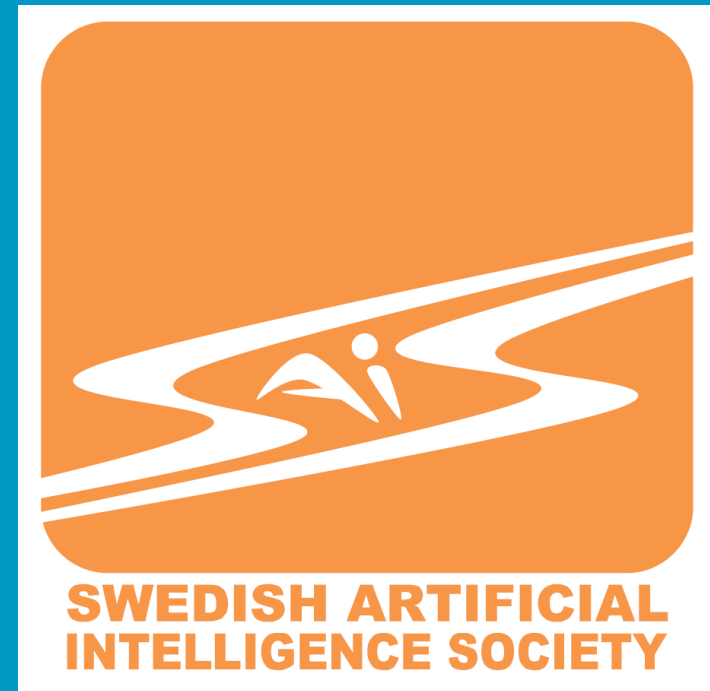
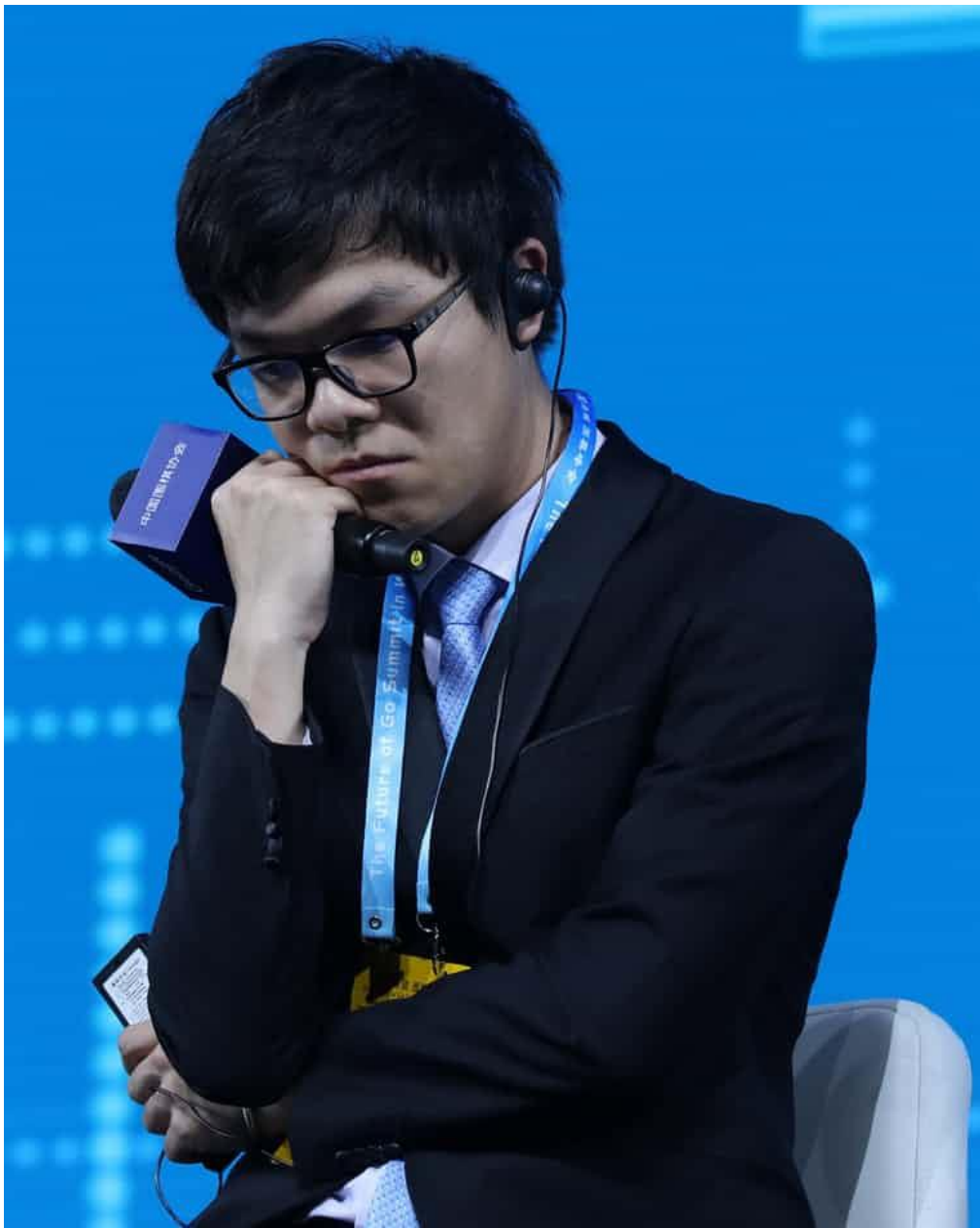


