Infiniot

Rich Data Analytics

and computers learn with Artificial Intelligence, Machine & Deep Learning

GSNM 2018

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Thanks for examples: Peter van Bokhoven (AI expert Infiniot)

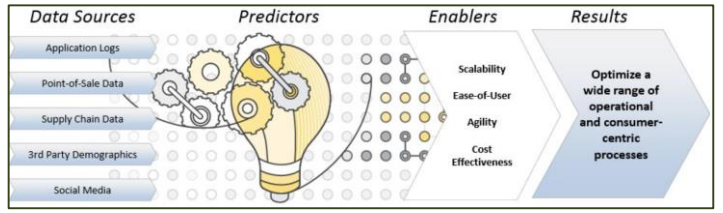
Firms that value from Digitalization & AI

Netflix

Google

Facebook

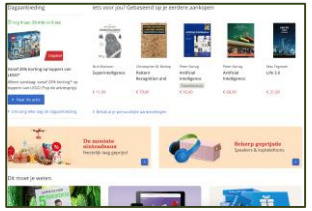
Amazon



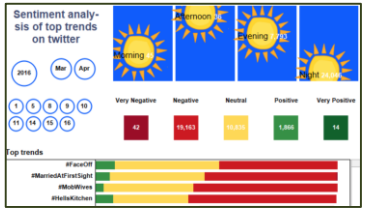
Apple

IBM Watson

Bol.com



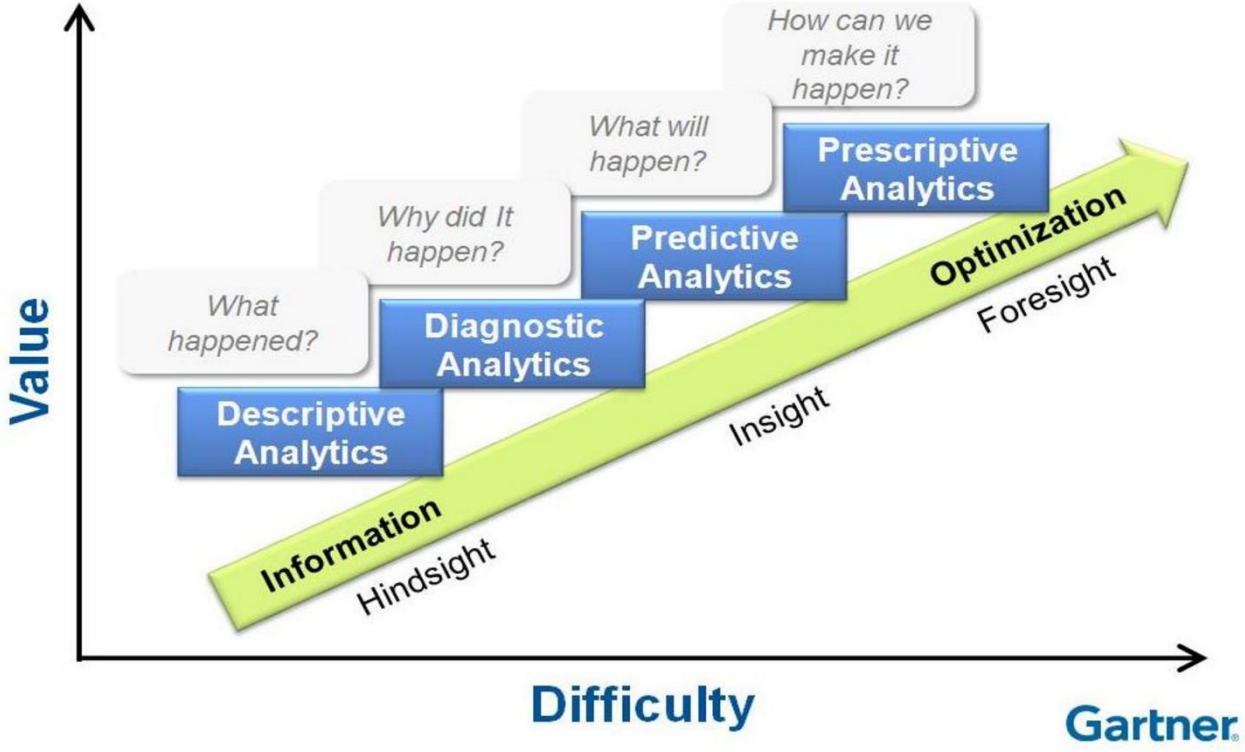
Sentiment



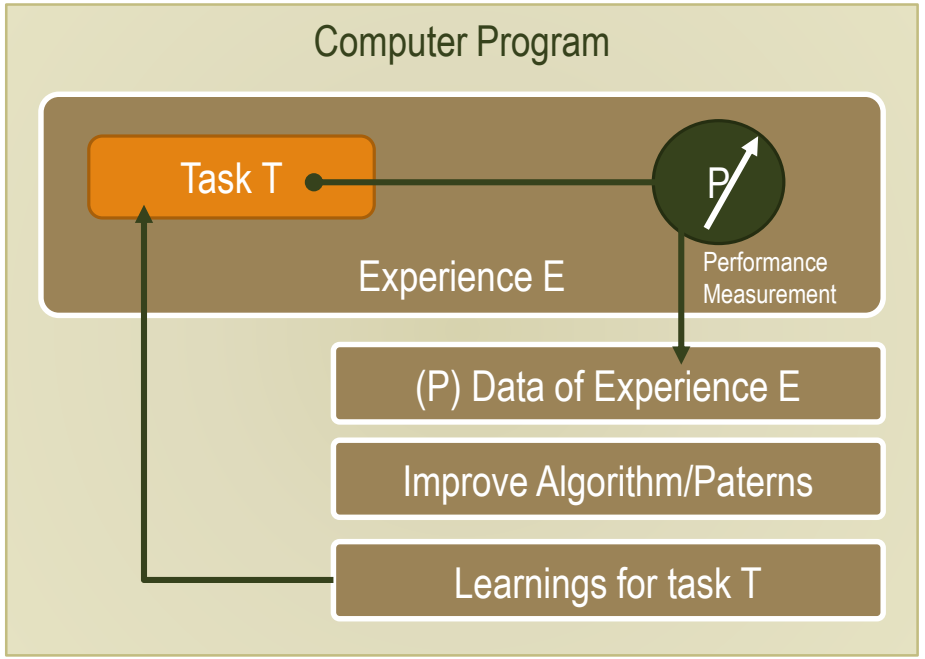
Nest

The Ability to Learn from Data

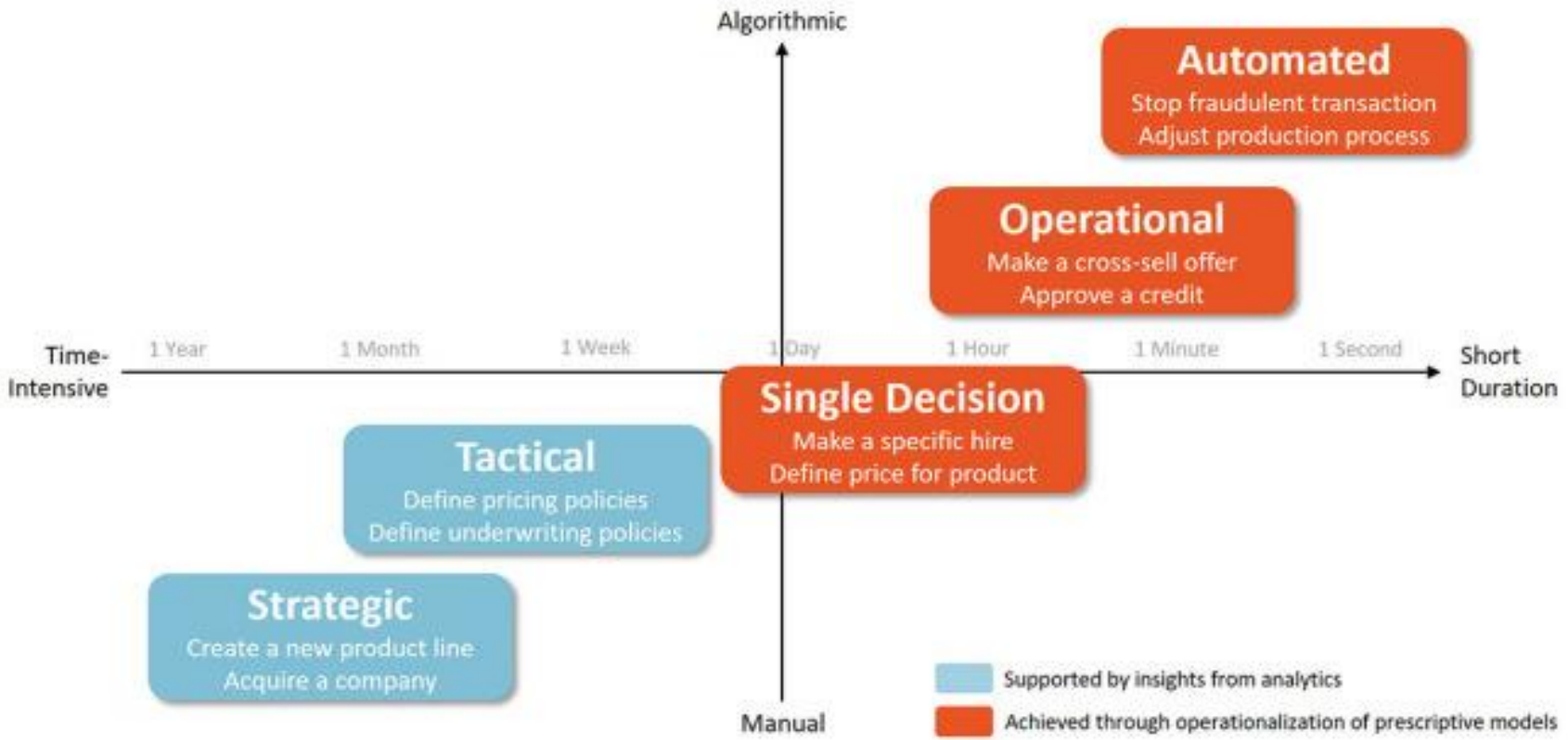
Types of insight



A typical learning cycle

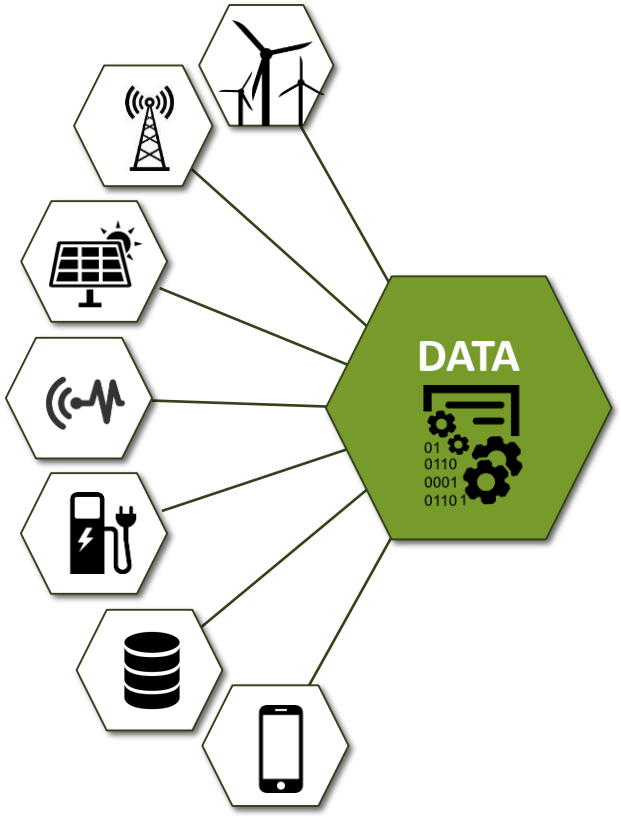


Making faster and more complex Decisions

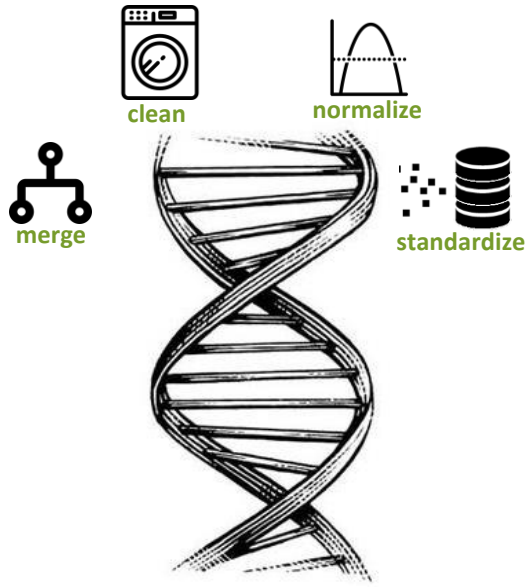


