual patient**.



Benefits

- The time of the segmentation process is reduced by automation
- Spared time can be used for the physician´s benefit
- The automated segmentation process can be applied to specific tissues of interest to the physician

*"Using this toolkit is beneficial for both patients and physicians, as automation allows us to **achieve high-quality image reconstructions in a fraction of the time and with minimal effort**."*

Jan Roman, MD, University Hospital Ostrava

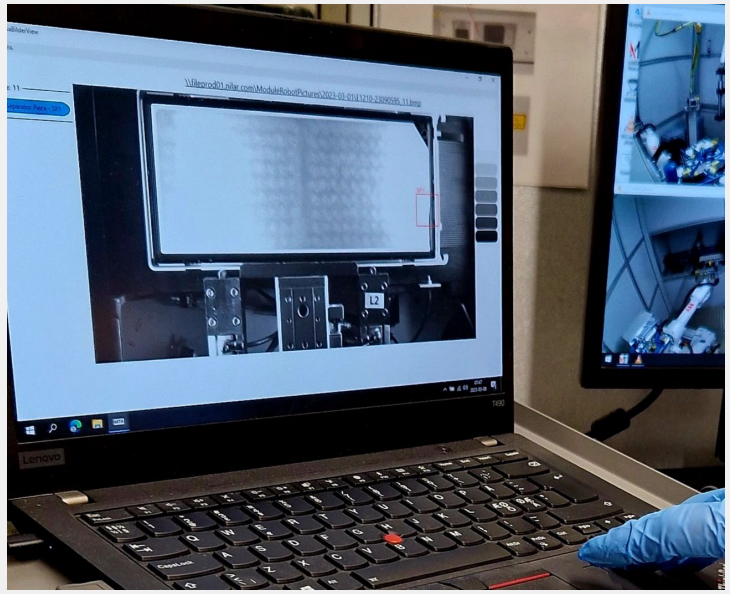
Full story:

Manufacturing & engineering

Nilar automates battery inspection using AI vision on Vega

Challenges & Solution

ENCCS and Nilar AB have leveraged the computational resources that the EuroHPC JU **Vega cluster** provides and the large image datasets Nilar has collected from their assembly lines to **develop an AI-based computer vision solution** as a first step **towards complete automation of Nilar's quality inspection process of batteries.**



Benefits

- Spot negative trends earlier
- Faster manufacturing adjustment
- Reduce scrap rate

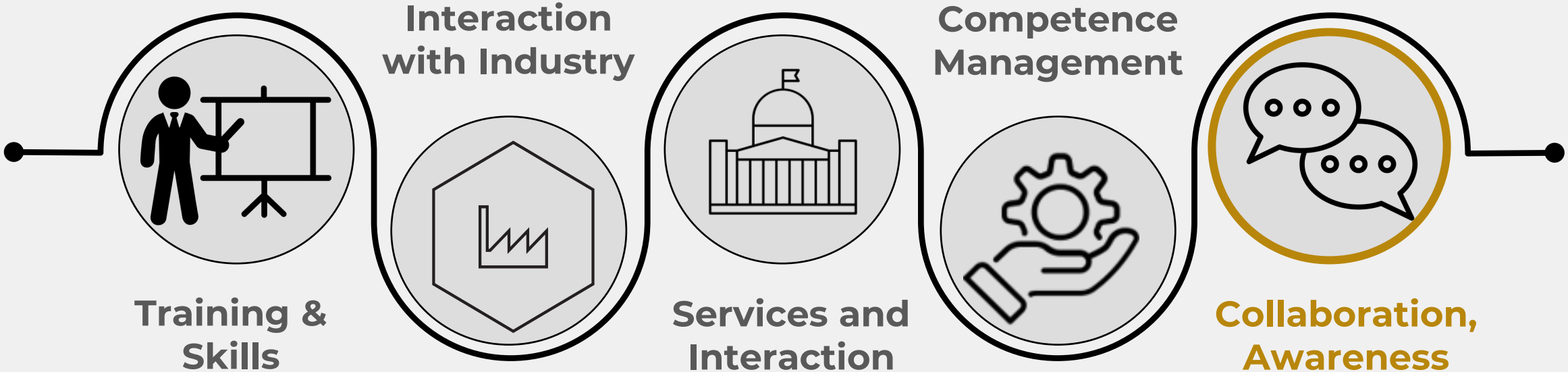
*"Nilar is already seeing benefits from the solution, such as **being able to spot negative trends in quality earlier, which enables faster adjustment of process parameters to reverse these trends**. This has helped reduce scrap rate, which in turn has led to a positive impact on their business."*

Andreas Thore, Researcher at ENCCS/RISE

Full story:

NCCs – What do they do?