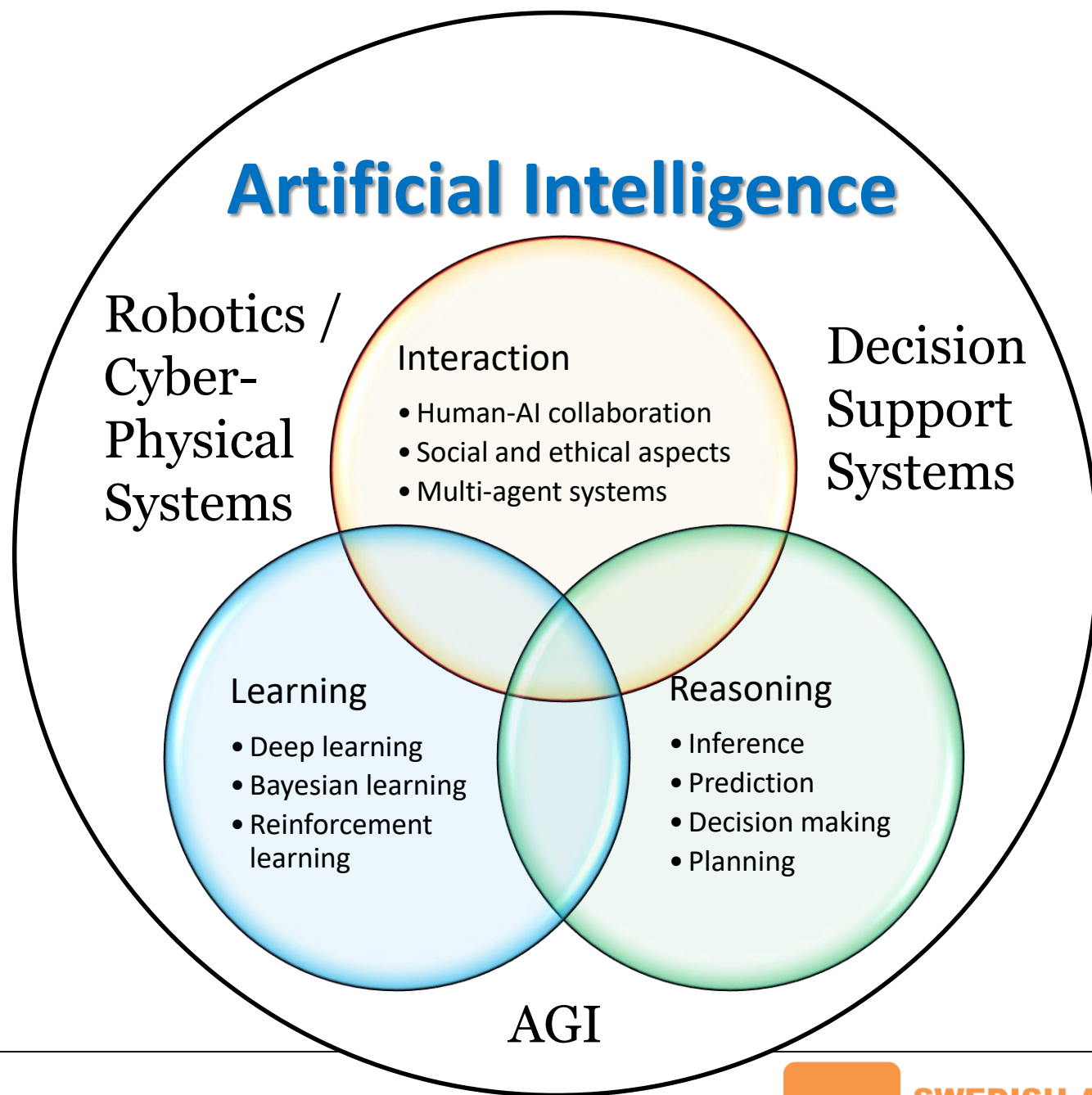
# Artificiell Intelligens

Fredrik Heintz, Institutionen för Datavetenskap  
Linköpings universitet  
fredrik.heintz@liu.se  
@FredrikHeintz





