EURO

Human engagement on HPC

Luisa Monti, CINECA

How to boost people engagement on HPC and the participation to HPC-related initiatives?

EURO

NCC Italy activities

TARGET

- GENERAL PUBLIC
- COMPANIES
- ACADEMY / PA

EUROCC ITALY
HPC Competence Center

- Staff

TYPE

- Training
- Support for innovation

Public events to present HPC

- Web marketing festival, June 2022, Rimini
- Market Faire festival, January 2020
- Notte dei ricercatori, September 2022, Bologna
- European Projects dissemination events

- Training for non-HPC experts :

- IFOA program, for diplomats
- Big data lab (*post lauream courses, for several academic background*)

- Upcoming event:

Leonardo Supercomputer Inauguration, November 2022, Bologna

Notte dei ricercatori

- 30 September 2022
- Public in-situ event in 5 different cities in Emilia - Romagna
- 10.000 attendees
- Awareness
- Engagement of citizens
- targeted high-school activities
- Funded by the EU project “Society”

Web Marketing Festival

WMF 2022 in numbers:

- Attendees and international delegation from 49 countries
- + 100 events, + 700 speakers, +100 talks and events on mainstage
- Topics: Sustainability, Robotics, Startups, AI, Virtual Reality, Entrepreneurship, Digital Marketing, SEO, Internationalisation, Edutech, Tourism, Healthcare, Creators, Culture, Agritech

Involvement of EuroCC Italy:

- EuroCC Italy online and interactive stand
- CINECA HPC director speech at the mainstage
- In situ training events
- Previous edition 2021 : PoCs' presentation

Public events to present HPC

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- Market Faire festival, January 2020
- Notte dei ricercatori, September 2022, Bologna
- European Projects dissemination events

- Training for non-HPC experts :

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Companies, SMEs

Support in **searching and applying** for national and EU funding opportunities for innovation (EU cascade funding projects, EU in-kind projects, FESR, national initiatives)

Proof of concept: collaboration with SMEs came from networking activities, through trade associations and business clusters, networks and supply chains of companies participating in the projects (Eurocc: Leonardo s.p.a., Eni, Dompé)

Direct contract with SMEs or big company

Training for industries (within EuroCC)

TRAINING on several level

Interest and awareness events: industrial workshops, training session at universities.

Introductory courses to supercomputing: basic courses for new users, both industrial and academic, to introduce the HPC technical advantages and its basic usage.

Courses focused on specific technologies: courses for academia and industry, of up to 3 days, where a single technology, its use and applications in science and engineering are presented.

Basic and advanced schools: 1- or 2-week schools to provide a general overview on HPC or HPC-related specific topics

Upskill training paths: internships at CINECA and joint doctorates with Italian universities.

Collaboration with HPC stakeholders at European and national level

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Collaboration with academic staff with outputs on industrial projects (like IoTwins)

IoTwins
BIG DATA OPTIMIZE INDUSTRY AND SERVICES

bi-rex
Big Data Innovation & Research Excellence

Collaboration with the national Network: IFAB, Bi-Rex

IFAB

f4f EuroHPC

Interaction with European projects: EUmaster4HPC, Fortissimo

EUMaster4HPC

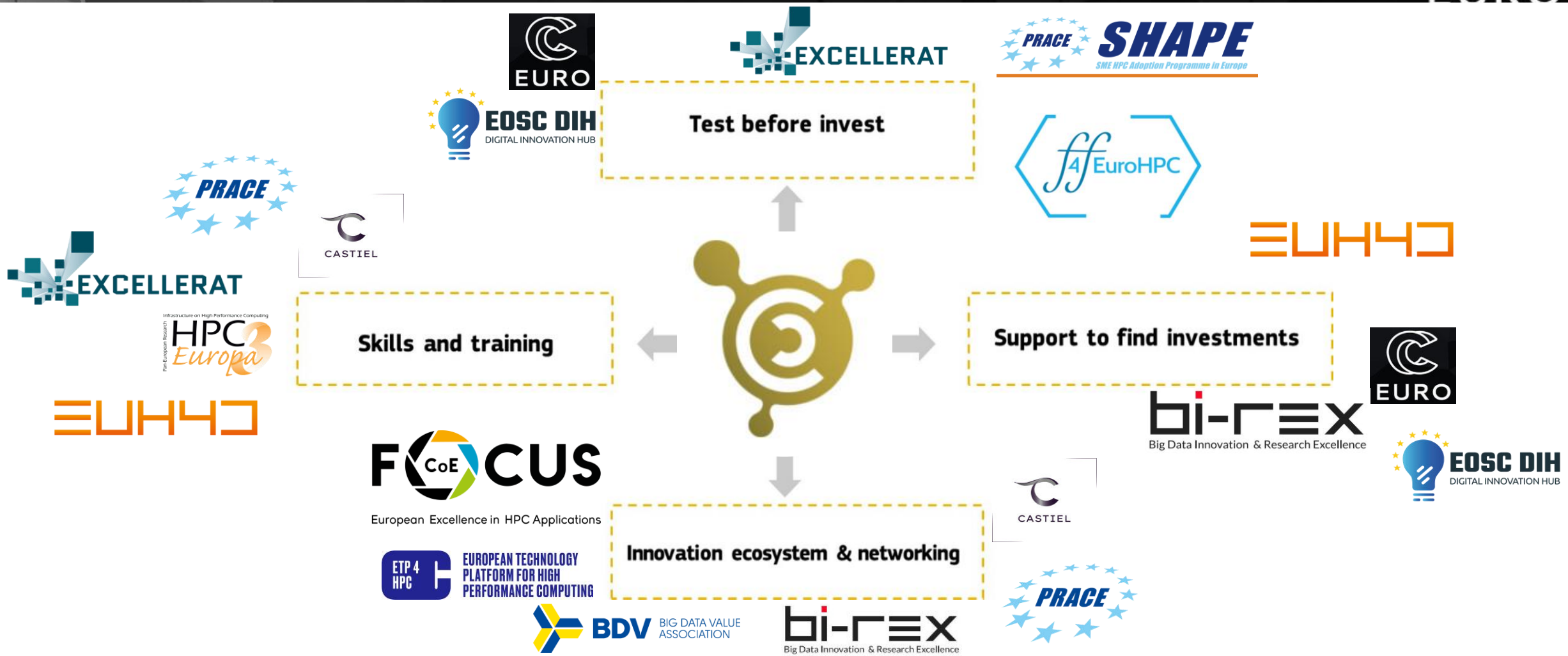
CASTIEL

EuroHPC, ETP4HPC, Big Data Value Association - BDVA

EUH4D

BDV BIG DATA VALUE ASSOCIATION

EuroCC Italy and the European Ecosystem



EuroCC 1 results in a nutshell

Test before invest
12 PoCs running

Develop skills and training
20 courses planned in two years

Support to find investments
FF4EuroHPC first call: 13 submissions 5 awarded

Facilitate access to the **innovation ecosystem**
Leonardo Supercomputer, FocusCoE, Castiel

