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What is meant by the "digital transformation of industry"?

Laurent Zibell, Policy Adviser

Project "Social consequences of the digital transformation in companies: Giving industrial trade unions the tools to act"

Regional workshop in Bucharest

04 December 2019

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Reference documents of iAllE on the digitalisation of industry

- Policy brief "Open standards for digital integration of manufacturing" (2014)
- Policy brief "Digital platforms" (2014)
- Position Paper DE EN FR + Policy brief "Digitalisation of industry" (2015)
- Project + report "Anticipation of change in European ICT sector" (2015 - 2016)
- Policy brief “Sharing the value added from industrial Big Data fairly” (2017)
- Policy brief “Artificial Intelligence: Humans must stay in command” (2019)

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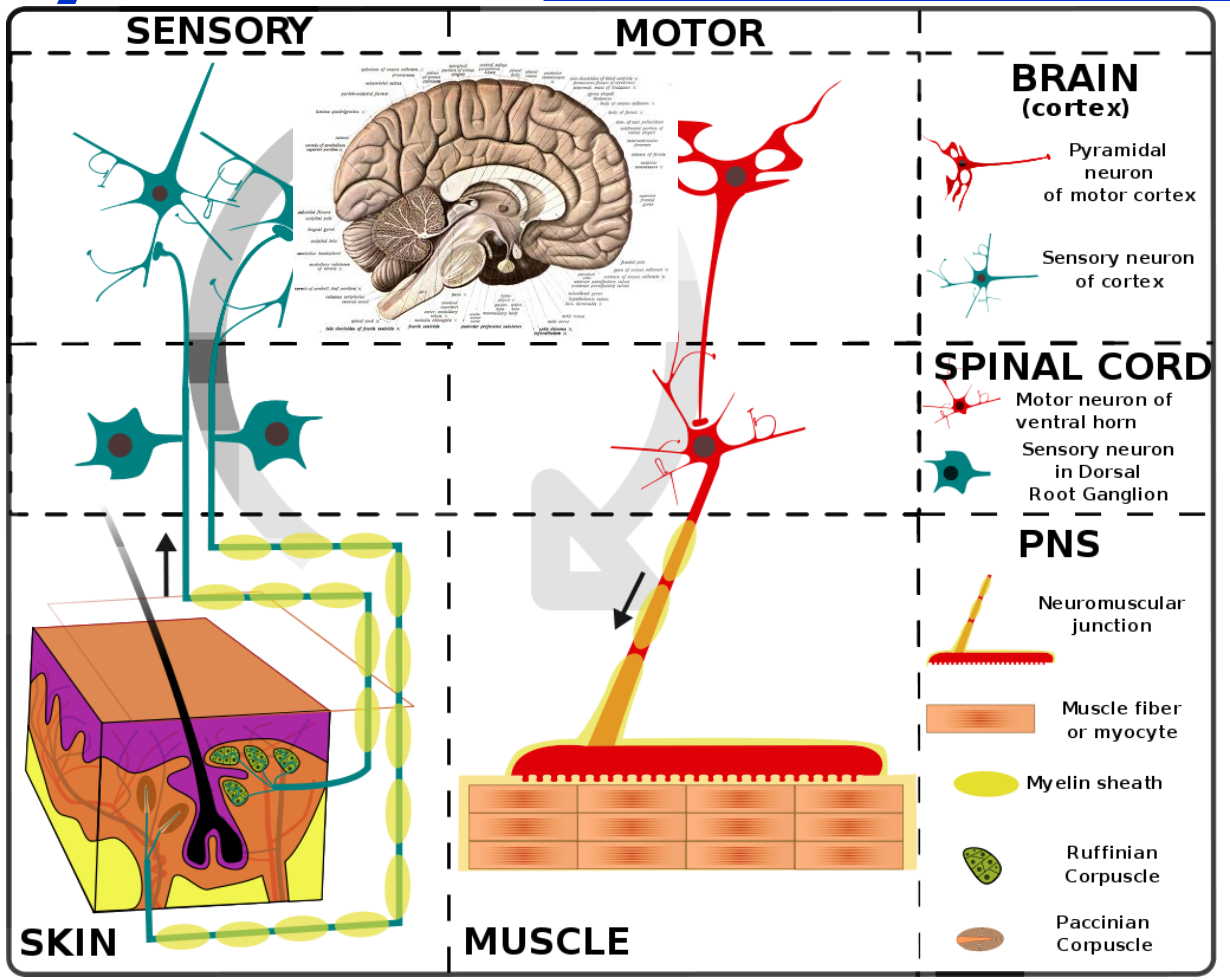
Digitalising industry = creating the nervous system of the whole company

High-Performance Computing (HPC),
Massive magnetic data storage

Mobile & fixed networks
RFID tags, Industrial Internet of Things (IoT)
Blockchain

Sensors



Cloud,
Machine Learning
Artificial Intelligence (AI)

