



# **Fyysisen tekoälyn kiihdytyshanke**

Kick-off

11.9.2026



# Päivän ohjelma

- |              |                                                                                                                        |
|--------------|------------------------------------------------------------------------------------------------------------------------|
| <b>9.00</b>  | <b>Tervetuloa &amp; Fyysisen tekoälyn kiihdytyshanke</b>                                                               |
| <b>9.20</b>  | <b>Key note: Physical AI – The Art of Deployment, Ilkka Raiskinen, senior advisor Sitra</b>                            |
| <b>9.35</b>  | <b>Keskustelu</b>                                                                                                      |
| <b>10.00</b> | <b>Key note: Fyysinen tekoäly teknologiana, Marko Mäkipää, Vice president Physical AI VTT</b>                          |
| <b>10.15</b> | <b>Keskustelu pöytäryhmissä</b>                                                                                        |
| <b>10.30</b> | <b>Key note: Terveiset fyysisen tekoälyn kentältä ja Suomalaisten yritysten vahvuudet, Teemu Heikkilä, CEO Emblica</b> |
| <b>10.45</b> | <b>Keskustelu</b>                                                                                                      |
| <b>11.05</b> | <b>Yhteenveto – Mika Ruokonen, AI Industry Professor LUT</b>                                                           |
| <b>11.15</b> | <b>Lopetus &amp; siirtymä lounaalle</b>                                                                                |

**SITRA TOTEUTTAA FYYSISEN TEKÖÄLYN  
KIIHDYTYSHANKETTA YHDESSÄ LAAJAN  
KUMPPANIVERKOSTON KANSSA**

**HANKKEELLA ON 3 TAVOITETTA**

## **1 EKOSYSTEEMI & YRITYKSET**

**Vahvistaa ekosysteemin private&private ja private&public -yhteistyötä sekä tuottaa uusia pilotteja, TKI-kumppanuuksia, ja tukea kasvua lyhyellä aikavälillä**

## **2 TIEKARTTA & JATKON KASVUTOIMET**

**Tuottaa selkeä kuvaus Suomen vahvimista kasvun kärjistä fyysisessä tekoälyssä ja määritellä jatkotoimet kasvun takaamiseksi keskipitkällä aikavälillä**

## **3 YHTEISKUNTA**

**Auttaa suomalaista yhteiskuntaa ja instituutioita heräämään fyysisen tekoälyn mahdollisuuksiin generatiivisen tekoälyn rinnalla**

# KIIHDYTYSHANKKEEN AIKAJANA

**Q4/26**

**Q1/27**

**Q2/27**

**Physical AI matchmaking & kansallinen tilannekuva**

**Tietoaukkojen täydentäminen  
tiekarttaa varten**

**Physical AI tiekartta Suomelle**

Sitran julkaisu  
fyysisestä tekoälystä  
laajemmalle yleisölle  
tammikuussa

**Jatkotoimet & toimintamallin  
kehitys**



# Kiihdytyshankkeen verkosto & roolit

| Yritysverkostot                                                                                                                                                                                                                         | Ohjausryhmä                                                                                                                                                                                                                                                                                                                                                   | Sitra                                                                                                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>• <b>Business Turku</b></li><li>• <b>Business Oulu</b></li><li>• <b>Business Tampere</b></li><li>• <b>Business Espoo</b></li><li>• <b>Oulun Yliopiston tuki teknologiaskenaarioissa</b></li></ul> | <ul style="list-style-type: none"><li>• <b>Business Finland</b></li><li>• <b>VTT</b></li><li>• <b>AI Finland</b></li><li>• <b>Teknologiateollisuus</b></li><li>• <b>TEM</b></li><li>• <b>Petteri Hemminki (PV)</b></li><li>• <b>Mika Ruukonen (LUT)</b></li><li>• <b>Laura Ruotsalainen (HY)</b></li><li>• <b>+ kaupungit &amp; Oulun Yliopisto</b></li></ul> | <ul style="list-style-type: none"><li>• <b>Yleinen tuki &amp; project management kokonaisuudelle</b></li><li>• <b>Rahoitus</b></li><li>• <b>Julkaisualusta</b></li></ul> |

# 4x fokusalueet



- #1** Reunatekoäly ja agenttinen tekoäly laskentajatkumossa – Business Oulu
- #2** Meriteollisuus & merellinen turvallisuus, teknologiateollisuuden yritykset – Business Turku
- #3** Puolustus ja kaksoiskäyttö, terveysteknologiat, smart city, siruteknologiat – Business Espoo
- #4** Liikkuvat työkoneet, puolustus ja kaksoiskäyttö, siruteknologiat, smart city – Business Tampere
- +5** Oulun Yliopiston asiantuntijatuki teknologian kehitysskenaarioissa



# ***TEKOJA TULEVAI- SUUDELLE***

VTT Physical AI

# Physical AI

From sensing and reasoning to autonomous operations in the real world

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Marko Mäkipää · September 2026



# Physical AI: Autonomous machines among us

## Future promise

In the future, we will live and work alongside autonomous machines that make our lives easier and more comfortable.

