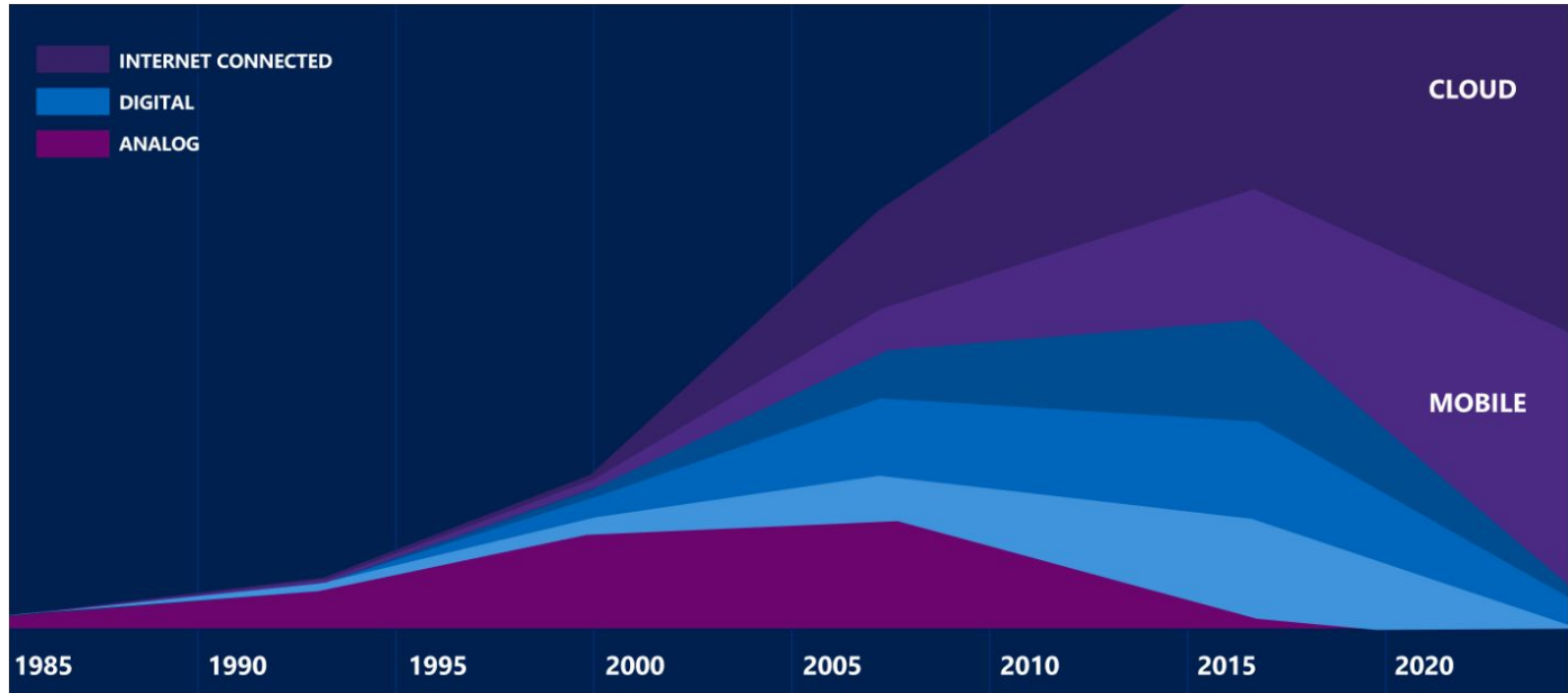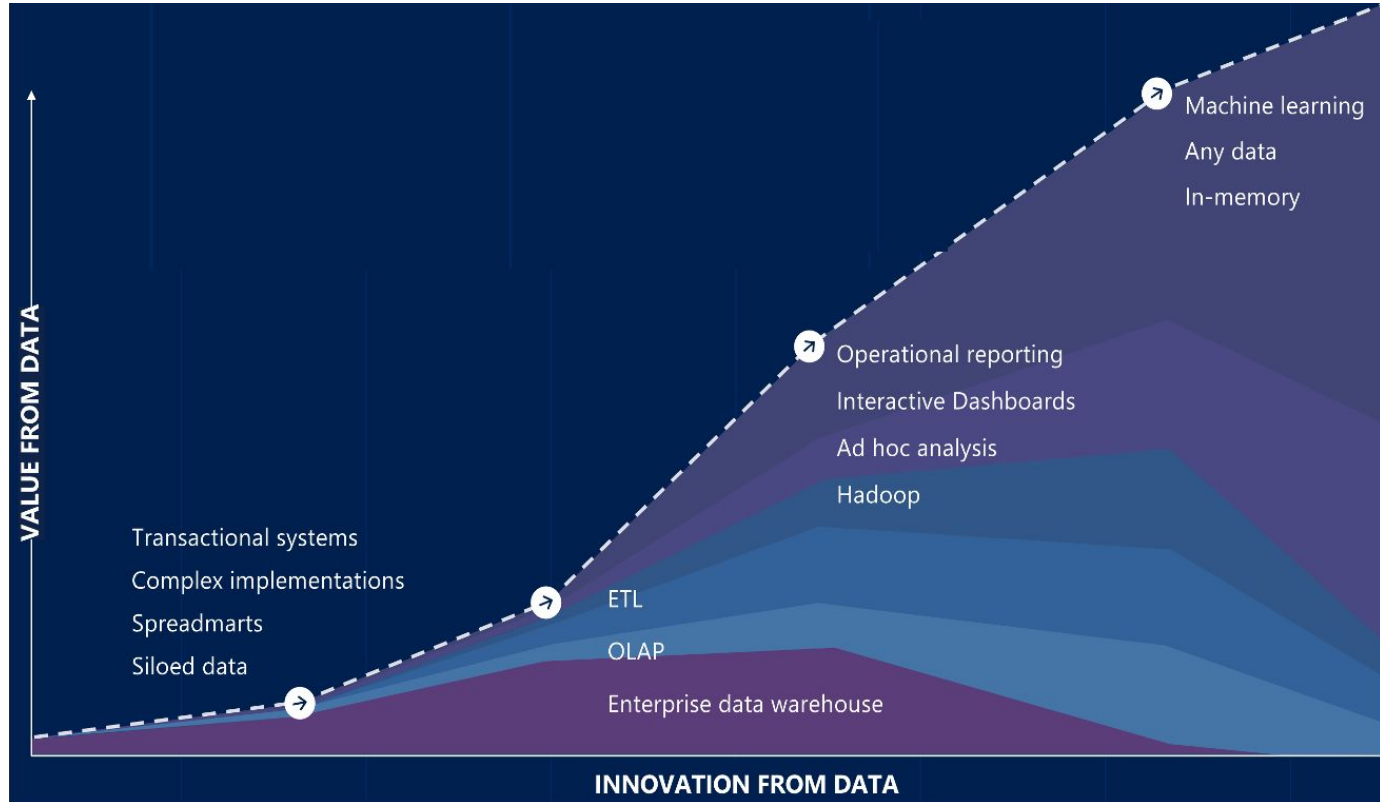# ML in the Cloud 101