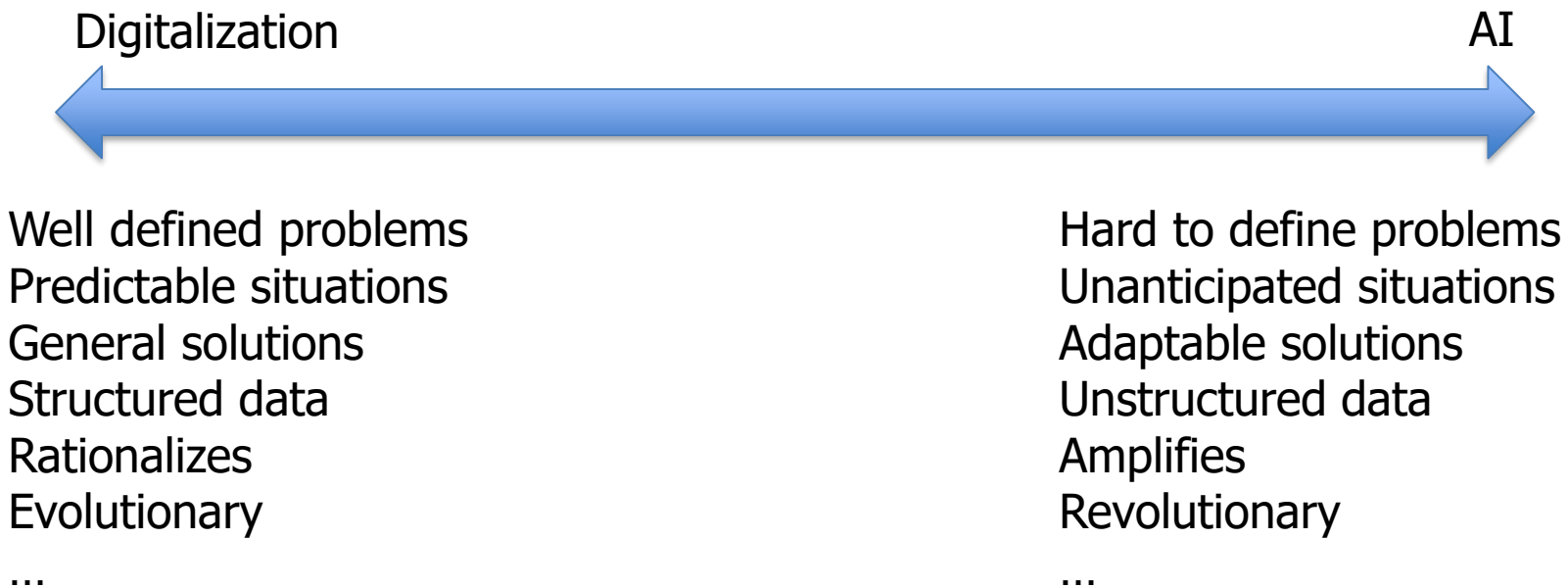
“Artificial Intelligence is the science and engineering of making intelligent machines, especially intelligent computer programs.” John McCarthy, Stanford



