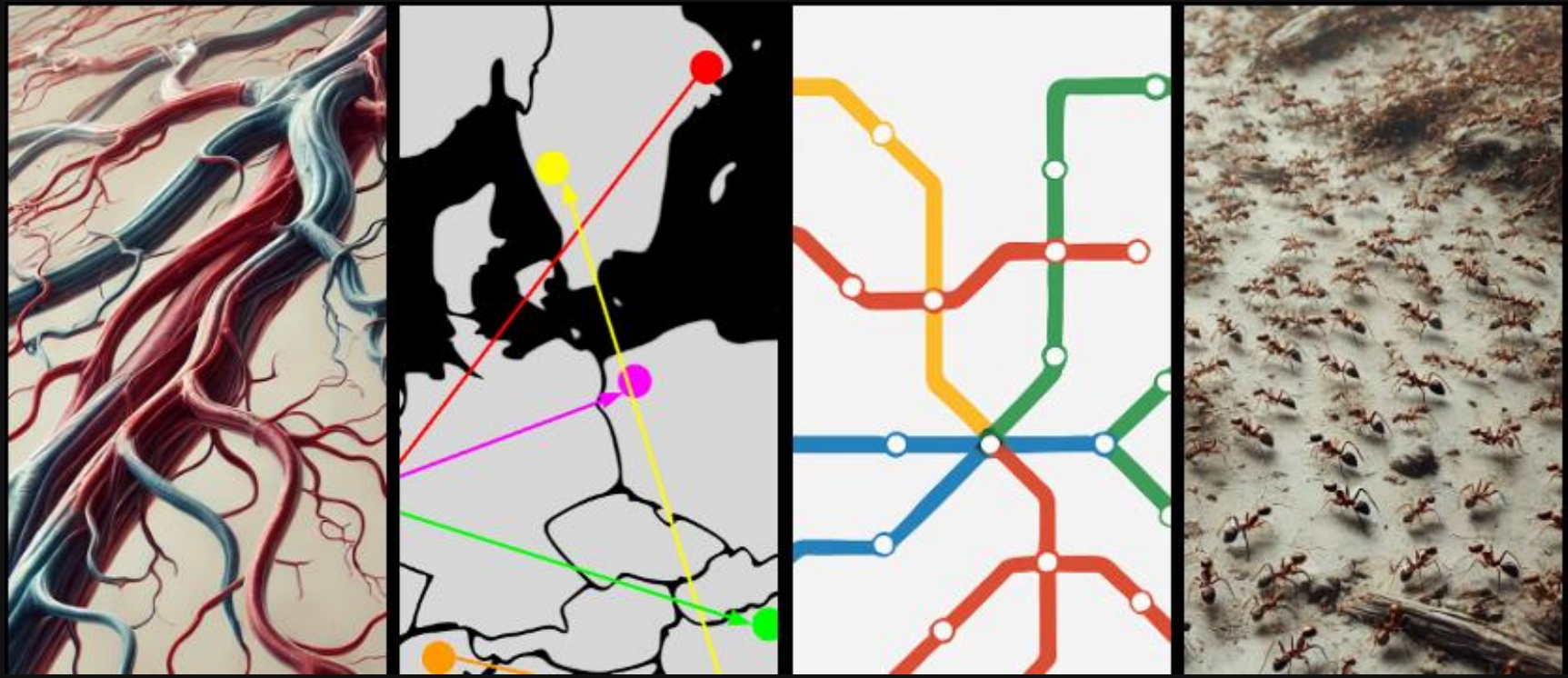

Embracing complexity - ending 100 years of simplification

Per Olof Arnäs, PhD

So happy to be here!

- MSc Mechanical engineering, Chalmers 1996
- PhD in logistics 2007
- Working with and in the haulage industry since 1989
  - Consultant/developer 1998-2002
  - Full time expert, developer, R&D (TRB Sverige) 2003-2010, finished PhD during
- Chalmers 2011-2020
  - Senior lecturer/researcher
  - Vice head of department (education) at Technology Management and Economics 2018-2020
- Director Logistics Strategy at Einride 2021-2023
- Independent advisor 2024-
- Secretary General of Game Changing Alliance 2024-
- Podcaster 

- Given some spare time, I tend to build things that you can cook in, on, or with.

I love the 21st century

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game changing alliance

ADNAVEM

Airon®

BEV_

CASA Delivery

CIRCUMFLEX

Duva

INQUIRE

LBC frakt

QPQ

SICOPA

TruckTrust

#solar
#electrification
#charging
#ai

#tech
#supply chain
#logistics
#freight
#lastmile

#coding
#IT-infrastructure
#4PL
#SocialSustainability

gamechangingalliance.se

1896
First truck
(Daimler)

1500 kg payload

Roads were low quality

Very slow market uptake

1896
First truck
(Daimler)

A lot of innovation

Easter morning 1900: 5th Ave, New York City. Spot the automobile.

Source: US National Archives

Easter morning 1913: 5th Ave, New York City. Spot the horse.

Source: George Grantham Bain Collection.

