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Intelligenza artificiale e tecnologie esponenziali

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Singularity

What is Singularity University (SU)?

We are a global community using exponential technologies to tackle the world's biggest challenges and build an abundant future for all.

@singularityu

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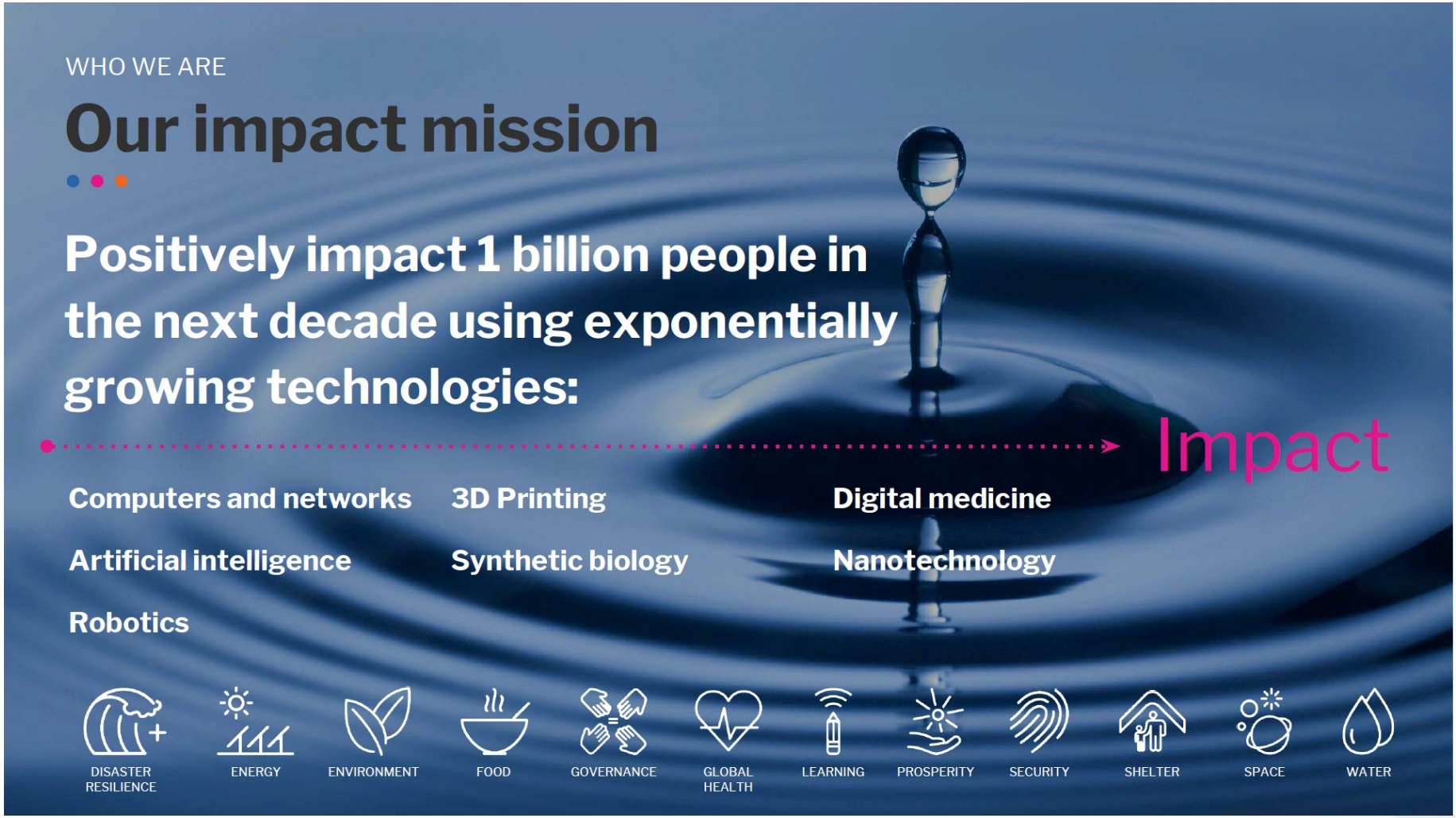
Exponential Technologies



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Human development

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Human development

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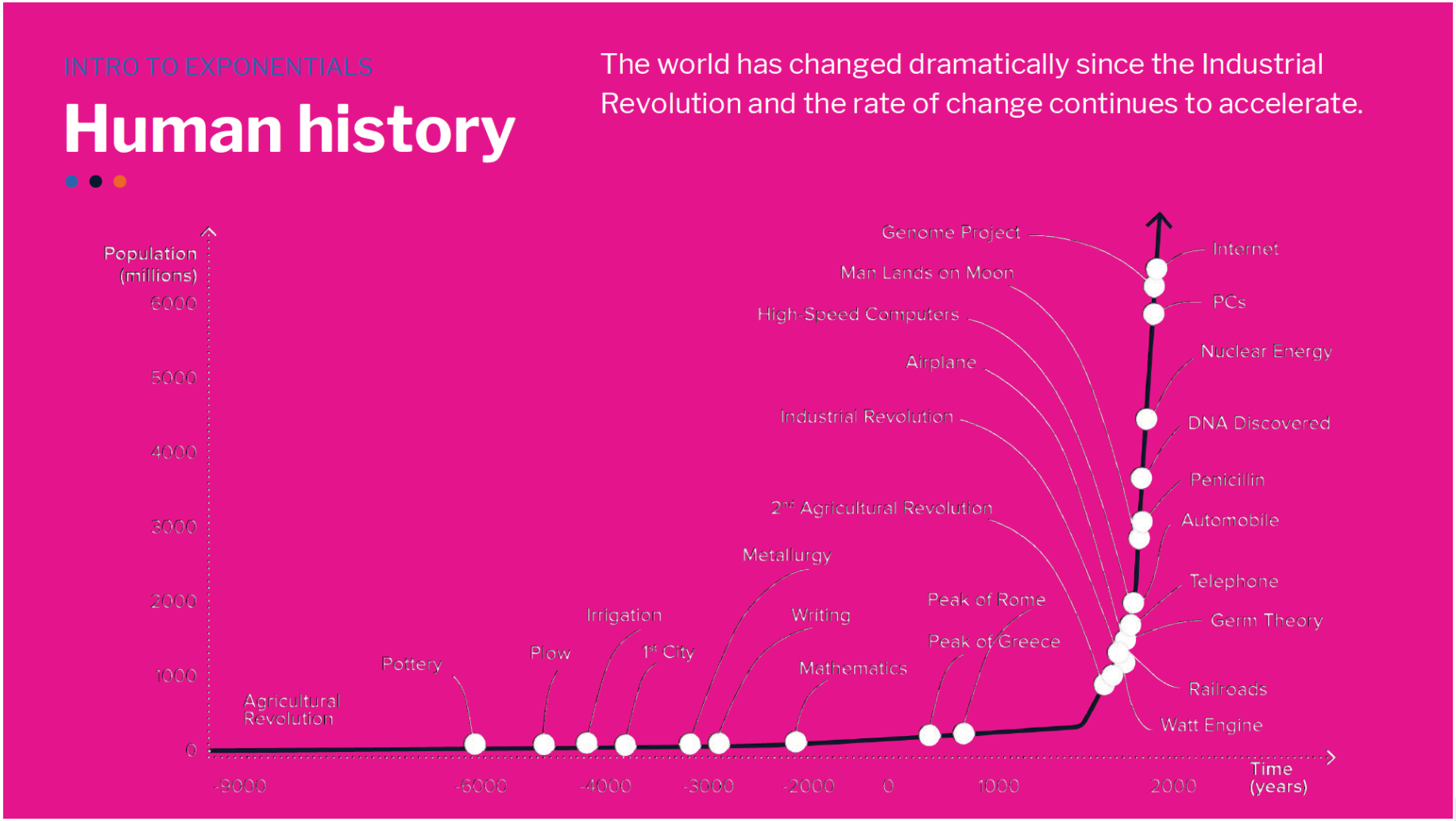
Exponential History