# AI and Digitalization

"AI refers to systems that show intelligent behaviour: by analysing their environment they can perform various tasks with some degree of autonomy to achieve specific goals."

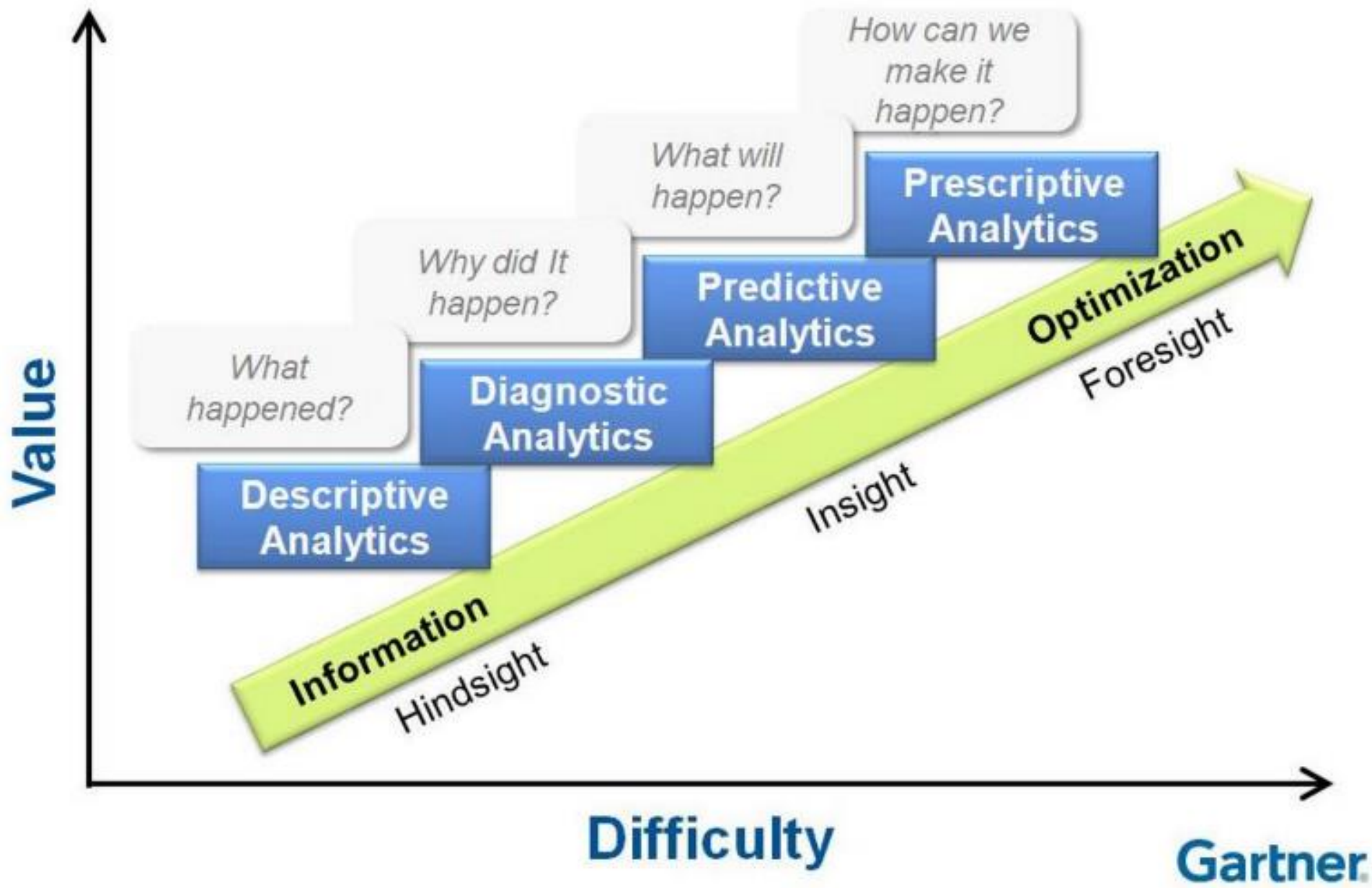
EU Factsheet: AI for Europe, 2018



# Supervised learning

T. Mitchell, M. Jordan:  
“Most of the recent progress in machine learning involves mapping from a set of inputs to a set of outputs.”

| INPUT X                   | OUTPUT Y                       | APPLICATION          |
|---------------------------|--------------------------------|----------------------|
| Voice recording           | Transcript                     | Speech recognition   |
| Historical market data    | Future market data             | Trading bots         |
| Photograph                | Caption                        | Image tagging        |
| Drug chemical properties  | Treatment efficacy             | Pharma R&D           |
| Store transaction details | Is the transaction fraudulent? | Fraud detection      |