1920-30
Trucks
disrupt
horses

1896
First
truck

A lot of innovation

1910
Ice delivery

1923

1896
First
truck

1920-30
Trucks
disrupt
horses

A lot of innovation

Trucks take over land based freight

Production and sourcing could be located almost anywhere

Many roads taken over by government

Unprecedented growth

1896
First
truck

1920-30
Trucks
disrupt
horses

1956
Containers
disrupt global
trade

A lot of innovation

Trucks take over land based freight

Huge economies of scale

Distance less important

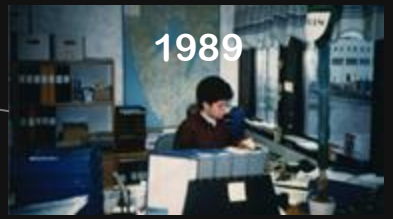
A global transportation network emerges

Still administered using analog technology

1920-30
Trucks
disrupt
horses

1896
First
truck

1956
Containers
disrupt global
trade



A lot of innovation

Trucks take over land based freight

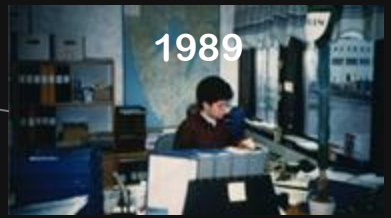
Globalization
commences

1920-30
Trucks
disrupt
horses

1896
First
truck

1956
Containers
disrupt global
trade

1990s
Computers



A lot of innovation

Trucks take over land based freight

Globalization
commences

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1896
First
truck

1920-30
Trucks
disrupt
horses

1956
Containers
disrupt global
trade

1990s
Computers

The era of Spreadsheets

Path of least resistance

A lot of innovation

Trucks take over land based freight

Globalization commences

Transport industry is computerized but not disrupted

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1896
First
truck

1920-30
Trucks
disrupt
horses

1956
Containers
disrupt global
trade

1990s
Computers

2020s
Electric
trucks

A lot of innovation

Trucks take over land based freight

Globalization
commences

Transport
industry is
computerized
but not
disrupted

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1896
First
truck

1920-30
Trucks
disrupt
horses

1956
Containers
disrupt global
trade

1990s
Computers

Gamechanger

2020s
Electric
trucks

A lot of innovation

Trucks take over land based freight

Globalization
commences

Transport
industry is
computerized
but not
disrupted

Towards digital,
electric and
highly
automated

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Planning for ICE truck

Planning for BE truck


Planning for ICE fleet
Maximise paid tonne-km
Minimise cost
Scaling by Copy-Paste
Planning for BE fleet
Maximise paid tonne-km
Minimise cost
Each transport is unique
Sweet-spot flows a minority
Charging investment
Increased complexity when scaling
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The diesel based system is almost fully commoditized
Commodity
Competition
Commodity
Commodity
Commodity
“Price” is the only competition area left

In the electric system almost nothing is a commodity

Superior to humans

Large data sets

Identify abstract patterns and trends

Control large systems

Generating content

Recommendations and decision support

Optimisation

Reinforcement Learning

When the AI learns by doing

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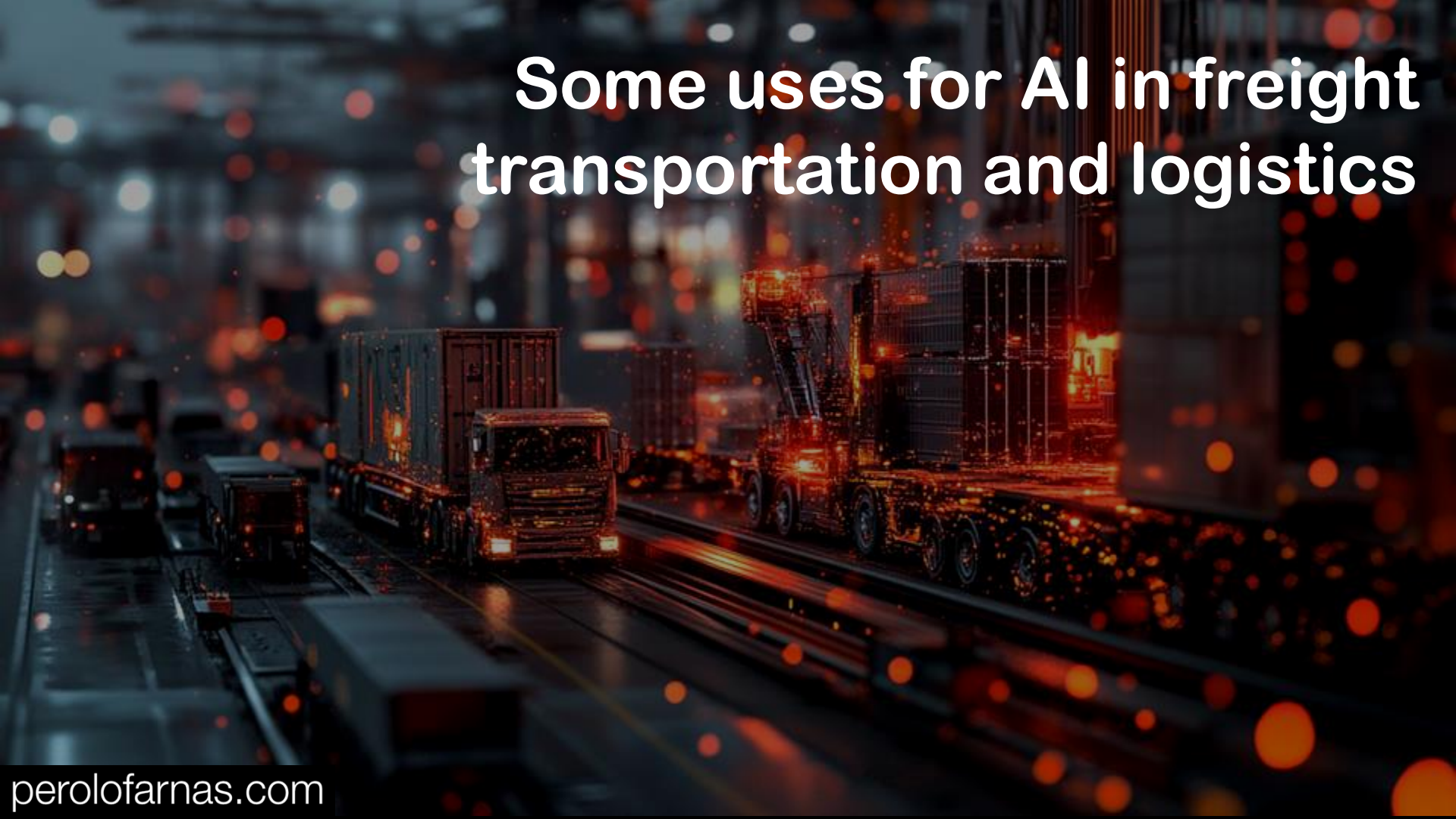
Some uses for AI in freight transportation and logistics

Forecasting


Warehouse
automation
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Inventory
managment
perolofarnas.com