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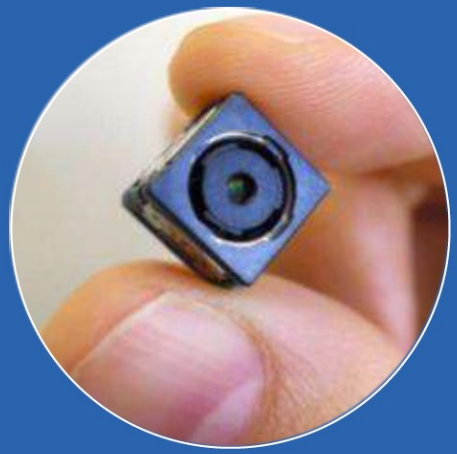
Exponential growth

INTRO TO EXPONENTIALS

Exponential growth



1000x resolution
1000x lighter
1000x cheaper
1,000,000,000 x better

1976: 1st digital camera (Kodak)
0.01 MP / 3.75 lbs / $10,000

2014: Mobile digital camera
>10 MP / 0.03 lbs / $10

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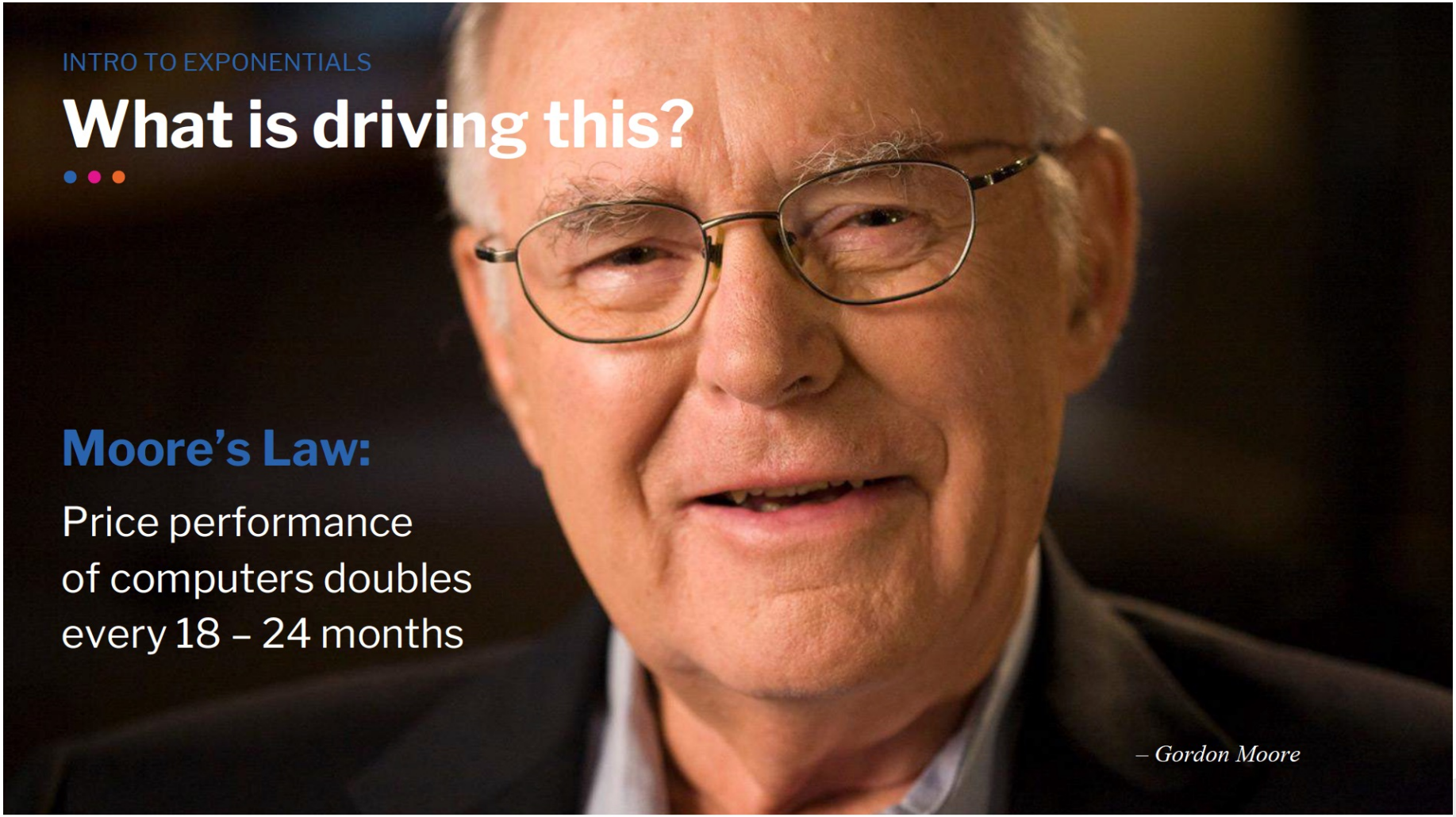
Gordon Moore



