

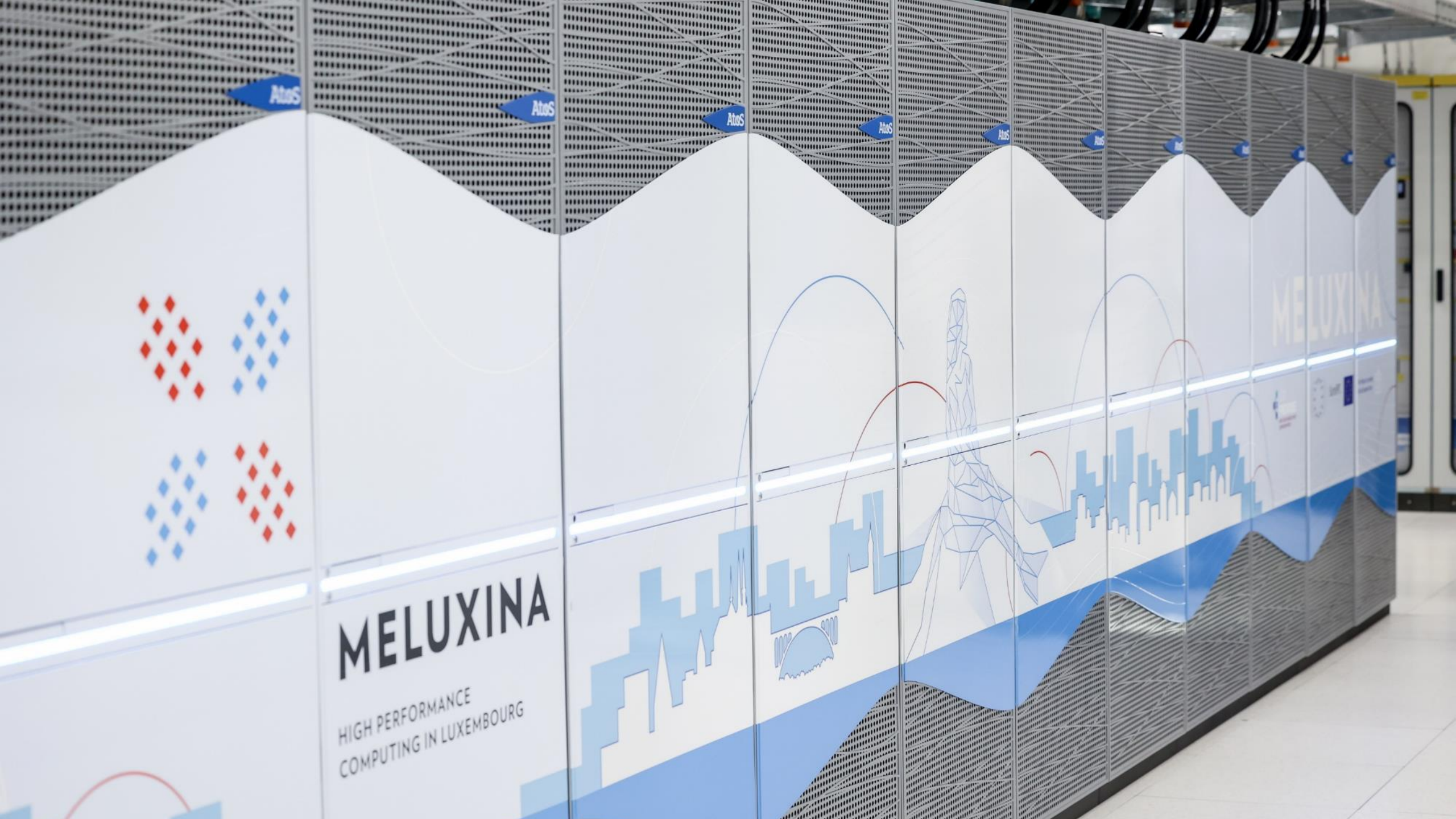


REINVENTING  
HPC

# Powering European AI with EuroHPC Supercomputers

16 May 2024





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# MELUXINA

HIGH PERFORMANCE  
COMPUTING IN LUXEMBOURG

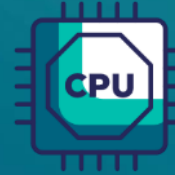
# MELUXINA





## FLOP/SECOND PEAK COMPUTE PERFORMANCE

If all the humans on the planet were to make a calculation in one second, it would be necessary to multiply the population of the Earth by more than two million to reach MeluXina's capacity



