COMP2400/6400 Intelligent Machines, Law and Ethics

Week 1.2

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What is intelligent machine?

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- A machine is considered intelligent if it equipped with artificial intelligence (AI) and can perform tasks that typically require human intelligence.

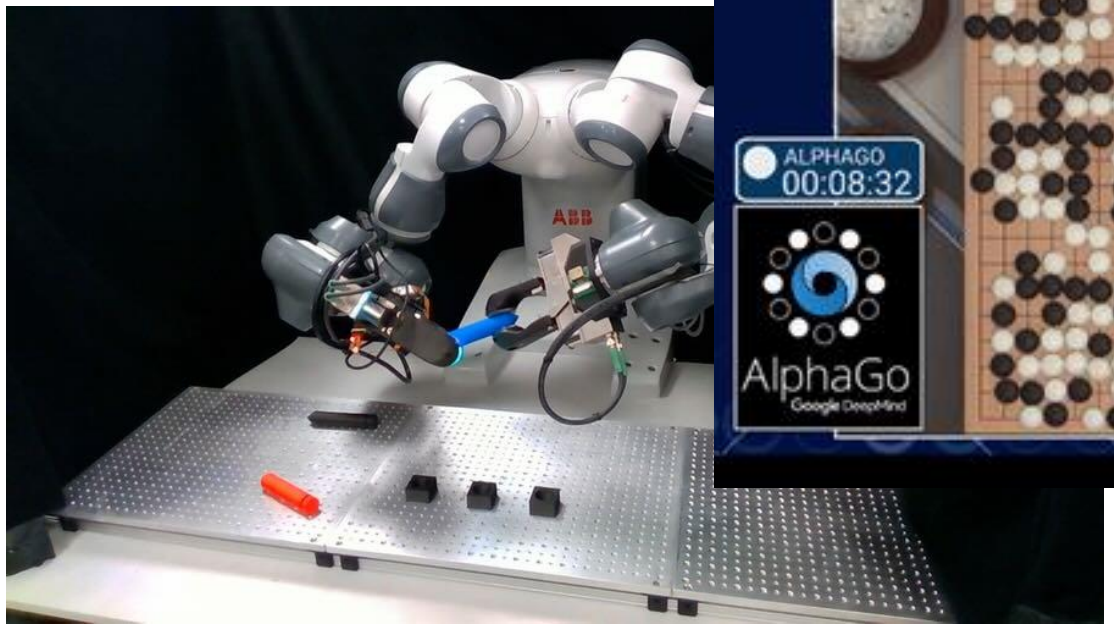
Intelligent machines are developed through technologies such as **machine learning, deep learning, natural language processing, and computer vision**, etc.

- **Adaptability** :

These machines continuously learn and adapt, improving their performance over time based on the data they collect and their interactions with the world. This adaptability is a hallmark of AI and is what makes machines "intelligent."