- First pillar: PoCs
- Second pillar: HPC/HPDA/AI integrated training program for industry
- Awareness and communication activities
- Pre-existing tailored network of NCC Italy

Proof of Concept - POC

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Business development support

- **Support SMEs** in **the evaluation of ROI** of HPC/HPDA/AI innovation actions
- **Support first time HPC users** to obtain funding for PoCs (**FF4EuroHPC** first call: 13 submissions, **5 proposals awarded**)

1,08 MLN
CPU Core Hours

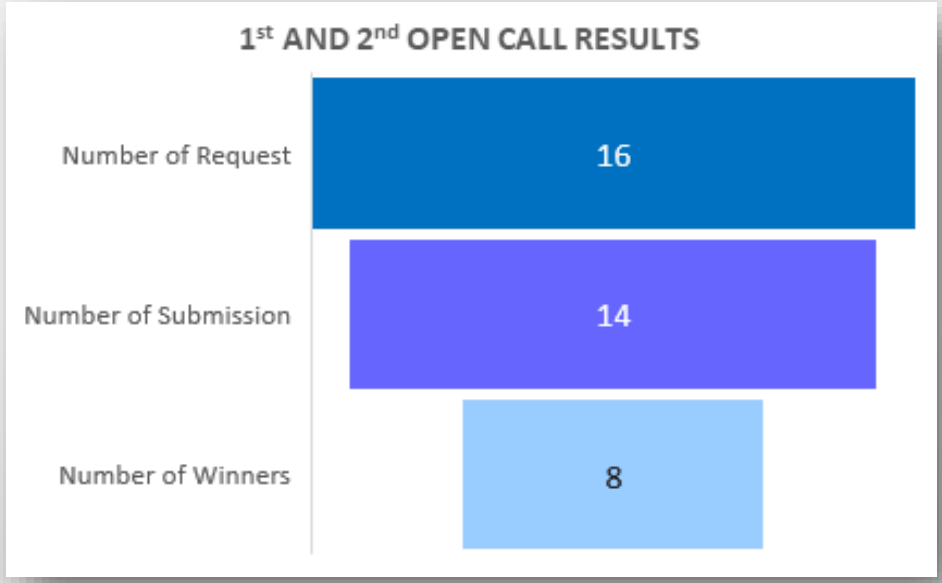
120 K
Node Hours CPU + GPU

2
FTE Support (23,5 PM)

Launch two Calls for Proof of Concepts (PoCs) – test before invest

- Set up of the **Call management platform**
- Launch of the first and second calls for PoCs
- **First OpenCall:** 8 projects submitted, 6 accepted through the evaluation process - Kick Off of the six projects :– Leonardo is following two PoCs**4 environment & climate, 1 fintech, 1 CFD**
- **Second OpenCall: 3** project submitted, 2 accepted: **video processing and digital heritage.**

Participation to CASTIEL workshops and industry champions meetings



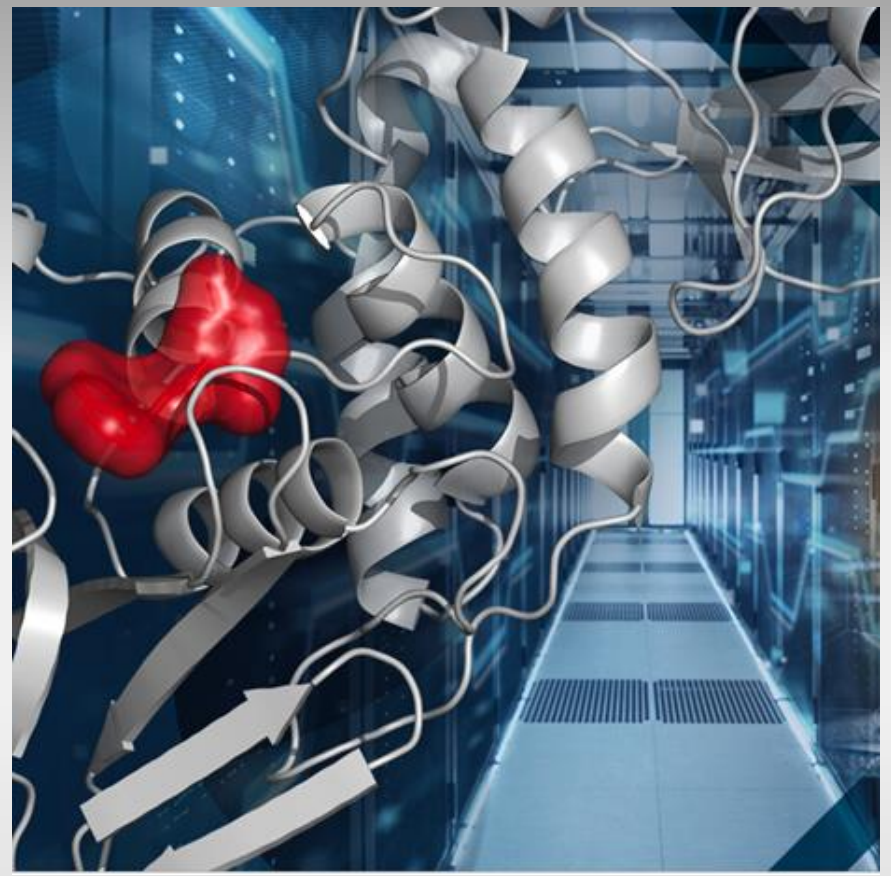
Industrial PoCs

Other Industrial Proof of Concepts (PoCs)

To increase awareness on the impact of HPC/HPDA/AI technologies in the pharmaceutical industry, *the EUROCC third-party Dompé Farmaceutici elaborated and proposed* ***four innovative Proof of Concepts****, to be implemented in the second year of the EUROCC project:*

- ❑ Molecular Dynamics improvements for **Drug Design**
- ❑ **Machine Learning / Deep Learning** for the **Drug Discovery** Platform
- ❑ **Quantum Computing for Molecular Docking**
- ❑ **Computational Fluid Dynamics** (CFD) model development for **granulation processes**

The proposals with objectives and workplan have been defined, and will be implemented with the support of NCC Italy



Dompé

TRAINING PROGRAM 2021/2022

FIRST YEAR OVERVIEW

The Training Program organised by EuroCC Italy focuses on sharing knowledge about High Performance Computing (HPC), High Performance Data Analysis (HPDA) and Artificial Intelligence (AI), and on their applications. The main aim of the program is to enable SMEs to the use of HPC technologies, by providing them with HPC-related skills. For this purpose, B2B events are organised to encourage a close interaction between industries and local/national organizations involved in technology transfer.

