



# Skills for HPC

Postgraduate education



Professional development



**EuroHPC Academy**

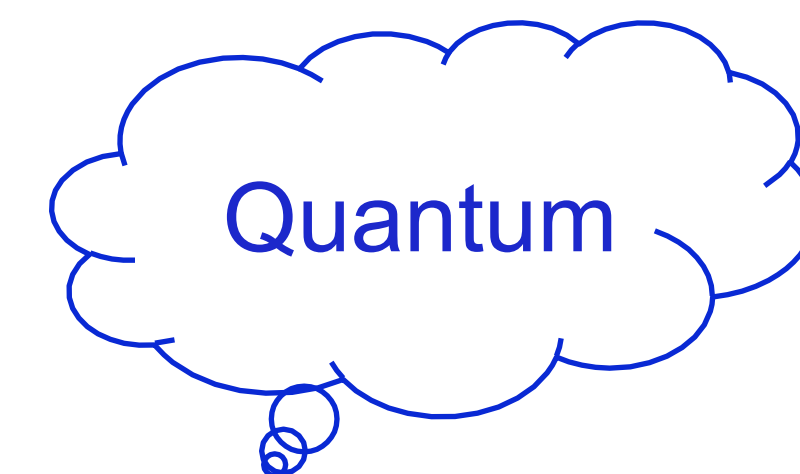
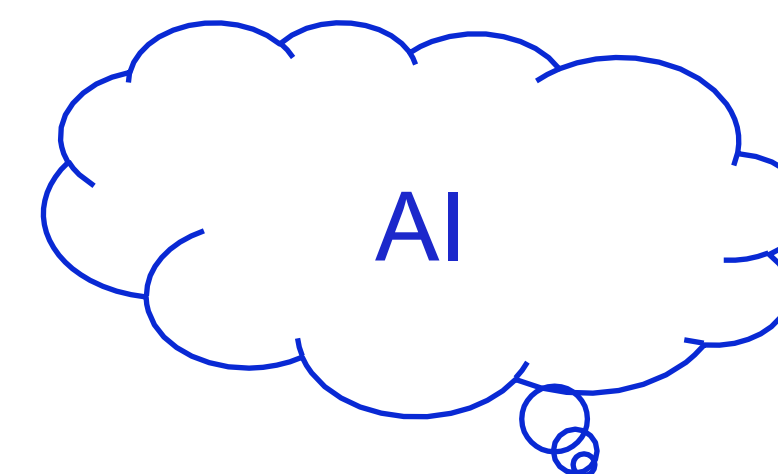
SMEs, industry,  
public sector



FORTISSIMO  
PLUS



Specialists



New technologies and  
innovations?

## SPECIALISED projects





# What are the future skills needed for HPC?

- **EUMaster4HPC**: First pan-European HPC Master programme launched in 2021.
- **New Master in HPC Engineering** launched at Politecnico di Milano in 2022.
- **Mission**: Forming  **$\Pi$ -shaped** profiles bridging HPC expertise across domains
  - Two vertical depth skill areas on {**Parallel Computing / Parallel Computer Architectures**} and {**Numerical Methods / Applied Statistics**}
  - Specialization skills on {**Supercomputing / Quantum Computing / AI & Data Analytics**}
  - Domain-specific skills on {**Genomics / Chemistry / Physics / Mechanics / ...**}





# How to embrace the latest technological innovations?

- Fostering a culture of curiosity and critical thinking;
- Encouraging the cross-fertilization across multiple disciplines;
- Exploring new paths and challenging opportunities;
- Going beyond the university walls to be part of the HPC ecosystem;
- Leading research and innovation initiatives.