## Challenge

As the population ages, many sectors face a shortage of workforce, especially in rural areas. In parallel, many industrial occupations (dull, dirty, dangerous, dear, and difficult) may not appeal to younger workers.

## Excellence

We combine expertise in sensor technologies, spatial computing, secure connectivity, AI reasoning, multimodal human-machine interaction, and robotic platforms to develop human-centric autonomous solutions for manufacturing, mobile machinery, autonomous systems, and defence.

## Uniqueness

Solutions require seamless integration of several novel technologies.



# Europe's Digital Future: Physical AI

- "As advances in artificial intelligence (AI) are accelerating the emergence of

## Physical AI

- robots capable of **perceiving**, **reasoning** and **acting** in the physical world,
- there is a growing opportunity for Europe to translate its scientific excellence into industrial leadership.
- Strengthening Europe's position in AI-powered robotics is essential to enhance its competitiveness, reinforce its technological sovereignty, and ensure that the next generation of AI powered robotics is developed and deployed in line with European values and strategic interests."

# VTT Physical AI Research Area

## Research portfolios

**9 Teams**  
**150 experts**

**New sensor technologies**  
(Eyes and senses for machines)



### **Situational Awareness**

Machine vision, spectroscopy, optical measurement devices, concept development & prototyping hyperspectral imaging, SAR

**Portfolio Lead:**  
**Marko Paavola**

**"Brains" for machines**



### **AI-based Reasoning**

Sensor fusion, spatial computing, LLM, LMM, generative AI, agentic AI, explainable AI

**Portfolio Lead:**  
**Taru Hakanen**

**Autonomous operations in harsh environments**



### **Autonomous Machines and Platforms**

Robotics and machines, Humanoids, drones, vehicles, non-road mobile machines

**Portfolio Lead:**  
**Hannu Karvonen**

# Our teams / Physical AI Research Area at VTT

## AUTONOMOUS MACHINES



**Intelligent Robotics**



**Automated Vehicles**



**Aerial Systems**

## AI-BASED REASONING



**Situational Awareness and Decision-Making**



**Reliable Intelligence**



**Embodied AI**

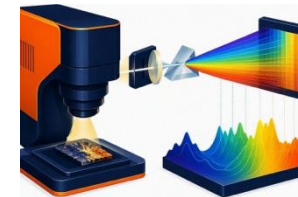
## SITUATIONAL AWARENESS



**Remote Sensing**



**Optical Sensing Systems**



**Microspectrometers**

# Complementary technological enablers

*Secure data connections and intelligence from cloud to machine*



## CONNECTIVITY

Resilient data links for distributed machines

- 5G / 6G and private networks
- Optical and satellite connectivity
- Machine-to-machine communications



## POST-QUANTUM CRYPTOGRAPHY

Trust for long-living physical AI systems

- Quantum-safe cryptography
- Secure identities and data exchange
- Cyber-resilient autonomous operations



## EDGE AI & CHIPS

Real-time intelligence close to sensors

- Embedded AI acceleration
- Low-latency sensor processing
- Energy-efficient local decision-making

## The evolution of physical AI



### 01 HUMAN-IN-THE-LOOP

#### Remote control

The machine relies on human guidance to function. AI translates human intent and assists execution—it does not make decisions independently.



### 02 TASK-DRIVEN AUTONOMY

#### Autonomous

The system executes complex tasks and navigates unpredictable environments without real-time intervention, within a scope defined by humans.