AI in Energy – The Playingfield of Infiniot

- Wind
- Electricity
- Sun
- Sensors
- Machines
- Databases
- Mobile



PREPARATION

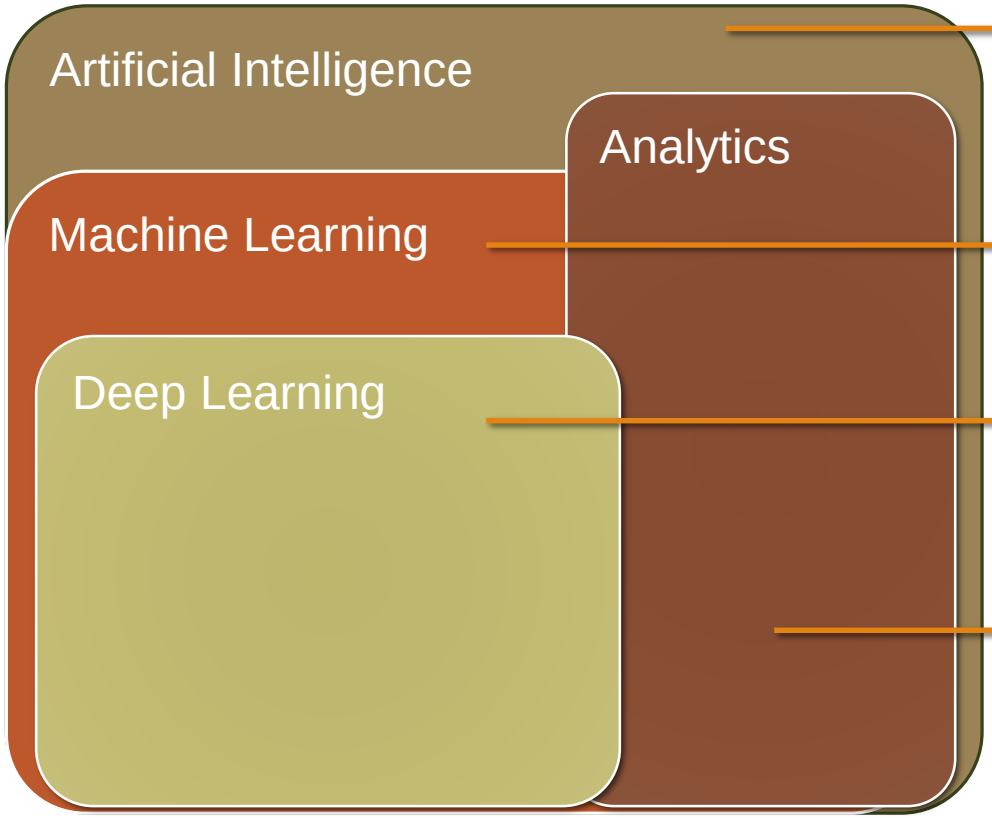


MACHINE LEARNING

- Visualize
- Share
- Analyze
- Automate

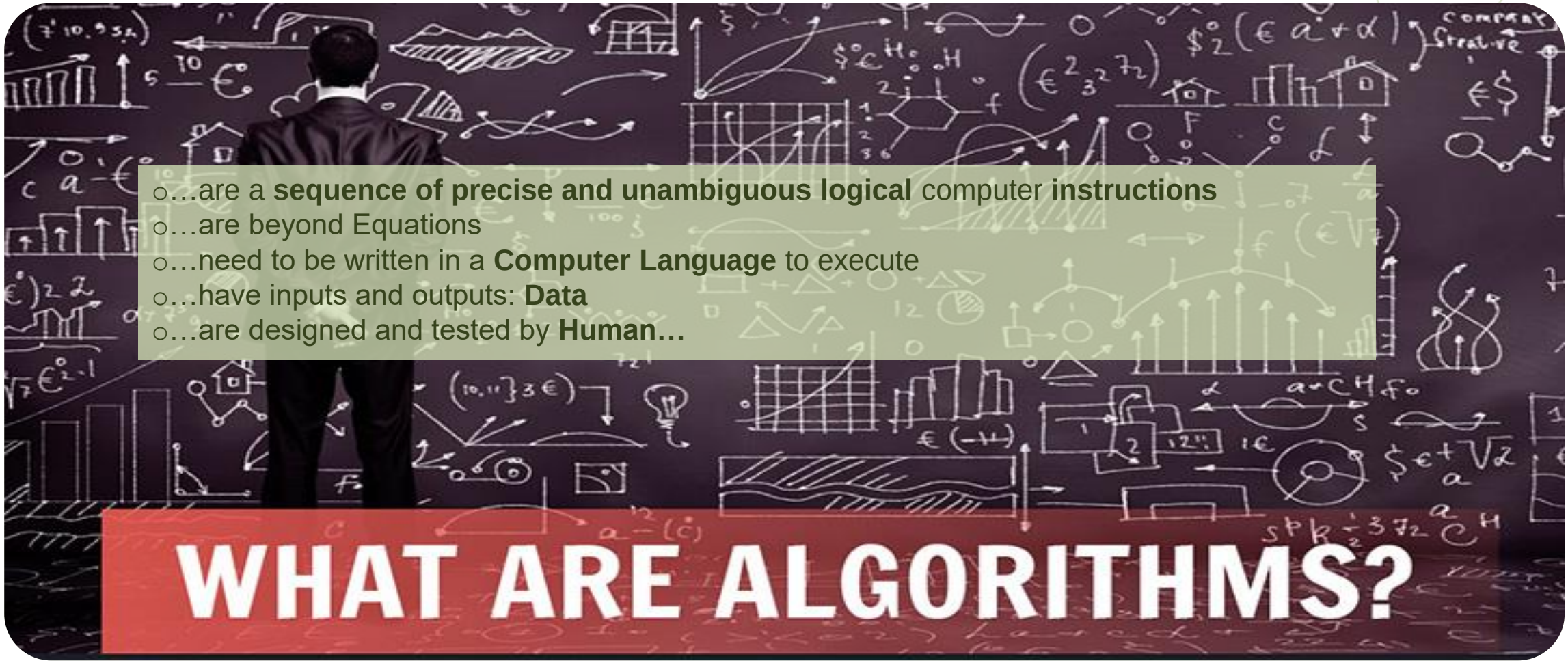
Artificial Intelligence on the map

POSITIONING



- A program that can Sense, Reason, Act & Adapt
- Algorithms whose performance improve as they are exposed to more Data over time
- Subset of machine learning on which multilayered neural networks learn from vast amounts of data
- The activities that are input for human or automatic desicions based on extensive use of data, statistical an quantitative analyses, explanatory and predictive models and fact based insights, including the applications that interface with that