ANTWERP  
18-21 MARCHTO EXASCALE  
AND BEYOND

# Skills on BDVA

- BDVA Data Science Labelling Program
- Increase the transparency of the essential characteristics of non-formal training in data science
- Ease the comparison of different non-formal training credentials
- Help to establish “best practice” expectations for non-formal training
- *Currently in proof of concept*



BDV Data Science  
Training Label

BIG DATA VALUE

Data Analytics Fundamental	
<a href="https://www.aws.training/Details/eLearning?id=35364">https://www.aws.training/Details/eLearning?id=35364</a>	
Institution	Type of Institution
<b>Aws Training and Certification</b>	<b>For-profit Organization</b>
Main Audience	Domain
<b>Technical</b>	<b>Multidisciplinary</b>

Total Course Duration: 3,5H

Business Analysis	Data Preparation	Model Generation	Model Validation	Visualization
				

Type of Training
<b>Online interactive</b>
Kind of Testing
<b>No Testing</b>
Language
<b>English</b>
Total Cost
<b>Free</b>



# Skills on EuroHPC JU

- State of play
  - A EuroHPC Master's programme launched in 2021
  - A grant for a pan-European network of NCCs signed (EuroCC2) in 2022. NCCs launched in 2023
  - A CSA on NCCs and CoEs grant agreement was signed (CASTIEL) in 2022
  - A call on HPC Professional Traineeships and a call on to develop a EuroHPC training platform and summer school launched in 2022
  - A study launched under procurement to understand user requirements in academia, SMEs, and industry in 2023
- Pillars of action
  - Appropriate support in using the EuroHPC infrastructure and applications needs to be provided
  - Cross-cutting topics, such as AI, data, cybersecurity or quantum computing
  - Specialised training for HPC specialists
  - SME-tailored courses, encourage mobility, ...



# What are the future skills needed for HPC?

- Actually: What skills do you (practitioner, data center) actually need today?
  - Can you clearly define these skills? Can you organize them?
  - It is already **difficult** to organize and define these skills
  - Even more challenging to find a meaningful granularity!
- The HPC Certification Forum <https://hpc-certification.org>
  - standardize HPC skills into a fine-grained competence standard
  - establish certification for practitioners
  - supports an ecosystem for HPC competences
- EU projects for training and mapping out competences are valuable





# What are the future skills needed for HPC?

- Some observations...
- Increasing pace of HPC skill aging and turnover
  - Evolutions and revolutions in hardware and software are omnipresent
- Attractiveness of tools becomes a major driver for students
  - Modern languages Julia/Rust and environments like Kubernetes
  - Integration of smarter HPC workflows ultimately fueled by AI
- Increasing demand of skill diversity
  - e.g. cloud tools, data science, agile principles, AI methods, ...
  - Motivated by user-friendly tools, end-user productivity and heterogeneity
- We need agility and embrace transformation in HPC

The diagram illustrates a cyclical relationship between three key areas:

- Training infrastructure** (top left)
- Industry and public sector** (top right)
- Levelling the playing field** (bottom center)

Curved arrows connect these three elements in a clockwise cycle, indicating a continuous process or feedback loop.