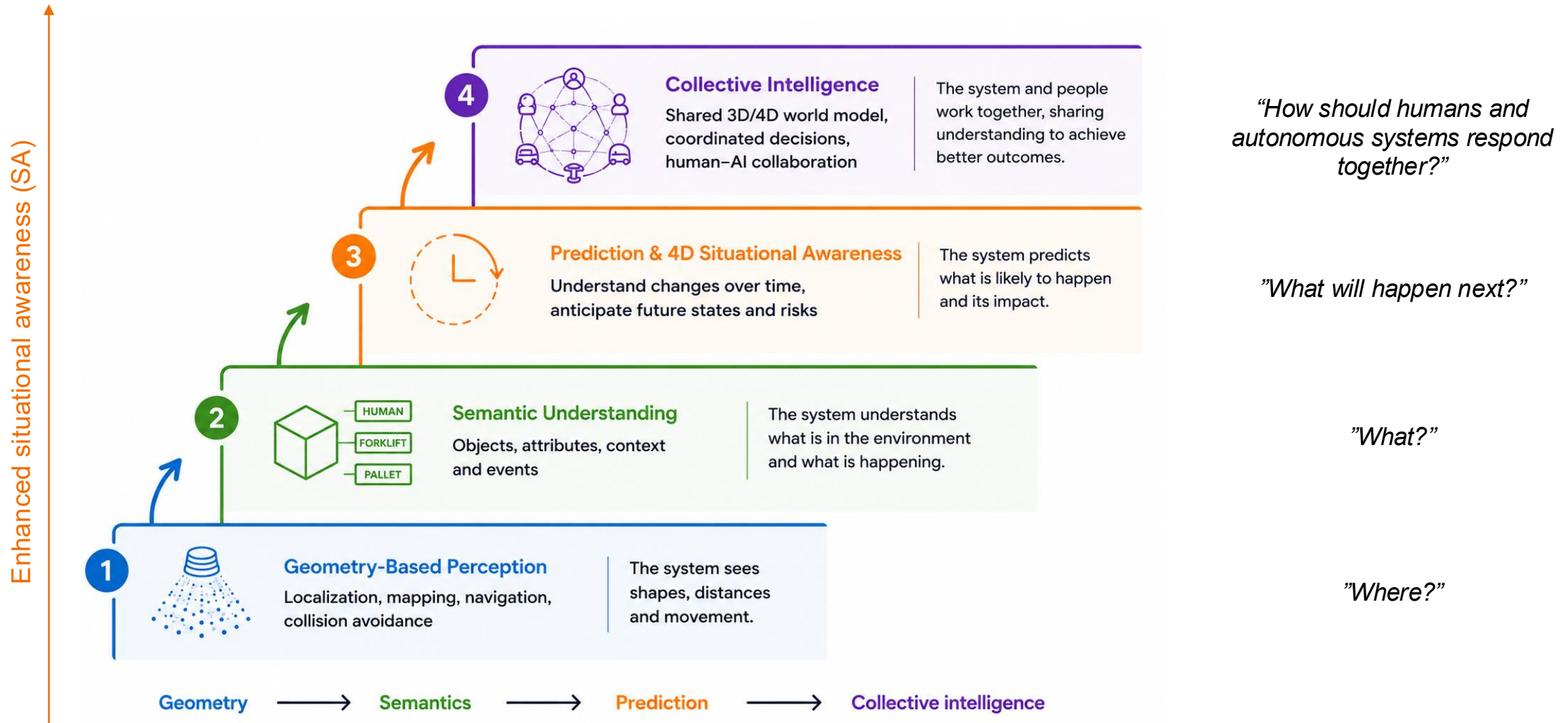


### 03 LIFECYCLE-INDEPENDENT

#### Self-sufficient

The AI sustains operations over time—adapting to new domains, managing energy and maintenance, and diagnosing or repairing itself.

# Improving situational awareness in physical AI systems



# Humanoid technologies – made in Finland?

## BODY + SENSING

### High-torque actuators

Compact motors and gears create joint force.

### Dexterous hands

Multi-DoF fingers handle human tools.

### Lightweight structures

Composites and titanium reduce weight.

### Tactile e-skin

Pressure sensing enables delicate touch.

### Proprioception

Joint encoders track limb position.



## INTELLIGENCE + ENERGY

### VLA models

VLA turns vision and language into action.

### Real-time sensor fusion

Fuses cameras, LiDAR, IMUs and force data.

### Sim-to-real learning

Simulation trains safe, transferable behaviors.

### High-density batteries

More energy extends runtime in less space.

### Thermal management

Cooling protects motors and AI processors.