Mobile & fixed networks

Connected machines & robots
3-D printers
Augmented-reality glasses

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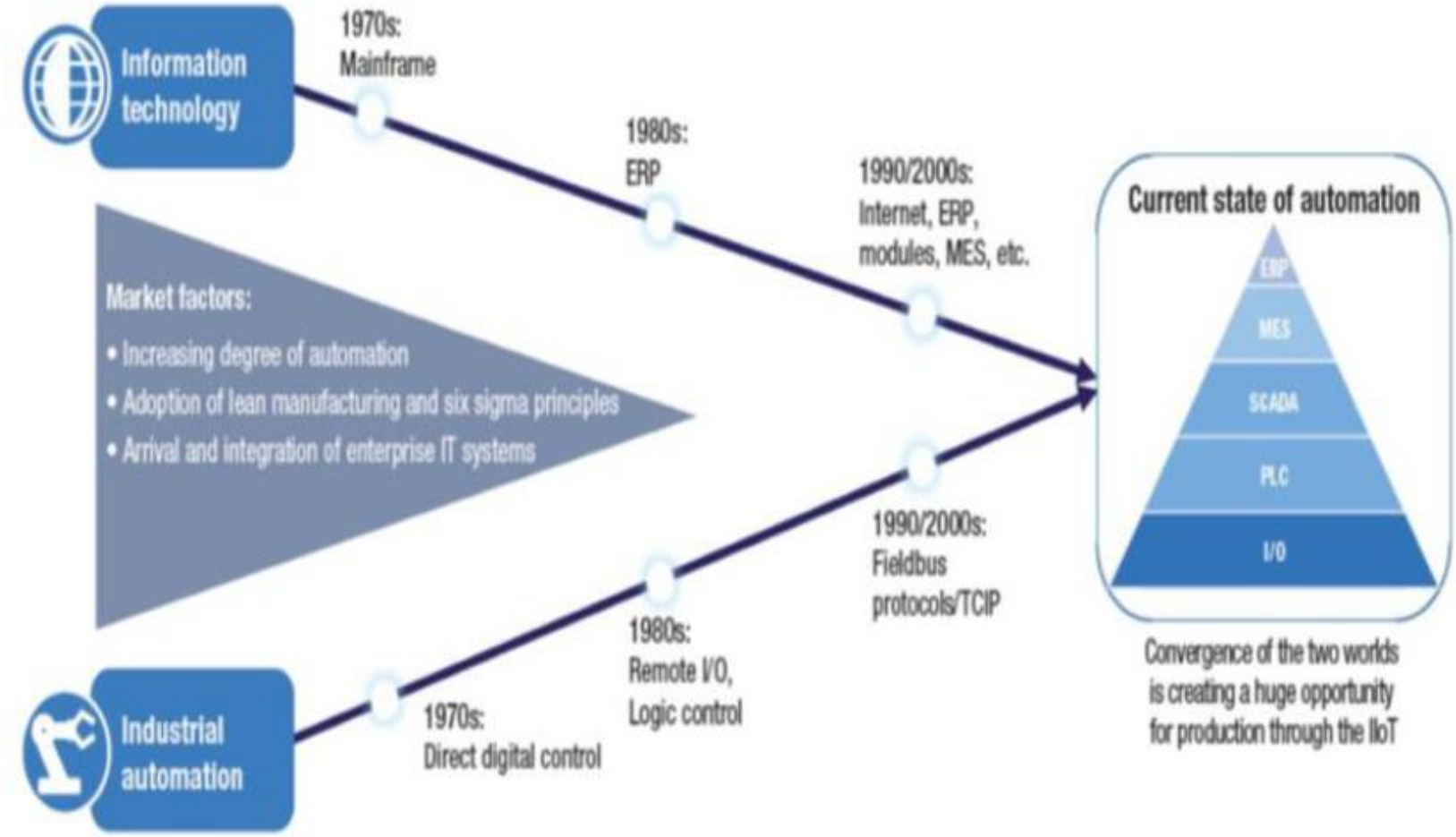
Alternative view: convergence of corporate IT and industrial automation



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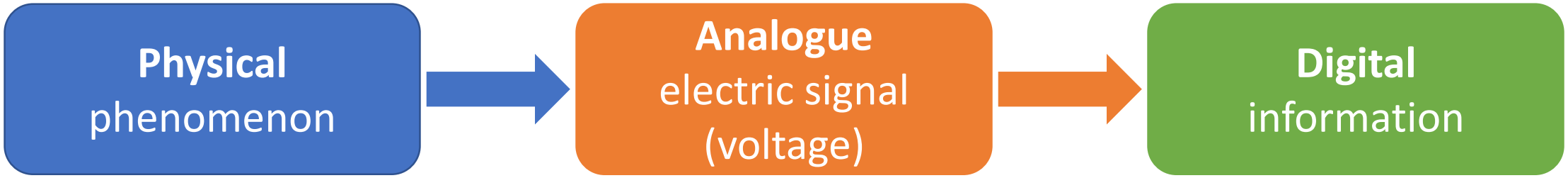
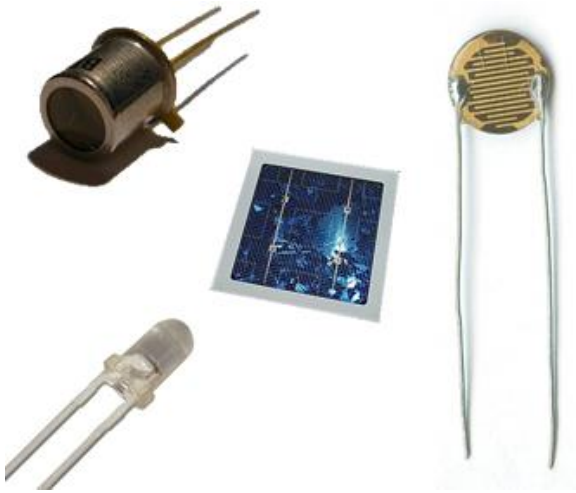
Sensors: transforming the physical world into digital signals