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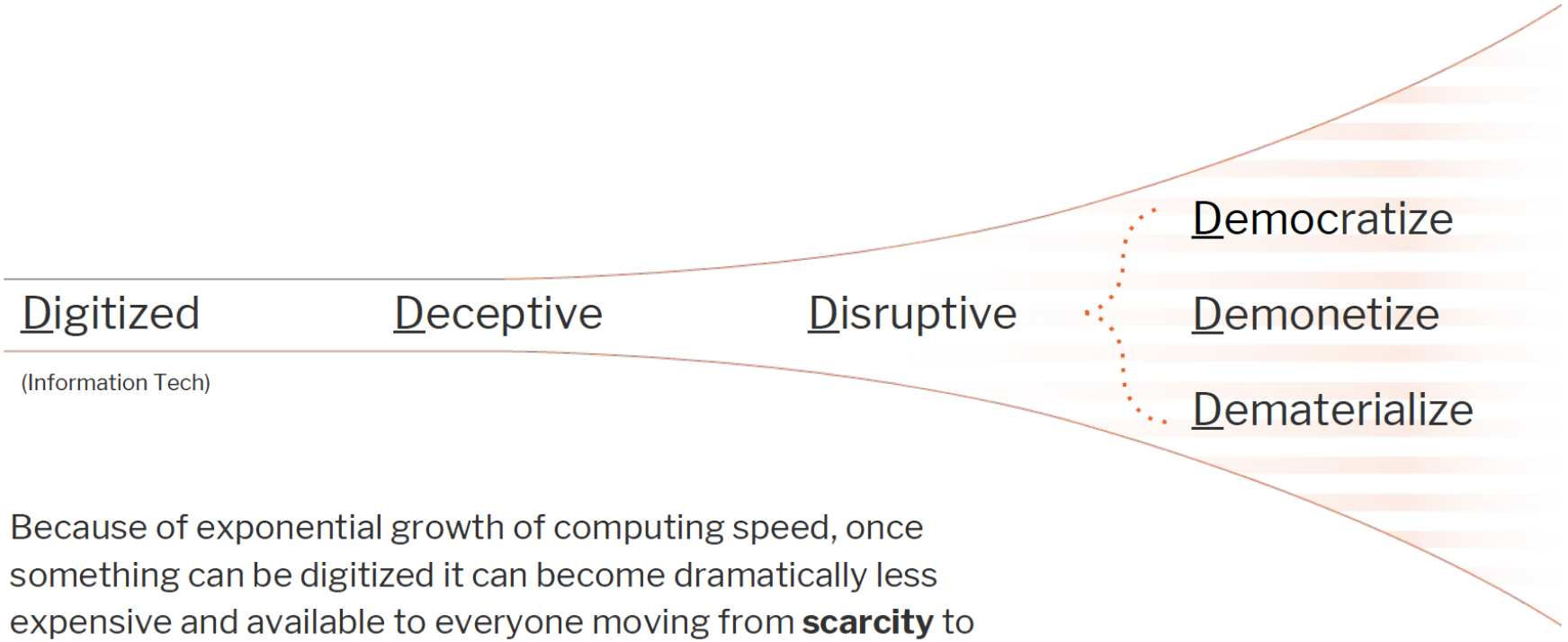
6D framework

SCARCITY VS. ABUNDANCE

"6 Ds" exponential framework



Because of exponential growth of computing speed, once something can be digitized it can become dramatically less expensive and available to everyone moving from **scarcity** to **abundance**, though it often is underwhelming at first.

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IA, ML, DS: Perché Oggi?

- ✓ Disponibilità di Dati (BigData)
- ✓ Disponibilità di potenza di calcolo (CPU, GPU, FPGA)
- ✓ Disponibilità di nuovi algoritmi (DeepNN, Reinforcement Learning,…)

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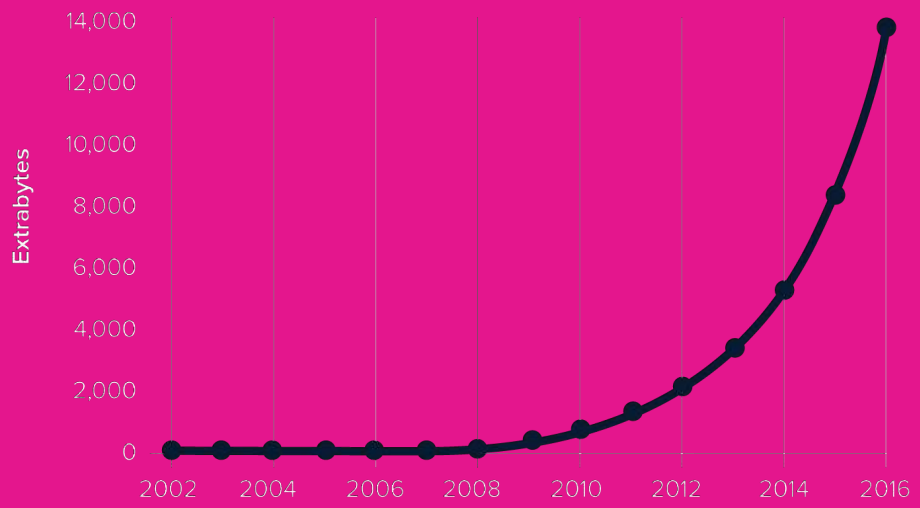
Big Data

INTRO TO EXPONENTIALS

The exponential growth of data



5 billion gigabytes

In 2010... ~2 days

In 2013... ~10 minutes

>100 hours of video content is added to YouTube every minute

A commercial airliner generates >1 Terabyte of data per day.