Data, data and more data

Data needs for..
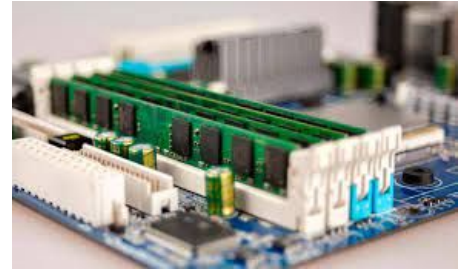
A brief review of physical infrastructure

Simple "*server*"

Server

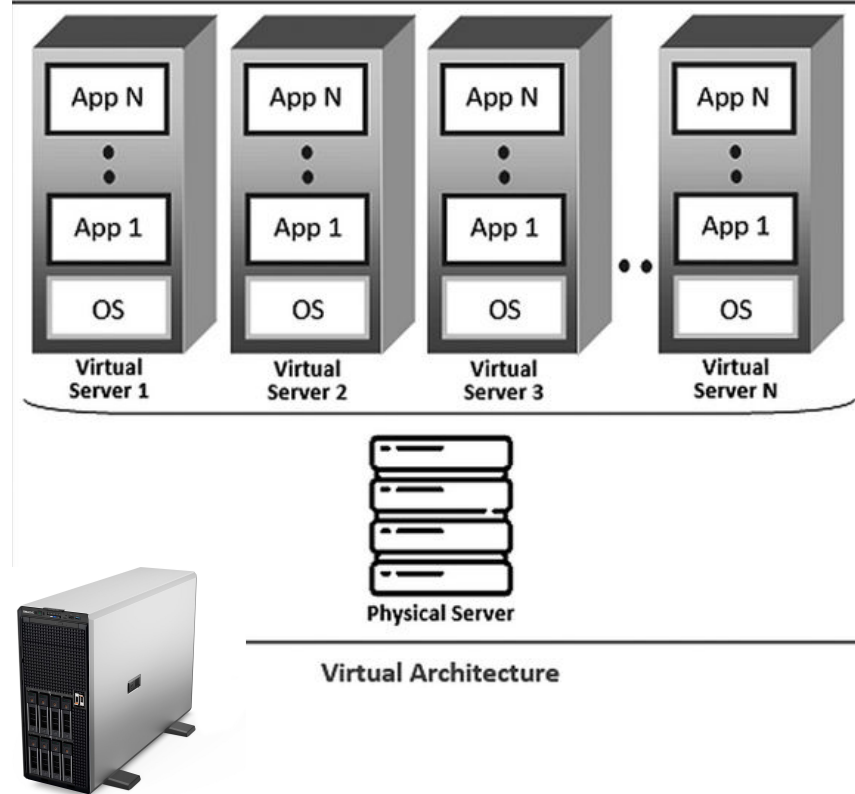# One server one app

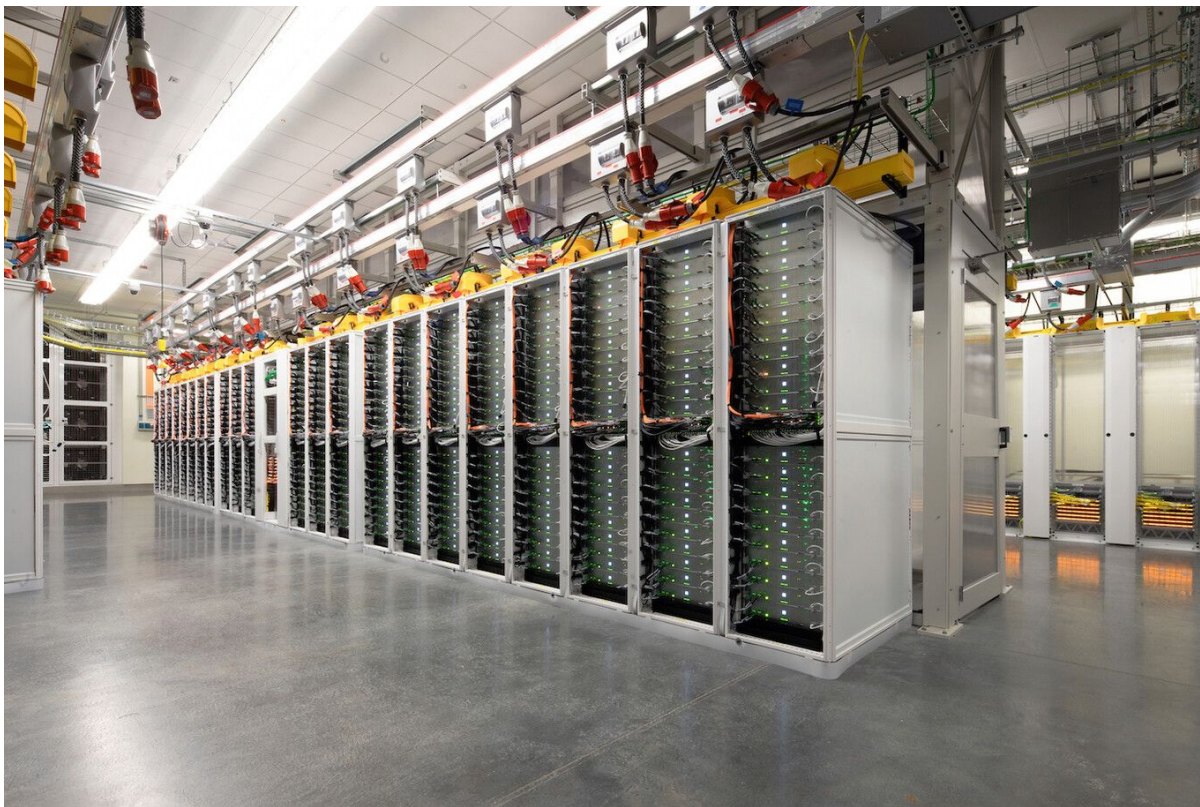# Virtualization

Virtual Architecture
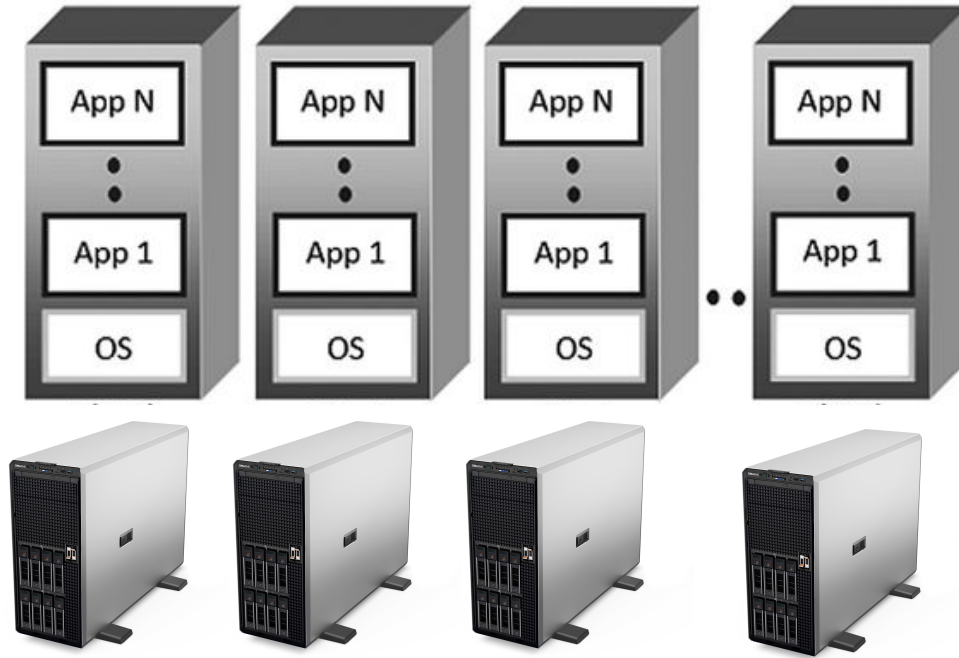
Rack servers and racks