- **Fluids:** flow, temperature, pressure, humidity, viscosity, density
- **Position:** contact, distance, angle
- **Movement:** acceleration, vibration, shock, rotation, speed
- **Mechanics:** force, torque
- **Electromagnetics:** magnetic or electric field
- **Light:** wavelength, intensity
- **Image & sound:** fixed, video, audio
- **Radio-activity…**



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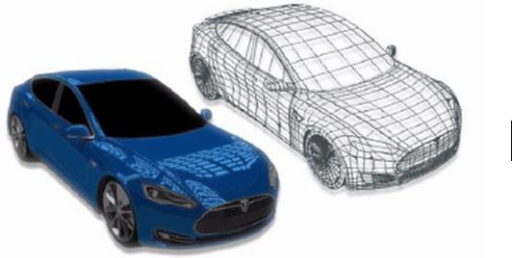
Industrial Internet of Things (IIoT): connecting every item

All components of a manufacturing factory **connected** to the **Internet**:

- All processing **machines**
- All **items** being manufactured (via RFID tag)

"**Digital twin**" of each element of hardware



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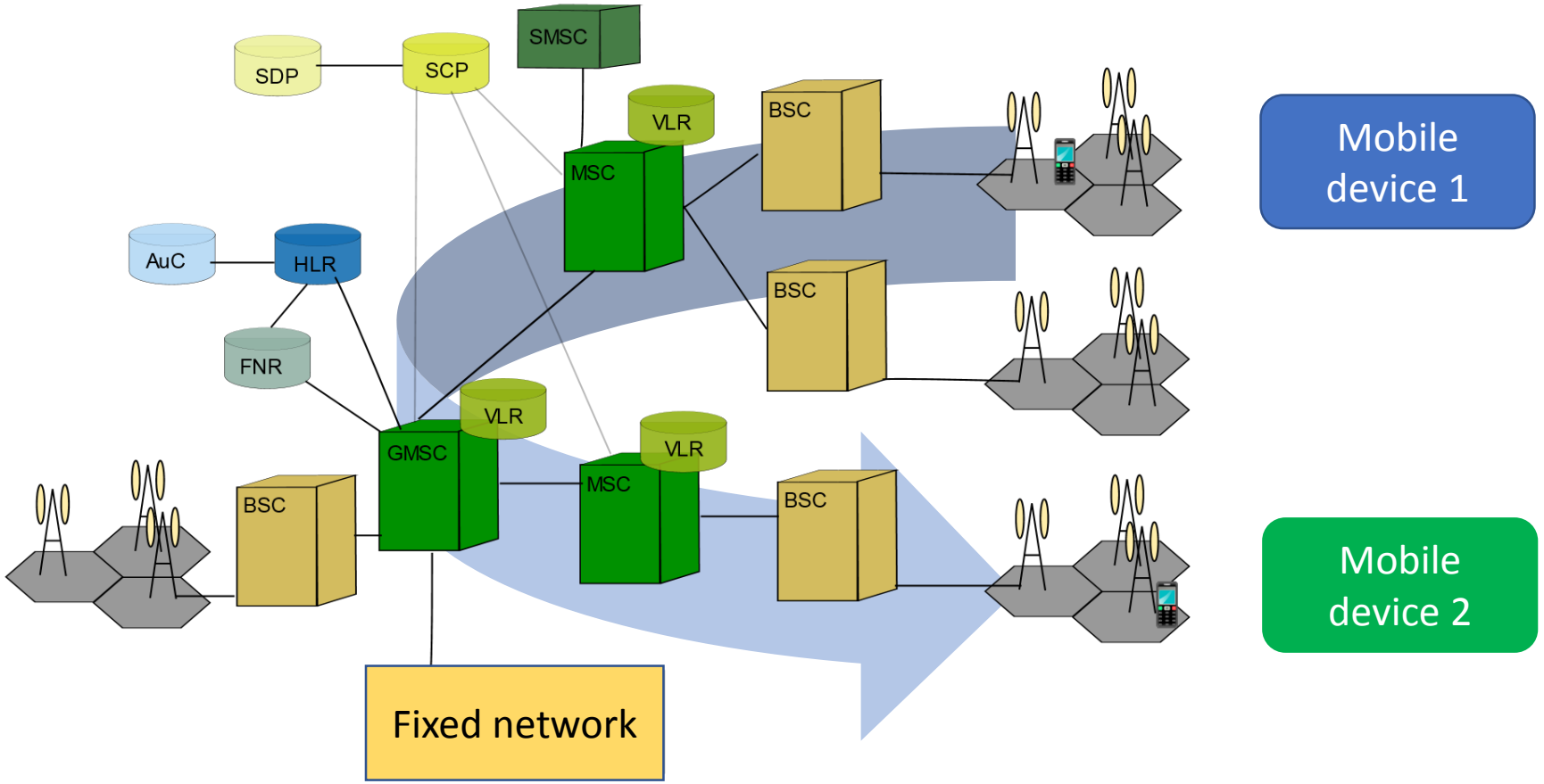
Mobile & fixed networks: transmitting data anywhere, anytime