Predictive capacity planning

Some uses for AI in freight transportation and logistics

Forecasting

Digital twin

Warehouse automation

Predictive capacity planning

Inventory management

Business intelligence

Some uses for AI in freight transportation and logistics


Port logistics


Robots


Forecasting


Digital twin


Warehouse automation


Legal


Last mile


Cargo scanning


Predictive maintenance


Predictive capacity planning


Inventory management


Business intelligence


HR


Yard management


Rail logistics


Routing


Fraud detection


Carbon reduction


Autonomous vehicles


Driver education


Drones


Energy management


Cold chain monitoring


Pricing

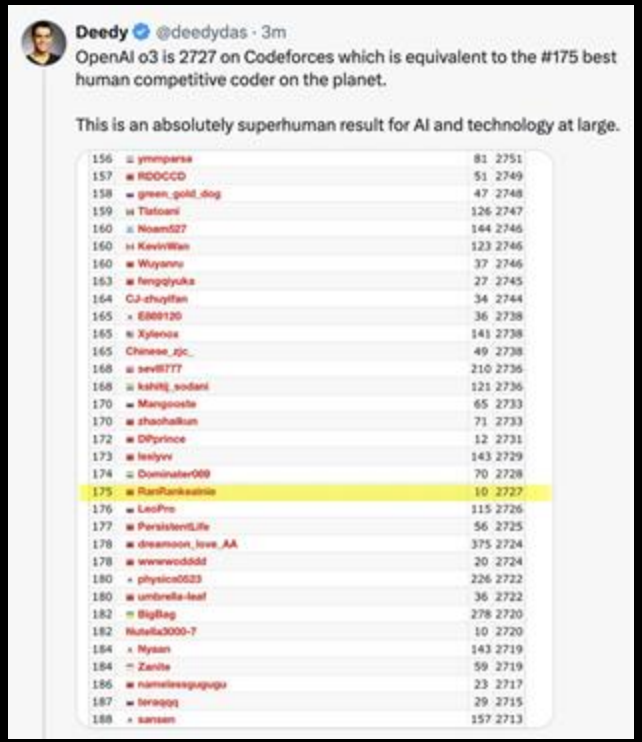

Automated checkpoints


Scheduling

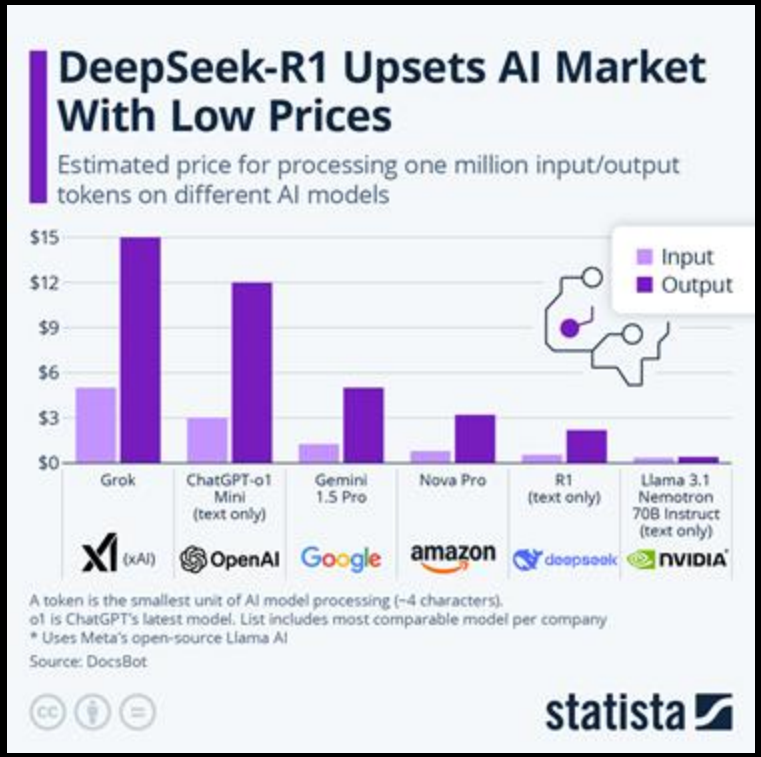

Compliance and documentation


Customer contact

New models all the time



Open AI o3 - previewed Dec 24 2024



DeepSeek-R1 launched Jan 10 2025

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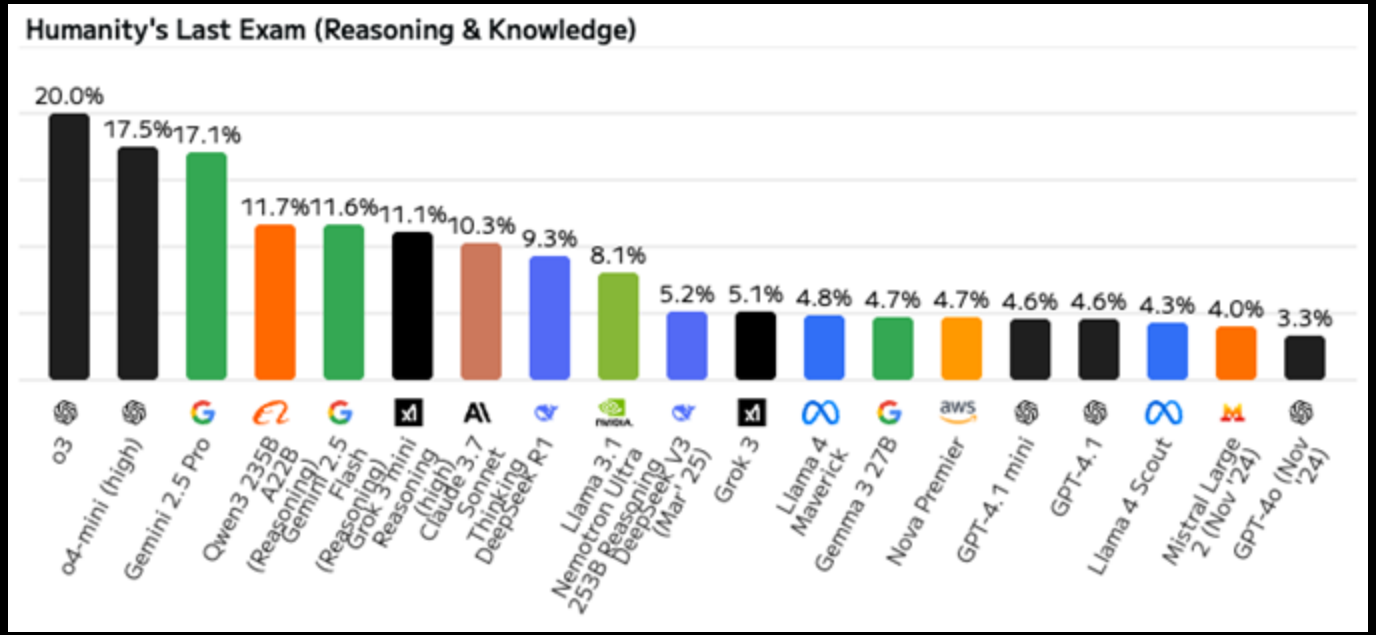
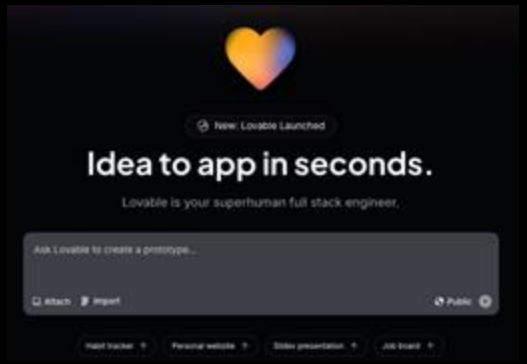
They are getting better



https://artificialanalysis.ai/models#intelligence-evaluations, updated May the 4th, 2025