Data Center

Storage Area Network (SAN) and blade servers

Servers (CPU + RAM)
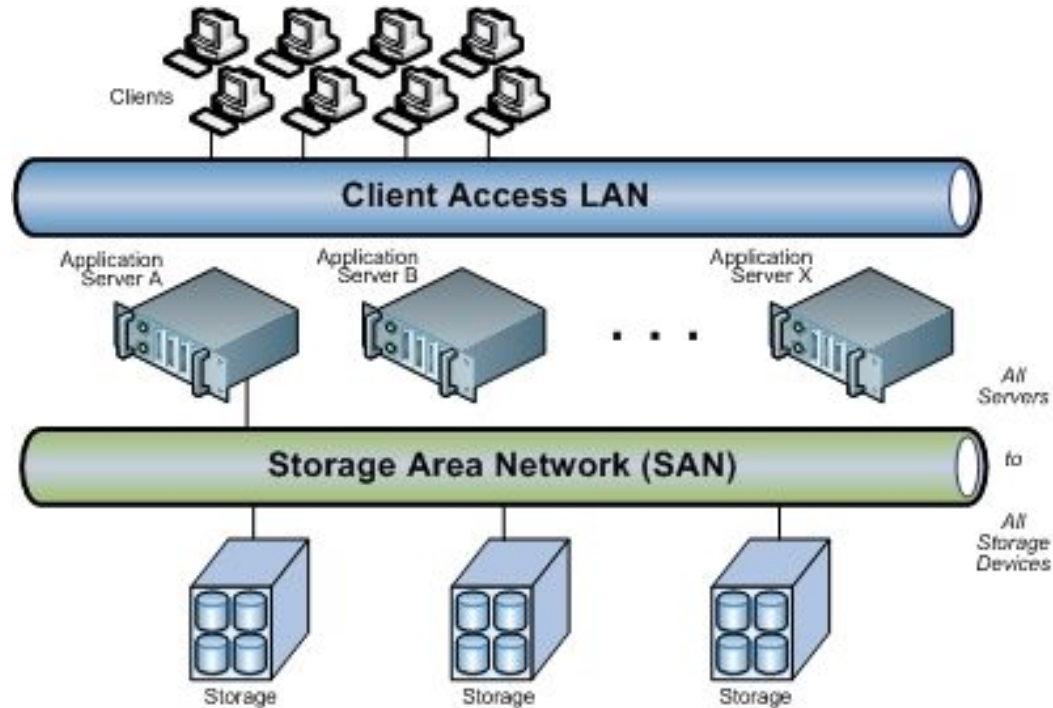
Storage

A new world of possibilities…

Replication

On-premise data centers

*If you are **managing** the complete infrastructure **by yourself**, it is call **on-premise** data centers*

Cloud Computing definition

*The practice of using a network of **remote servers** hosted on the **internet** to store, manage, and process data, rather than a local server or a personal computer.*

On-premise vs cloud computing

On-Premise

Pros
- Full data control
- Full hard- and software control
- Full access reliability
- No operating software costs
- Performance
- Customization

Cons
- High acquisition- and maintenance costs
- Internal knowledge
- Full responsibility
- Long-term reliability

Cloud

Pros
- Easy setup
- Low acquisition and maintenance costs
- Flexibility and scalability
- Accessibility and integration
- Updates and security

Cons
- Control limitations
- Ongoing software costs
- External dependencies
- Performance limitations
- mandatory internet access
- Personalization limitations