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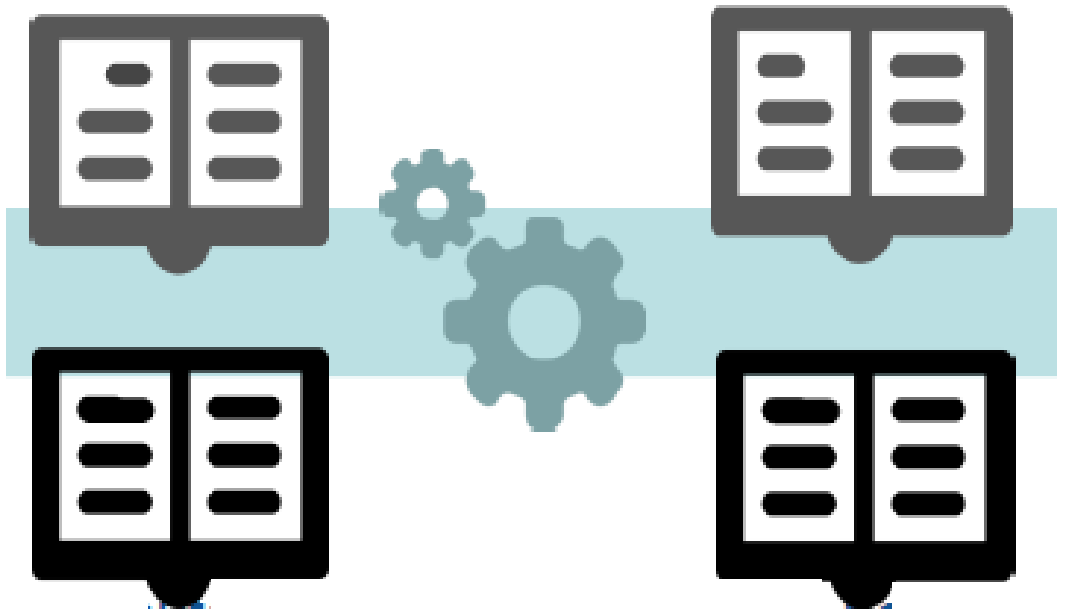
Distributed Ledger Technologies (Blockchain) keep an immutable record of transactions



- Each transaction is written in a distributed ledger, and **cannot be changed** once added
- **Track & trace** of operations in the supply chain: corporate accountability, Circular Economy

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Cloud computing provides processing power + storage on demand

User

High-speed Internet network

High-performance computing (HPC)

