



# **Data analytics in the era of large-scale machine learning**

**23-24 May 2023**

**Computation-based Science & Technology Research Centre  
The Cyprus Institute**

Dr. Panayiota Katsamba, Dr. Myrianthi Hadjicharalambous

# The Cyprus Institute (Cyl)

Est. 2005

European Institution dedicated to **Excellence in Research, Education** and **Innovation** with a local (Cyprus) and regional (EMME) and international outlook.

**16** Research Laboratories

**24** Active Research Projects

**>30** Nationalities

**>200** Research staff

## Competitive Grants

**>€86M**

## Scientific publications

**>1200**

**58.2%**

Top 10%  
Scientific  
Journals

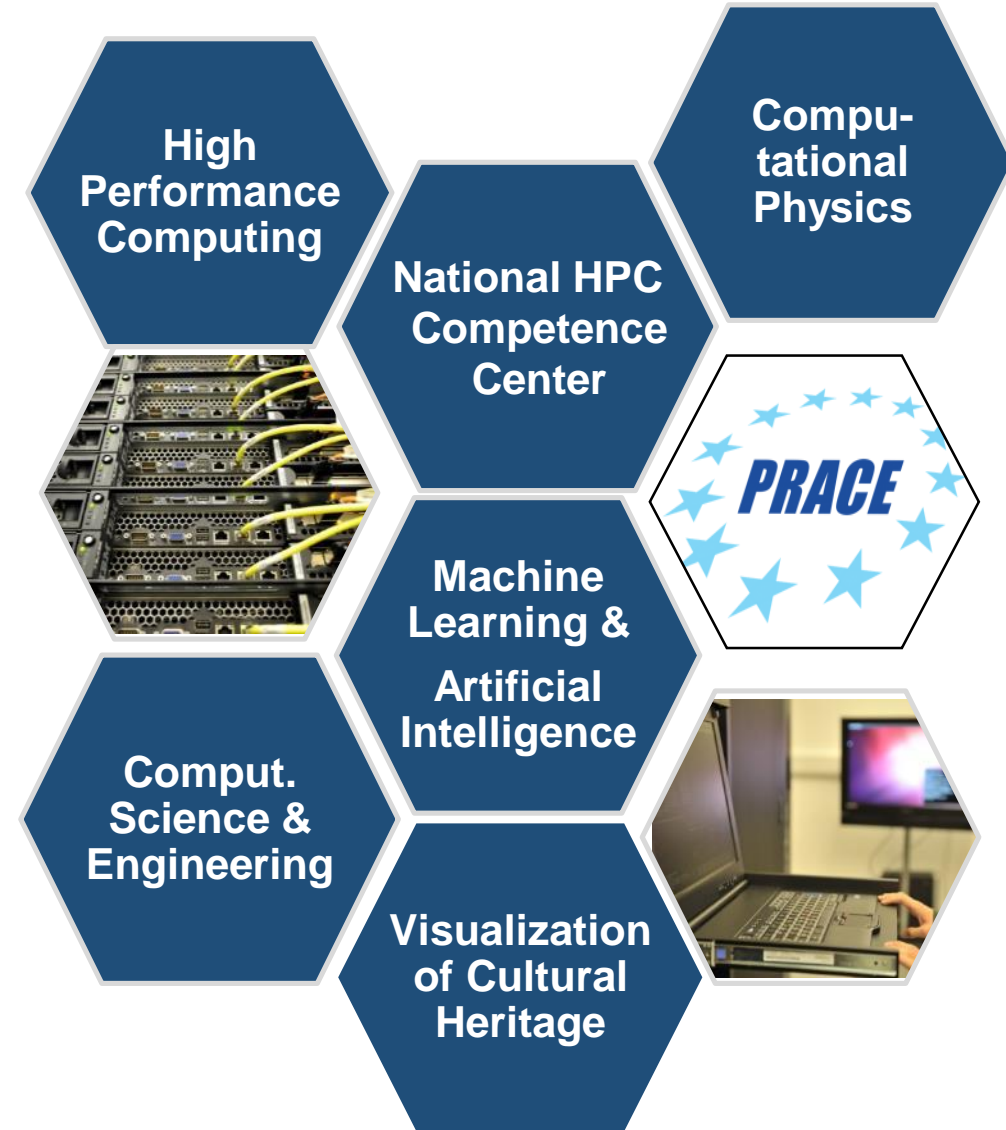
**27.3%**

Top 10%  
Citation  
Percentiles

# Computation-Based Science & Technology (CaSToRC) - Est. 2009

- Pioneering **compute-intensive** methods in scientific & technological applications
- > **30** researchers with diverse backgrounds
- **€20M** external funding, **€8M** in current projects, 2 ERA Chairs
- European & International projects: EuroCC, PRACE, SESAME, EU-MATHS-IN, CoE RAISE, ECMI
- MSc in Simulation & Data Sciences
- PhD in Computation Sciences