Cloud, why now?

- Data Volume

- Need of elastic computing power

- Very dynamic hardware evolution (GPUs, TPUs, …)

- Pay only for use

- Flexibility

For example, "Nestlé's journey to cloud"

Providing safe, quality nutrition for **155 years**

2 000 + **brands** worldwide

Around **273 000** employees

Number of countries we sell in **186**

376 **factories** in 81 countries

CHF 84.3 **billion** Group sales in 2020

1 billion Nestlé products sold every day

For example, "Nestlé's journey to cloud"

So…

Cloud means flexibility… can you tell an example of development that needs a lot of flexibility in computer resources?

Big cloud providers

Figure 1: Magic Quadrant for Cloud Infrastructure and Platform Services


Source: Gartner (July 2021)

Cloud concepts

IaaS, or *infrastructure as a service*, is on-demand access to cloud-hosted physical and virtual servers, storage and networking - the backend IT infrastructure for running applications and workloads in the cloud (like Virtual Machines).
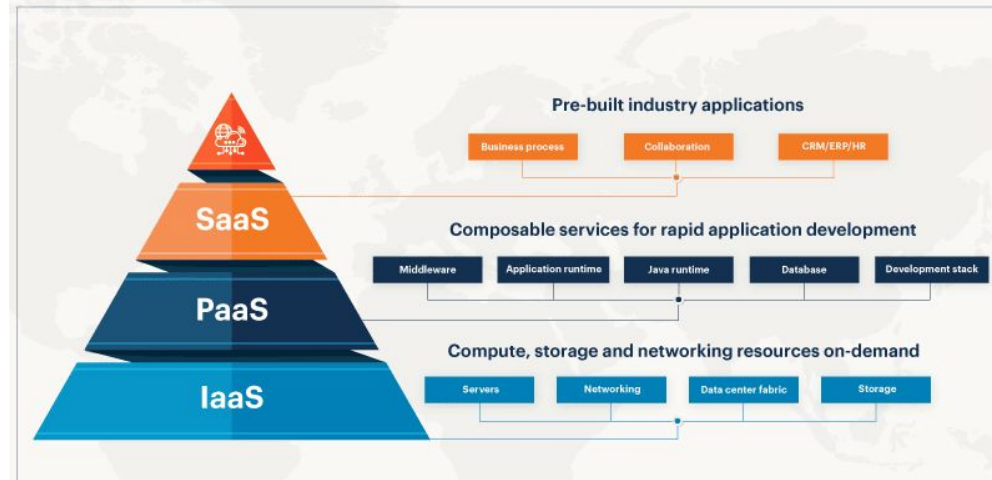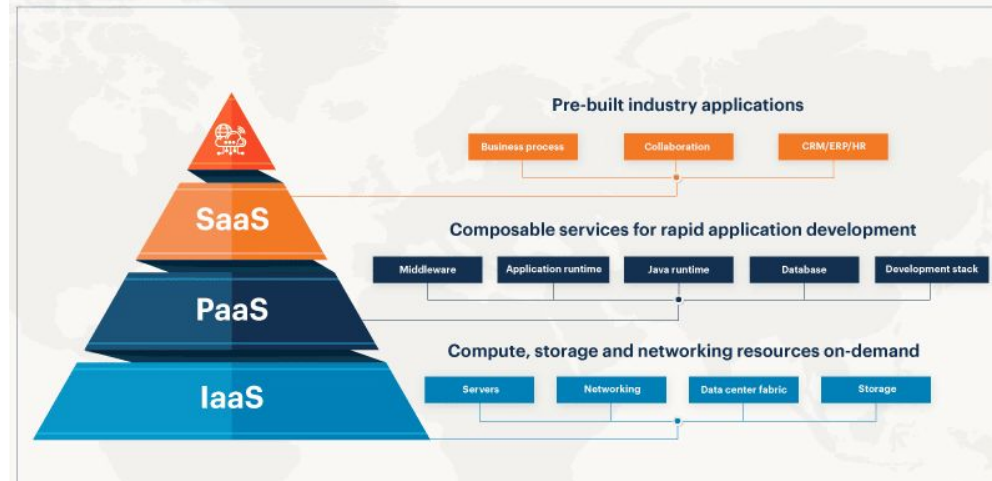
Cloud concepts