| Recipe ingredients        | Customer reviews               | Food recommendations |
| Purchase histories        | Future purchase behavior       | Customer retention   |
| Car locations and speed   | Traffic flow                   | Traffic lights       |
| Faces                     | Names                          | Face recognition     |





# Machine learning is still brittle...



$x$

“panda”

57.7% confidence

+ .007 ×



$\text{sign}(\nabla_x J(\theta, x, y))$

“nematode”

8.2% confidence

=



$x +$

$\epsilon \text{sign}(\nabla_x J(\theta, x, y))$

“gibbon”

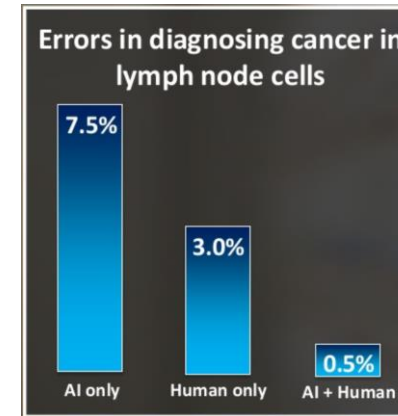
99.3 % confidence

# Why Important?

- Machine learning allows complex patterns to be extracted
- Machine learning also allows adaptation
- Data-driven decision making and optimization cutting across the organization
- Natural language processing allows language-based interaction
- Move decisions from design-time to run-time
- Robots allows physical presence anywhere
- Knowledge work is ripe for automation