The training program is geographically distributed and is developed on two main levels:

7 COURSES

CURIOSITY & INTEREST

The first approach to HPC,HPDA, AI innovative technologies, and it is carried out in collaboration with other training institutions.

4 COURSES

HIGH PERFORMANCE INNOVATION

Aimed at satisfying specific training needs, the purpose of the training offers is to provide company personnel with skills on the technologies to be applied in the innovation processes of services and products.

In addition, EuroCC Italy organised, in collaboration with other entities, 6 events aimed at raising awareness about the benefits of HPC-related technologies in innovating industrial processes.

380 PARTECIPANTS

130 COMPANIES

265 TEACHING HOURS

7 CITIES

9/10 SATISFACTION RATE

SOURCE: EUROCC ITALY TRAINING PROGRAM - FIRST YEAR REPORT OF TRAINING ACTIVITIES

EUROCC ITALY HPC Competence Center
CASTIEL
EURO

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 857191

Training: Interest & Impact

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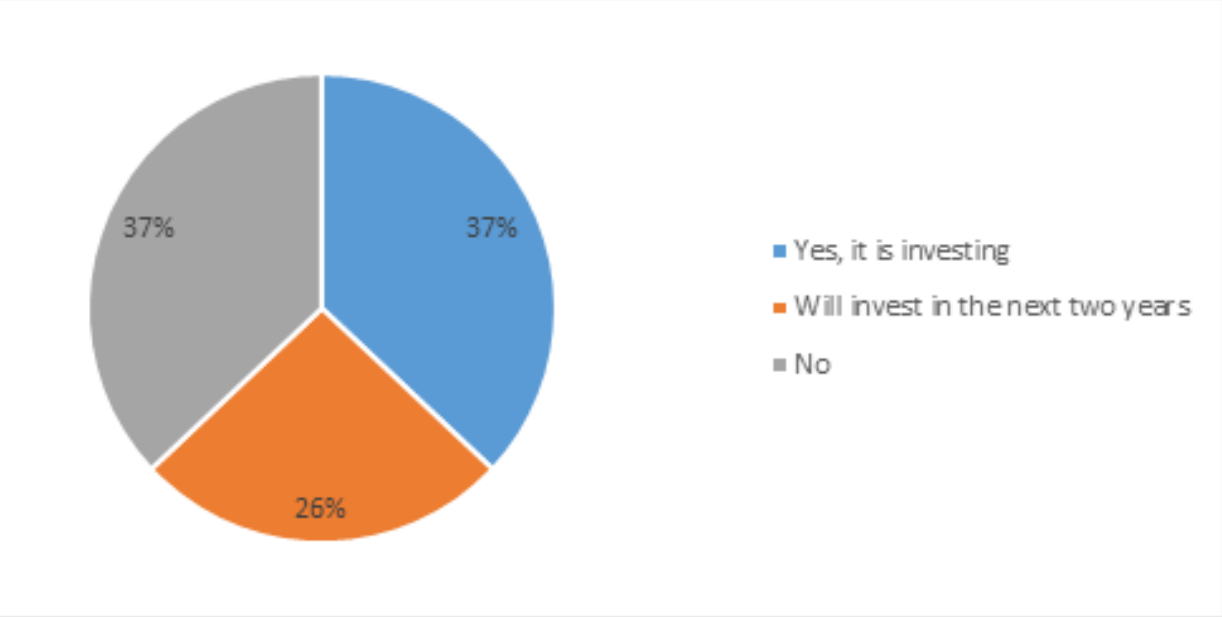
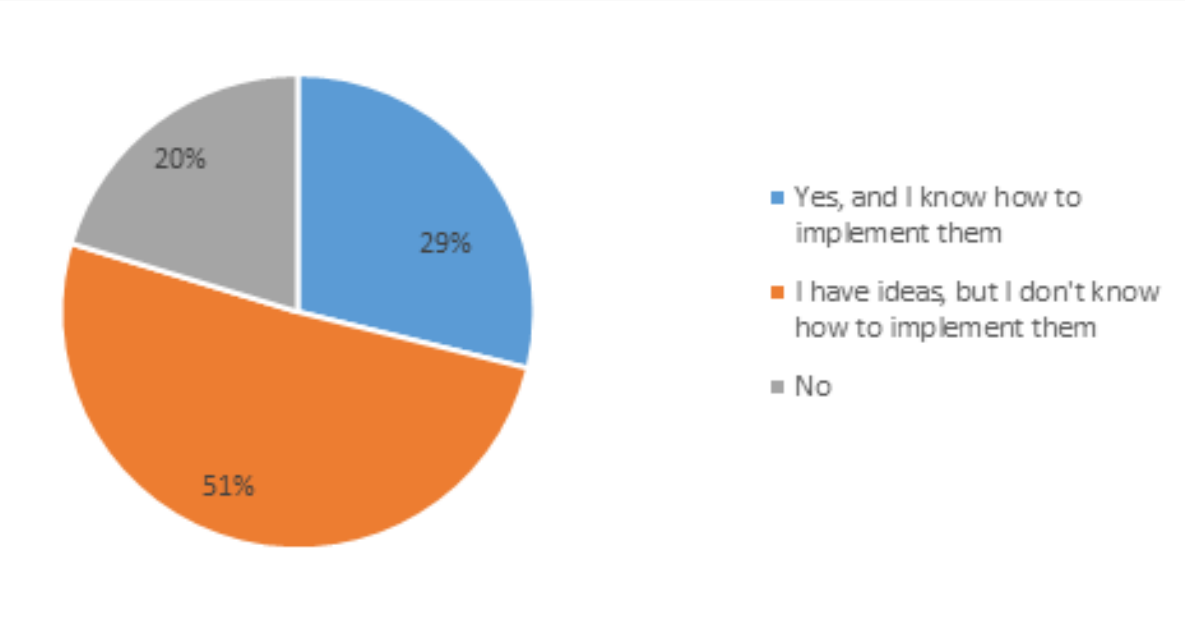
Is your company investing or will be investing in the next two years in HPC technologies?



Did the course give you interesting insights for your work?



Awareness and communication activities

Identity design of EuroCC Italy

- Created a personal and original EuroCC Italy Logo
- Web Site to share and host all relevant contents and initiatives
- Social media platforms: LinkedIn and Twitter
- YouTube Channel
- Created and shared two videos on:
  - EuroCC Italy project: presentation of the project
  - EuroCC Partners: a brief overview of partners of EuroCC Italy

Collaboration with CASTIEL

- Involvement in the creation of the competence map, providing severe mocks-up
- Shared relevant news and Success Stories on EuroCC Access Web Site

Challenges

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Structured tools to reach out and engage new SMEs

Hiring HPC young experts

How to reach PA users?

Focus on those users who have ideas but do not know how to implement them

Thanks for your attention!