New services all the time

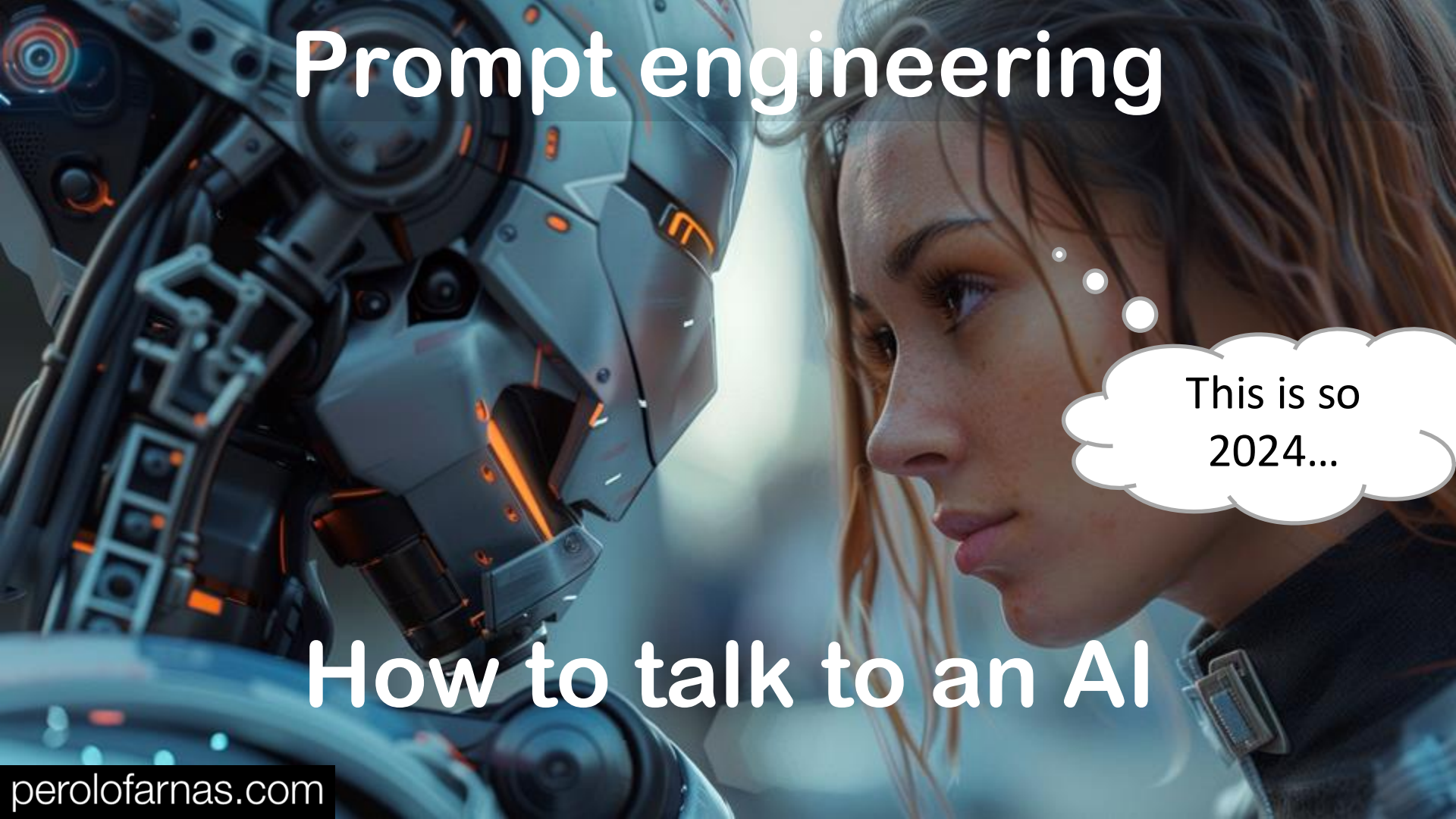
Open AI Deep research



Lovable

Heygen

Prompt engineering



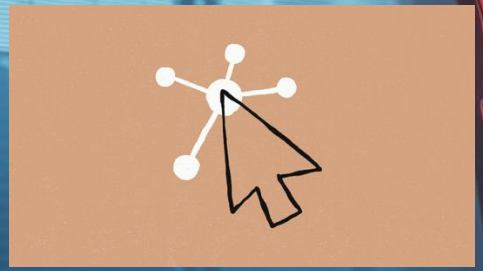
How to talk to an AI

We are all getting our very own digital assistants

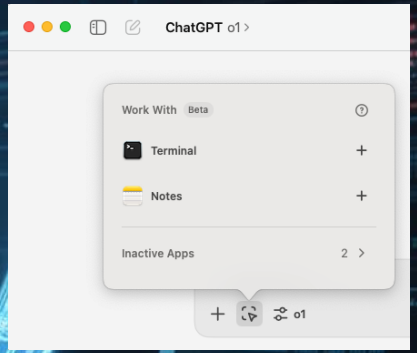
Prepare for the agents

Please help me start an online business. I want to increase my net worth.

“Please, take control of my computer”



Claude Computer Use



ChatGPT app use

What comes next when the AI steps outside the confines of a computer and gains control over its “universe”?

Figure - Humanoid robots

Source: Figure.ai

Figure - Humanoid robots

Source: Figure.ai

Source: Figure.ai

Source: Figure.ai

New colleagues

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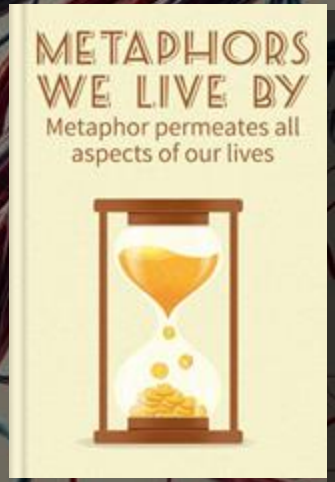
Metaphors Matter!