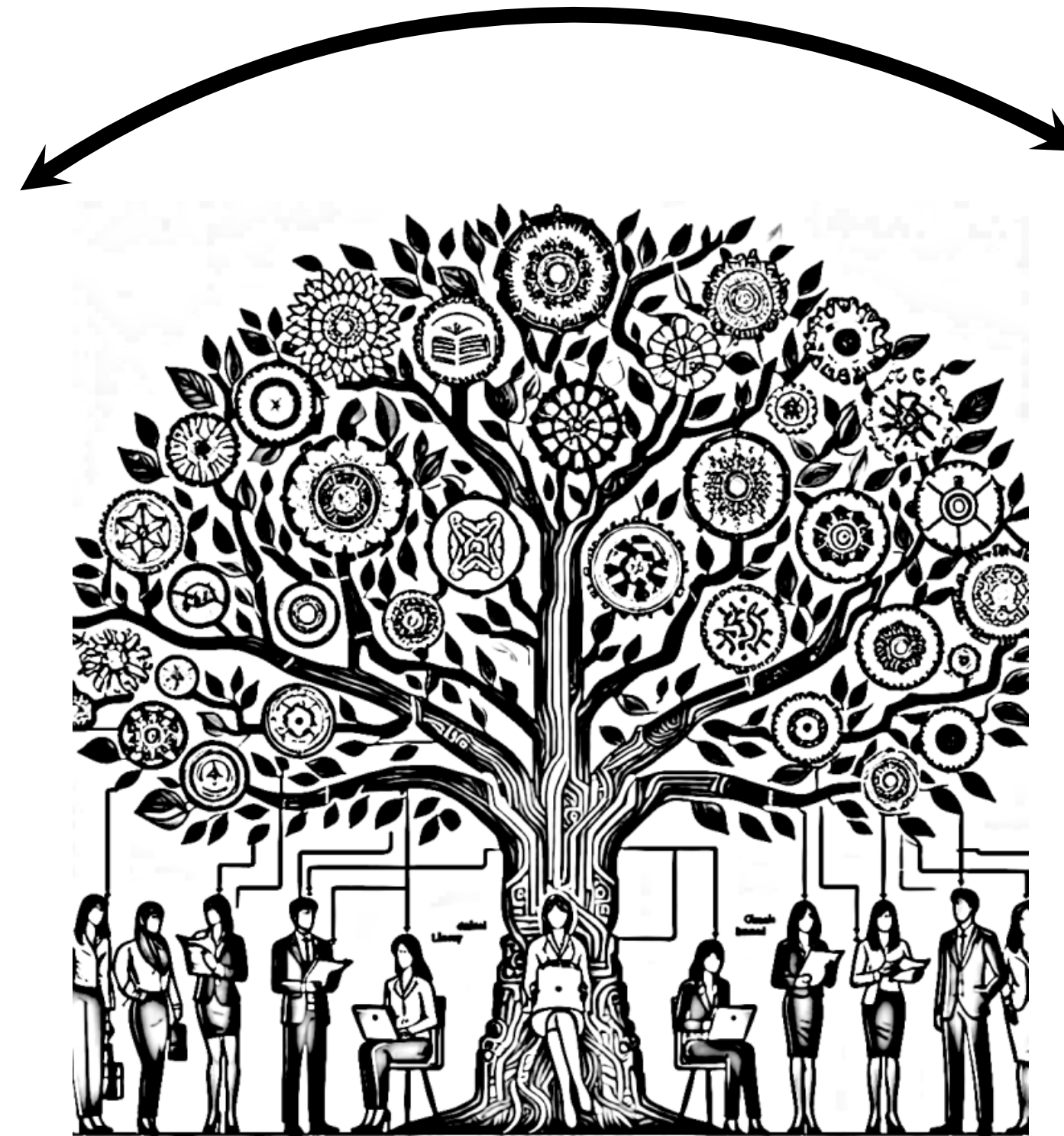
Thor Wikfeldt, ENCCS/RISE





## Training infrastructure

- Up-to-date, peer-reviewed training modules
- Support to training providers
- Train-the-trainer, “HPC ambassadors”
- Active community of HPC educators
- Learning platform
- Learning paths for different professional profiles
- **A dynamic and flexible skills tree**