EuroCC: This project has received funding from the European High-Performance Computing Joint Undertaking (JU) under grant agreement No 951732. The JU receives support from the European Union's Horizon 2020 research and innovation programme and Germany, Bulgaria, Austria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Greece, Hungary, Ireland, Italy, Lithuania, Latvia, Poland, Portugal, Romania, Slovenia, Spain, Sweden, United Kingdom, France, Netherlands, Belgium, Luxembourg, Slovakia, Norway, Switzerland, Turkey, Republic of North Macedonia, Iceland, Montenegro

CASTIEL: This project has received funding from the European High-Performance Computing Joint Undertaking (JU) under grant agreement No 951740. The JU receives support from the European Union's Horizon 2020 research and innovation programme and Germany, Italy, Spain, France, Belgium.

CASTIEL WP2: castiel-workpackage2@lists.projects.hlrs.de

CASTIEL - Coordination & Support for National Competence Centres on a European Level

EuroHPC-04-2019: HPC Competence Centres

Miriam Koch, HLRS

HUMAN ENGAGEMENT & DIVERSITY IN EUROCC

What do we want to do today?

Miriam Koch, HLRS

1. Relevance
2. Status in EuroCC
3. Outcomes from Montenegro Workshop
4. Q&A / Discussion

Relevance

Miriam Koch, HLRS

Engagement:

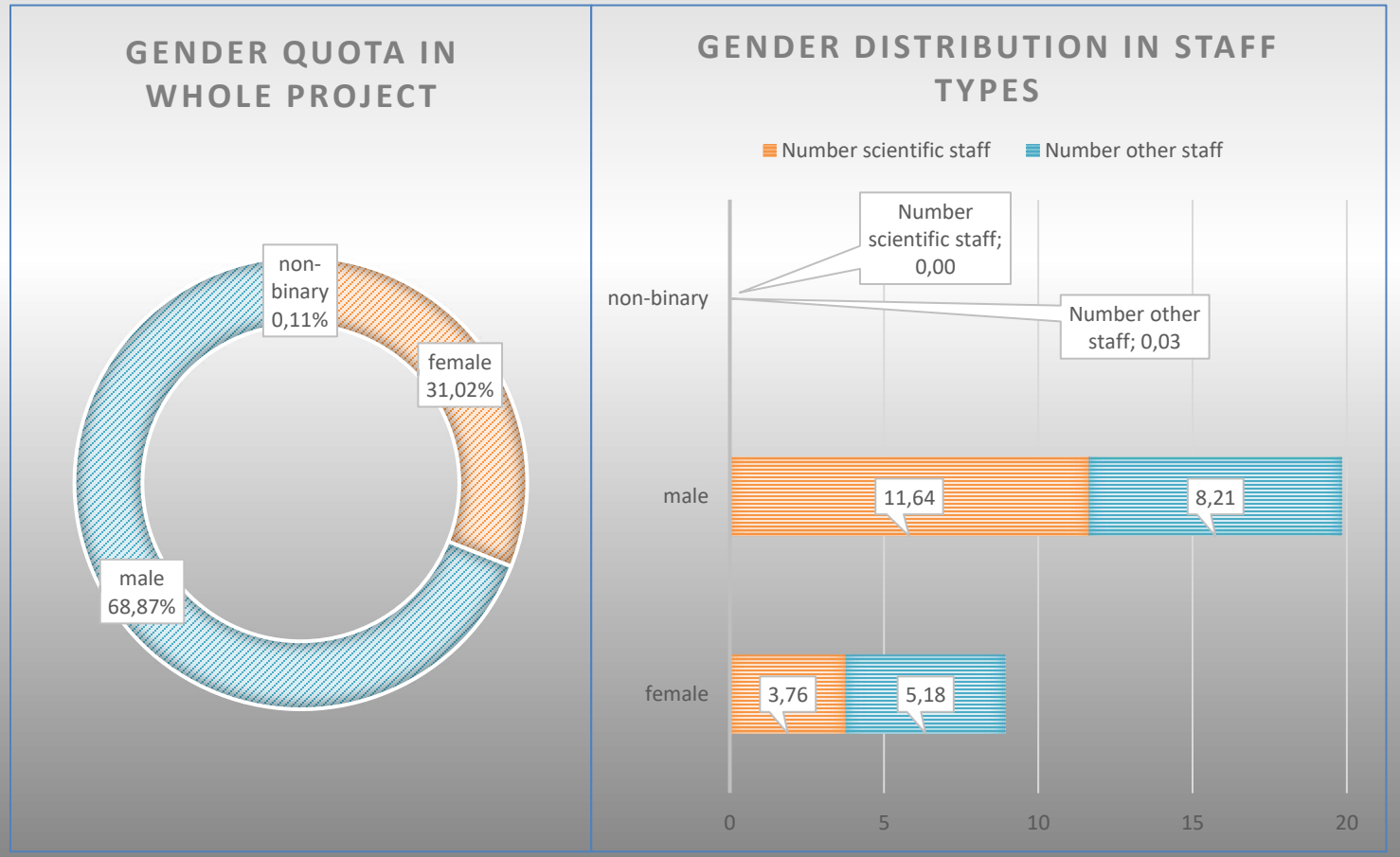
- ACTIVE: the fact of being **involved with something**
- PASSIVE: the **process of encouraging people** to be interested in the work of an organization, etc.

For both ways: Diversity is necessary! (**Identification & Reach**)

HPC shapes society: As an employer and a base for plenty of scientific & research fields. **We need to build a world that works for everybody.**

Where do we stand?

Miriam Koch, HLRS



Our only data!