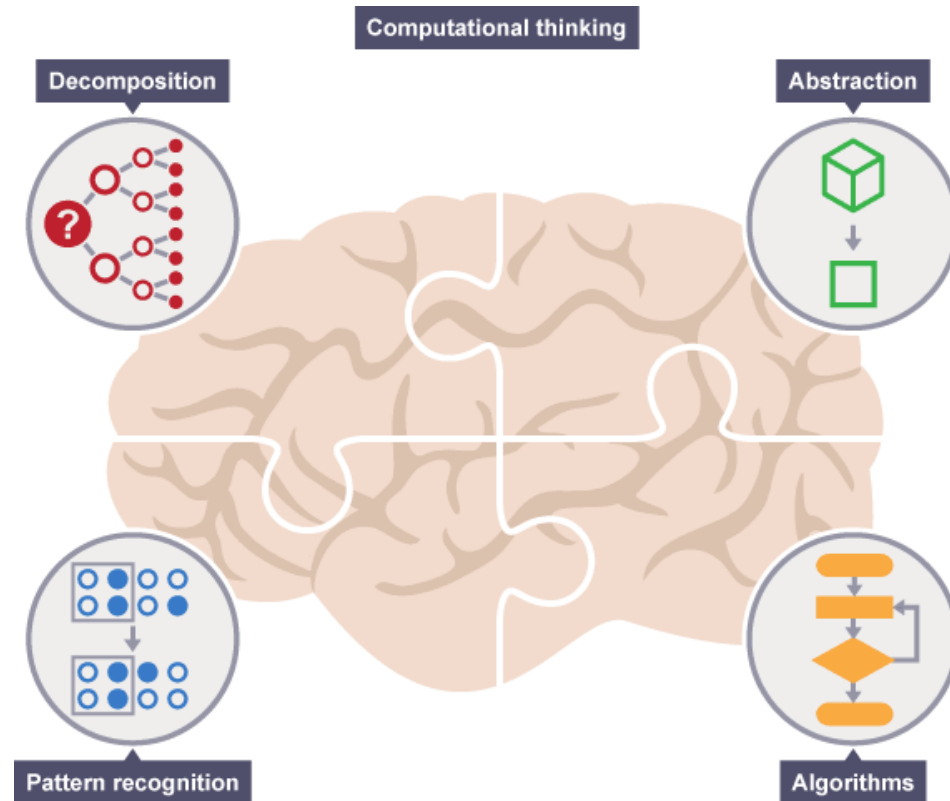


“Weak human + machine + superior process was greater than a strong computer and, remarkably, greater than a strong human + machine with inferior process.”

Garry Kasparov



**Digital Competence**

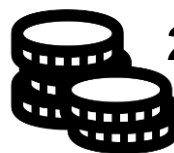


**Computational Thinking**

# AI Sverige – Regeringens AI-kompetenssatsning



Regeringen



20 mnkr 2018 (motsv beräknat 2019)