**90.000**

HPC CPU cores

**800**

GPU-AI accelerators



**20**

Petabytes high-speed storage

**300+**

Software packages



When it was launched in June 2021, the MeluXina accelerator module has been ranked:



TOP500 in 2021

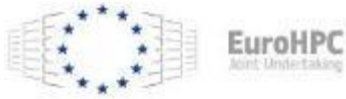
**36th**



GREEN500 in 2021

**4th** **1st**  
(world) (EU)





## European High Performance Computing Joint Undertaking

Over 8 billion Euro for cutting-edge supercomputing and quantum computing ecosystem in Europe



## European Network of Competence Centers in HPC

United network of 33 countries fostering adoption of HPC



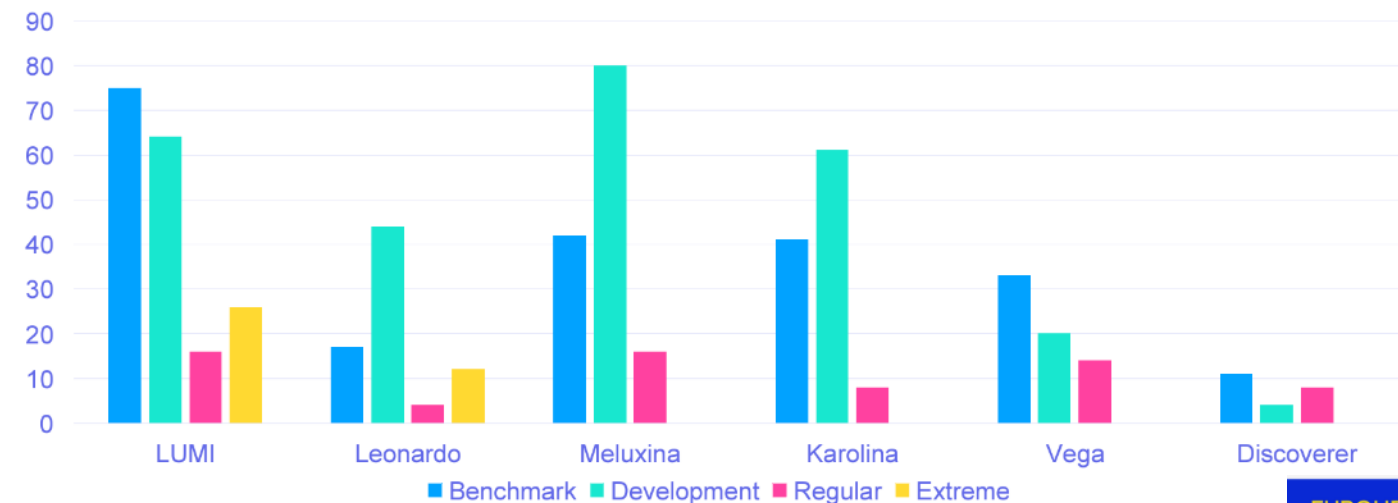
## European Master for HPC

Pan-European Master's program by leading educational institutions focused on HPC





## 596 active projects distribution per system per type of EuroHPC JU access modes

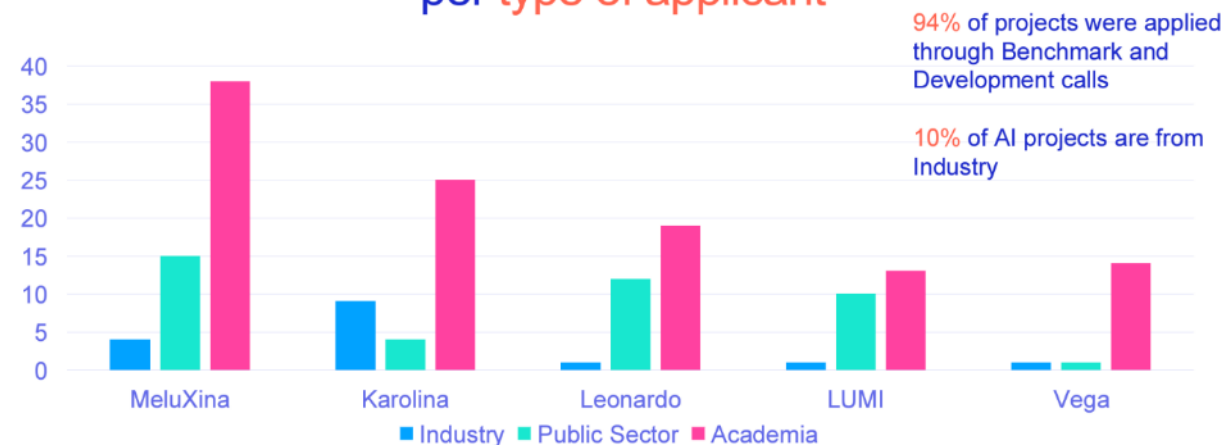


Meluxina runs 25% of all EuroHPC JU projects

Meluxina runs 35% of all EuroHPC JU AI projects



## 167 active AI projects distribution per system per type of applicant



(\*) Leonardo was available for access since June 2023