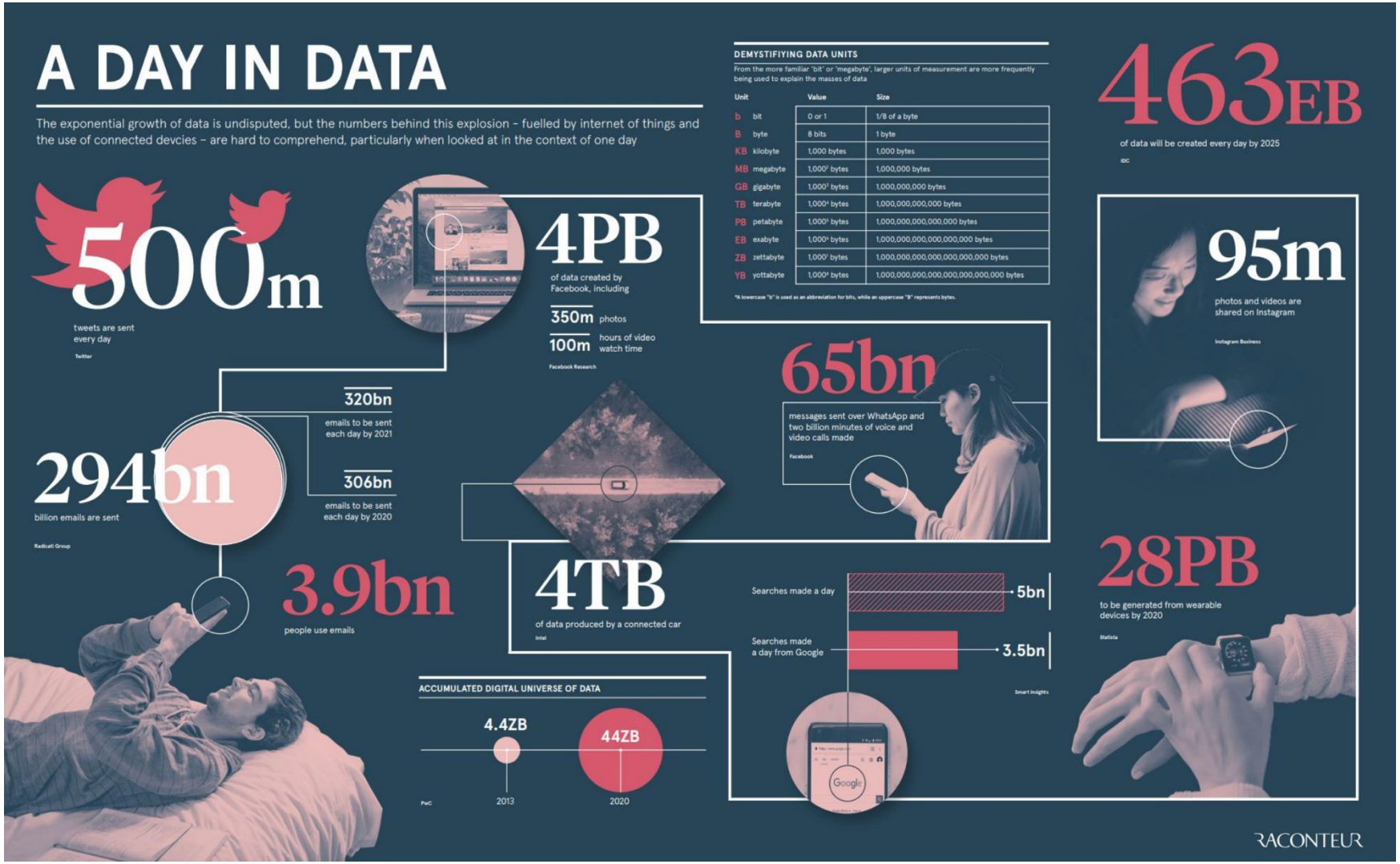
State-of-the-art AI / ML

- Robot → interact with complex objects
- Computer → play complex games
- Autonomous vehicles



- Can you name more?

Data


A DAY IN DATA
The exponential growth of data is undisputed, but the numbers behind this explosion – fuelled by internet of things and the use of connected devcies – are hard to comprehend, particularly when looked at in the context of one day
500m
tweets are sent every day
Twitter
4PB
of data created by Facebook, including
350m photos
100m hours of video watch time
Facebook Research
DEMYSTIFIYING DATA UNITS
From the more familiar 'bit' or 'megabyte', larger units of measurement are more frequently being used to explain the masses of data
Unit | Value | Size
b bit | 0 or 1 | 1/8 of a byte
B byte | 8 bits | 1 byte
KB kilobyte | 1,000 bytes | 1,000 bytes
MB megabyte | 1,000² bytes | 1,000,000 bytes
GB gigabyte | 1,000³ bytes | 1,000,000,000 bytes
TB terabyte | 1,000⁴ bytes | 1,000,000,000,000 bytes
PB petabyte | 1,000⁵ bytes | 1,000,000,000,000,000 bytes
EB exabyte | 1,000⁶ bytes | 1,000,000,000,000,000,000 bytes
ZB zettabyte | 1,000⁷ bytes | 1,000,000,000,000,000,000,000 bytes
YB yottabyte | 1,000⁸ bytes | 1,000,000,000,000,000,000,000,000 bytes
*A lowercase "b" is used as an abbreviation for bits, while an uppercase "B" represents bytes.
463EB
of data will be created every day by 2025
IDC
95m
photos and videos are shared on Instagram
Instagram Business
320bn
emails to be sent each day by 2021
306bn
emails to be sent each day by 2020
294bn
billion emails are sent
Radicati Group
65bn
messages sent over WhatsApp and two billion minutes of voice and video calls made
Facebook
3.9bn
people use emails
4TB
of data produced by a connected car
Intel
Searches made a day 5bn
Searches made a day from Google 3.5bn
Smart Insights
28PB
to be generated from wearable devices by 2020
Statista
ACCUMULATED DIGITAL UNIVERSE OF DATA
4.4ZB
2013
44ZB
2020
IDC
RACONTEUR

More computational power

- The fundamental concepts of artificial intelligence and deep neural networks have been around since 1940.