Massive data storage

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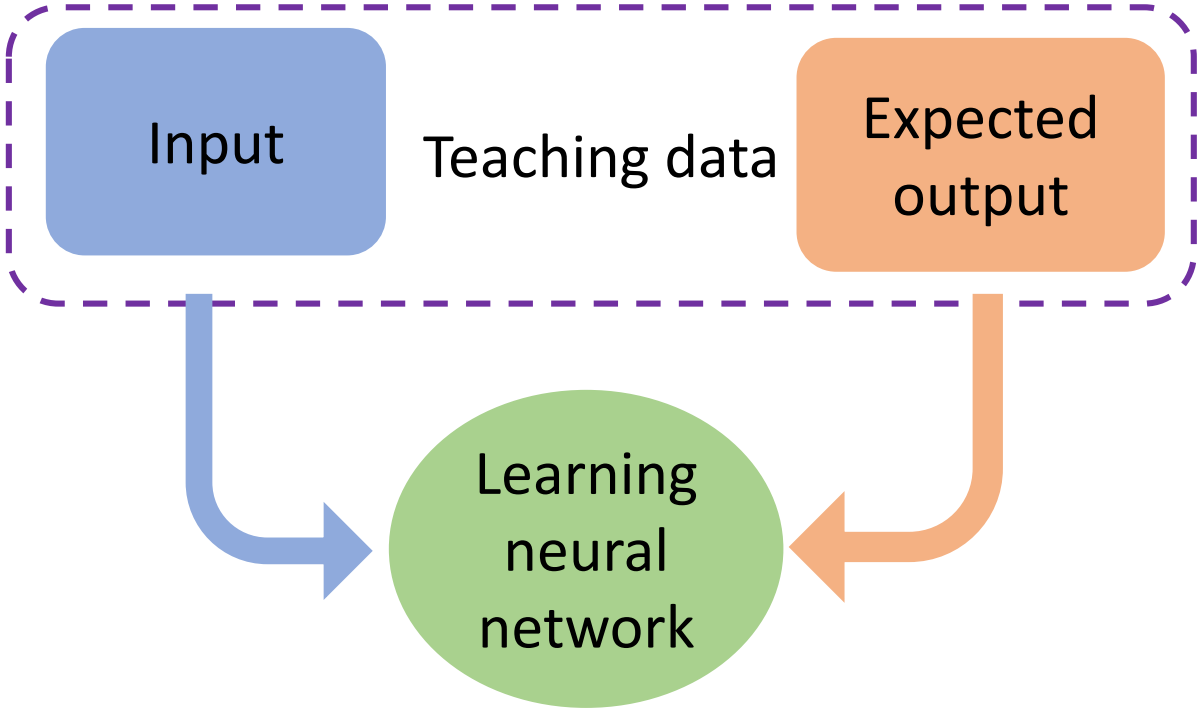
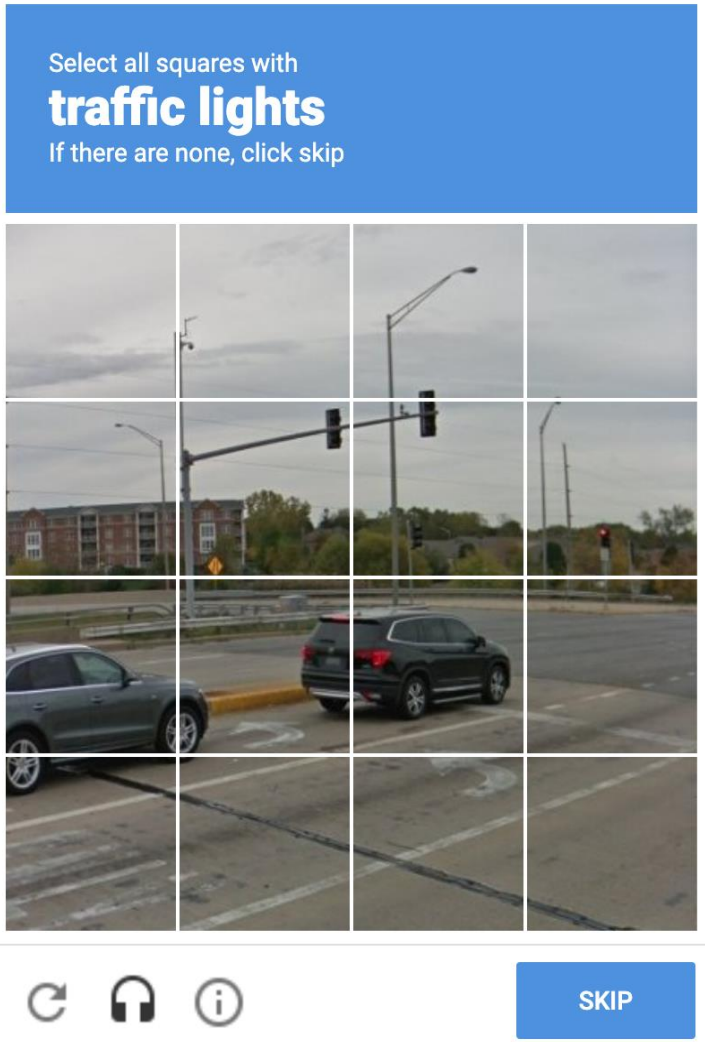
Machine Learning systems recognise patterns from sets of teaching data (1/2)





Ex: Internet users providing free teaching data to Google automated driving systems