# Physical AI - our leadership team at your service

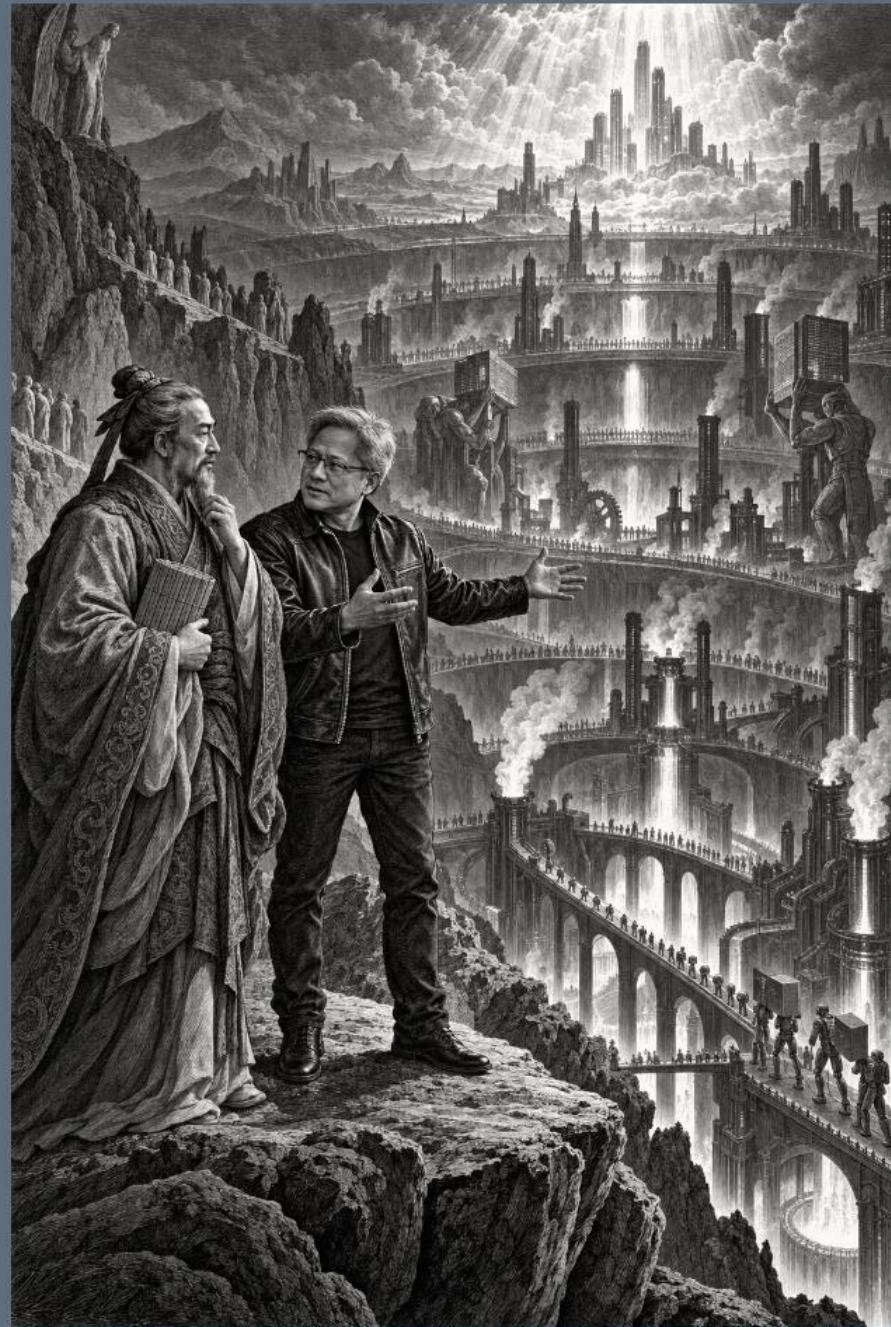


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# Physical AI

## The Art of Deployment

Ilkka Raiskinen, Senior Advisor, SITRA



# | The AI story has been a story of scale

Big companies

Big valuations

Big models

Big data centres

**The narrative on media: only a few companies compete at the frontier — they define the rules and terrain — the others are expected to follow**



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|   | Rank | Name                                                                                                                         | Market Cap | Price    | Today   | Price (30 days)                                                                       | Country      |
|---|------|------------------------------------------------------------------------------------------------------------------------------|------------|----------|---------|---------------------------------------------------------------------------------------|--------------|
| ☆ | 1    |  <b>NVIDIA</b><br>NVDA                      | \$5.400 T  | \$223.67 | ▼ 0.91% |    | 🇺🇸 USA       |
| ☆ | 2    |  <b>Apple</b><br>AAPL                       | \$4.602 T  | \$315.34 | ▼ 0.28% |    | 🇺🇸 USA       |
| ☆ | 3    |  <b>Alphabet (Google)</b><br>GOOG           | \$4.016 T  | \$328.38 | ▼ 2.09% |    | 🇺🇸 USA       |
| ☆ | 4    |  <b>Microsoft</b><br>MSFT                   | \$3.650 T  | \$491.65 | ▼ 0.47% |    | 🇺🇸 USA       |
| ☆ | 5    |  <b>Amazon</b><br>AMZN                      | \$2.722 T  | \$252.40 | ▼ 1.78% |    | 🇺🇸 USA       |
| ☆ | 6    |  <b>TSMC</b><br>TSM                         | \$2.257 T  | \$435.36 | ▼ 0.83% |    | 🇹🇼 Taiwan    |
| ☆ | 7    |  <b>SpaceX</b><br>SPCX                      | \$1.944 T  | \$147.55 | ▼ 3.86% |    | 🇺🇸 USA       |
| ☆ | 8    |  <b>Broadcom</b><br>AVGO                  | \$1.733 T  | \$364.38 | ▼ 1.13% |  | 🇺🇸 USA       |
| ☆ | 9    |  <b>Saudi Aramco</b><br>2222.SR           | \$1.682 T  | \$6.96   | ▲ 0.31% |  | 🇸🇦 S. Arabia |
| ☆ | 10   |  <b>Meta Platforms (Facebook)</b><br>META | \$1.665 T  | \$653.69 | ▲ 6.55% |  | 🇺🇸 USA       |