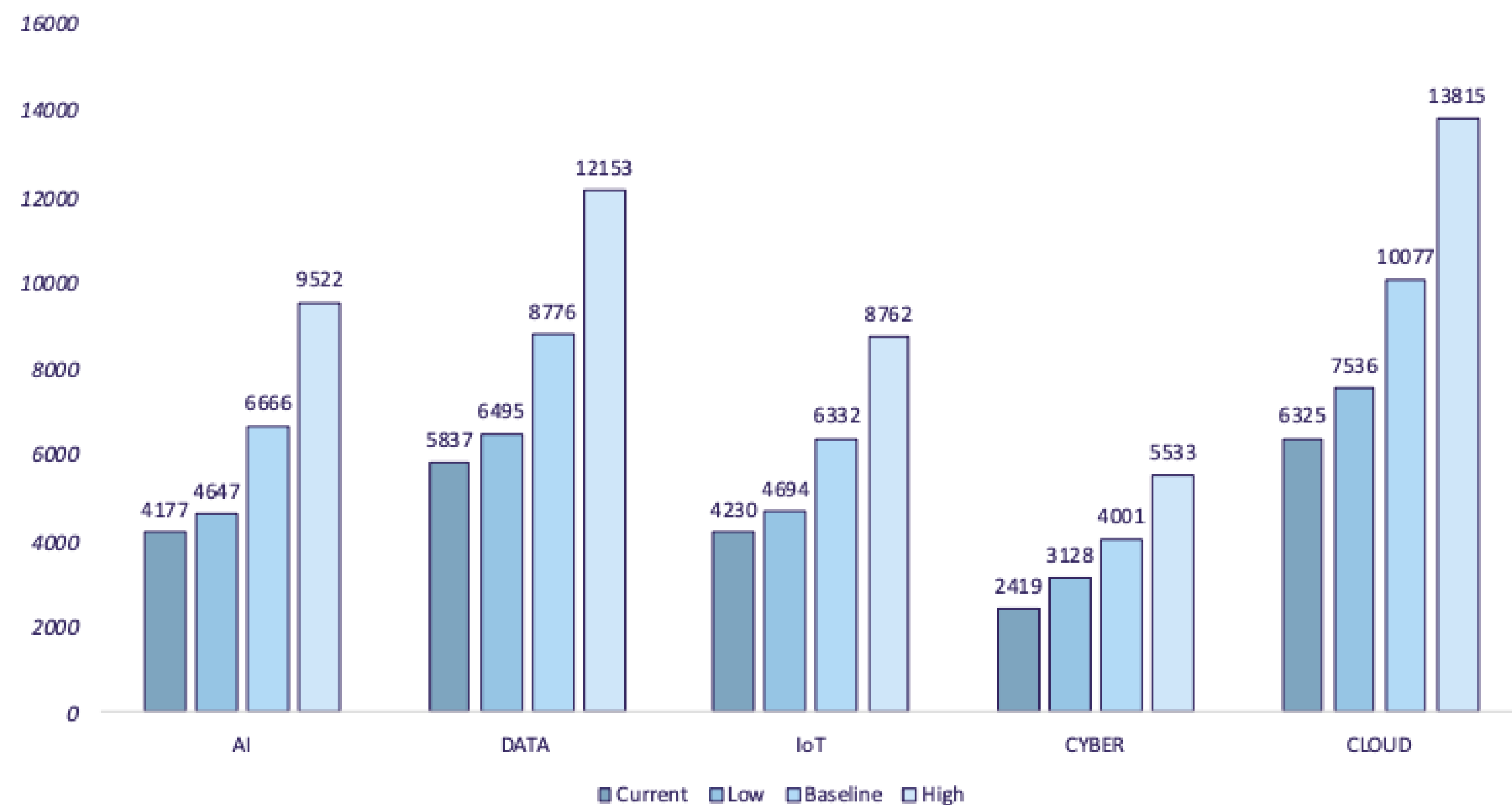
## Industry and public sector

- Varied needs, interests and time constraints in industry & public sector
- Large-scale AI attracts new user groups
- Not only Unix shell – new UIs
- Lowering barriers: HPC isn't only for “technical people”
- The computing continuum – HPC is just one of many backends
- Microcredentials
- **Lifelong learning – upskilling, reskilling and newskilling**