Algorithms are the building block



- …are a **sequence of precise and unambiguous logical** computer **instructions**
- …are beyond Equations
- …need to be written in a **Computer Language** to execute
- …have inputs and outputs: **Data**
- …are designed and tested by **Human…**

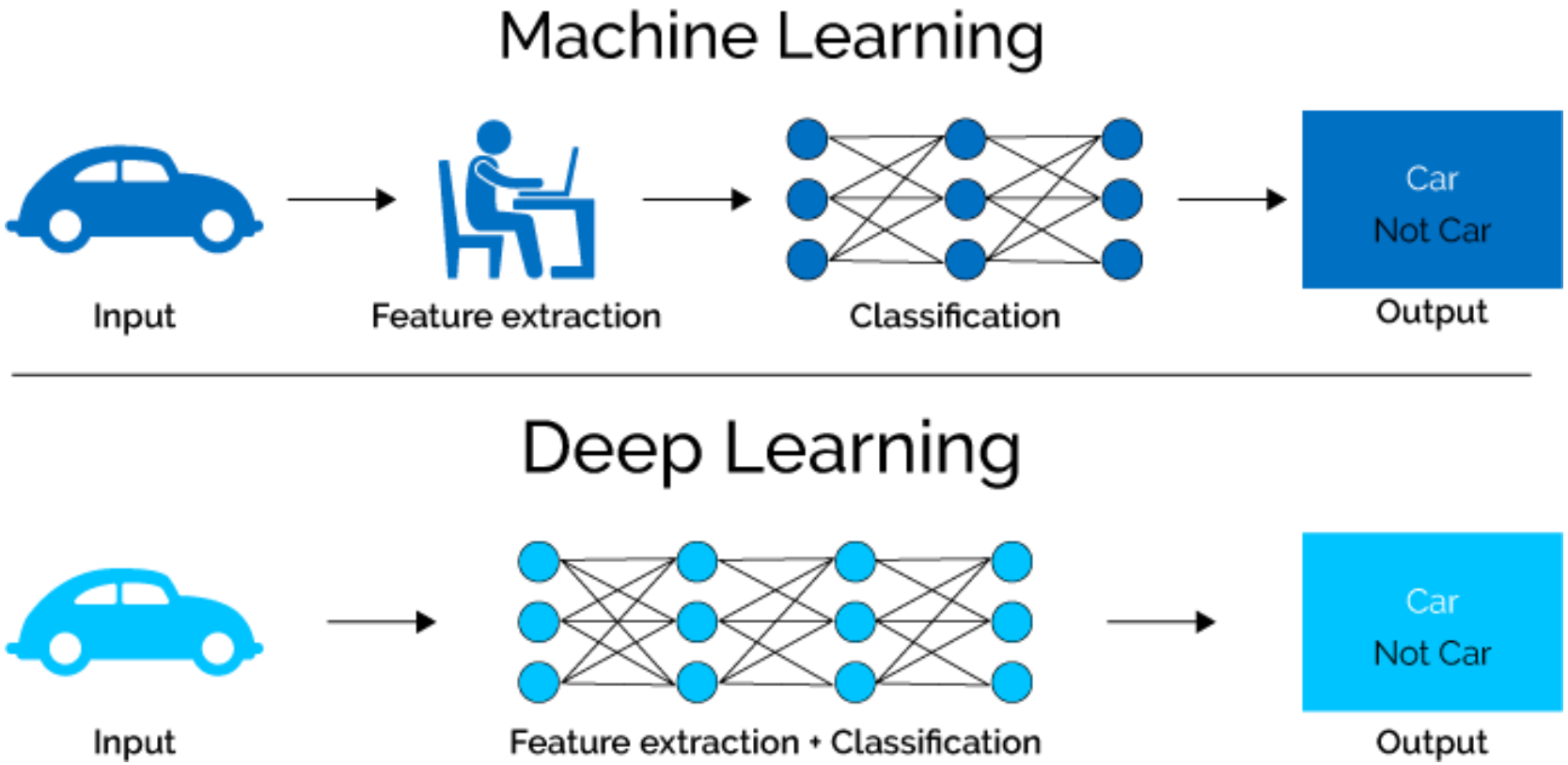
Machine Learning is the Accelerator

- …follows the same process as a Researcher: Generating, Testing, Discarding & Refining Hypotheses
- …can do it in a split second.
- …Automates and Accelarates the Discovery of Knowledge, if data available
- …with the growth of data creating devices and the internet the world is flooding with Big Data
- …machine Learning can turn this Big Data into knowlegde faster than other, traditional approaches
- …learns about what is already, but faster.