# Another AI market is emerging

Physical AI perceives its surroundings, makes decisions and acts through a physical system.

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## **CES · January 2026**

New Physical AI models and infrastructure: systems that understand the real world, reason and plan actions

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## **GTC San Jose · March 2026**

"This is the age of Physical AI and Robotics"

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## **GTC Taipei · 2026**

Cosmos 3 at the frontier of Physical AI; data among the hardest problems in robotics



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# CLOUD AI – PHYSICAL AI

SUOMI  
FINLAND

| Dimension                 | Cloud AI                                                                                                         | Physical AI                                                                                                 |
|---------------------------|------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| Execution                 | Centralized in data <u>centers</u> ;<br>Same model for consumers and businesses                                  | Embedded in a physical device. Processing can be distributed                                                |
| Data & learning           | Global, cross-domain data, generalist                                                                            | Domain-specific data, specialist                                                                            |
| System constraints        | High compute, software-dominant                                                                                  | Several constraints for compute and communications. Security and Reliability focus.                         |
| Deployment & Distribution | APIs and platforms: Global Branding and distribution                                                             | Physical systems, control at device/deployment layer; Domain specific brands and distribution               |
| Risk profile              | Informational errors/Brand risks                                                                                 | Physical and operational errors could cause significant issues.                                             |
| Key players               | Concentrated around a few frontier model providers and <u>hyperscalers</u> . (OpenAI, Anthropic, Google, NVIDIA) | Not yet consolidated, likely to remain vertical-specific across multiple markets. (Tesla, Qualcomm, NVIDIA) |

# Physical AI plays by different economic rules

## WHERE THE MONEY GOES

### DATA-CENTRE AI



### PHYSICAL AI



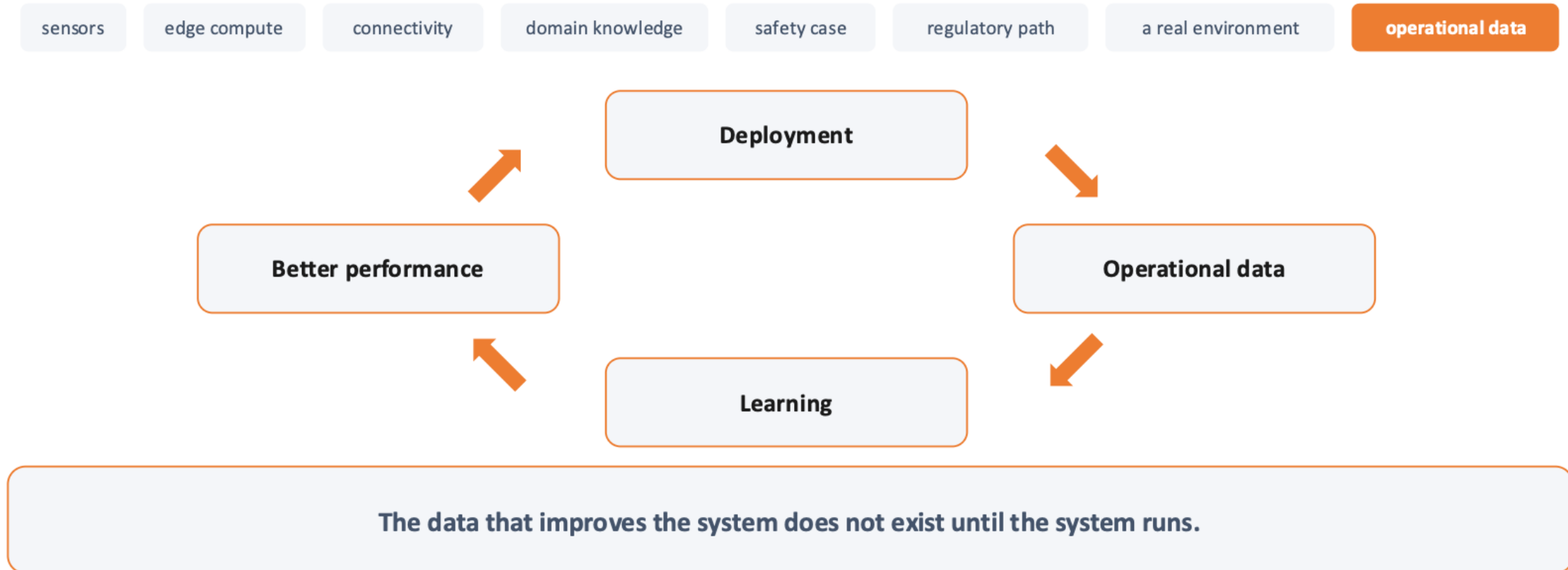
The question shifts from “who builds the biggest model?” to “who makes the whole system work and improve fastest?”