PaaS, or *platform as a service*, is on-demand access to a complete, ready-to-use, cloud-hosted platform for developing, running, maintaining and managing applications (like Azure Databricks).
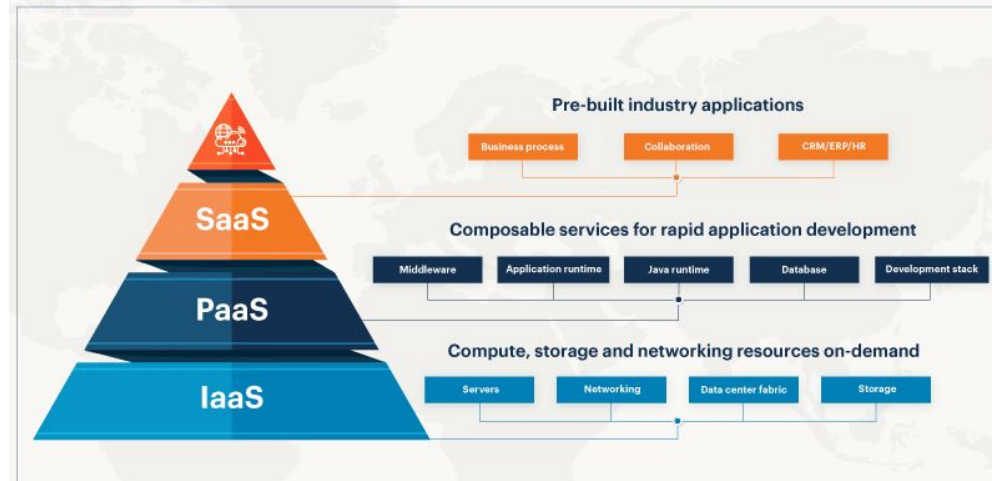
Cloud concepts

**SaaS,** or *software as a service*, is on-demand access to ready-to-use, cloud-hosted application software (like Office 365).

Pre-built industry applications

| Business process | Collaboration | CRM/ERP/HR |

SaaS

Composable services for rapid application development

| Middleware | Application runtime | Java runtime | Database | Development stack |

PaaS

Compute, storage and networking resources on-demand

| Servers | Networking | Data center fabric | Storage |

IaaS

Cloud Services

Cloud Computing Services: Who Manages What?