It can predict future behaviour of you or a system based on past behaviour

Can we teach Machines?

Deep Learning as a route to AI



Inspirational Schools for AI learning

POSITIONING

- Symbolist: ‘Learning starts with initial knowledge and new knowledge is a new combination of early excisting knowledge’
- Connectionist ‘Feedbackloops between desired output, input and adjusting parameters in processes (or algorithms in between)’
- Evolutionaries ‘Natural Selection and the learning structure what we need to simulate’
- Baysians ‘Learning is a form of Probalistic Inference, Statistical hypotheses and uncertainty based, building in new evidence’
- Analogizers ‘Extrapolate similarity judgements and interfering other similarities’

All these approaches are relevant and applicable for development of AI

AI, should I Love or Hate it?

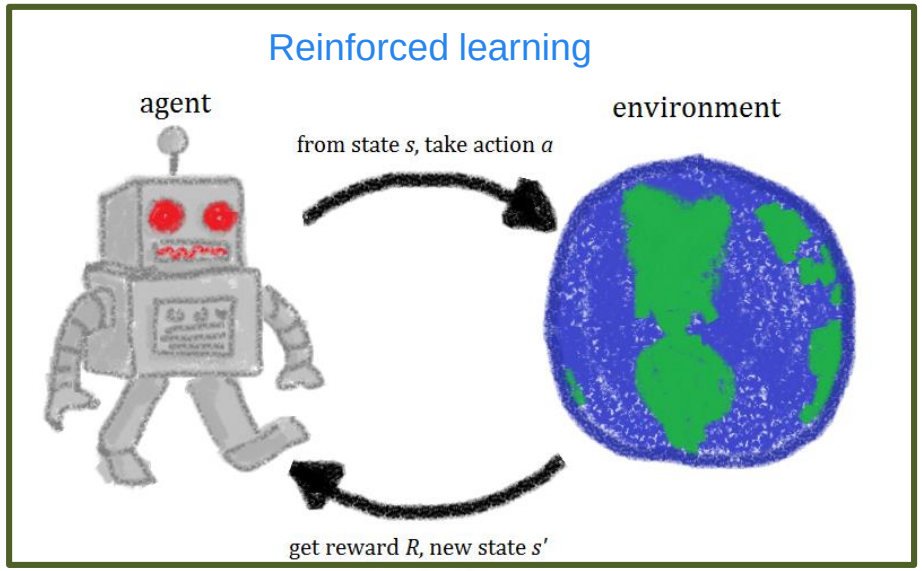
POSITIONING

- Every time you interact with a computer, smart phone, server across the ocean you will interact on 2 levels:

1. Answer a question, find a product, order a service
2. You are teaching the computer about you

- The more you teach it, the better it can serve you, **or manipulate you**
- You can refuse to play or play to win or at least understand what happens
- so, some more about learnings by computers…..

How computers learn: 3 main approaches

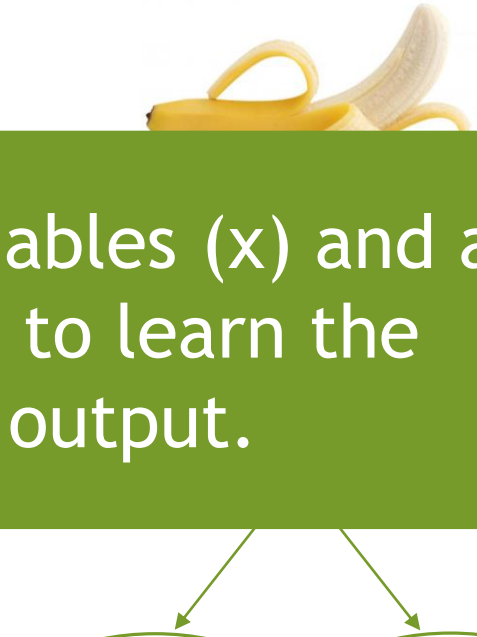


Types ML – Supervised Learning

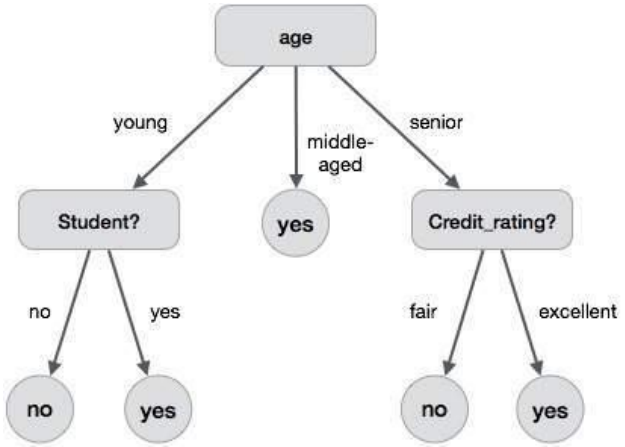
Banana

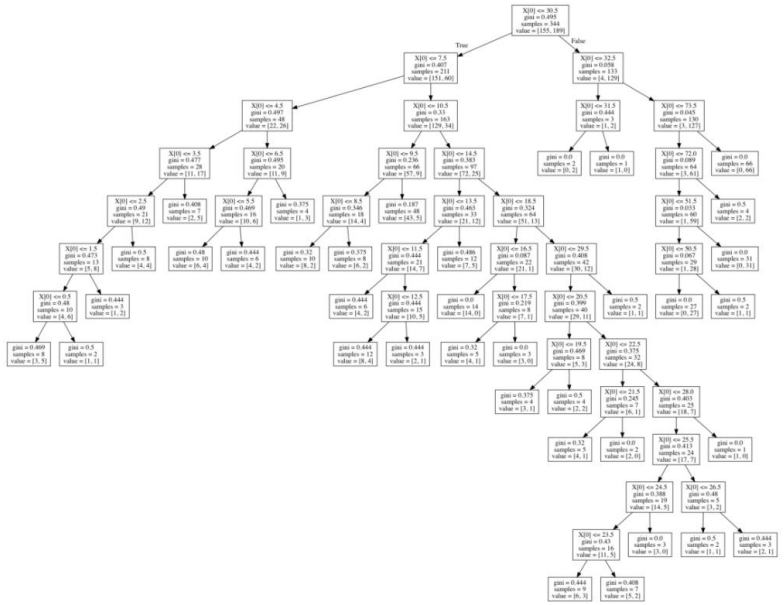
Apple

Supervised learning is where you have input variables (x) and an output variable (Y) and you use an algorithm to learn the mapping function from the input to the output.