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# You cannot learn faster than you deploy.

*Deployment is how the system begins to learn.*



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# Finland is strong where deployment happens

*The layers that decide a Physical AI deployment are the layers Finland already has. And advantage emerges vertical by vertical — not once, for the whole market.*

Frontier models and data centres

**Research**

**Silicon**

**Connectivity**

**Devices and sensors**

**Industrial deployment**

*where the headlines are*

**where deployment happens**

*plus demanding operating environments to learn in*

**Cutting across every layer: trust.**

So how do we do this?

If Deployment is key— how to accelerate those ?  
Where do we get the right deployment targets ?

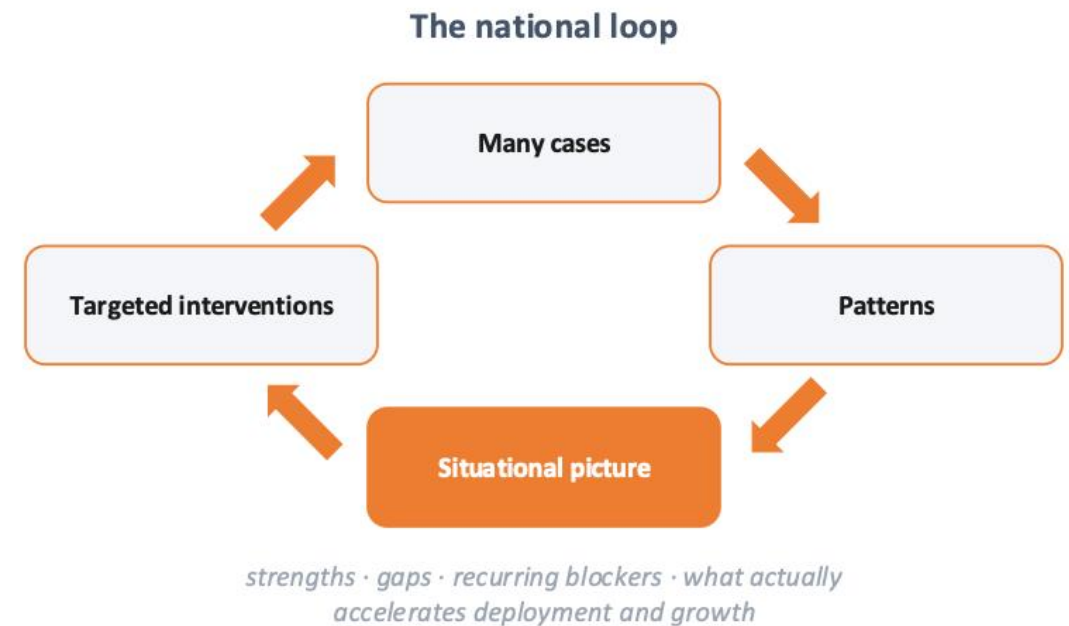
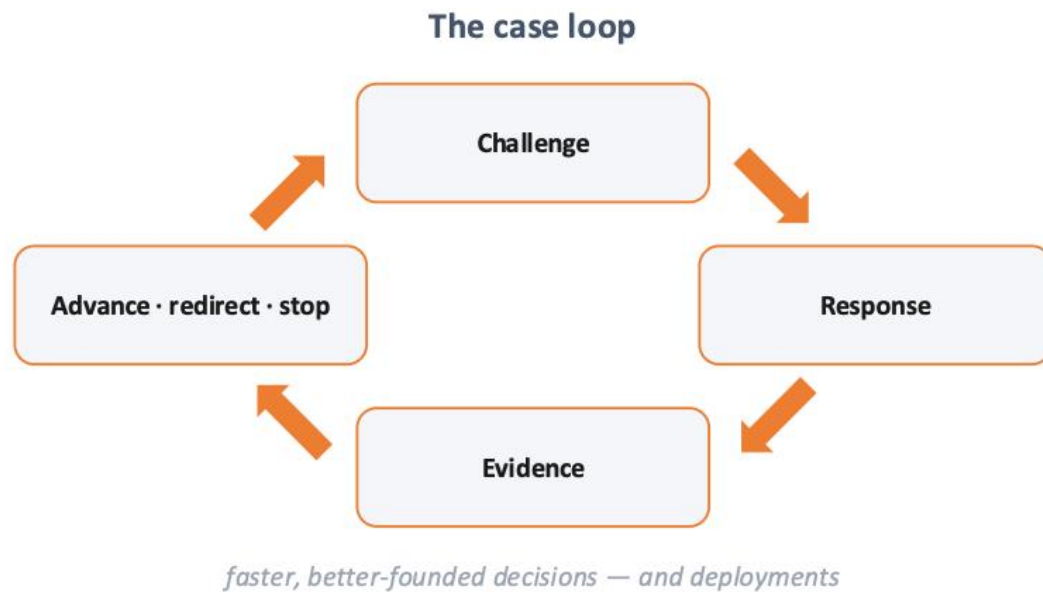