(\*\*) LUMI-G was on maintenances few times during the 2023 as it was newly installed

# WE SERVE



## RESEARCH



## PUBLIC



## BUSINESS



**450 projects** | **1800 users** from Luxembourg, Europe and beyond



# OUR SERVICES

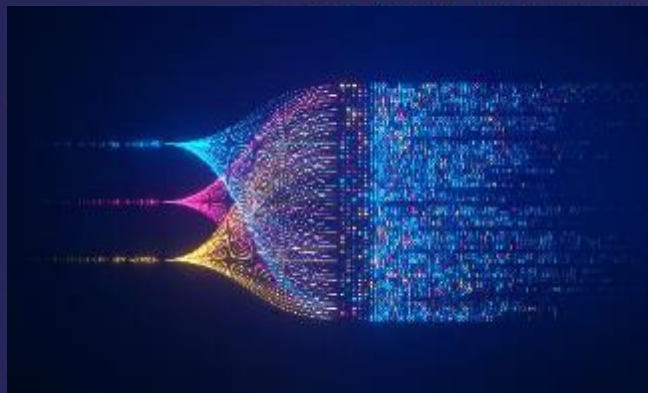
## CONSULTING



### Guidelines

- To exploit massive amounts of data
- To improve processes through the usage of AI
- To scale simulations on HPC

## AI AND BIG DATA ANALYTICS PLATFORM



- NUMERICAL SIMULATION
- AI
- BIG DATA

DIGITAL TWINS

## COMPUTE



- HPC AS A COMMODITY
- HPC AS A SERVICE
- HPC AS AN APPLIANCE





We guarantee **high-speed** and **low latency** connectivity, **advanced applications**, the easiest onboarding and the **highest quality** assistance, in a confidential, **trusted**, and **cybersecured** environment.



**DATA  
SOVEREIGNTY**



**DATA CENTER  
TIER IV**



**ISO 27001**

They have already trusted us



# PIONEERING AI STRATEGY



## Luxembourg Government Signs Europe's First National AI Collaboration with NVIDIA

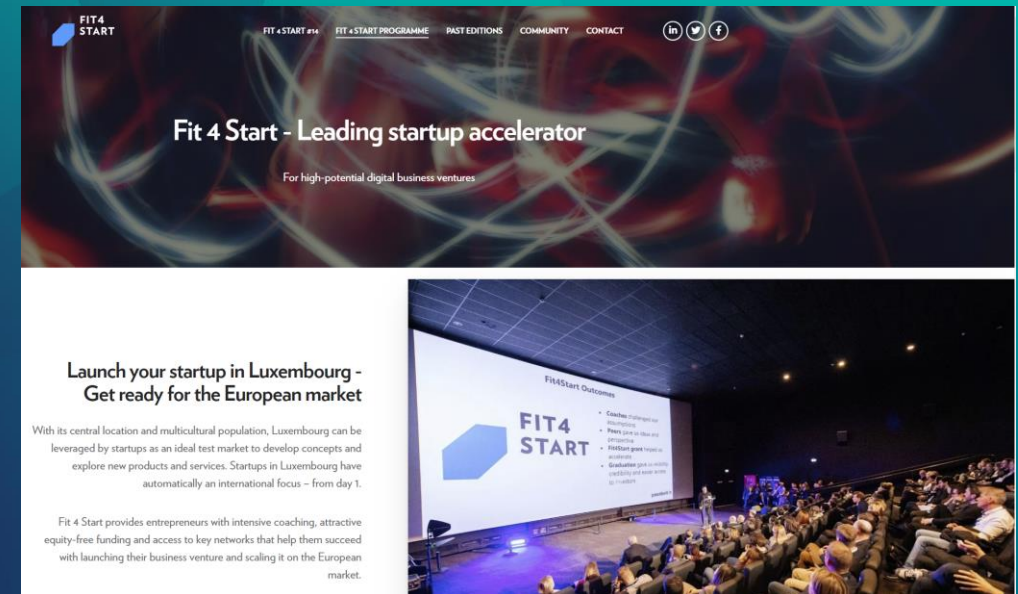
January 30, 2019 by [Stefan Kraemer](#)