## Founding Partnership



# Expertise & Compute-intensive Applications

High  
Performance  
Data Analytics

Molecular  
Dynamics

Artificial Intelligence

Machine

Learning

Big data

High  
Performance  
Computing

Computer Vision

Computational  
Physics

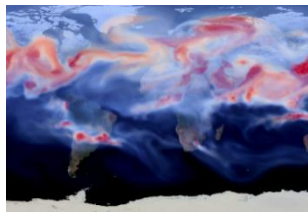
Quantum  
Computing

Multi-  
scale  
methods

CFD/FEM

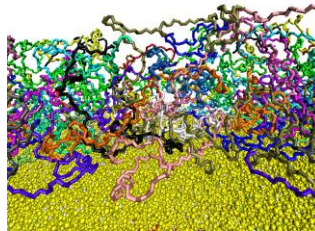
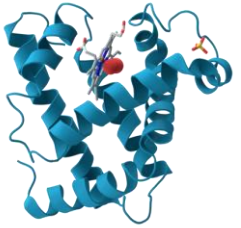
## Environment

Climate Monitoring  
Remote Sensing



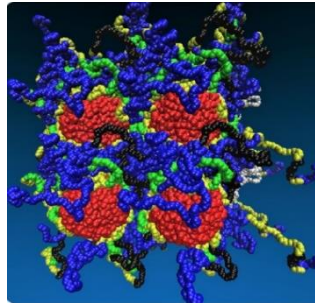
## Biomedicine

Medical imaging  
Bioinformatics  
Biomolecules for  
drug design & biotech



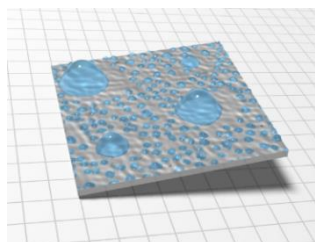
## Material Science

Novel & smart material design  
Nanostructured materials for  
Green Tech  
Nanocomposites



## Micro-Engineering

Microfluidics  
Micro-robotics





# HPC Infrastructure and Partnerships in Europe

## National HPC infrastructure (Cyclone)

- 0.6 Petaflop/s – since 2020
- One of the most powerful academic HPC facilities in the Eastern Mediterranean

## CaSToRC: Cyprus representative for:

- EuroCC HPC project
- National Competence Center in HPC
- Pan-European HPC Ecosystem PRACE & regional projects



# Supporting the Digital Transformation of Cyprus



National HPC  
Competence Center

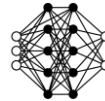
Aim: Knowledge transfer on  
Advanced Digital Technologies



European Digital  
Innovation Hub for  
Cyprus



Big data / HPDA



Machine learning - AI



Modelling and algorithms



Visualisation



Data management



Advanced computing &  
engineering simulations



High Performance Computing



Modelling & Simulation  
for Engineering  
Applications

# National Competence Centre in HPC – EuroCC2



EuroCC is a part of the pan-European project [EuroHPC Joint Undertaking](#), involving over 30 countries

Aims:

- identify and address the skills gaps in the European HPC and HPDA ecosystem
- coordinate cooperation across Europe to ensure a consistent skills base
- advance scientific discovery and innovation

**CaSToRC: National Competence Centre (NCC) in High Performance Computing (HPC)**

NCC for Cyprus since 2020, now in its second 3-year phase.

**More info:** <https://castorc.cyi.ac.cy/national-hpc-competence-centre>.



**EuroHPC**  
Joint Undertaking



## Aims of EuroCC-2 for Cyprus NCC:

- Advance competitiveness in research and innovation
- Improve the effectiveness of government services
- Promote innovation by engaging with industry
- Strengthen the HPC and HPDA competencies
- Maximize the socioeconomic impact of HPC and HPDA through increased collaboration with industry, the public sector, national projects, and other NCCs







## Activities of EuroCC-2 for Cyprus NCC:

- Liaise with local computational communities – academia, industry, public sector
- Identify main needs in computational communities
- Provide tailored training activities
- Knowledge transfer on Advanced Digital Technologies
- Cooperate with EuroHPC projects and other NCCs to strengthen the competencies of NCC staff



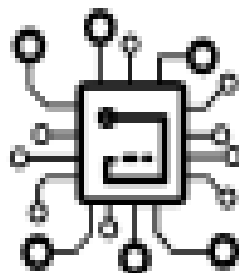
# How can EuroCC2 support you?