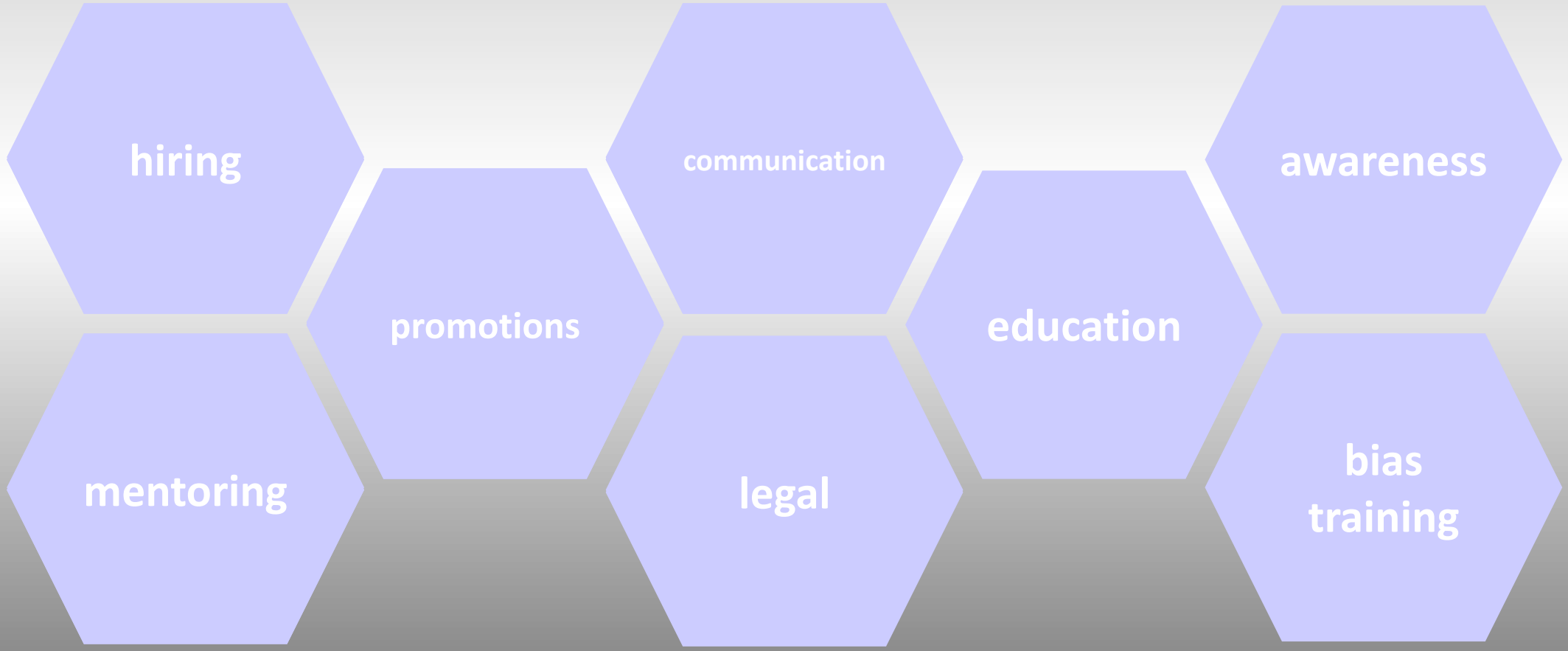
No information about:

- Race
- Age
- Qualification
- People with Disabilities
- Skills
- Religion
- …

But: Data collection in the making (sector specific).

Montenegro Workshop

Miriam Koch, HLRS



Goal:

Find out what workes in our microcosm

Results

Miriam Koch, HLRS

- Define gender equality **plan**
- Set up hiring committee with **knowledge** on how to implement the plan

Results

Miriam Koch, HLRS

- Management to **define** mentors/mentees
- Community of mentors should be **as diverse** as mentees

Results

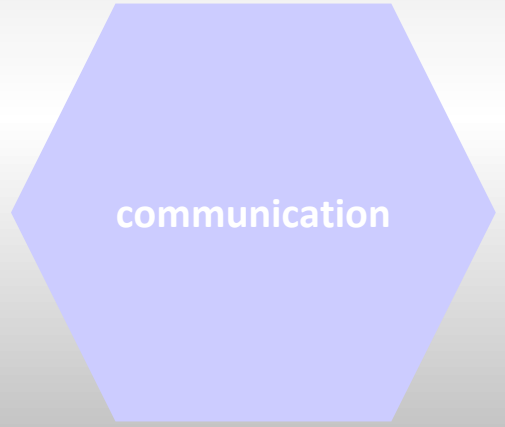
Miriam Koch, HLRS

promotion

- Through Hiring and Mentoring, the candidate pool should be increased
- Make the promotions attractive for everyone (e.g. Part Time, support for child care)
- Change mentality of the decision maker through training

Results

Miriam Koch, HLRS



- Analysis of the current situations and improvement potentials
- Regular Seminars and trainings: Best way to implement best practice in the daily life
- Promote diversity through communications

Results

Miriam Koch, HLRS

legal

- Create the possibility to work from home
- Transparency in Payrolls
- Set Quotas

Results

Miriam Koch, HLRS

education

- Diversity competence skills: introducing diversity skills from kindergarten age (Exercises and courses about career orientation)
- Training: train the trainers, career counselors and campaigns in society to present and educate diversity

Results

Miriam Koch, HLRS

awareness

- Barriers exist in school, workspace. Lead the discussion about a quota
- Measuring: measure numbers and analyse them; have a gender policy
- Trainings are done, but add and encourage all to participate