Produzione Dati 2018: 33 ZB (1 ZB ~ 1K EB ~ 1M PB ~ 1B TB – by 2025 175ZB Forbes)

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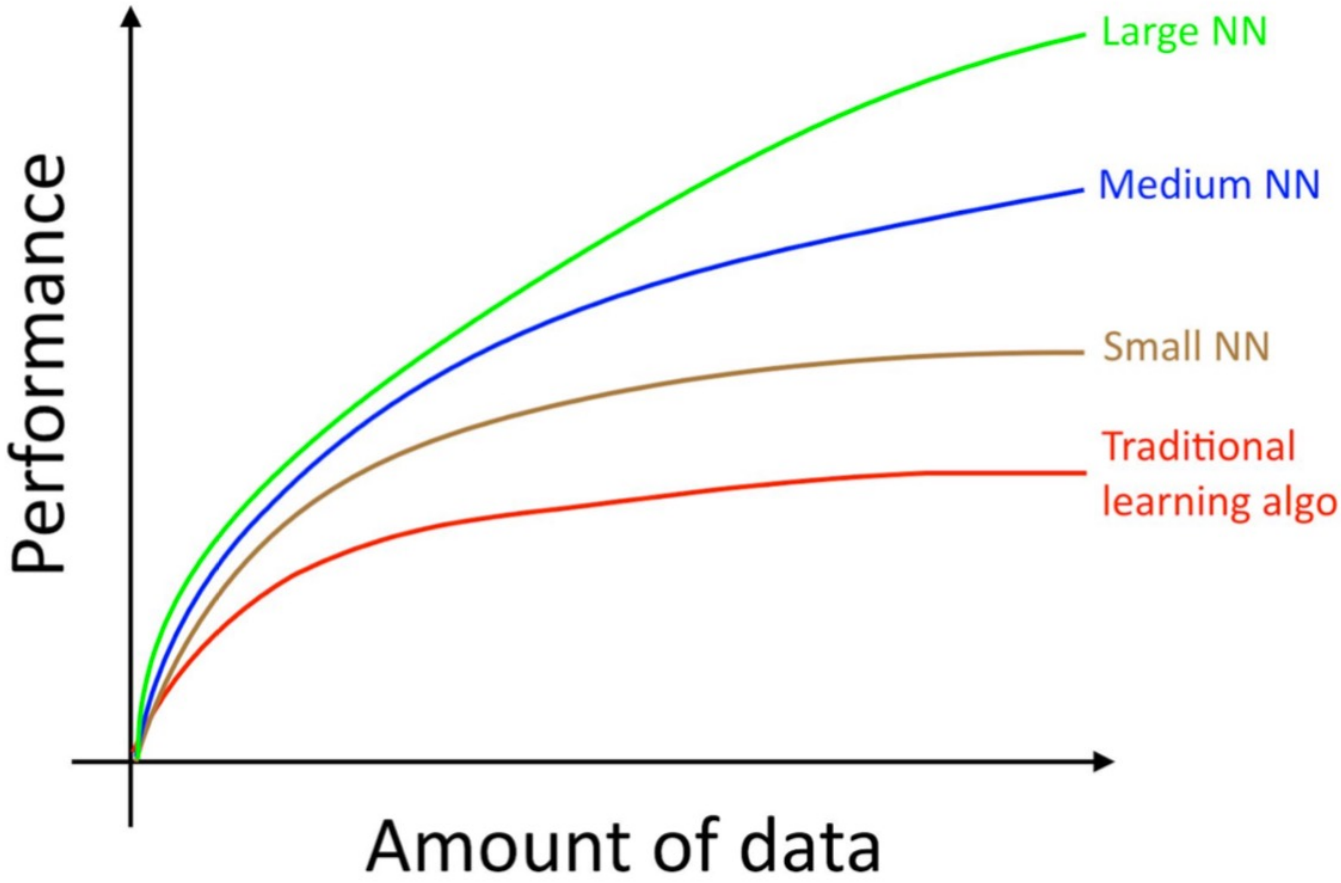
Performance, Data, Algoritmi



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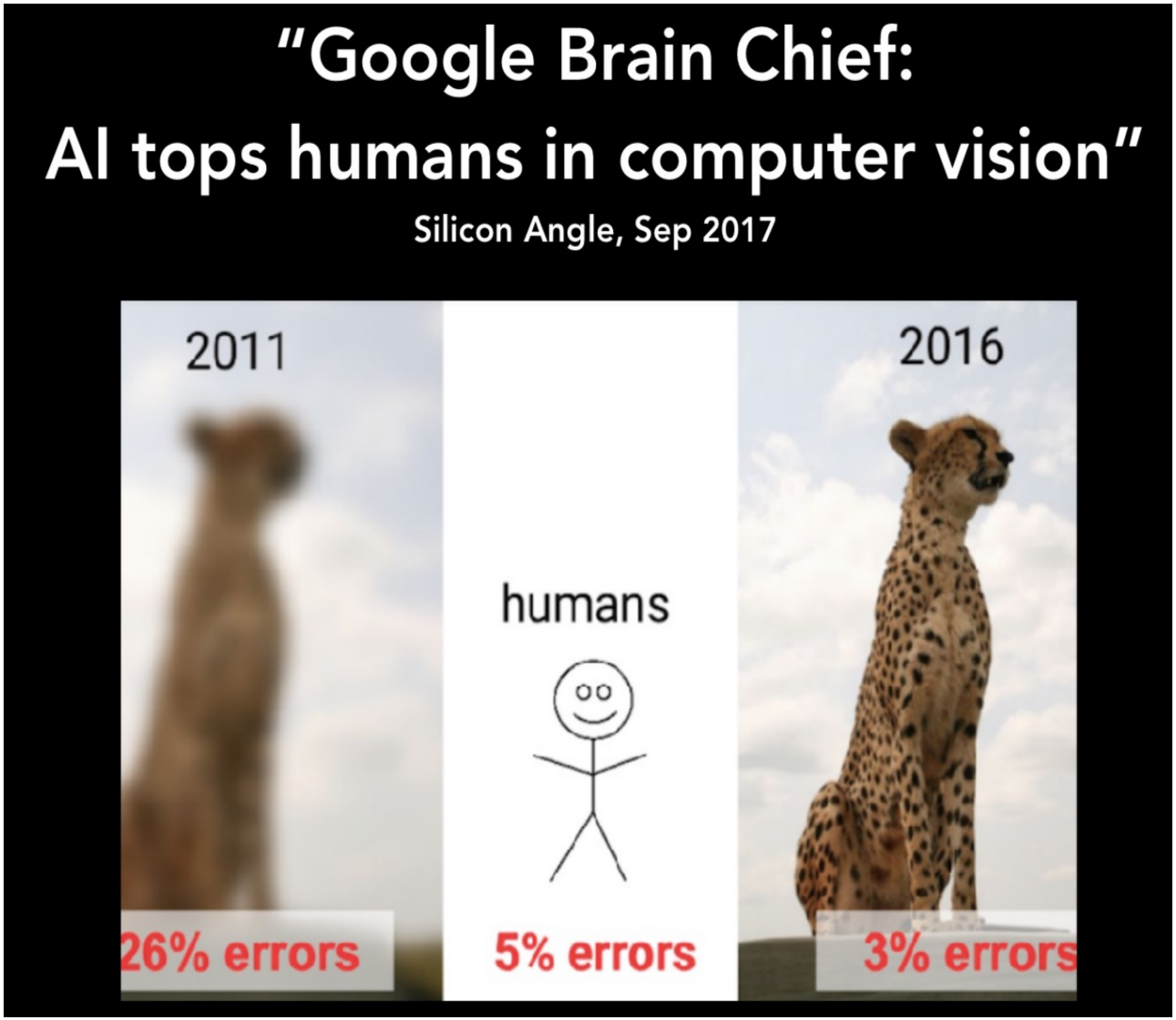
IA Meglio dell'uomo … in alcuni task