Supervised Learning – Decision Trees

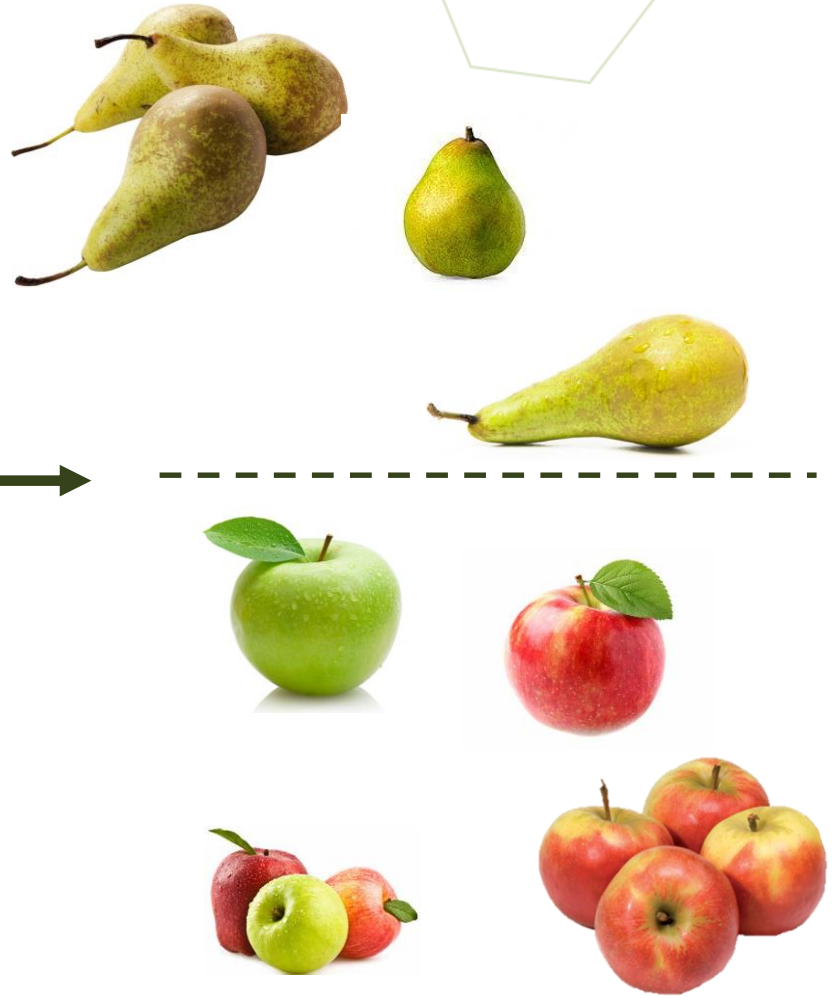




Types ML - Unsupervised Learning

LEARNING METHODS

Unsupervised learning



Unsupervised Learning - Association rules

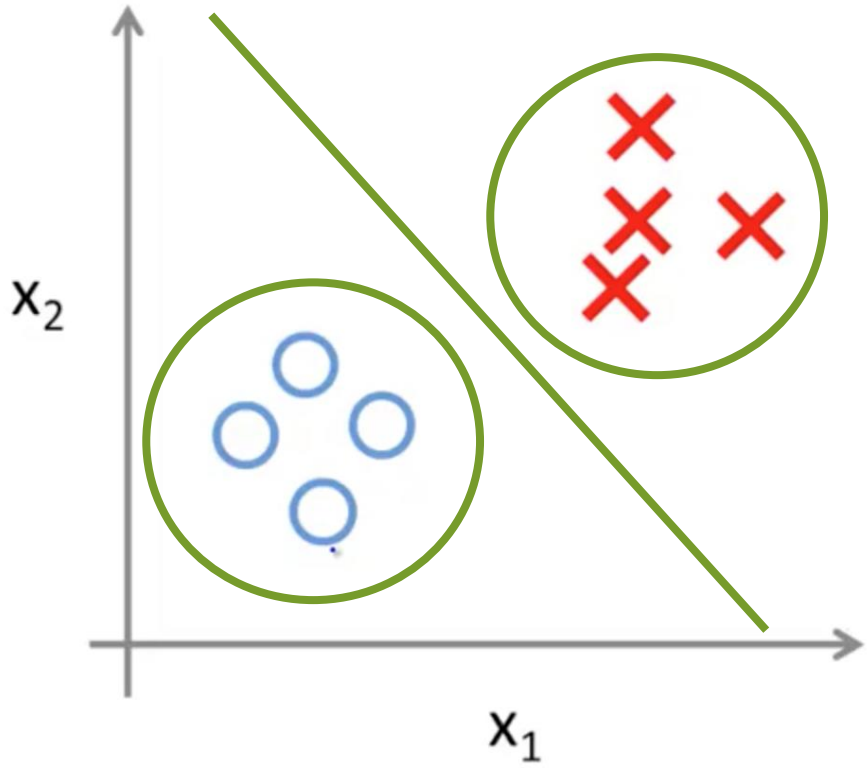
Market Basket Analysis

$$Support = \frac{frq(X,Y)}{N}$$

$$Rule:\ X \Rightarrow Y \rightarrow Confidence = \frac{frq(X,Y)}{frq(X)}$$