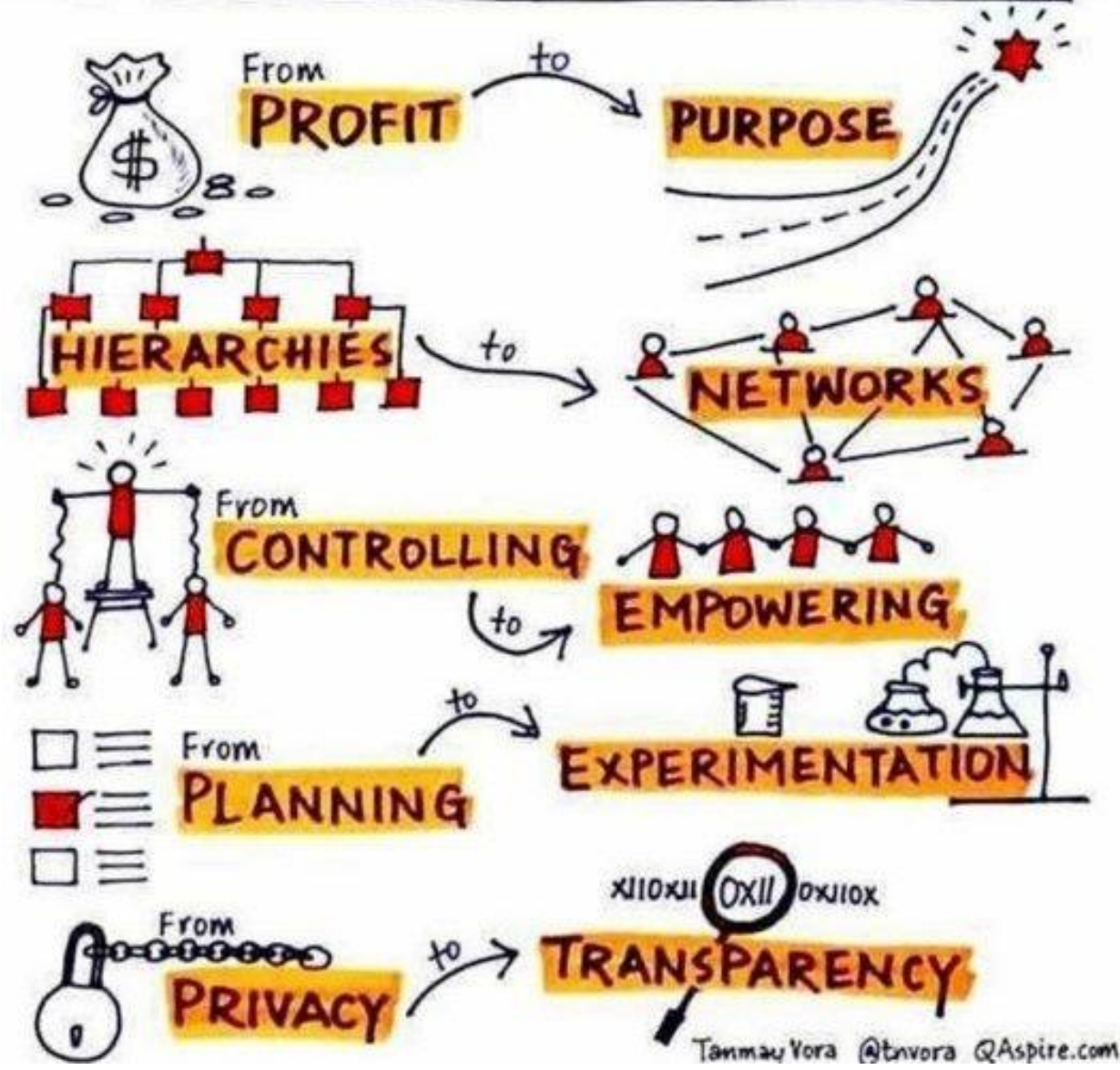
**CTH, LU, GU, LiU, OrU, KTH, UmU**

**Syfte** främja fördjupad kunskap om artificiell intelligens inom både näringsliv och offentlig sektor för stärkt konkurrenskraft och utvecklad välfärd.

Kunskapsplattform  
(5 mnkr)

Kompetensutvecklingsinsats  
(15 mnkr)