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Tesla autopilot demo

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Non solo Tesla

GM AUTONOMOUS CAR WITHOUT STEERING WHEEL OR PEDALS BY 2019

Experts Predict Car Ownership “Dead” by 2025

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Applicazioni del Machine Learning

AIRBUS BUILDING ELECTRIC-POWERED FLYING TAXI – TESTING IN 2018

Carries 4 passengers on short flights in dense urban areas, connecting train stations and airports. Piloted to begin, eventually fully autonomous.

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Atlas Boston Dynamics

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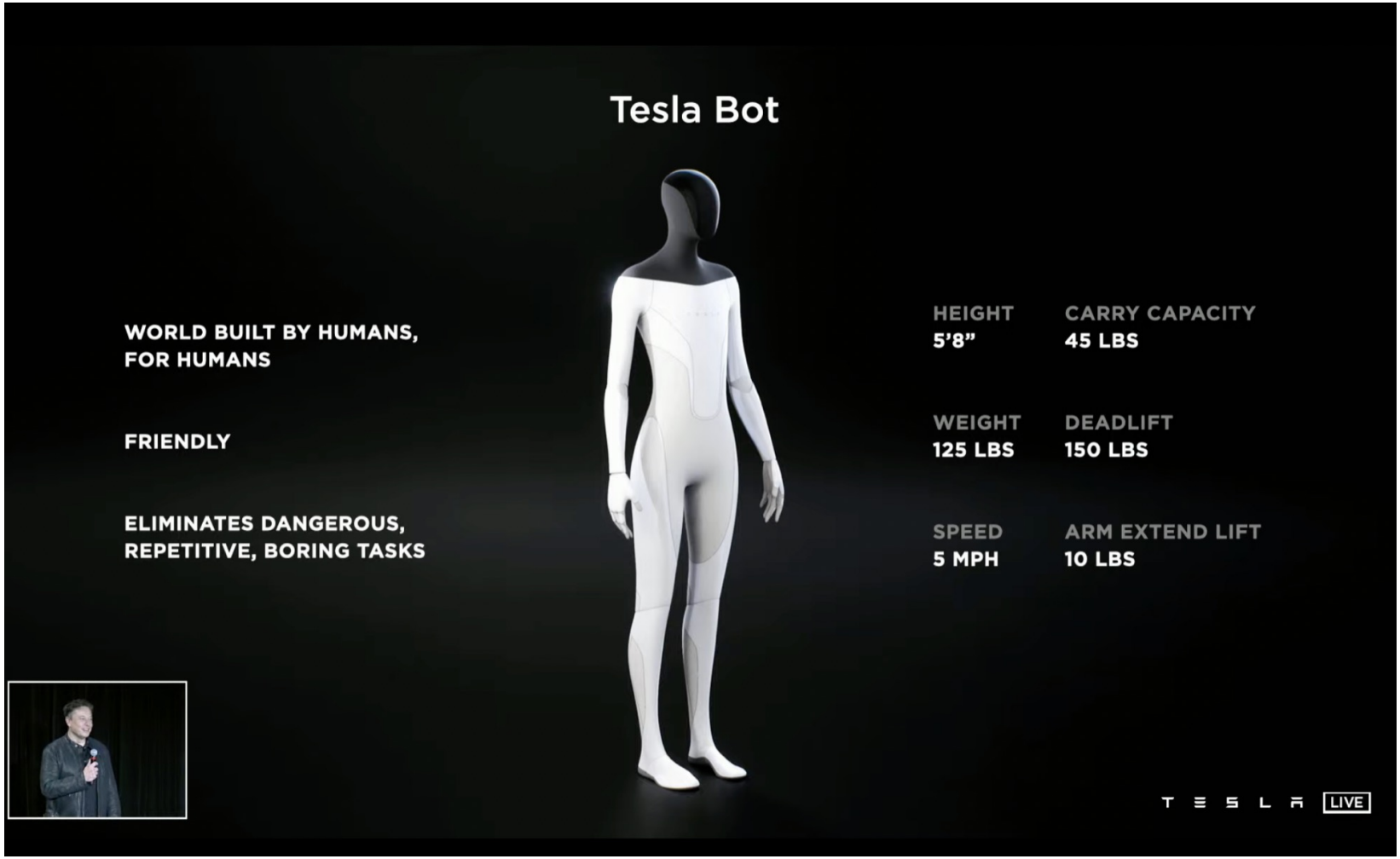
Demo Tesla Bot (**Optimus**) … coming soon