*“a milestone towards working together to solving society’s most important challenges using artificial intelligence and high-performance computing”*

*“Initially bootstrapped by the research community, the founders plan to open up the AI laboratory to Luxembourg’s industry partners and startup community. There is a growing demand for AI-related technologies in Luxembourg, including in finance, healthcare, space resources research and more”*

# STARTUPS & NATIONAL PROGRAMMES



50 startups with AI-based products | 300MEUR valuation

Fit4Start | digital, tech- and data-driven, healthtech & space

# OWN PROGRAMMES



## INITIATE PROGRAM

### FOR STARTUPS REFINING THEIR BUSINESS IDEAS AND PROTOTYPING

- ✓ 4,000 CPU or 1,500 GPU node-hours
- ✓ 10 TB of data storage
- ✓ 24 support tickets (L1 or L2)
- ✓ Up to 6 months

#### Eligibility requirements

- Founded within the last 5 years
- Have not yet been granted credits beyond the free trial
- Have not previously contractually engaged with LuxProvide
- Subject to the availability of hardware resources

# OWN PROGRAMMES

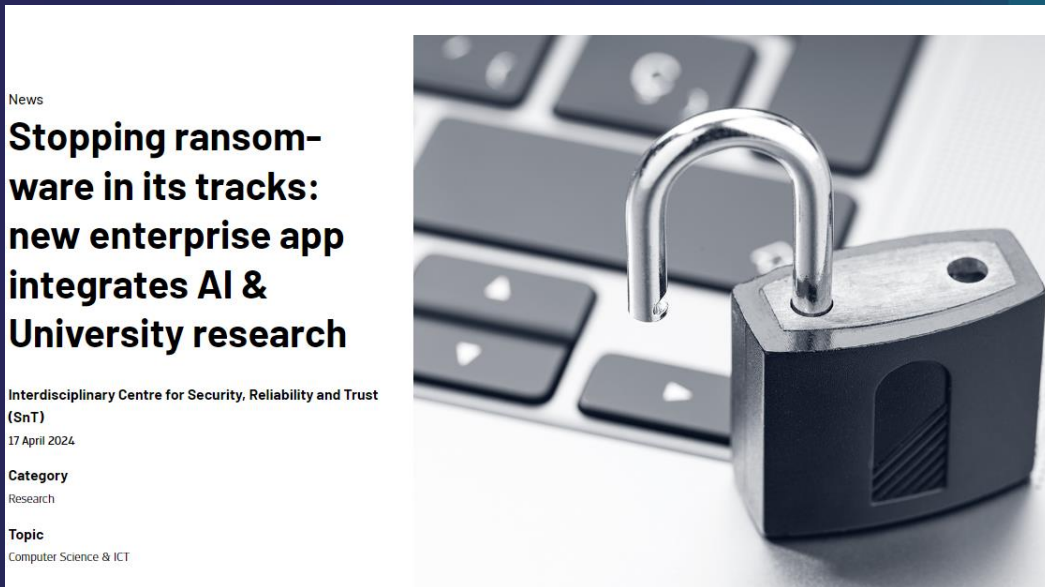
## CASHBACK 80% PROGRAM

### UP TO 80% CASHBACK ON USAGE OF MELUXINA, LUXEMBOURG'S WORLD-CLASS SUPERCOMPUTER

- Cutting-edge CPU and GPU computing
- Ultra-fast interconnectivity, top-notch data storage and expert support by skilled supercomputing team
- Available to small and medium-sized enterprises (SMEs)
- Prior to signing this offer, the company should submit a state aid (“Innovation aid for SMEs – RDI scheme”) to the Ministry of the Economy, with the help of LuxInnovation. The general state aid rules apply.