|	Traditional IT	IaaS	PaaS	SaaS
Applications	You manage	You manage	You manage	Provider manages
Data	You manage	You manage	You manage	Provider manages
Runtime	You manage	You manage	Provider manages	Provider manages
Middleware	You manage	You manage	Provider manages	Provider manages
OS	You manage	Provider manages	Provider manages	Provider manages
Virtualization	You manage	Provider manages	Provider manages	Provider manages
Servers	You manage	Provider manages	Provider manages	Provider manages
Storage	You manage	Provider manages	Provider manages	Provider manages
Networking	You manage	Provider manages	Provider manages	Provider manages

You manage Provider manages

Cloud for Data Scientist
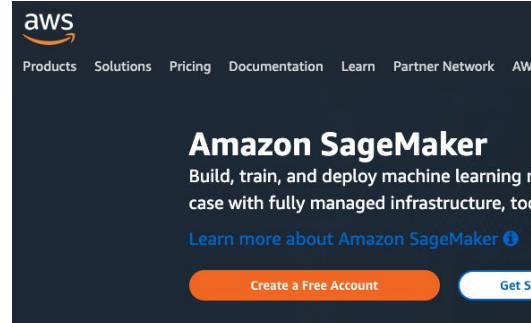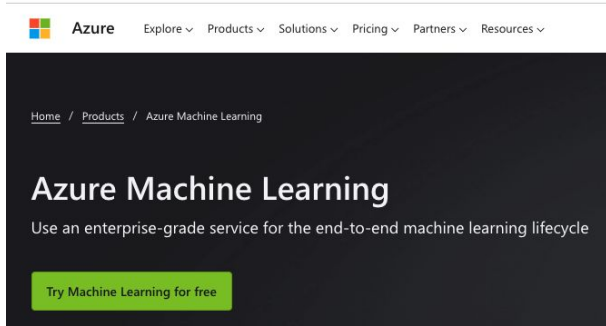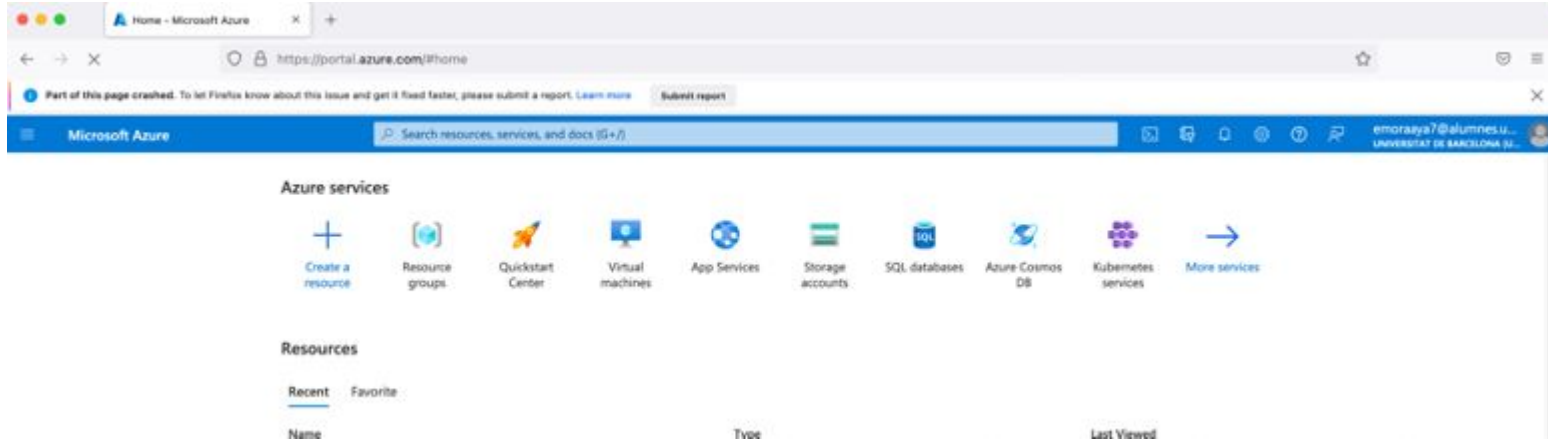
Azure Portal lab
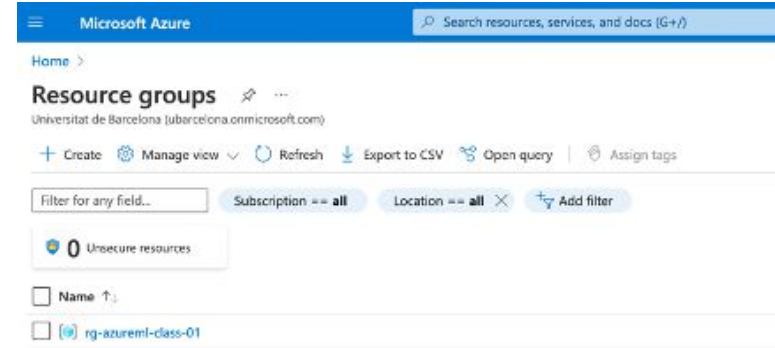