https://www.youtube.com/watch?v=JgMQDtDVz_M

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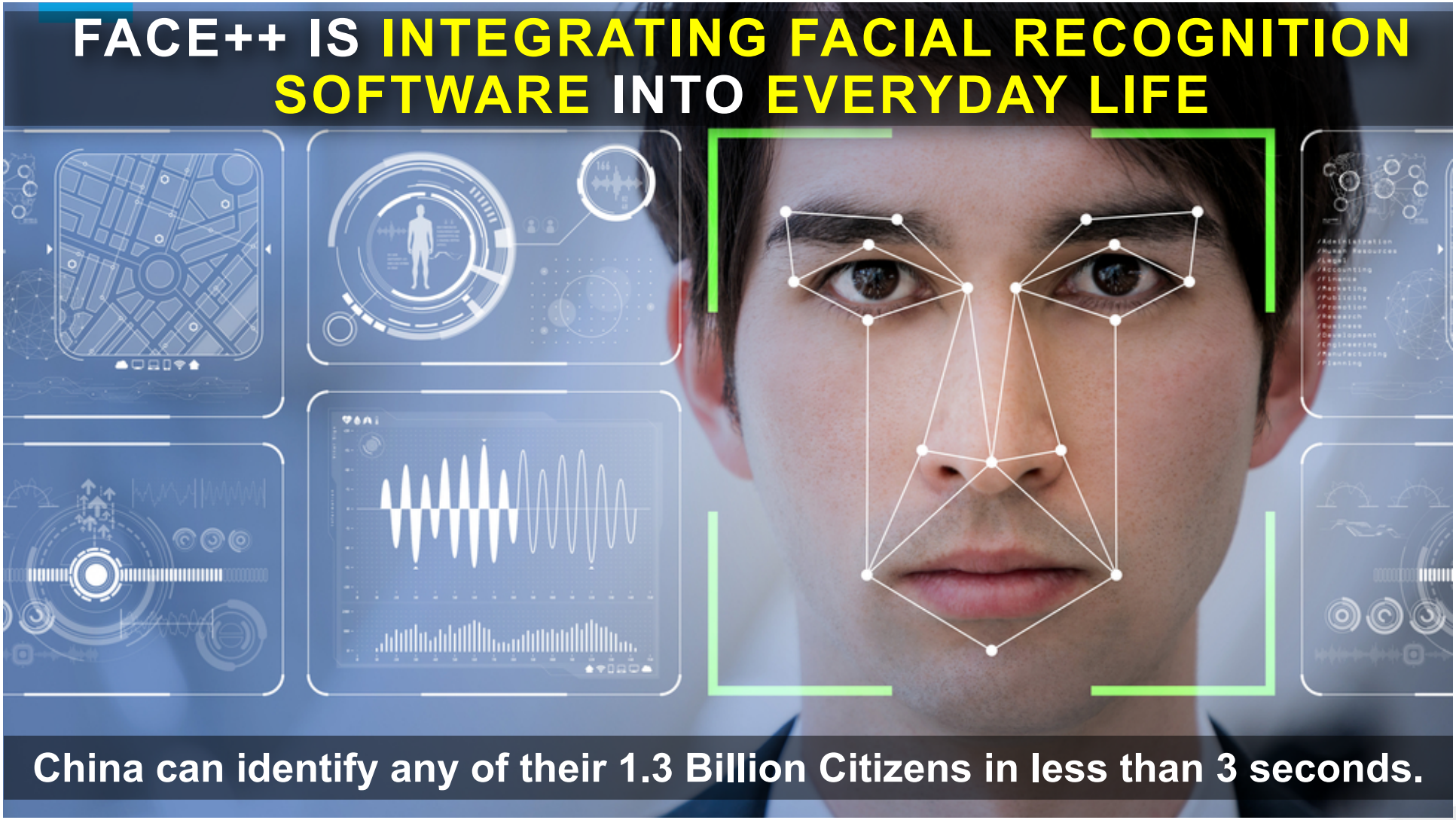
Applicationi del Machine Learning



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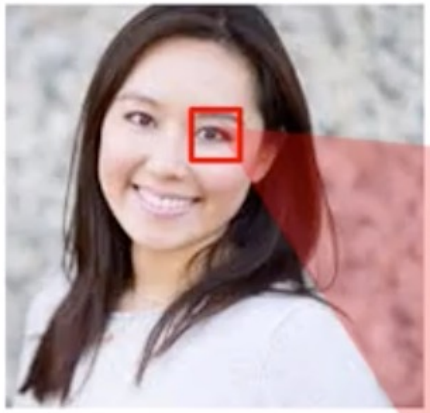
Deep Learning: Face Recognition



30	32	22	12	10	10	12	33	35	30
12	11	12	234	170	176	13	15	12	12
234	222	220	230	200	222	230	234	56	78
190	220	186	112	110	110	112	180	30	32
49	250	250	250	4	2	254	200	44	6
55	250	250	250	3	1	250	245	25	3
189	195	199	150	110	110	182	190	199	55
200	202	218	222	203	200	200	208	215	222
219	215	220	220	222	214	215	210	220	220
220	220	220	220	221	220	221	220	220	222