# MINDSET SHIFTS FOR Organization Transformation

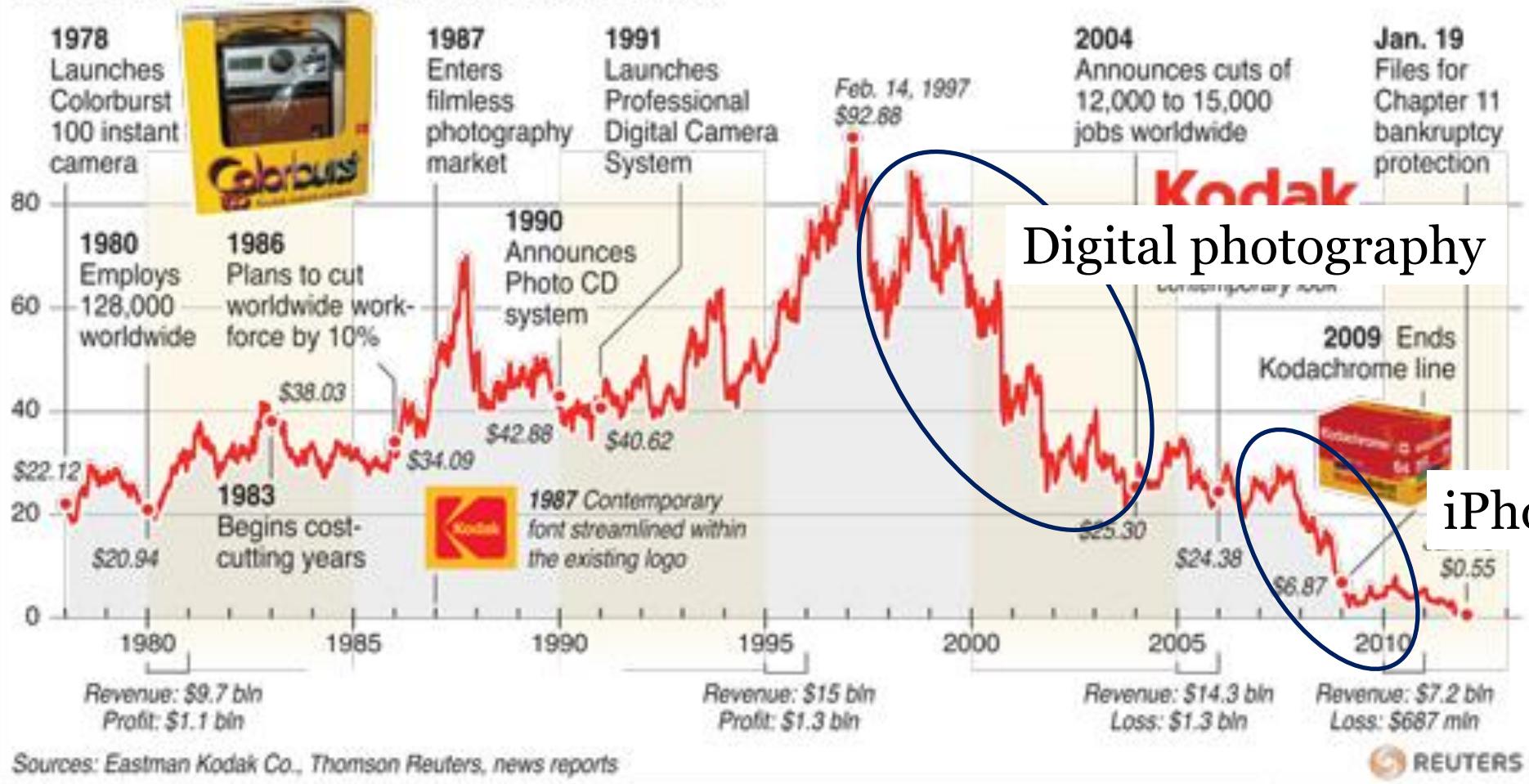




# KODAK FILES FOR BANKRUPTCY

Eastman Kodak Co, a 130-year-old photographic film pioneer, has filed for bankruptcy protection. It said it had also obtained a \$950 million, 18-month credit facility from Citigroup to keep it going

## SHARE PRICE HISTORY — WEEKLY CLOSE IN US\$



Digital photography

iPhone era

# Recommendations

- Learn
  - Competence development is essential, consultants can help but are temporary
- Do
  - Find a real business problem that require prediction or classification and solve it
  - Use off-the-shelf-tools
  - Industrial PhD students / postdocs
- Scale up
  - Business development at least as important as technology development



# Artificiell Intelligens

Fredrik Heintz, Institutionen för Datavetenskap  
Linköpings universitet  
fredrik.heintz@liu.se  
@FredrikHeintz