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# One case builds a solution. Many cases build national capability.

*One loop accelerates each case. The other builds a fact-based picture of where Finland actually stands.*



**A structure tuned to learn and self-correct — fast.**

*Everything validated by concrete cases*

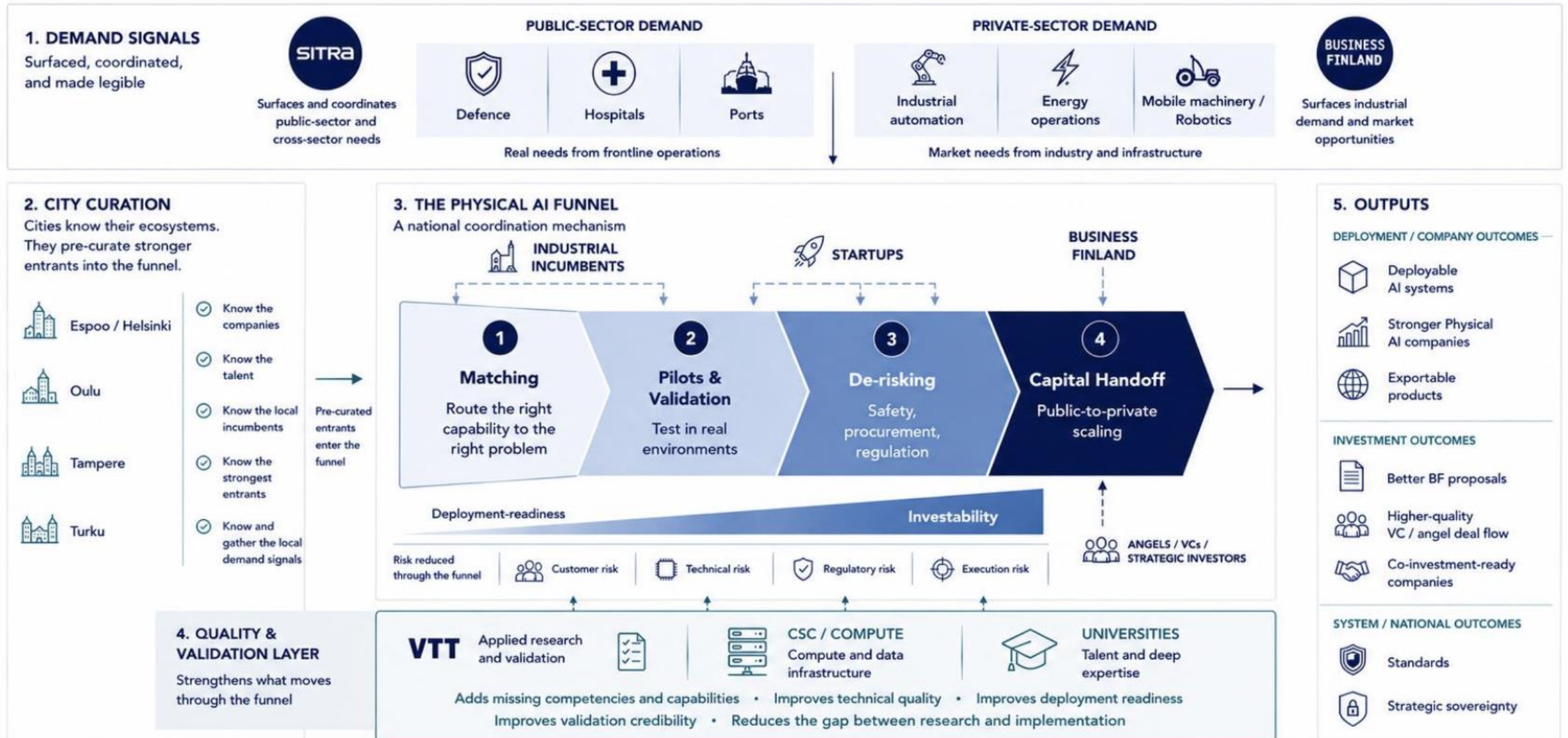


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# The Physical AI Funnel

From real demand to deployable solutions and investable companies

This is how the process is currently depicted.  
The design is a hypothesis — real cases will refine it.