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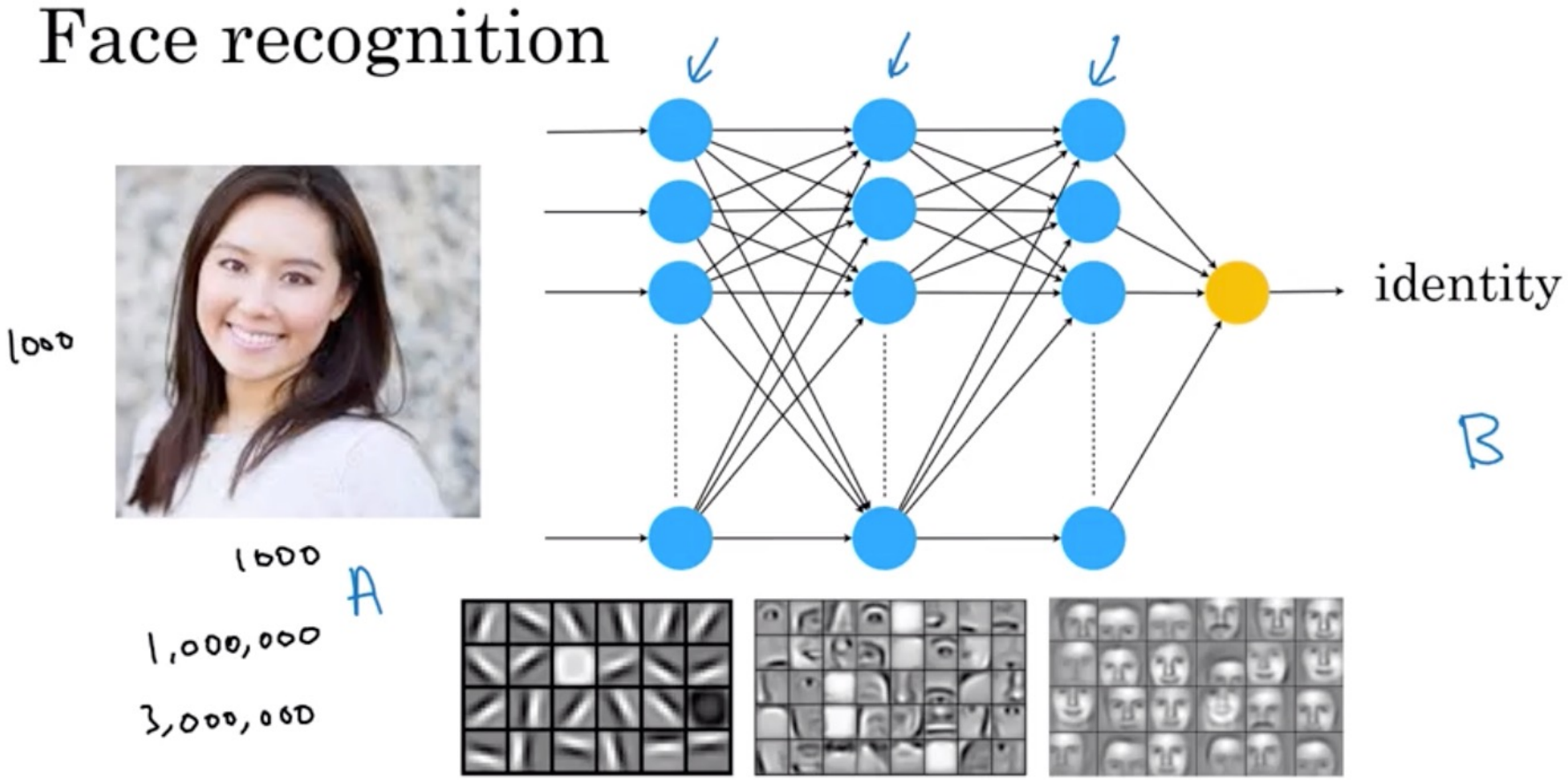
Deep Learning: Face Recognition



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YOLO: You Only Look Once

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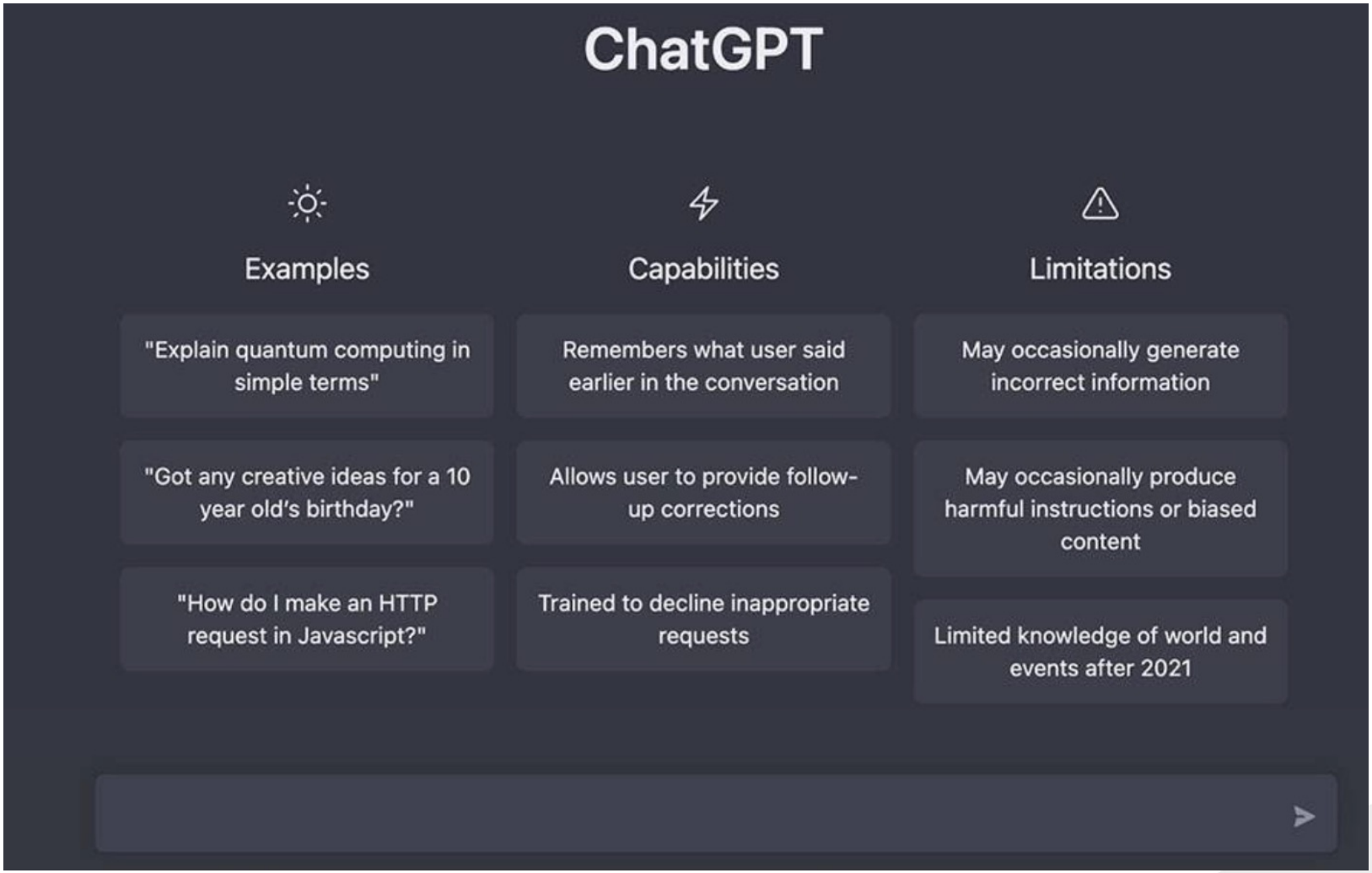
Come usare Chat GPT?