AI Support of NCCs



Just some examples!

NCCs – AI Support: Awareness

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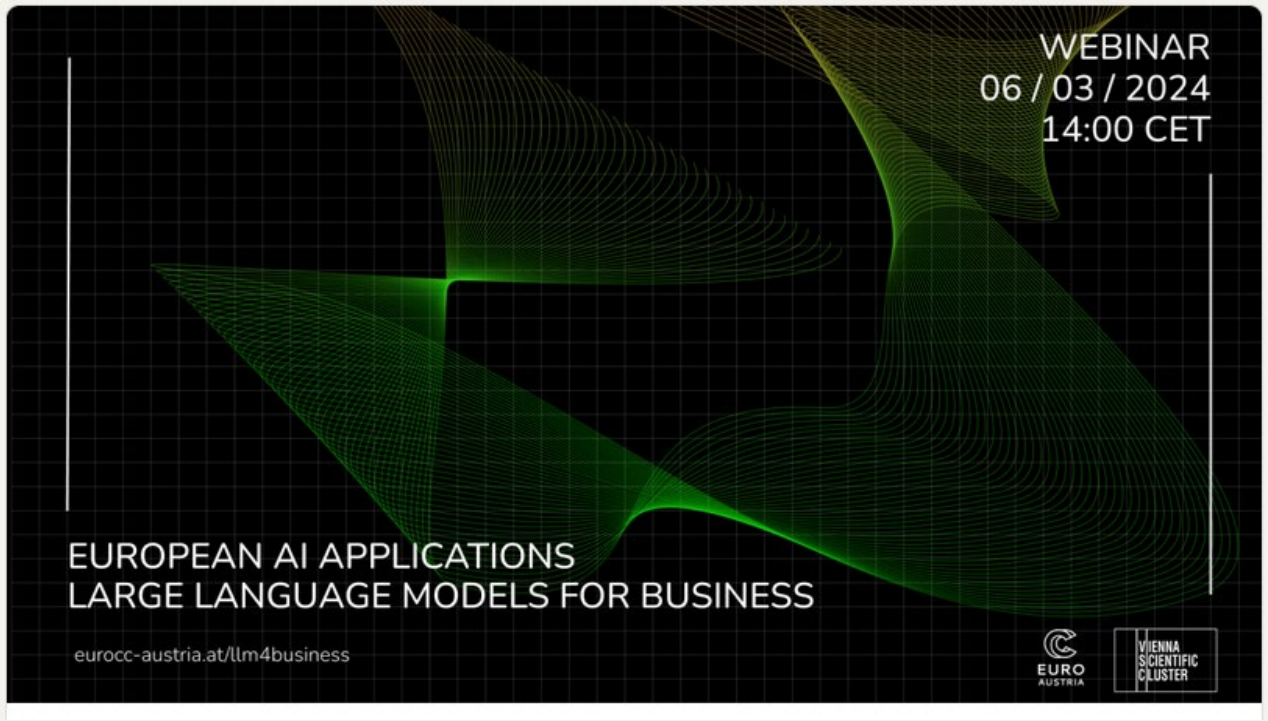

NCCs – AI Support: Training

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NCCs – AI Support: Awareness

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SLING

If you want to know more!