Finland's bottleneck is not capability — it is the absence of a shared deployment funnel.

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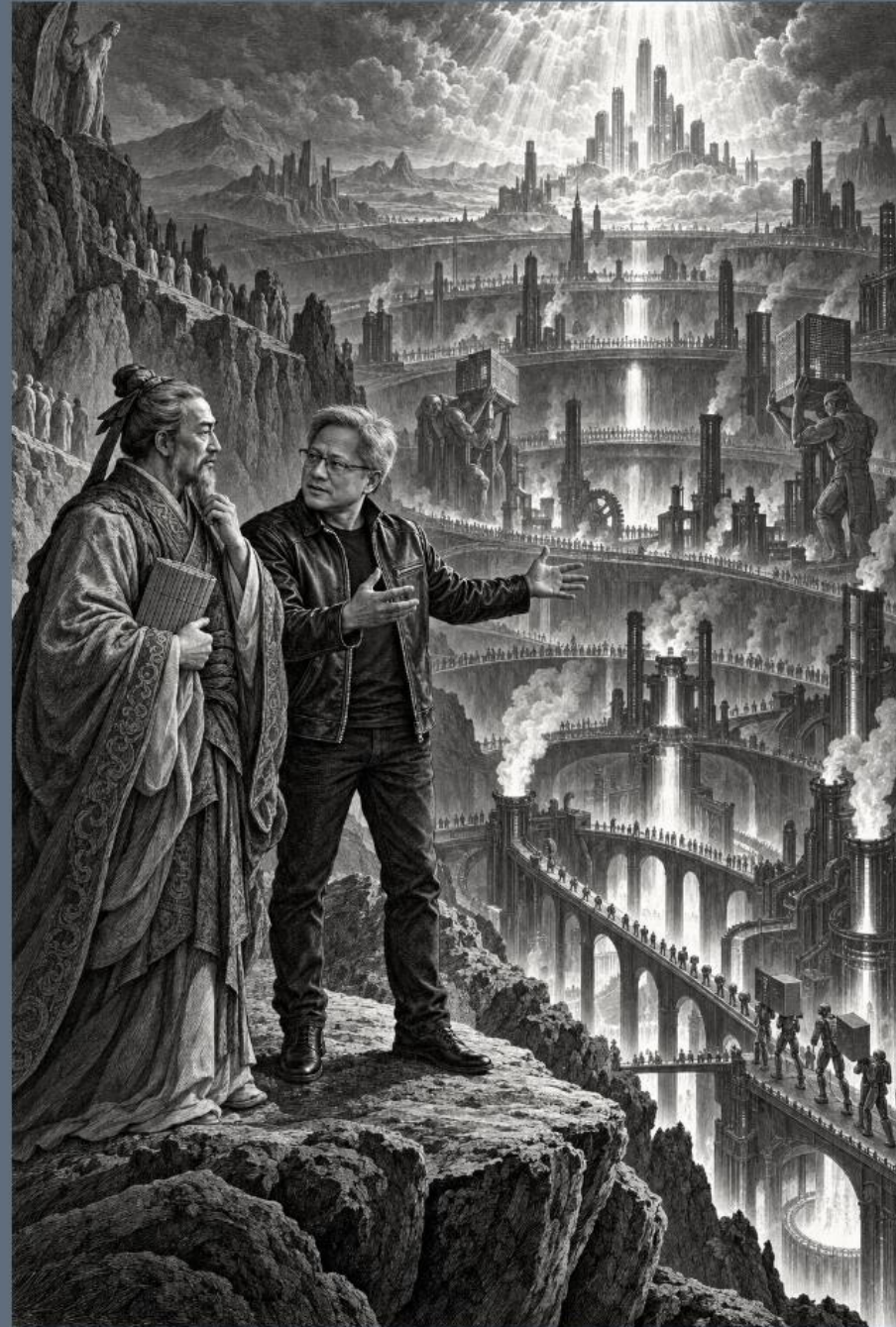
# Physical AI

## The Art of Deployment

Choose the right terrain.

Start with the real problem.

Deploy, learn and improve.



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