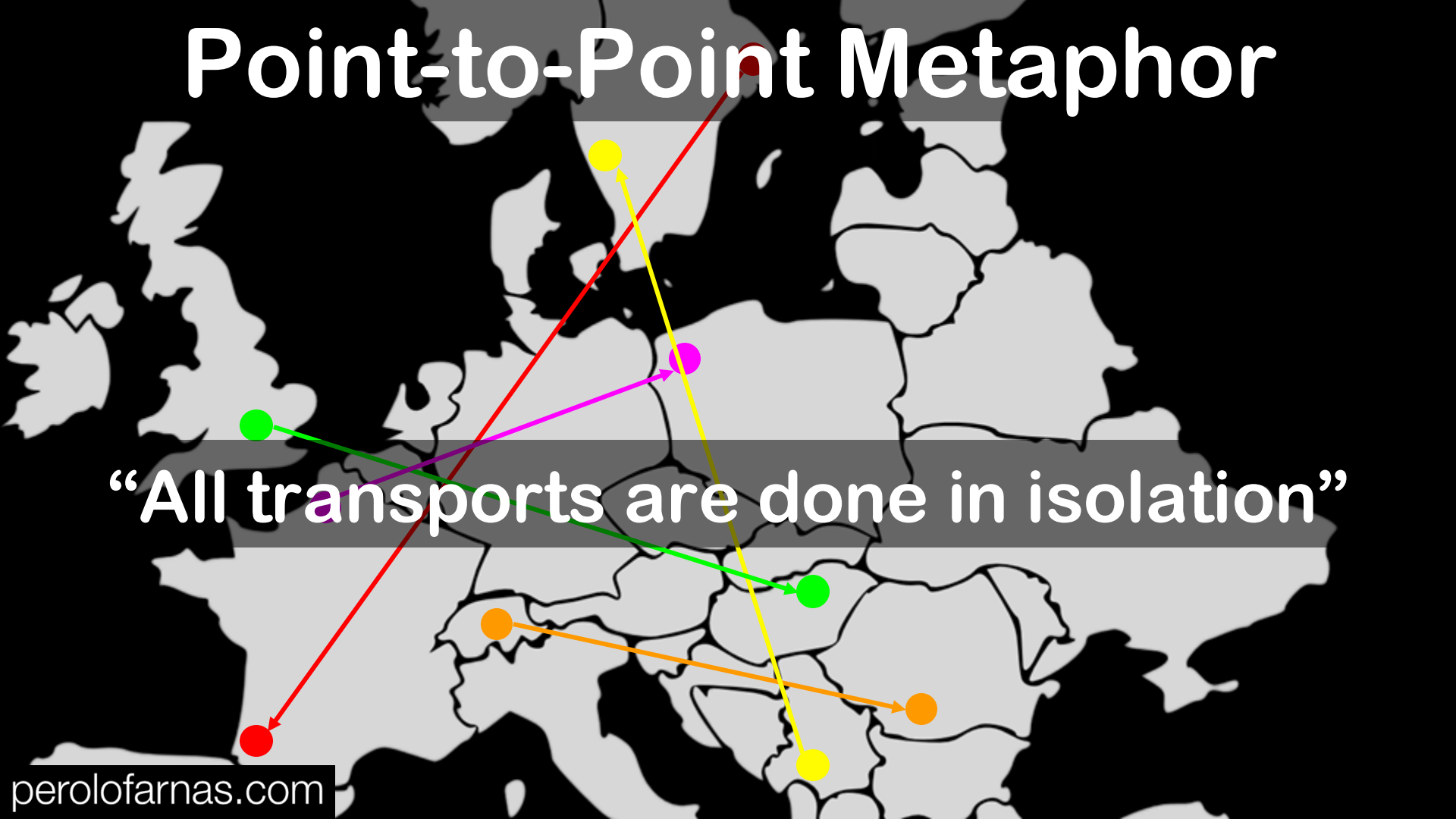
"Metaphors are not merely linguistic expressions; they structure our perceptions and understanding of the world."

George Lakoff, Mark Johnsen

Blood Vessel Metaphor

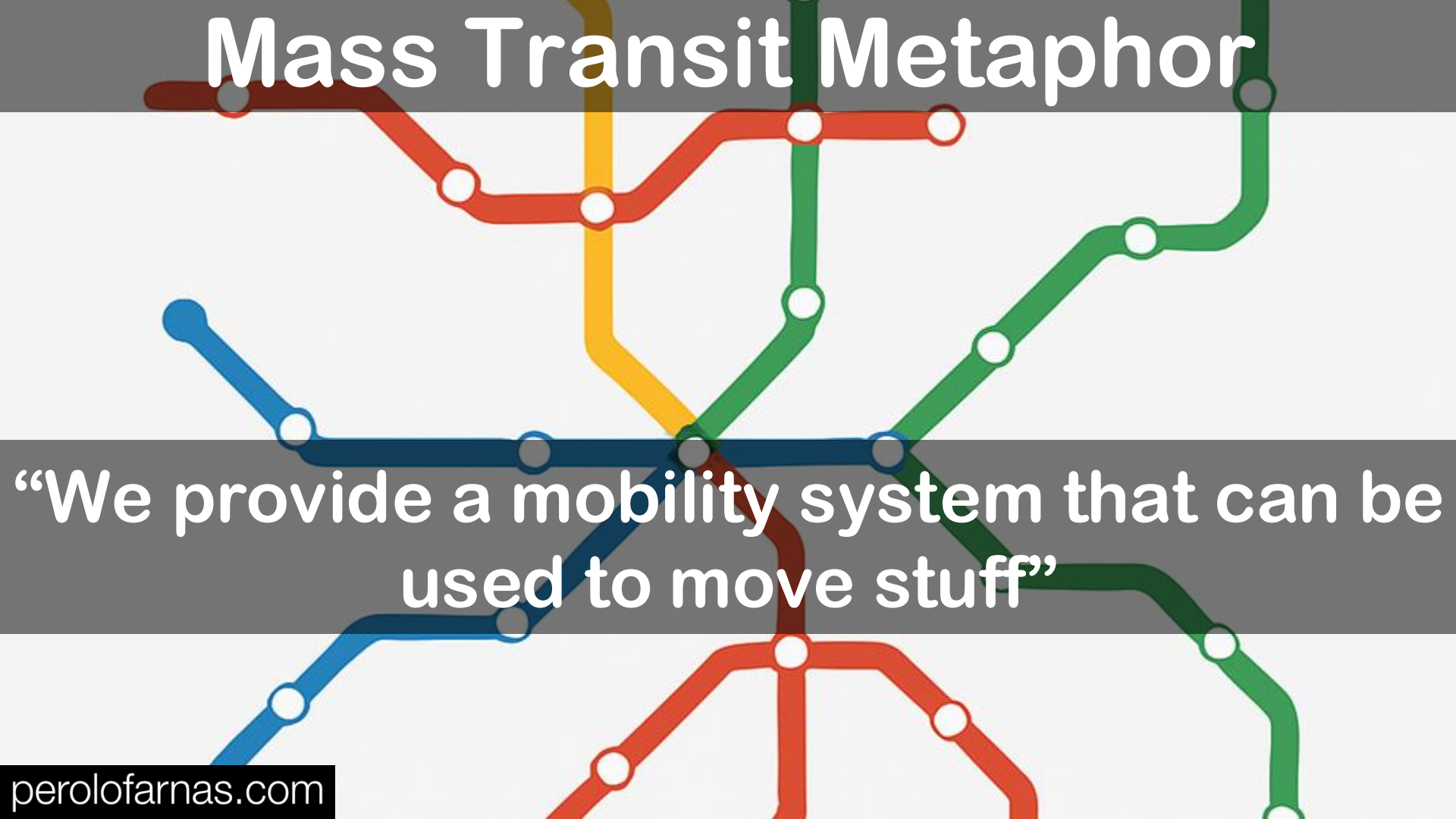
“We have an infrastructure in place that we can use”