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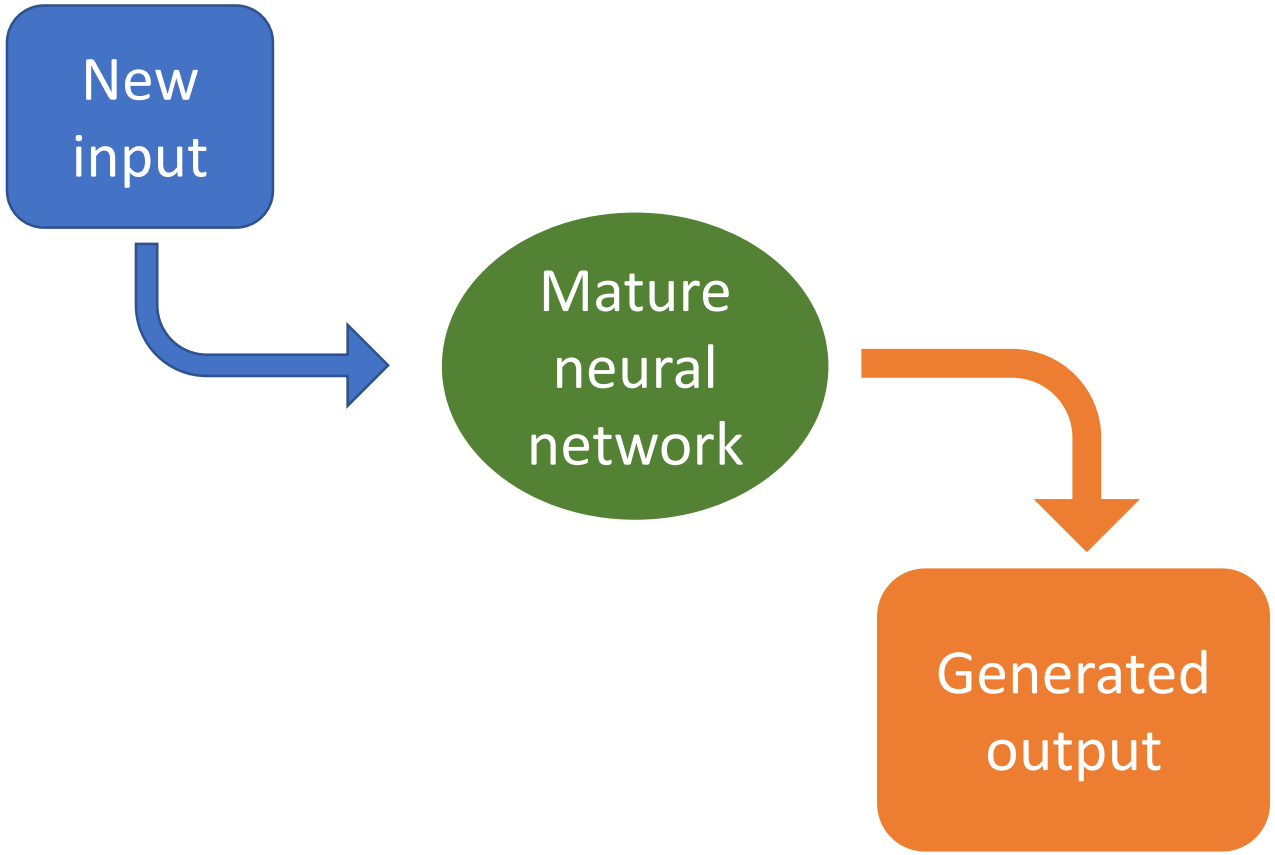
Machine Learning systems recognise patterns from sets of teaching data (2/2)



Applications:

- Classification
- Prediction (of failures, of human behaviour, of health condition)
- Industrial processes

Issues:

- No explanation given (no explainability)
- Requires huge amounts of data

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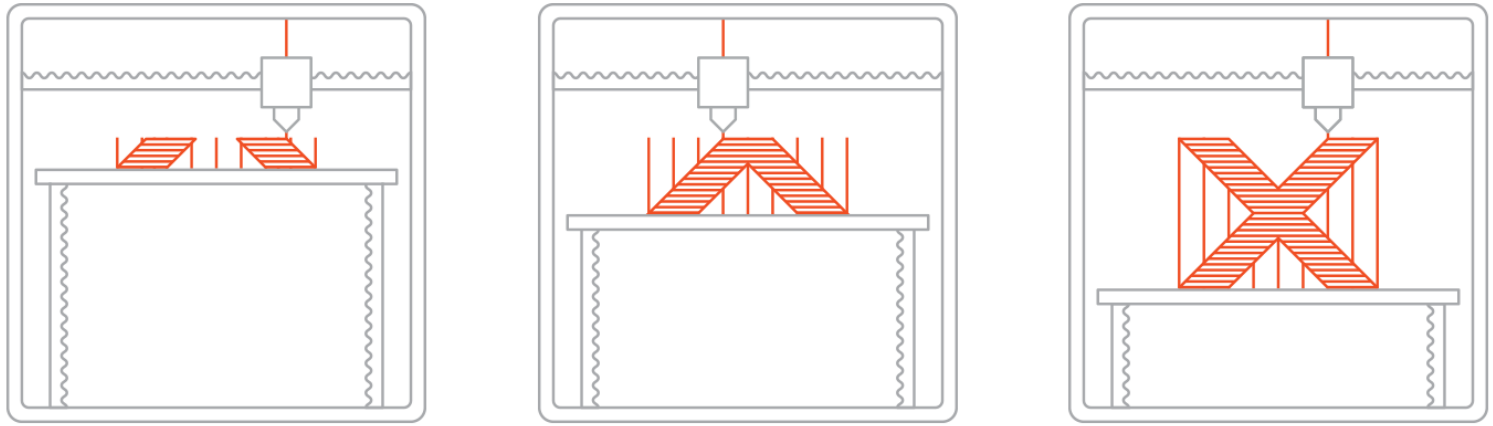
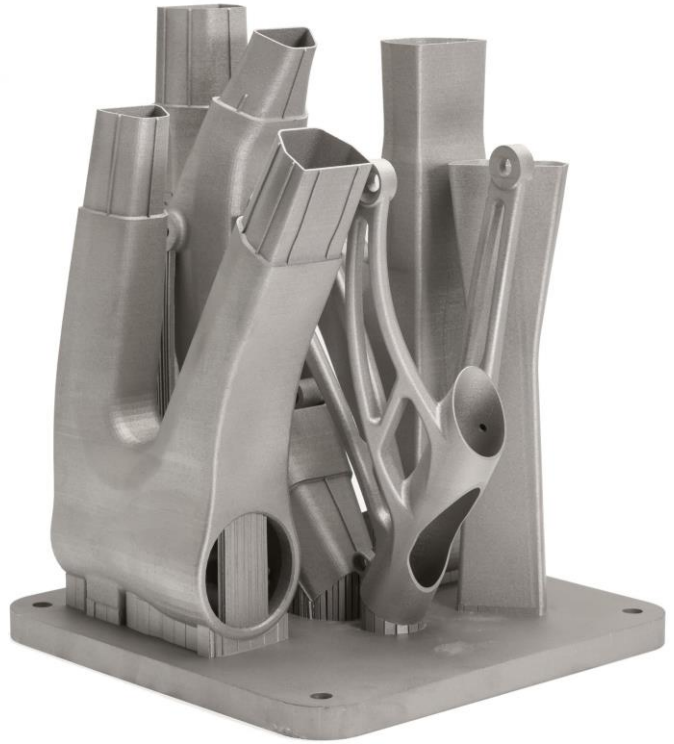
Additive manufacturing (3D printing) builds complex shapes in one operation