Results

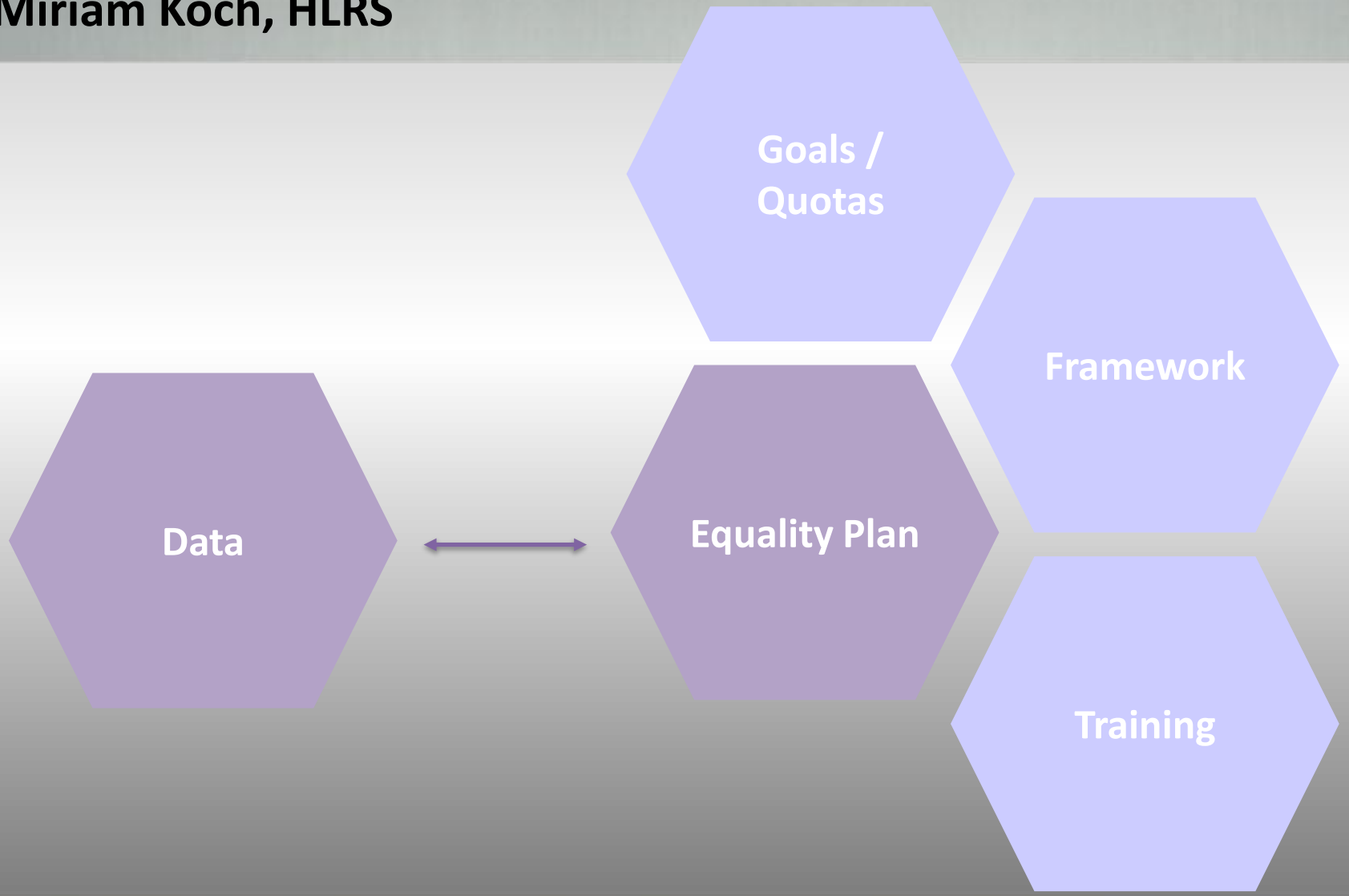
Miriam Koch, HLRS

bias training

- Normalise bias training (similar to health and safety training)
- Put the bias training as a requirement so that people get aware if they are biased
- Bias training could cover: regional characteristics, accents, venue etc.

Results

Miriam Koch, HLRS



What comes next?

Miriam Koch, HLRS

3 Groups:

1) It’s not a problem
2) It’s a problem, but I have many
3) It’s a problem and we do something

Different starting grounds within the groups.

Measurements:

- Success Stories (make advantages visible)
- Best Practices (what works)

THANKS!

QUESTIONS / DISCUSSION POINTS?

Co-funded by the Horizon 2020 programme of the European Union

How to engage younger students, including high schools, on HPC

EURO

Montenegro NCC (WP 34)

18.11.2022

About us – Montenegro NCC 34 (UDG)

- University of Donja Gorica (UDG) was established in 2007.
- It has 300 employees and 3500 students.
- 12 faculties + Center for Foreign Languages, Institute for Entrepreneurship and Economic Development
- Keywords: Business, Multidisciplinary, Innovation

How to engage younger students, including high schools, on HPC

Awareness creation

EURO

Open Mind Academy for awareness raising amongst high school students in Montenegro. Within the Open Mind Academy at the University of Donja Gorica we organized the trainings for Analyzing Social Media Trends in the field of Data Science and Python Video Game Programming.

The training aimed at animating young people to get familiarized with modern technologies and acquire basic knowledge for enrollment in AI.

The training within the Open Mind Academy were intended for high school students who wish to gain practical experience in one of the very popular areas using modern technologies such as 3D printing, design, programming, drones, AI and others, all in collaboration with lecturers from UDG.

The acquired knowledge enabled participants to envision their future in one of the areas they liked from this program.

Initially, there were around 120 participants from various high schools throughout Montenegro. Today, there are courses on HPC/AI and Machine Learning, Parallel Programming, Hugging Face, and others (link)

How to engage younger students, including high schools, on HPC

Awareness creation

An Invited Lecture "Artificial Intelligence and Mathematics" by Petar Veličković (DeepMind) - prof. dr Petar Velickovic, an Affiliated Professor at the University of Cambridge and Scientific Researcher at DeepMind. Prof. Velickovic gave a very interesting talk on machine learning, a few practical applications of AI/ML used by Google Maps, pharmaceutical industry, and mathematics. Prof. Velickovic presented his latest research activities and results, most notably the AI/ML applications in mathematics that was published in Nature journal. There were around 80 attendees that included high school and college students (undergraduate and graduate), representatives of industry. Prof. Velickovic then had a meeting with Prof. Veselin Vukotic, UDG Rector, professors and young researchers.

EUROCC at Days of Science and Innovations Exhibition - EUROCC project was featured at the exhibition organized within the "Days of Science and Innovation" festival. This event is traditionally the central annual event of the Ministry of Science and Technological Development and it aims to bring science and innovation closer to the widest population. University of Donja Gorica and NCC Montenegro supported the organization of the event and participated in various activities and exhibits. EUROCC had its own stand in the exhibit where we discussed the aims and results of the project with the visitors and displayed the materials (videos, brochures).

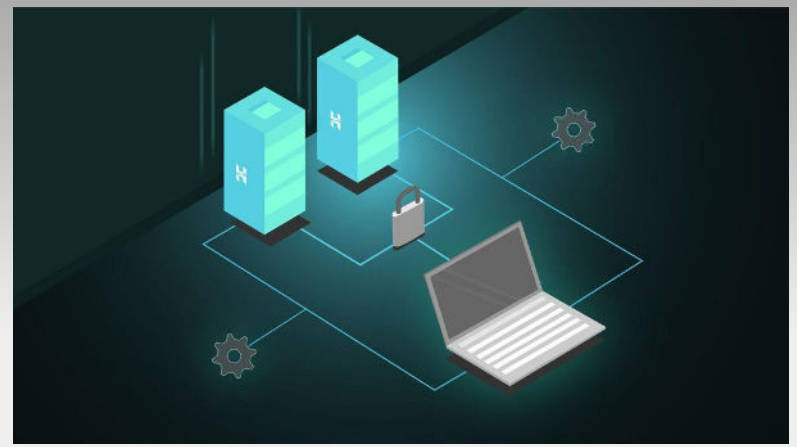
How to engage younger students, including high schools, on HPC

Awareness creation

EuroCC Montenegro: Training Events - EuroCC NCC Montenegro held two sets of events, a training program that includes specialized training for Montenegrin institutions called High Performance Computing and Digitization

EuroCC project presented at national conference - EuroCC NCC Montenegro participated in a national conference on Industry 4.0 and Cyber Security issues in Montenegro, where reference solutions on the possibility of applying HPC in the process of digitalization and possibilities for collaboration with EuroCC were presented.

AI and function of the brains of adults and the unborn - What does modern science know about the structure and function of the brains of adults and the unborn? A conference has been held to intrigue the young students wonder about the use of Artificial intelligence for pattern recognition, ultrasound diagnostics and prediction of performance and potential failures of medical devices.