Point-to-Point Metaphor



"All transports are done in isolation"

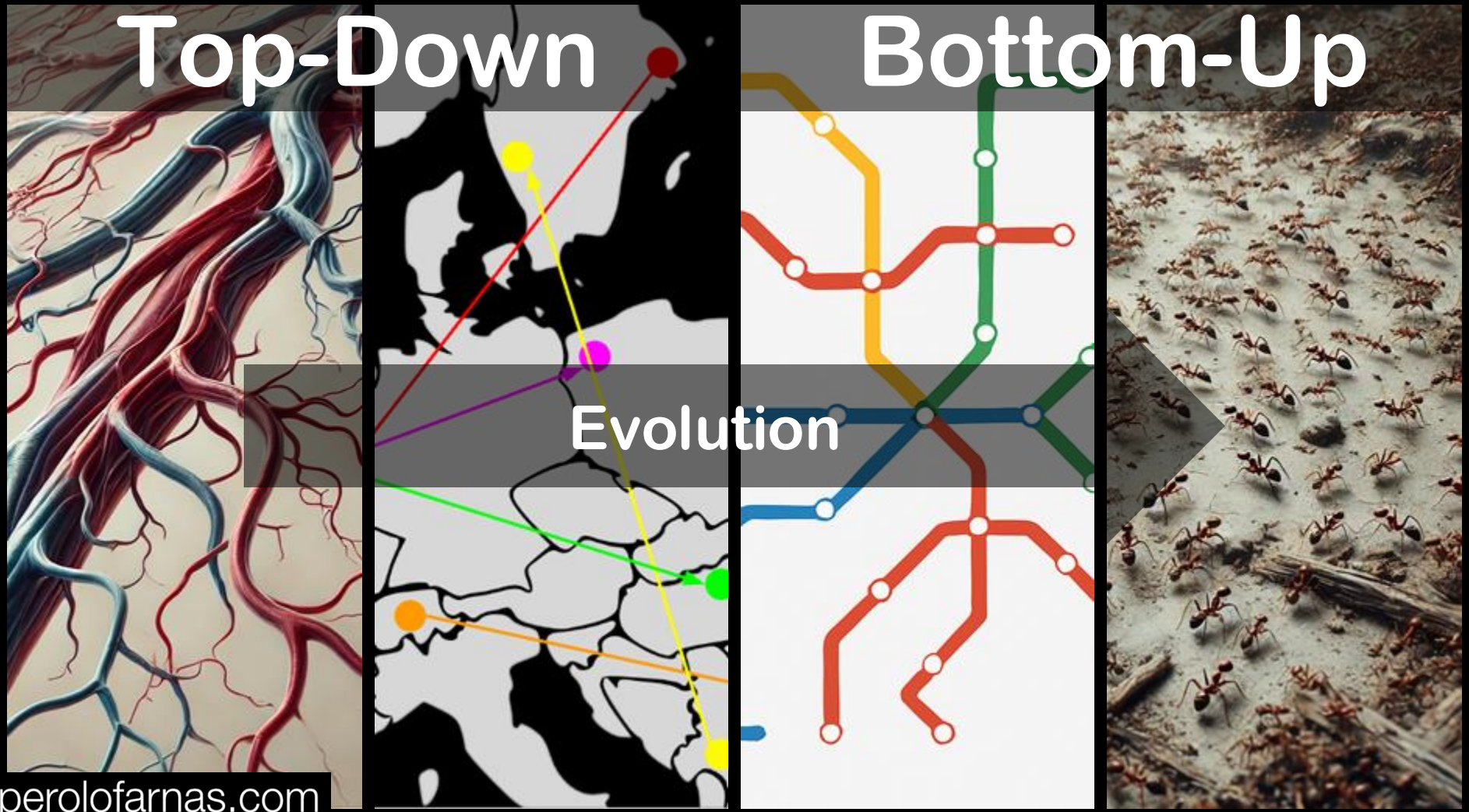
Mass Transit Metaphor



"We provide a mobility system that can be used to move stuff"

Ant Hill Metaphor

"The transportation system is an ever changing complex entity that cannot be controlled from above, only nudged from within"