## Consultation

Our team working on one of your needs

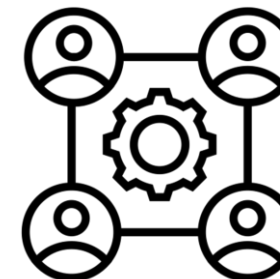
- **Short-term** collaboration (1-2 months)
- **Code inspection**
- **Suggestion** of parallelization strategies
- **Suggestion** of potential machine learning models applicable to your problem
- **Our team mostly** working on the problem with input from your team
- **Bespoke** training suggestions



## Resource provision

You can apply for a competitive project to use Cyl's HPC facility.

- Your team usually working on your projects
- The center can support you on the infrastructure
- Depending on the nature of the project, you can apply for a preparatory or production access

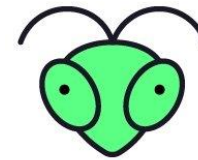


## Collaborative projects

Our engineering team working with your team on a **PoC**

- Small-scale demonstration of how advanced technologies can add value to your workflow
- Useful before a greater investment in time, money and effort is made
- **Not for business-critical products/services**
- Bespoke training provision as part of the collaborative project

# Business Engagement & Innovation – Success Stories



IREROBOT



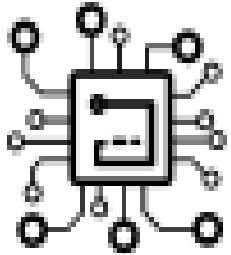
REPUBLIC OF CYPRUS | MINISTRY OF INTERIOR  
DEPARTMENT OF LANDS AND SURVEYS



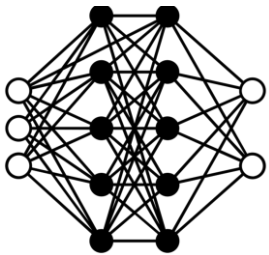
# Industrial Case study - Collaboration with Electi Consulting



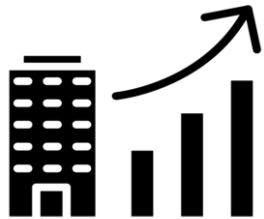
## Novel AI image denoiser model using a bias-free convolutional neural network



Electi Consulting used the HPC facility at the Cyprus institute, as a **testbed** to run several experiments for their deep learning denoiser model.



This helped them **optimize** the architecture of a deep learning model using various regularisation methods and the training of several permutations of the model's architecture.



After selecting the best-performing architecture, Electi consulting could then release that version in their production environment, achieving superior results.

## EuroCC-2 Training events

- Main objective: **Enhance the competences of Cyprus in HPC, AI, HPDA**
- Series of training events
- Various topics
- Targeted audiences
  
- Focus on the community!
  - Feedback form on how we can improve
  - What would you like to learn?
  - Future questioners for identifying needs

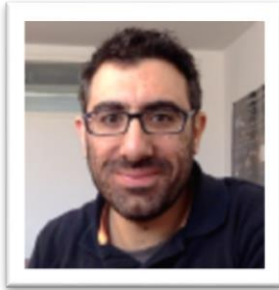




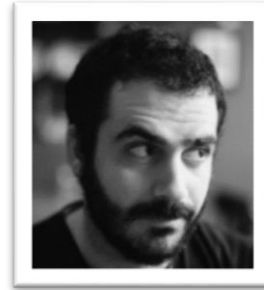
# EuroCC-2 Team



**Constantine Dovrolis**  
Principal Investigator



**Giannis Koutsou**  
Training and Skills  
Development Leader



**Mihalis Nicolaou**  
Services to and Interaction with  
Industry Leader



**Andreas Athenodorou**  
Training Specialist



**Christos Christodoulou**  
Industry Scout



**Charalambos Chrysostomou**  
Services to and Interaction with Academia and  
Public Administration Leader



**Stelios Erotokritou**  
Collaborations Leader & Awareness Creation  
and Communication Leader



**Valeria Filippou**  
Computational and Data Scientist



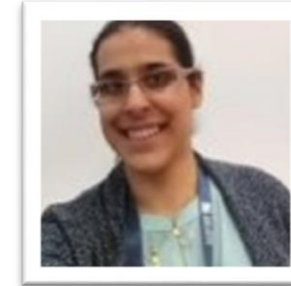
**Jacob Finkenrath**  
Training Specialist



**Pantelis Georgiades**  
Machine Learning Engineer



**Myrianthi Hadjicharalambous**  
Scientific Coordinator



**Panayiota Katsamba**  
Service Portfolio and Competence Management  
Leader & Industry Scout

More information:

<https://castorc.cyi.ac.cy/>

→ <https://eurocc.cyi.ac.cy/> ←

Join our meetup and don't miss any event:

<https://www.meetup.com/high-performance-computing-cyprus>

Contact us at: **eurocc-contact@cyi.ac.cy**

Thank You  
for your attention