$$Lift = \frac{Support}{Supp(X) \times Supp(Y)}$$

Unsupervised Learning - Clustering



Social network analysis

Computer clustering

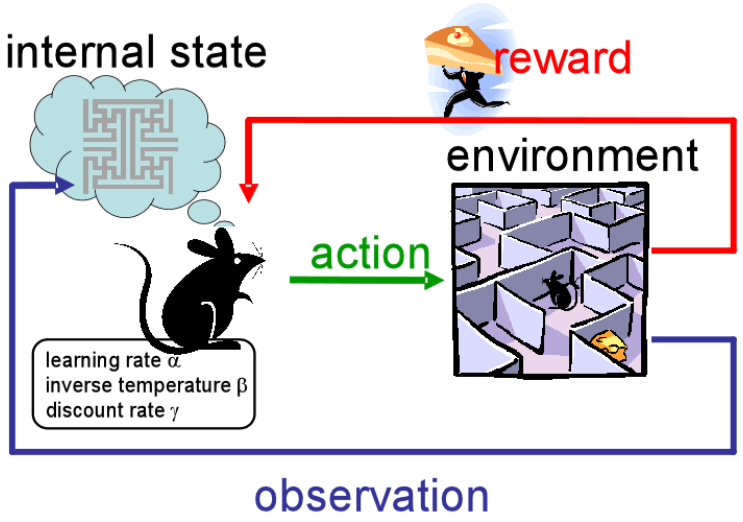
Positioning problems

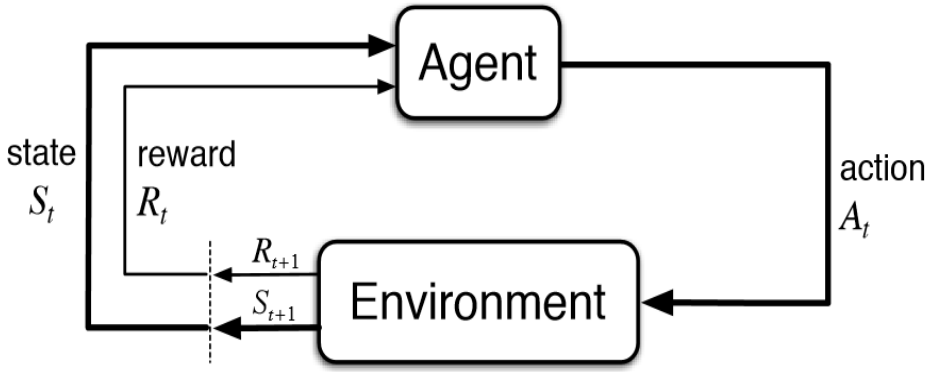
Visualization

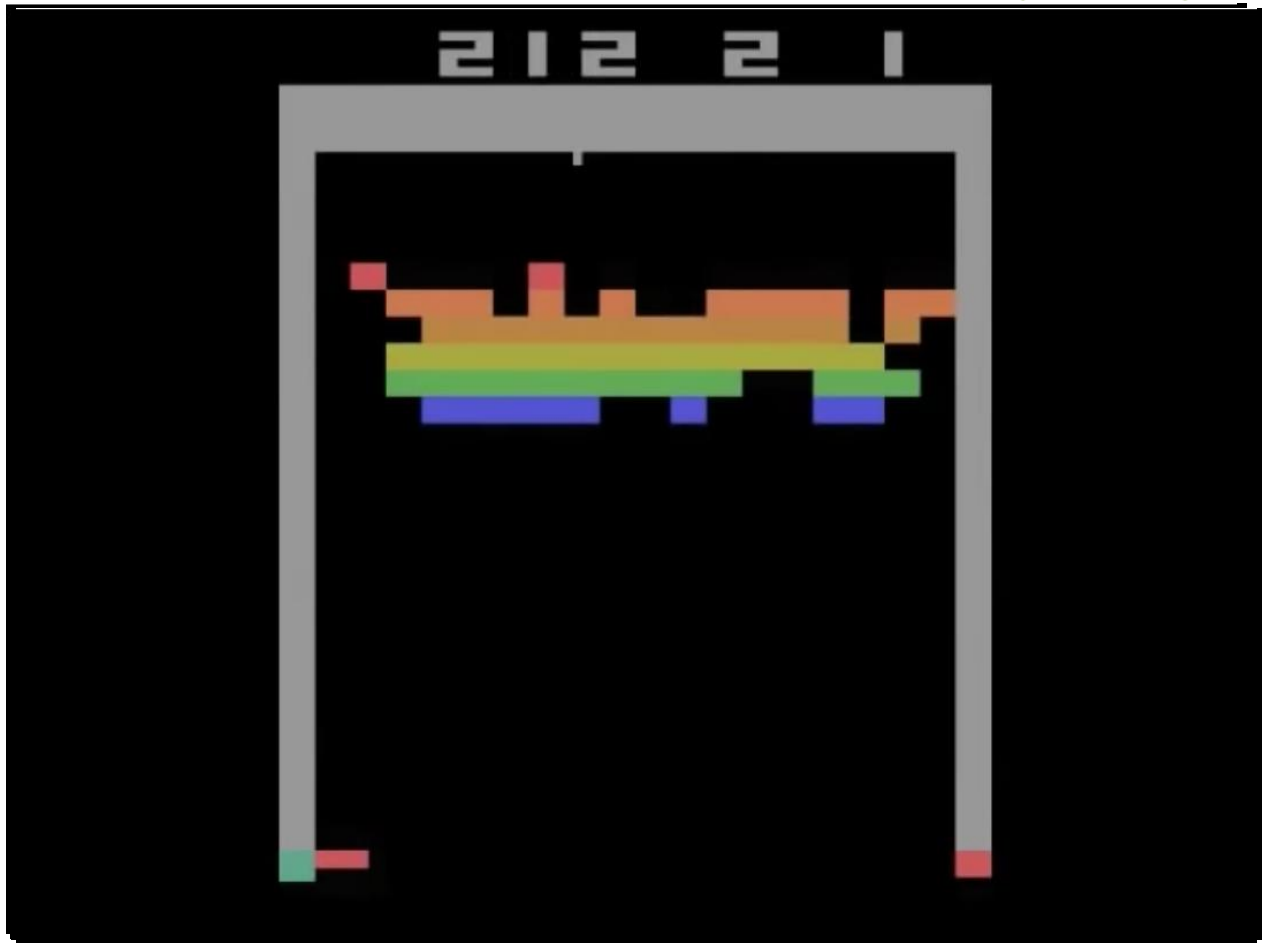
Pattern recognition

Image recognition

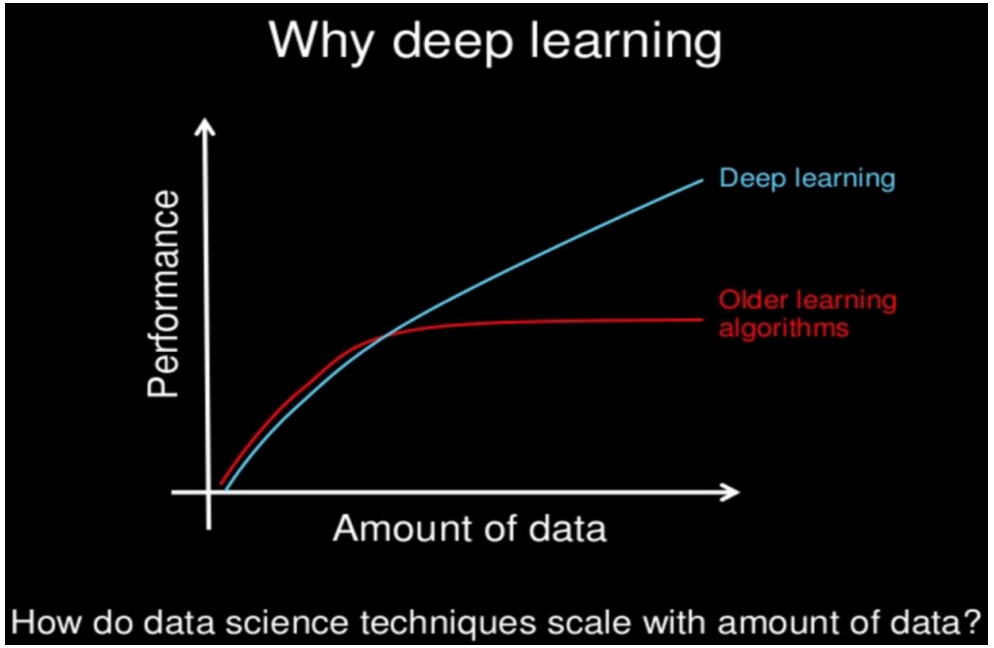
Types ML – Reinforced Learning