Top-Down
Bottom-Up
Evolution
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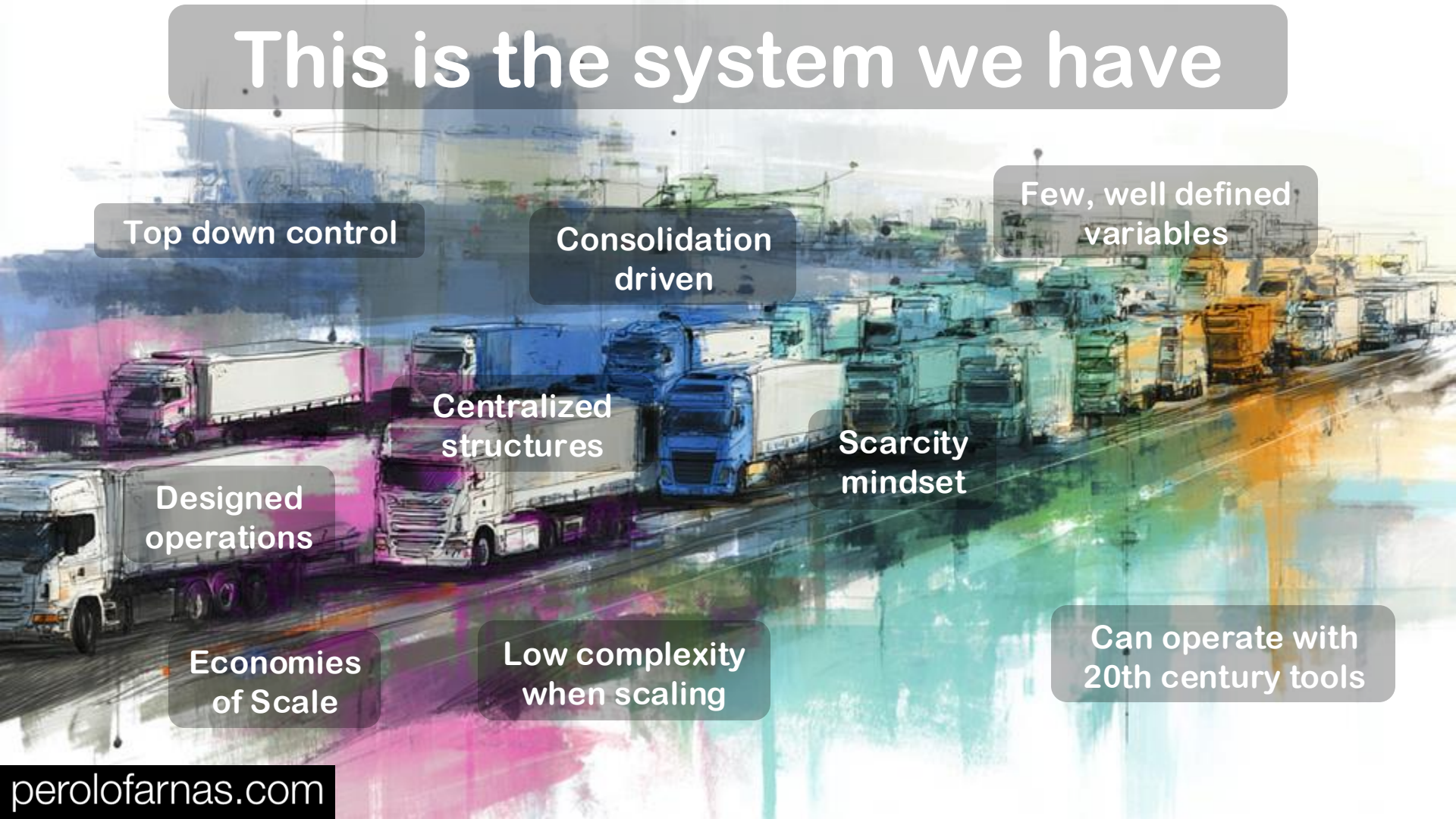
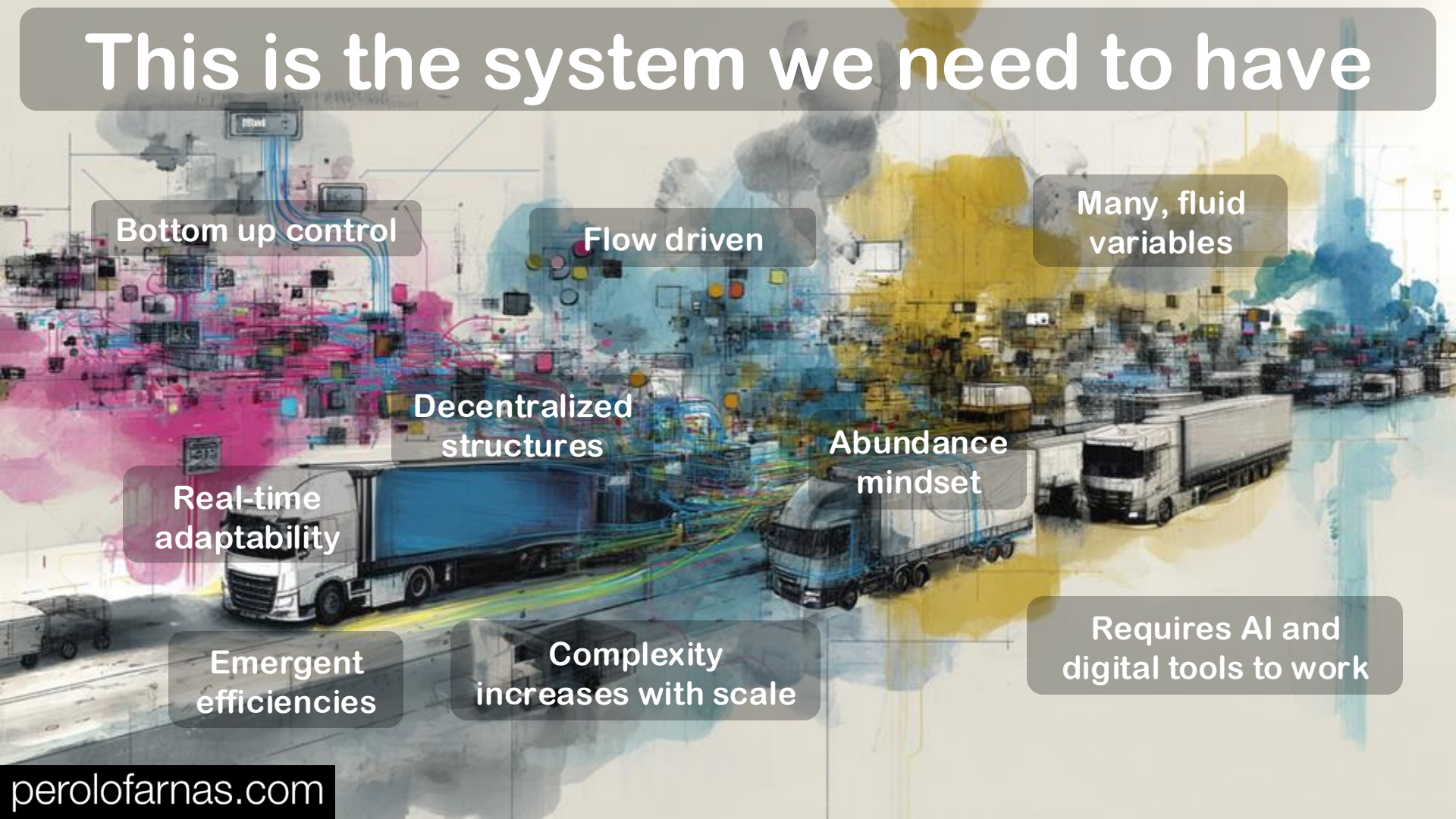
This is the system we have