Adding layers of matter on top of one another

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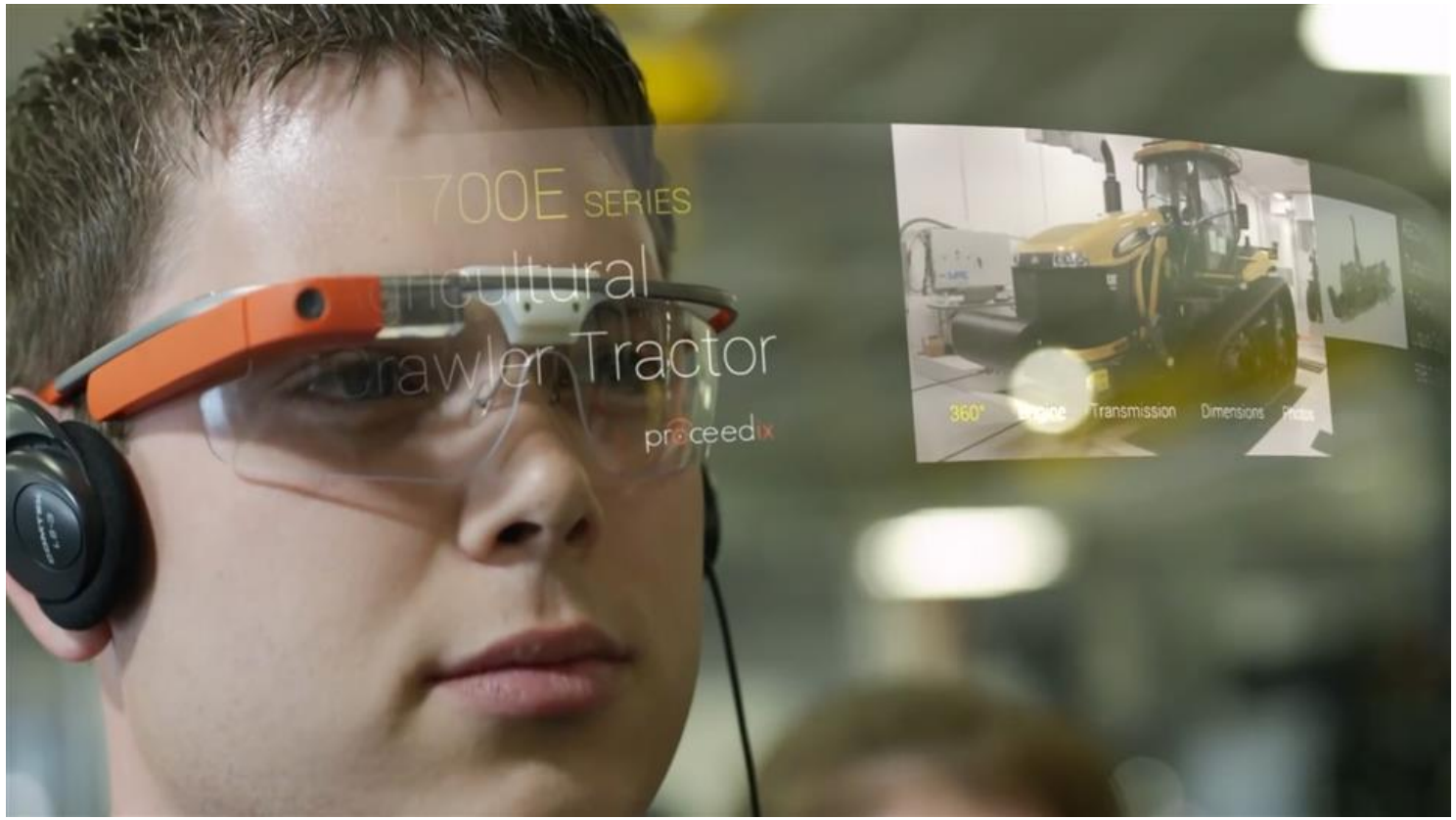
Augmented Reality brings information directly to the eye of the worker