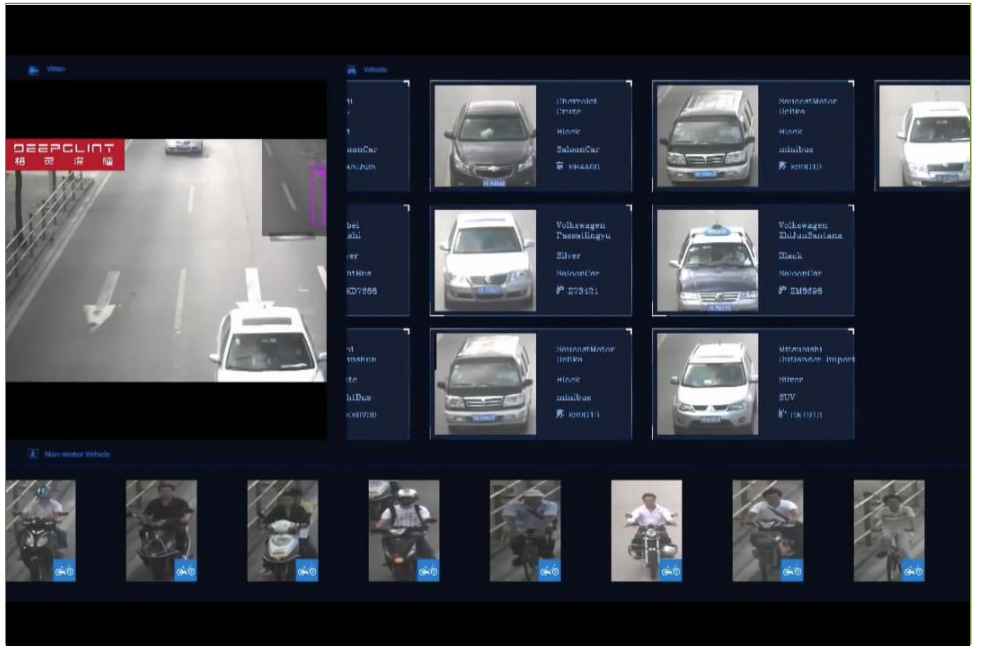




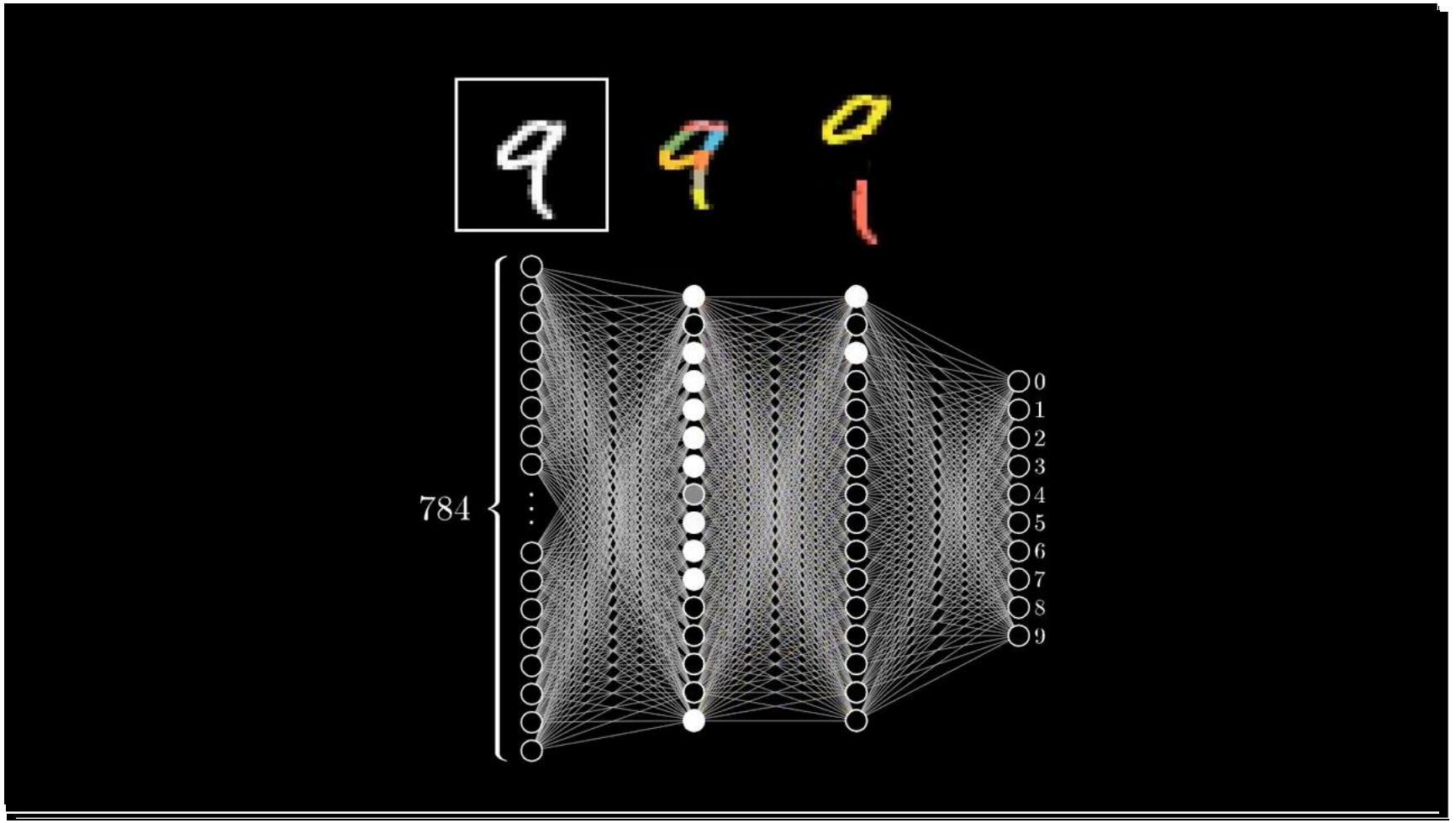


Deeplearning – Neural Networks





Deep Learning – Learning Patterns



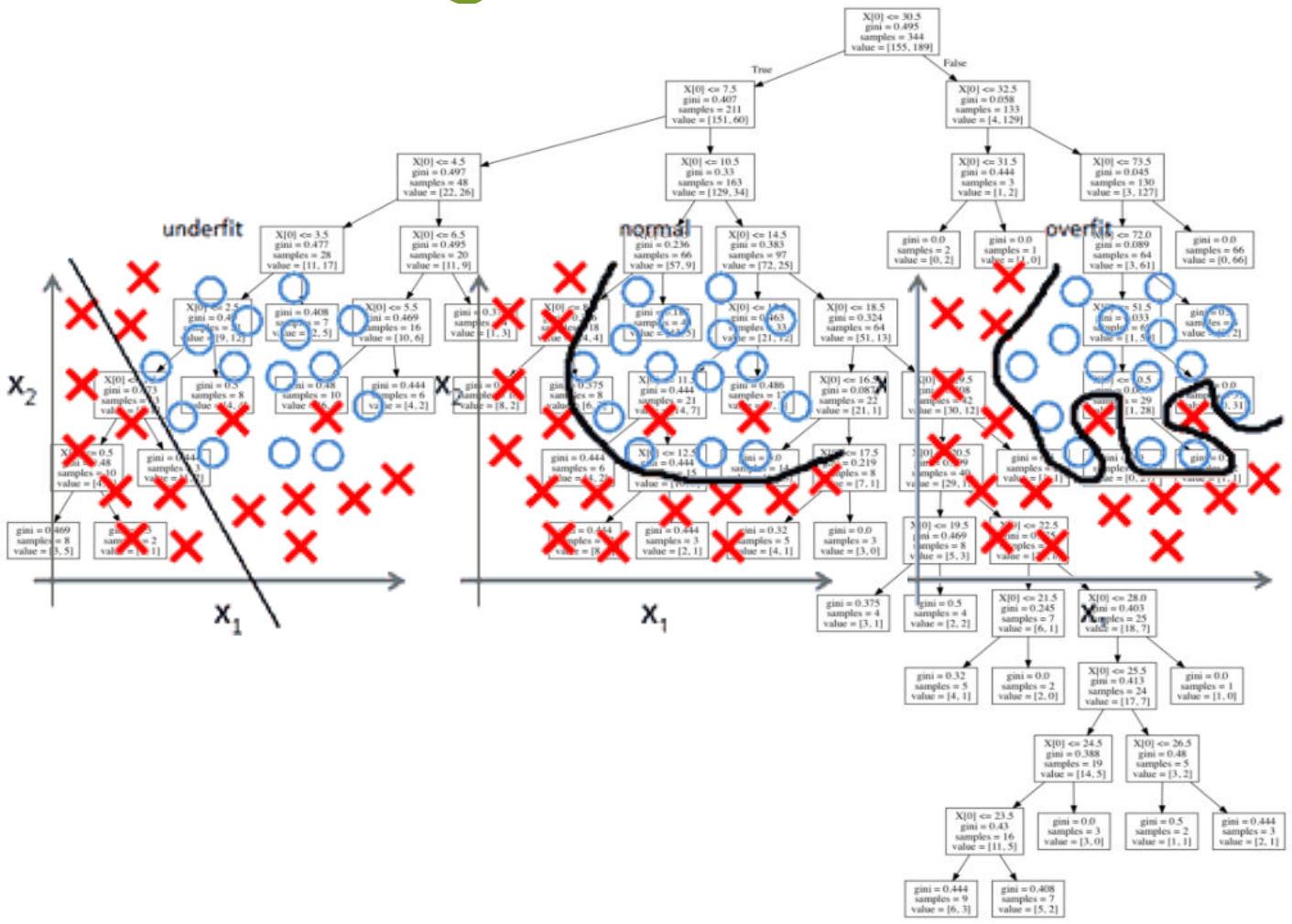
One key element: the Data itself

LEARNING CONDITIONS

- Missing data
- Standardization / Normalization
- Unskewing
- Add attributues
- Cleaning
- Transformation
- Add other data sources