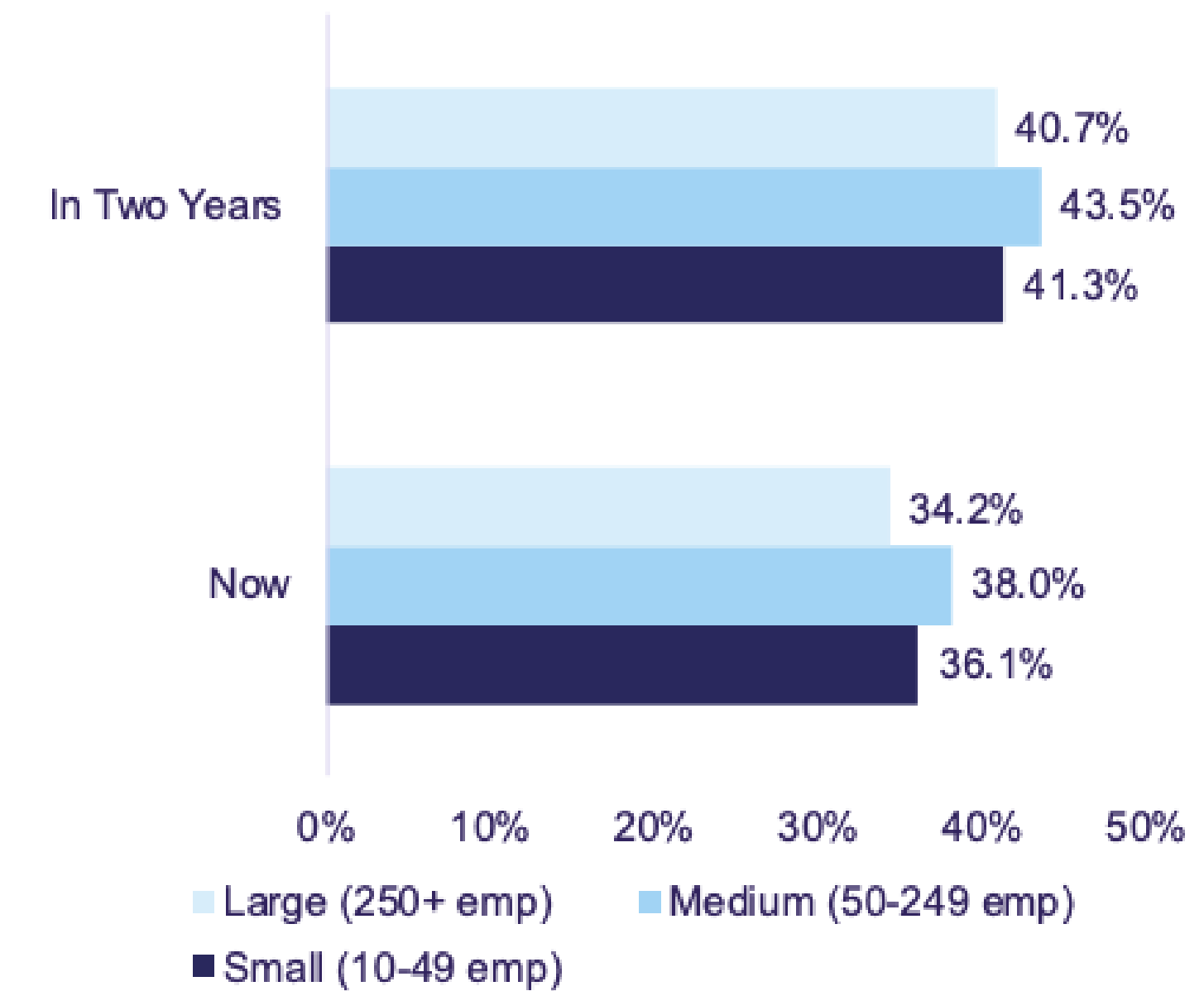
## Levelling the playing field



### Headcount Prediction By Technology Area



### % of Training Budget for Advanced Digital Skills







# SPECIALISED Projects



<https://20x30.advancedskills.eu/>





# What are the future skills needed for HPC?

- A university educates people for a whole career, not for a first job.
- Education focuses on the basics: math, sciences, reasoning, managing complexity, system thinking, abstraction, critical thinking, ethics,... and more recently sustainability and lifelong learning.
- Computing graduates obviously need to master the basics of computing: algorithms, programming, computer hardware, networks, software engineering, AI, security, data science, CPS, ...
- Students are further trained on the job: upskilling.



# The elephant in the room: inflow

1. High school children have to be convinced to start a STEM degree (especially girls)
2. STEM students have to be convinced to choose computing
3. Computing students have to be convinced to major in HPC

A different approach is needed for 1. 2. and 3.

More effort is needed: internships, hackathons, ...

Graduates with a computing degree could be upskilled

Graduates with a STEM degree could be reskilled.