Other examples of dissemination

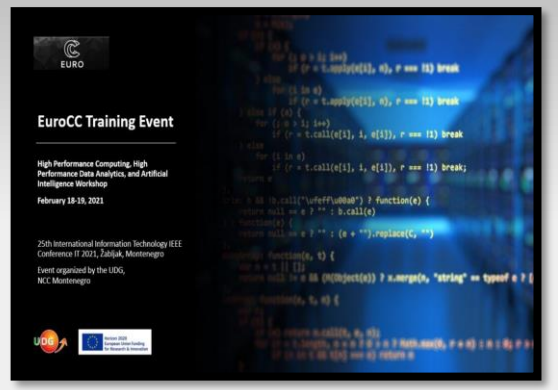
Awareness creation

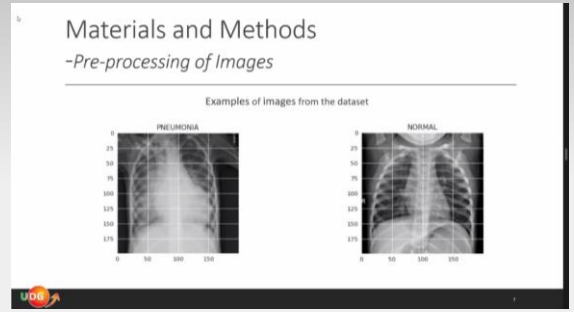
Media exposure - EuroCC project several times was featured on TV programmes on national frequencies where Dr Tomo Popovic gave a brief interview on the held IEEE IT Conference on Information Technology IT2021/22 and announced the HPC training that was done in context of EuroCC project. This training event was organized by HPC NCC Montenegro at UDG.

EuroCC project presentation at UDG - The Euro CC project was presented to the research and scientific community within the UDG. During the presentations, senior and junior researchers were invited to join the future HPC Competence Center. The presentation was held by prof. dr Milica Vukotic, member of the Euro CC team and dean of the Faculty for Information Systems and Technologies.

Workshop and **conference papers** on IT 21/22 - In the context of EuroCC project, NCC Montenegro (UDG) organized a workshop on High Performance Computing, High Performance Data Analysis, and Artificial Intelligence. This virtual event held on IEEE IT 2021 and IT 2022 Conference on Information Technology.

Several round tables were held during the two year period





Other examples of dissemination

Awareness creation

Euro CC presentation at European Researchers‘ Night 2021 - This was a 12-hour virtual event and Mr Cakic gave a presentation on his research work at UDG. The presentation discussed digital transformation and the use of AI/ML and HPC different domains and gave information about main projects being implemented at UDG. The presentation can be seen on YouTube, here.

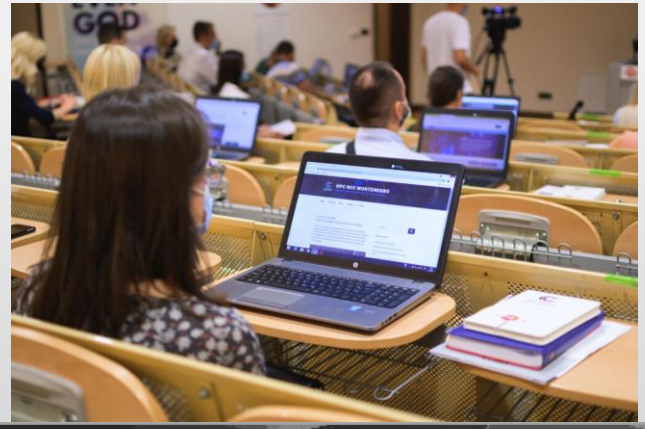
EuroCC Montenegro presented at the 4th Western Balkans Digital Summit - HPC NCC Montenegro presented the EuroCC project at the 4th Western Balkan (WB6) Digital Summit event. EuroCC was presented withing the Inspiring Cases presentations. The WB6 Digital Summit 2021 aims at showcasing good practices in the Western Balkans, highlighting the achievements and outcomes of the Digital Agenda, and exploring possibilities of building partnerships with the private sector, in the context of the digital transformation process.

Other examples of dissemination

Awareness creation

AIMHiGH project - The title of the project is AI/ML Enabled by HPC for Edge Camera Devices for the Next Generation Hen Farms and it is funded as an application experiment within Horizon 2020 FF4EuroHPC project. The AIMHiGH project proposes the use of HPC and deep learning AI to create prediction models that can be deployed on the edge devices equipped with camera sensors for the use in IoT/AI solutions in the poultry sector. UDG will be providing HPC and domain expertise through NCC Montenegro and FoodHub Centre of Excellence.

HPC Info Day for Companies - HPC NCC Montenegro organized an Info Day for companies in Montenegro. The main goal of the event is to inform the industry community about the EuroCC project and the activities of HPC NCC Montenegro. Introduction on HPC and its applications were provided. The Info day was attended by around 50 participants, representatives of academic institutions from three universities, research institutions and various companies in Montenegro. Finally, we informed the companies about the HPC assessment tool and invited them to participate in the survey.



Master program: Artificial Intelligence

Students started graduating with HPC related topics

Master thesis: Investigation of neural network efficiency in prediction electricity prices in the day-ahead market - Mr. Milutin Pavicevic defended his Master thesis. The work focused on the use of artificial intelligence and exploration of various prediction models based on neural networks in order to improve prediction of electricity prices.

Master Thesis: Ethics of Artificial Intelligence - Ms Jelena Tijanic, defended her Master thesis. The first part of the thesis presents the basic problems that the world is facing and why the development of artificial intelligence is a potential threat to the future of mankind. A new recommendation adopted by UNESCO member countries was presented.

Master Thesis: Practical Use of ML in the Fight Against COVID-19 - Mr Bogdan Laban, a master student at the University of Donja Gorica, defended his Master thesis. As AI has shown great improvements in the last few years, with many new feature-filled tools out on the market, it is almost certain that AI can help find ways to circumvent the dangers of COVID-19, in the form of noticing it, and preventing it.

Several BSc thesis were also defended.