# AI on MeluXina




*“CYSANA (CYberSecurity ANALytics) is a new AI-based enterprise solution to protect against malware and ransomware announced today by the cybersecurity company Conatix”*

*“In the development process CYSANA’s neural network models were trained and tested on the Luxembourg-based MeluXina supercomputer operated by LuxProvide. This high-performance computer testing ground, one of the most powerful in Europe, helped make the product effective at detecting novel and zero-day malicious files.”*

# AI on MeluXina

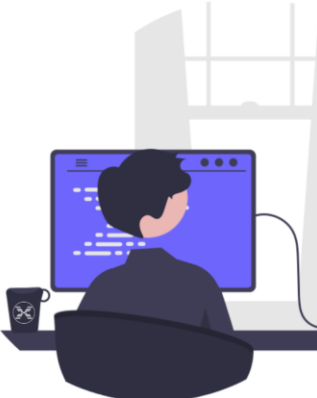


 Helical

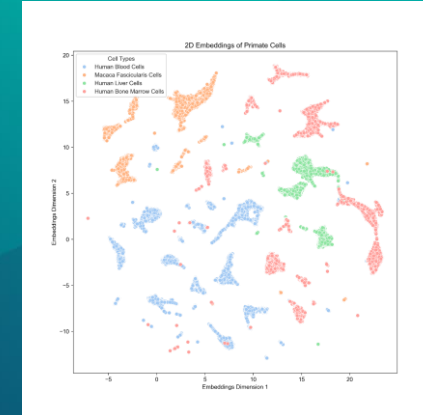
**Experiment. Build. Deploy.**

**The next generation of applications with Bio Foundation Models**

The first [open-source platform](#) for researchers, biologists & developers to explore bio foundation models, and build applications to accelerate drug development.

An illustration of a person sitting at a desk, viewed from behind, looking at a computer monitor displaying code. A coffee cup is on the desk next to the monitor.

*“Through LuxProvide, Helical was able to start developing its platform on a much larger scale by being able to use a wide range of bio foundation models directly with the distributed network of GPU nodes.”*



2D visualization depicting the embedding of primate cells categorized by type

*“In a first phase, Helical focused on biomarker discovery with RNA sequencing data. Using the Jupyterlabs interface on the HPC enabled for quick development cycles and the batch jobs will enable Helical to do optimizations on a larger scale in the future.”*

# AI on MeluXina

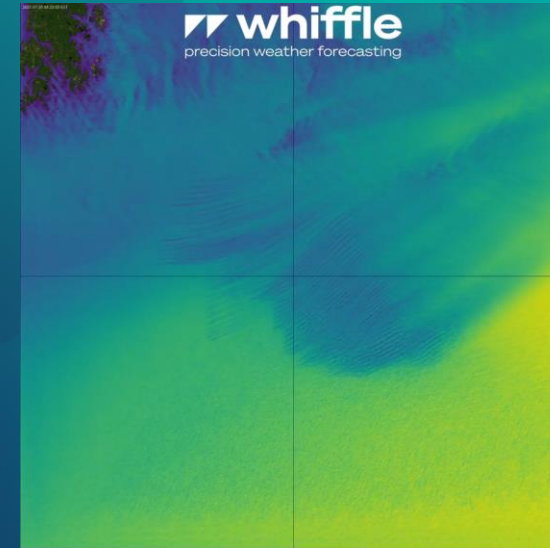


*“The video shows a simulation of the US East Coast: 100m wind speed field, including turbine wake effects and convective clouds (visualised in white) formed over land.”*

## Pushing the Boundaries of Numerical Weather Prediction with Advanced HPC Technology



*Whiffle, a frontrunner in numerical weather prediction, has partnered with LuxProvide, a leader in High-Performance Computing (HPC). This collaboration harnesses the MeluXina supercomputer*



*“We can now meet the expanding needs of multi-gigawatt wind farms, providing precise weather insights for large domains, in a fraction of the time.” says Remco Verzijlbergh. “Leveraging the extensive number of interconnected GPUs that are available on demand, we have markedly improved the speed and scale of our modelling processes. This advancement lays the groundwork for future continental-scale LES applications,” he adds.*



# Challenges



## AI user expectations

- develop
- train
- inference

HPC environments **not well suited** for hosting MLOps, LLMOps, ... workflows

HPC environments **well suited** for training AI models, although job scheduler time limits pose problems

HPC environments **not well suited** for real-time inferencing needs

A full-page background image showing an astronaut in a white spacesuit walking away from the viewer down a long, brightly lit aisle of server racks. The racks are filled with blue and green lights, and the floor is reflective. The overall color palette is dominated by blues, greens, and purples, creating a futuristic, high-tech atmosphere.

# EXPLORING THE FRONTIERS OF DIGITAL INTELLIGENCE

Our mission is to fuse data science and supercomputing capabilities, ensuring accuracy, security, and sustainability for a thriving future.