This is the system we need to have




What we have
What we need/get
Top down control
Bottom up control
Consolidation driven design
Flow driven design
Centralized structures
Decentralized structures
Designed operations
Real-time adaptability
Rely on economies of scale
Rely on emergent efficiencies
Ruled by a scarcity mindset
Ruled by an abundance mindset
Few, well defined variables
Many, fluid variables
Low complexity when scaling
Complexity increases with scale
It can operate with 20th century tools
It requires AI and digital tools to work
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What we have
What we need/get
Physical First
Digital First
Top down control
Bottom up control
Consolidation driven design
Flow driven design
Centralized structures
Decentralized structures
Designed operations
Real-time adaptability
Rely on economies of scale
Rely on emergent efficiencies
Ruled by a scarcity mindset
Ruled by an abundance mindset
Few, well defined variables
Many, fluid variables
Low complexity when scaling
Complexity increases with scale
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The old system
Slow
Big
Simple structure
Static
If you try to make this system complex, you will fail
The new system
Fast
Smaller parts
Complex structure
Dynamic
This system is built from small-scale parts that work
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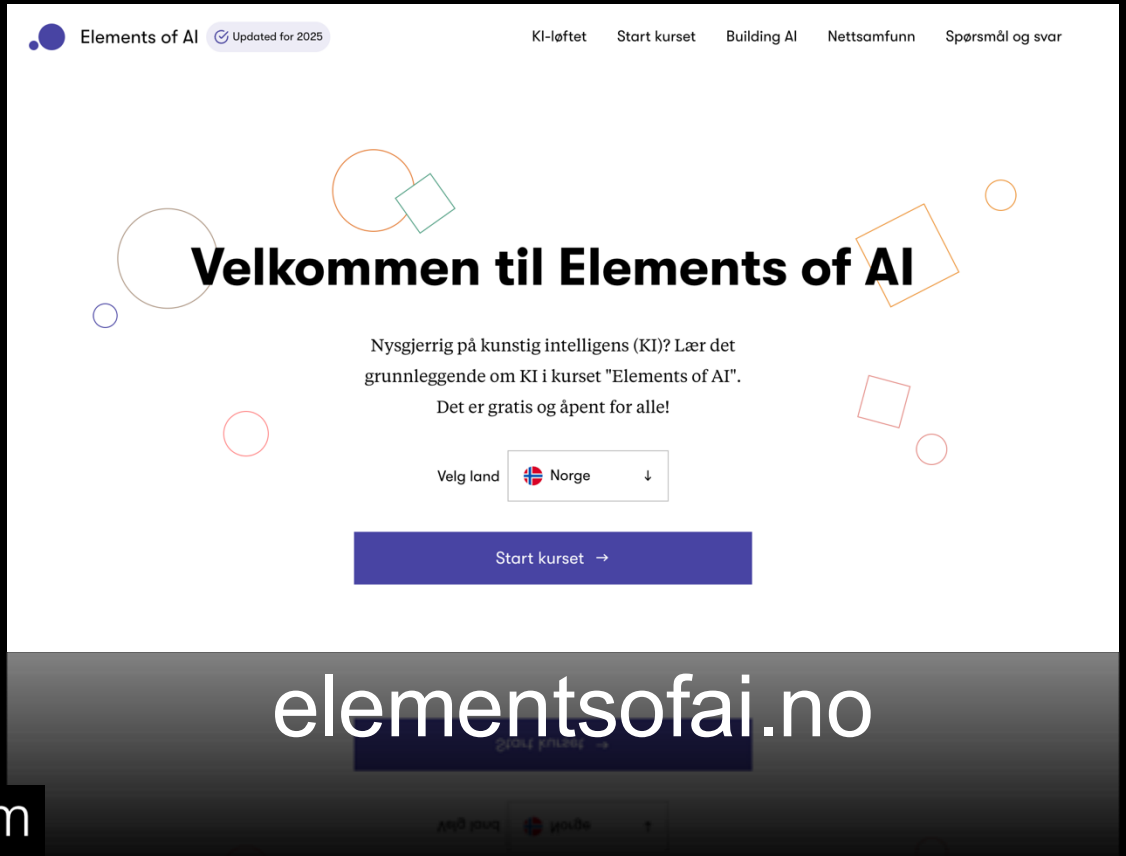
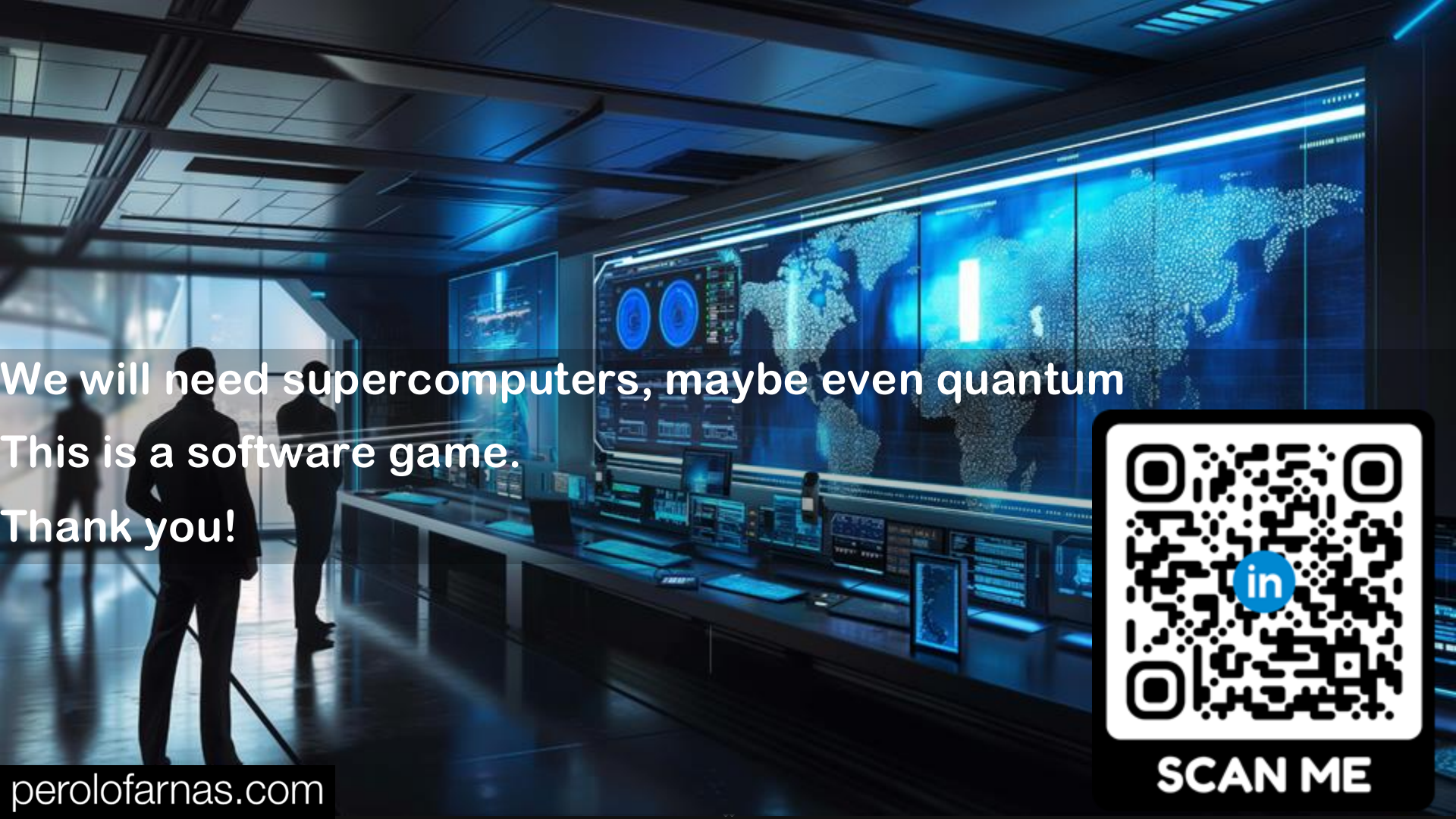
Unknown unknowns
Known unknowns

Elements of AI



elementsofai.no

But really, the best teacher is probably AI itself


We will need supercomputers, maybe even quantum
This is a software game.
Thank you!
SCAN ME
perolofarnas.com