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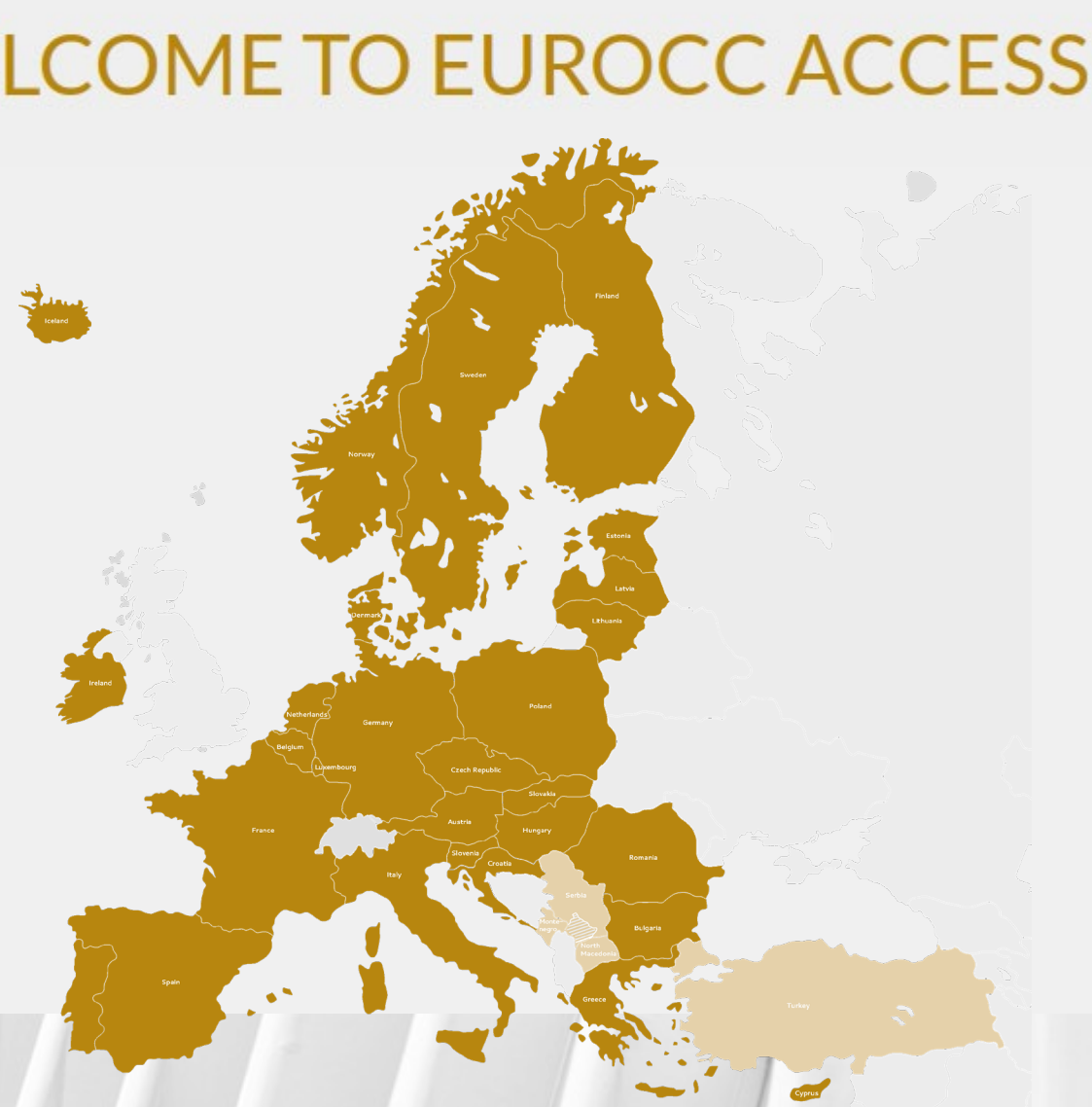
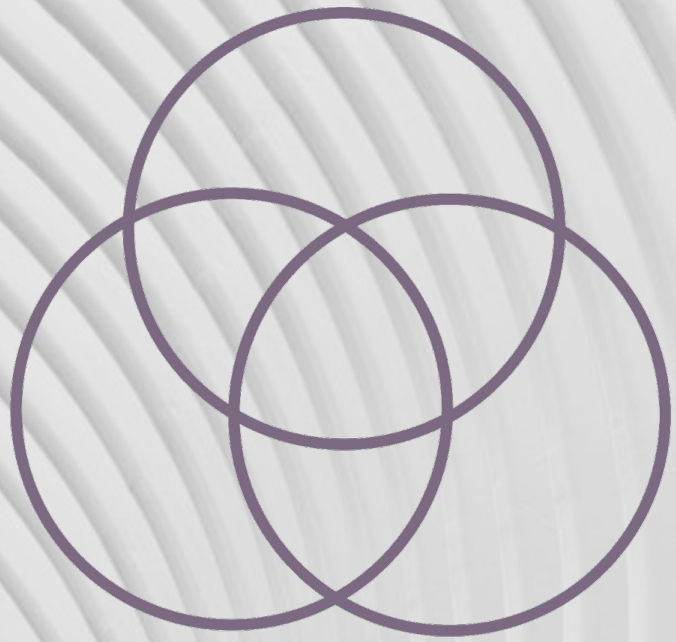
- **Trainings**
  - HPC Portal
  - LinkedIn / Webpages of NCCs
- **Success Stories**
  - Success Stories Booklet
  - Portfolio Industry Use Cases
- **Documents & Videos Library**

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





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Thank you!