Towards Dedicated AI Infrastructure at Wigner RCP

Motivations and Challenges



Ádám Pintér

pinter.adam@wigner.hun-ren.hu

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CONTEXT

Research compute demand is growing

Hungarian resources already provide a foundation, with AI-specific capacity emerging.

EXISTING COMPUTATIONAL RESOURCES

Komondor HPC
01

Debrecen

WSCLAB
02

Wigner Scientific Computing Laboratory

HUN-REN Cloud
03

Wigner RCP + SZTAKI

University of Szeged
04

Supercomputer

AI CAPACITY IN DEVELOPMENT

HunAIFA

Hungarian AI Factory Antenna

→ **JUPITER AI Factory**

Jülich, Germany

Levente HPC

Early-phase development

Subscription-based AI services

ChatGPT

Claude

STRATEGIC OPPORTUNITY

Towards dedicated AI capacity

A strategic question for research institutions and R&D-intensive companies.

POTENTIAL VALUE

Dedicated AI capacity

for research institutions and
R&D-intensive companies

WORK IN PROGRESS

Wigner RCP

Feasibility study underway

FINANCIAL DIMENSIONS

CAPEX + OPEX — Capital & operating costs

Return horizons — Short term + long term

RESEARCH MOTIVATIONS

Enabling research on our own terms

Control, model development, trustworthy results and hands-on research workflows.

01 Control & sovereignty

- Govern which questions AI can answer
- Operate models fully offline
- Keep prompts, workflows and data at Wigner
- Process sensitive research data

02 Trust & reproducibility

- Work with confidential HR / finance data
- Code faster in sensitive repositories
- Replicate results with the exact model and data—even 10 years later

03 Research & AI models

- Develop unique, customized AI models
- Fine-tune, inspect and debug AI models
- Generate better research data and results

04 Labs & research talent

- Use AI to control labs, equipment and infrastructure
- Attract new research talent
- Gain hands-on experience with AI instruments

INSTITUTIONAL MOTIVATIONS

Beyond research: strategic value

Long-term resilience, economics and an expanded research–industry ecosystem.

01

Control & resilience

Autonomy you can plan around

- Technological independence
- Guaranteed, controlled availability
- Readiness for possible future project audits

02

Cost & performance

Keep work close to the data

- Mitigate subscription-based AI costs
- Low-latency, high-speed and effectively “free” on-campus data transfer

03

People & partnerships

Build lasting institutional capability

- Develop excellence and hands-on know-how
- Forge new scientific and industrial partnerships in Hungary and abroad

TECHNICAL DESIGN

Hardware and software must evolve together

Infrastructure design balances deployment choices with access and sustainability.

01 Hardware

1. Datacenter environment
2. Power requirements and energy efficiency
3. Passive-cooled GPU cards in servers
4. High-speed server interconnects
5. Compare passive and liquid-cooled GPU systems on cost

02 Software

1. Time-based / separated resource use
2. Monitoring and resource utilization
3. Access, authentication and authorization
4. Long-term system sustainability

IMPLEMENTATION READINESS

An interdisciplinary team is essential

Leadership, scientific expertise and production infrastructure skills all matter.

ENABLE

Leadership & funding

Leadership support and financial backing

RESEARCH & AI

Scientific expertise

- Theoretical & practical Wigner physicists
- Department of Computational Sciences
- AI researchers and AI ambassadors
- Data repository expertise

OPERATE

Platform expertise

- Network, server, datacenter and storage deployment / operations
- Cloud support knowledge

Thank you

for your attention.

Questions?

Ádám Pintér

pinter.adam@wigner.hun-ren.hu

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