No need to consult documents

No need for accommodating sight

Risk of human worker being remotely piloted

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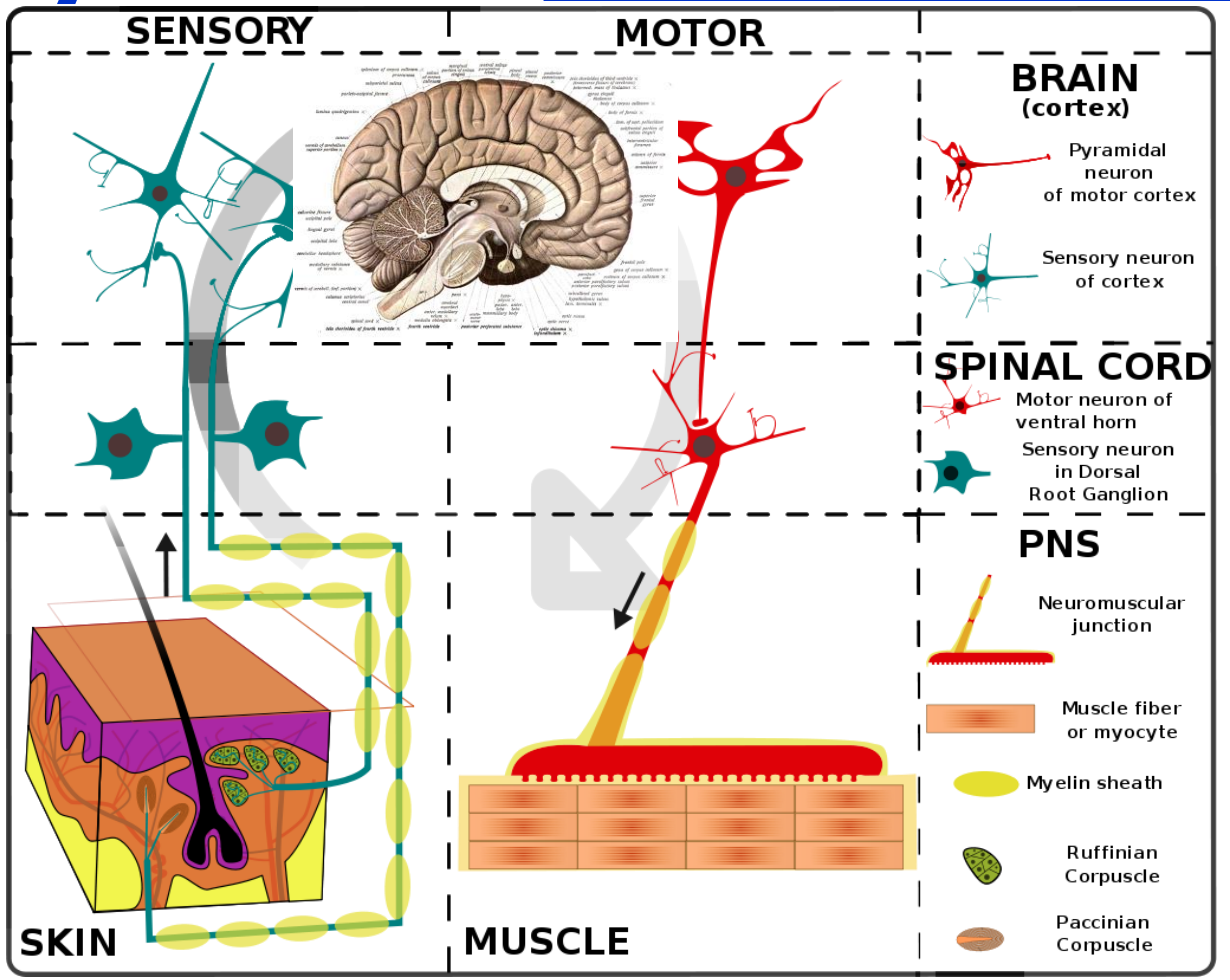

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Consequence: massive improvement in efficiency – for those who can pay

Comprehensive digitalisation of the **whole firm**: full **systemic** benefits

Massive improvement in **operational performance**, in all sectors. Best-in-class examples:

- **machine availability**: +90% (Bosch Automotive, Wuxi, China)
- **reliability**: -50% breakdowns (Bayer Pharmaceuticals, Garbagnate, Italy)
- **product quality**: -80% reject rate (Tata Steel, IJmuiden, the Netherlands)
- **delivery time**: -60% (Phoenix Contacts – automation equipment, Blomberg, Germany)
- **customer satisfaction**: -57% customer complaints (Danfoss – valves + air conditioning equipment, Tianjin, China)
- **labour productivity**: +38% for operators, +41% for engineering (Sandvik Coromant, Gimo, Sweden)

Requirements:

- full **knowledge** of process (what to measure, how to interpret)
- Massive **investment**

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Massive inequalities between firms

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Thank you!

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