- The development of powerful computer processing units (CPUs) and the leveraging of the graphical processing units (GPUs) for computation allowed the training of deep and complex algorithms in “human time”.

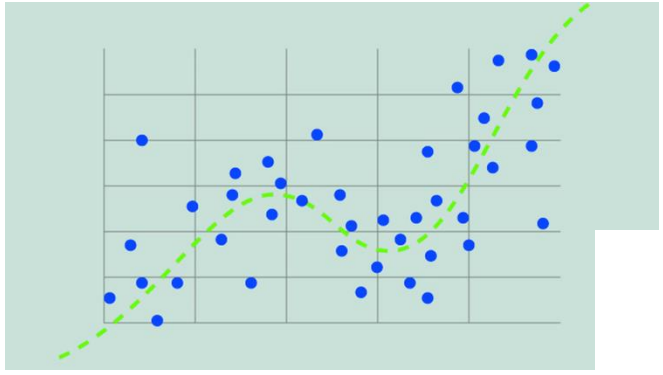
- Technology has been challenging human performance.

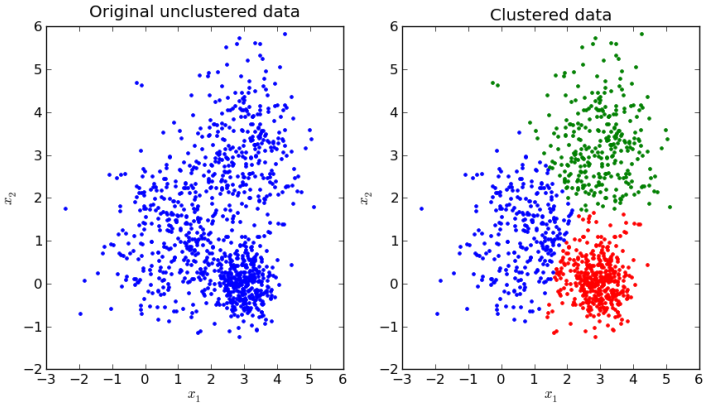
Impact / Concerns

- Economy:
  Innovation, product development, productivity, job displacement, …
- Political systems
  Policy making, public engagement, privacy and security, …
- Legal aspects
  Transparency, new tech-regulations, liability issues, …
- Ethical Considerations
  Fairness/Bias, accountability, …

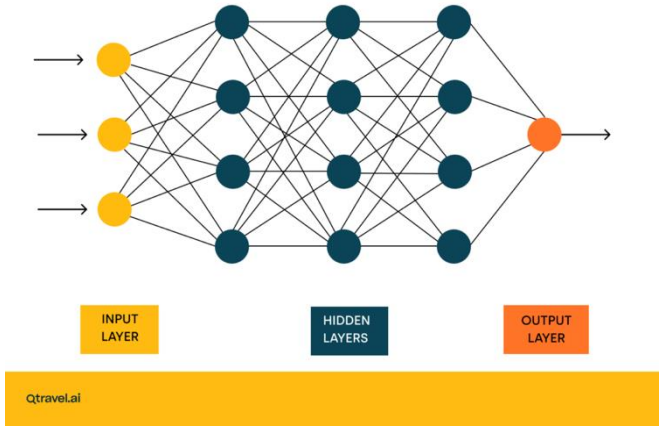
What to expect?

- We use Python:
  - Pandas
  - Numpy
  - Sklearn
  - Keras
  - Jupyter Notebook





- Topics:
  - Python basics
  - Regression models
  - Clustering and classification
  - Neural Networks



Python

- Python is designed to be highly readable.
- Python is good for fast prototyping.

We will introduce:

- Variables
- Sequences
- Dictionaries
- Loops
- Functions
- Modules
- ……

Basic Libraries – Pandas/Numpy

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- Pandas
  - Widely used for analyzing, cleaning, exploring and manipulating data.
  - Read CSV, excel, JSON and other files
  - Create dataframes

- Numpy
  - Widely used for scientific computing in Python
  - Supports large-scale mathematical operations and a wide array of numeric data types

ML Libraries – Ski-learn / Keras

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- Sklearn
  - Widely used for implementing machine learning algorithms
  - Simply and strong community support

- Keras
  - Powerful for building neural networks and machine learning models

Sklearn is primarily focused on traditional machine learning, including classification, regression, clustering, and dimensionality reduction.

Keras is specifically designed for constructing and training deep neural networks.