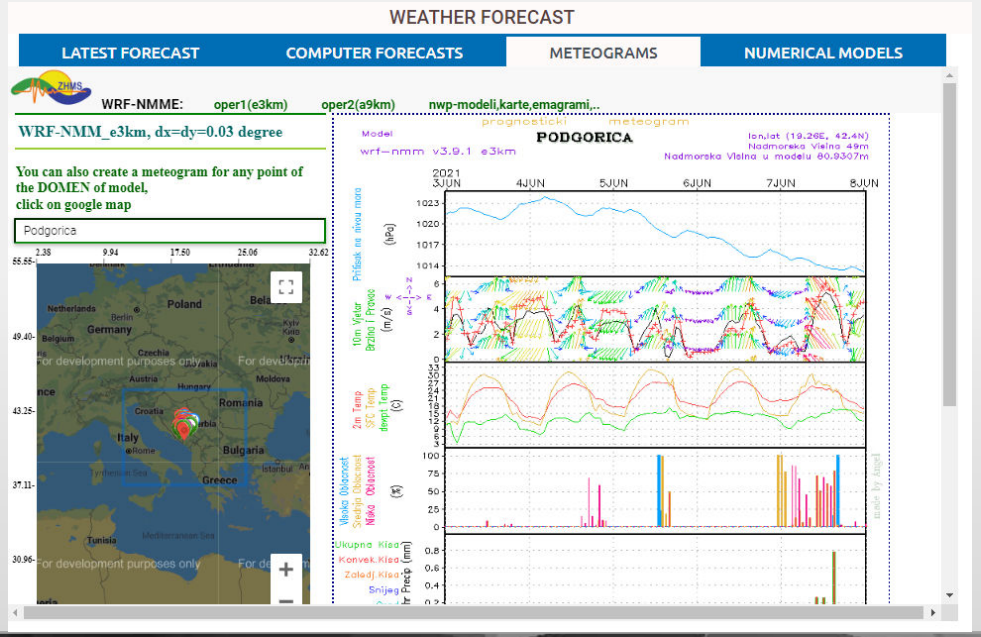
Collaborations with HPC ready users

Services and products

EURO

UDG Centre of Excellence in Food Safety – contains time-consuming processes such as DNA sequencing, outcome identification and prediction, food traceability, and isolation of food characteristics in order to find their relations with the region of origin. Cooperation between Centre of Excellence, FoodHub and HPC NCC Montenegro is hence established.

The Institute of Hydrometeorology and Seismology of Montenegro – the institute uses parallel processing on the local cluster and runs simulations for weather forecast on a daily basis. Given that computer resources and time period are limited, they are using fine resolution numerical models for smaller and limited areas, while initial and lateral conditions are provided from low resolution global models.



NMM-HIRES and WRF-NMM model are in operational use at the Hydro meteorological Institute of Montenegro. Both models provide very fine horizontal and vertical resolution (nested models)

Several NVIDIA Academic Grant: Equipment for Edge AI Classroom

EuroCC Conference in Montenegro

It was our pleasure welcoming you in Montenegro

NCC Montenegro was the host for this year's international conference. The international scientific and academic conference called "EuroCC/CASTIEL" took place from 6-9 September this year and gathered over 200 experts from 33 member countries of EuroHPC JU – Joint Undertaking for European High Performance Computing within the Horizon2020 program. The conference covered topics from the field of HPC technologies and related disciplines such as high performance data analysis (HPDA), artificial intelligence (AI), machine learning, parallel programming, computer simulations, etc.

Conference papers

In our centre we have teams who are working on AI projects and our goal is to increase public consciousness by incorporating the completed projects into public and private sectors. Of course, for this to be scalable we will need to have a High-Performance Computing (HPC) knowledge which can be gained through trainings in order to be able to apply the latest HPC/Big Data/AI technologies.

A few recent examples of work including ML/AI applications:

Natural Language Processing (NLP) - Analyzing customer satisfaction by applying natural language processing (NLP). We have collected over 50,000 airline reviews from TripAdvisor data in the period from 2016 until 2019. This analysis demonstrates the capability of discovering the pain points of the customers by using data science techniques related to NLP. Our study shows that in today`s world, data-driven decisions must be taken quickly in order to maintain customer satisfaction and prevent customer churn.

Pneumonia Detection Using Deep Learning Based on Convolutional Neural Network – Applying deep learning algorithm based on convolutional neural network to process chest X-ray images in order to support the decision- making process in determining the correct diagnosis. This model has the task to help with a classification problem that is detecting whether a chest X-ray shows changes consistent with pneumonia or not, and classifying the X-ray images in two groups depending on the detection results.

DIPOL project - Digital Transformation of Agriculture and Food Supply Chain in Montenegro:

- Precision Agriculture - Real time field measurements to optimize irrigation
- Tag it Wine – Know your wine (Food Supply Chain).

H2020 DEMETER project - Building an Interoperable, Data-Driven, Innovative and Sustainable European Agri-Food Sector (e.g. Milk quality)

Conference papers (continued)

Combined adaptive load balancing algorithm for parallel applications - This paper presents combined adaptive load balancing algorithm based on domain decomposition and master-slave algorithms and its core scheduling adaptive mechanism that handles load redistribution according obtained and analyzed data. Selection of distribution algorithm, based on collected parameters and previously defined conditions, proved to deliver increased performances and reduced imbalance. Results of simulations confirm better performance of proposed algorithms compared to the standard algorithms reviewed in this paper.

Forecasting Day-Ahead Electricity Price with Artificial Neural Networks: a Comparison of Architectures - The spot price prediction for the electric energy markets is a widely approached problem, used by many participants in the market. The ever-shifting rules and regulations, rising percentage of the electricity on the market being produced by solar and wind plants and many stochastic factors influencing it make the market price of electricity very volatile and hard to forecast. Many methods are used to tackle this problem, and their efficiency varies from dataset to dataset. In this work, we use the dataset of hourly day-ahead spot prices from the Hungarian HUPX market, and couple it with weather data for Hungary. We test various types of Dense, Recurrent and Convolutional neural network architectures and report on the results.

Human Activity Detection Using Deep Learning and Bracelet with Bluetooth Transmitter - The use of artificial intelligence, machine learning, and deep learning is finding its purpose in various fields nowadays. This paper describes a study in which Internet of Things and deep learning are used to implement human activity detection based on data collected from bracelet equipped with Bluetooth transmitter. The main focus of the study was development of a prediction model using deep learning that would help elderly people and their caretakers.

Image-Based Parking Occupancy Detection Using Deep Learning and Faster R-CNN - This paper describes the use of deep learning algorithms to process images of parking lots and determine their current occupancy. The development of prediction models was done using PKLot dataset with 12417 images, Detectron2 software library, and Faster R-CNN algorithm.

Conference papers (continued)

Young Researchers to Participate in the Upcoming IEEE INFOTEH 2022 Conference - Young researchers, Ms Almira Suljovic and Mr Ivan Jovovic, from UDG will be presenting their papers at the upcoming IEEE INFOTEH 2022 Conference. The first paper discussed the use of machine learning to detect disease in leafs with potential application in smart agriculture. The second paper demonstrated the use of machine learning to detect face masks and the use of prediction models on edge AI devices.

IEEE COINS 2022: Detecting Pneumonia with TensorFlow and CNNs - Researchers from EuroCC Montenegro presented two papers at the IEEE International Conference on Omni-Layer Intelligent Systems (COINS). The paper called "**Detecting Pneumonia with TensorFlow and Convolutional Neural Networks**", authored by D. Babic, I. Jovovic, T: Popovic, S. Cakic and L. Filipovic discussed the use of deep learning and HPC to create prediction models aimed at detecting pneumonia in chest x-ray images.
This second was a result of the collaboration on FF4EuroHPC application experiment project called AIMHiGH that focuses on computer vision and the use of HPC to develop object detection prediction models for the use in smart agriculture, more specifically in the poultry sector. The title of the paper is **"Developing Object Detection Models for Camera Applications in Smart Poultry Farms"**.

Thanks!

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