	Geslacht	Leeftijd	Kloedwaarde A	Kloedwaarde B	Kloedwaarde C	Ziekte	# dagen ziekenhuis	Output
18	F	18	6	8	9	8,78%	318	Yes
19	M	19	6	6	6	1,22%	121	Yes
20	M	20	7	6	8	8,16%	101	No

Overfitting

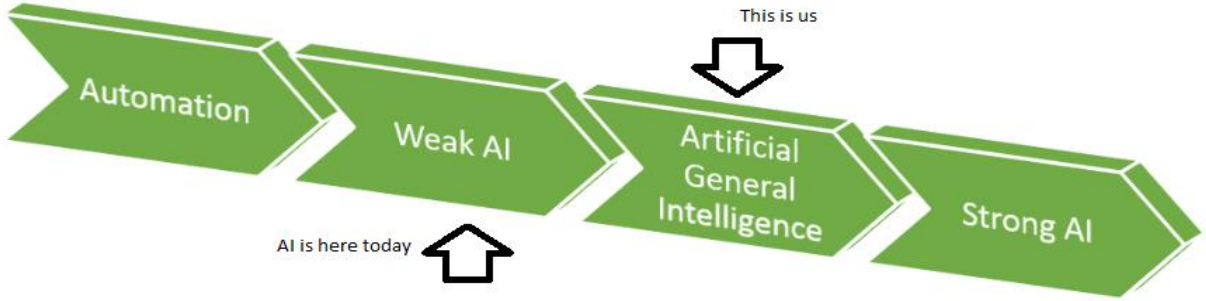


Overfitting: a model is trained only for a specific dataset – not applicable for general purposes, so with new data. Probably gives you a lot of wrong answers

Underfitting: a model is very general and sensitive for a high bias

Current State of AI

- Strong AI versus Weak AI
- Strong AI has the ability to fulfil general tasks
- Weak AI (also narrow AI), is focussed on one narrow task
- Currently weak AI has the upper hand, creating intelligent solutions by taking the human brain as inspiration.



- In example, Biological Neural Networks: Our brain is one big neural network, which we try to recreate in software as Artificial Neural Networks, to let a computer understand patterns or perceive knowledge as humans do.

Use Case 1 - Mortgage advisor automation

A use case is the use of Machine Learning to determine if a person can pay off his or her credit:

Learning through examples. By letting the model learn from existing data, it sees what factors should be taken into account to judge whether a person is likely to pay off his or her credit.

Here a model can learn from existing data, that:

- A positive influence is one's salary or level of education;
- A negative influence is if a person has other depts;
- A more complex factor is one's age, people too young (0 – 20) or too old (50+) are not likely to pay back their credit. People aged in-between are more likely to pay off their credit.

For each new person the model generates a score to determine whether or not it is likely that this person will pay off his credit. Hereby, the work of mortgage providers can potentially fade out.

Use Case 1 - Mortgage advisor automation

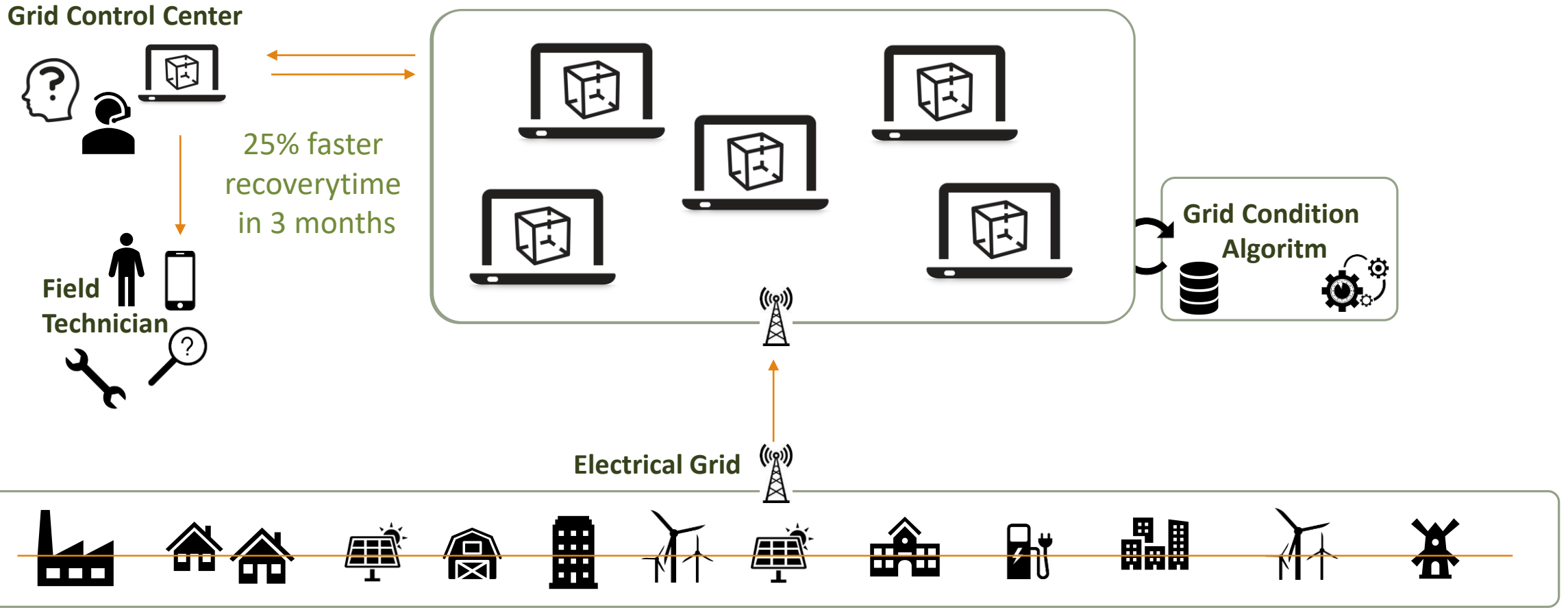
Salary	Credit	Age	Pay off
€50,000	€10,000	50	yes
€30,000	€10,000	40	no
€50,000	€20,000	30	yes
€40,000	€0	40	yes

Pay off = Yes →
IF: Salary*0.8 + Credit*-0.3 + Age^{2}*-0.2 > 0

Use Case 2 – Facial Recognition

?

Use Case 3 – Recovery Energy Outage



The position of AI in learning

DISCUSION

- Decisions frequently are made based on Intuition, Human Intuition is precious
- Intuition can not replace data, Intuition is what you need when you don’t know the facts
- What if you get easier to the facts, based on Data, and Algorithms…..
- What will it bring to the worker and his management?
- Machine learning speaks probability and is close to the nature of Decisions

- Question: Can AI generate new knowledge or will it only deliver unexplored insights