1. Create a $100 Azure for Students account for free with your UB Credentials.
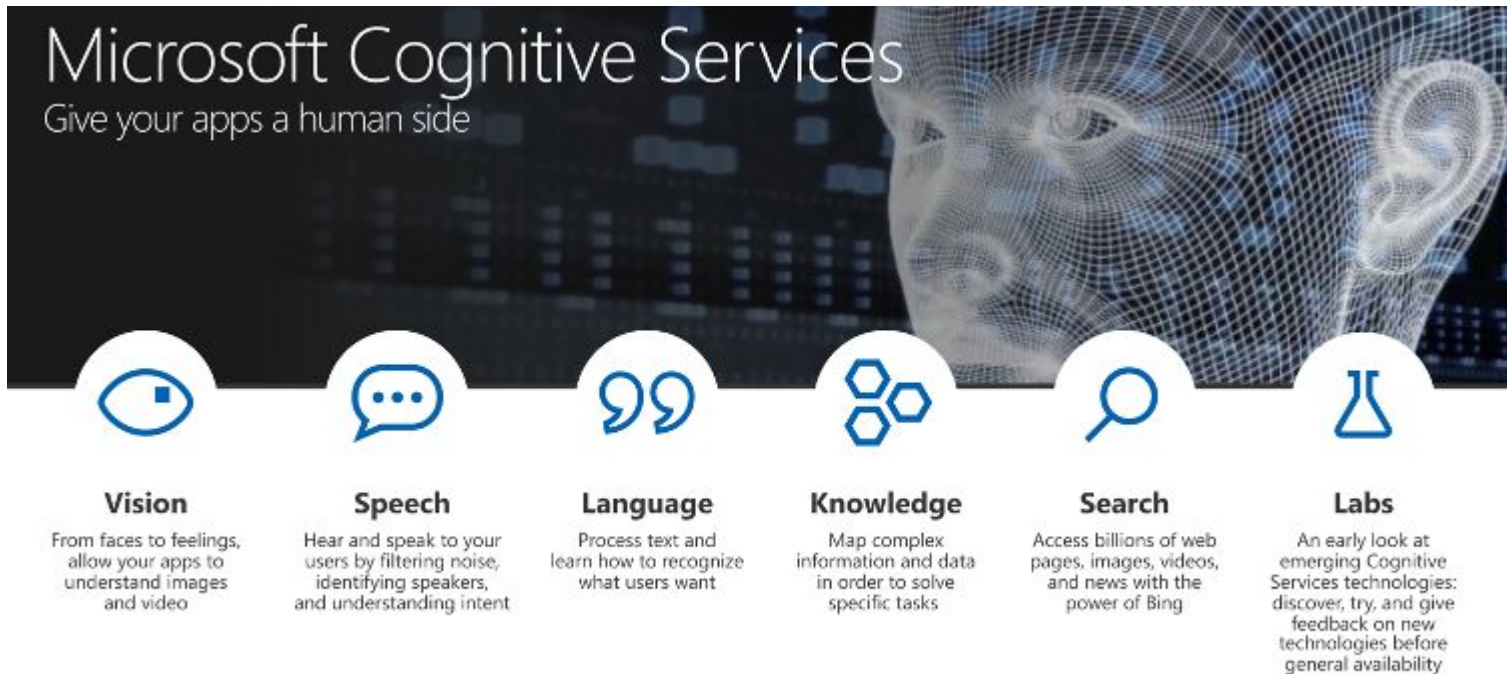2. Log in the Azure Portal
3. Azure Calculator

Azure Portal. Resource Groups

The **Resource Group** is the "logic" group of resources inside Azure

It can **manage** the user **rights** as well as the associated **costs**

ML SaaS. Cognitive Services and Azure AI