- ✓ https://chat.openai.com/chat



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Riflessioni su ChatGPT

- ✓ Non è ancora GAI
- ✓ Ma quanti lavori richiedono per essere sostituiti le capacità di una GAI?
- ✓ L'AI è una tecnologia esponenziale ma la nostra società, le norme, la politica è meno che lineare ☹

MARCH 22, 2023 — Editors' notes

AI vs EU: ChatGPT shakes up Brussels plans for regulation

by Raziye Akkoc

ChatGPT appeared in November and immediately generated a buzz …

How do you protect people using new technology when it can radically change from one day to the next?

Tech leaders urge a pause in the 'out-of-control' artificial intelligence race

March 29, 2023 · 5:05 PM ET

By The Associated Press

The OpenAI logo is seen on a mobile phone in front of a computer screen displaying output from ChatGPT on March 21, in Boston. A group of prominent computer scientists and other tech industry notables are calling for a 6-month pause to consider the risks of powerful artificial intelligence technology.

Michael Dwyer/AP

Are tech companies moving too fast in rolling out powerful artificial intelligence technology that could one day outsmart humans?

That's the conclusion of a group of prominent computer scientists and other tech industry notables such as Elon Musk and Apple co-founder Steve Wozniak who are calling for a 6-month pause to consider the risks.

Pugliese, 2023

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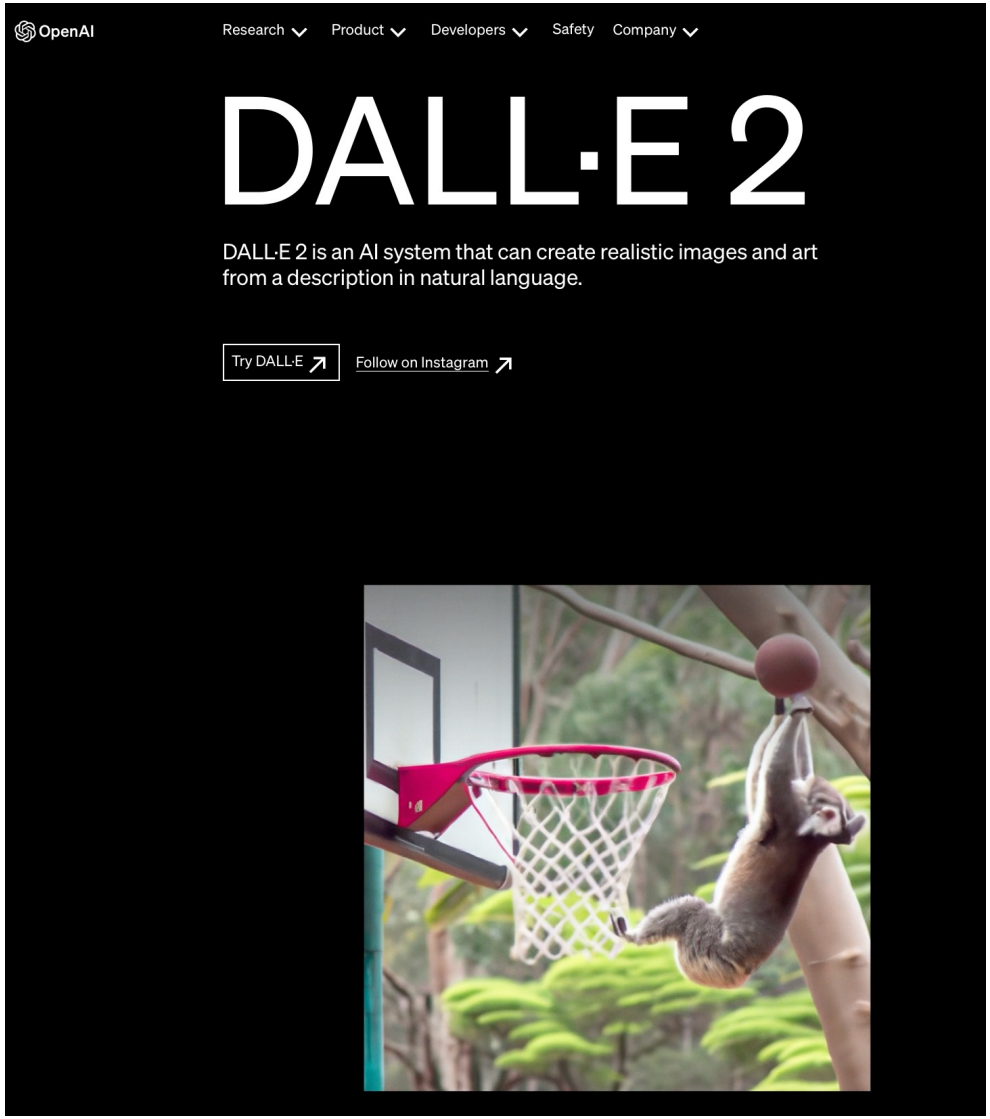

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E nel campo della musica?

✓ https://google-research.github.io/seanet/musiclm/examples/

MusicLM: Generating Music From Text

| paper | dataset |

Andrea Agostinelli, Timo I. Denk, Zalán Borsos, Jesse Engel, Mauro Verzetti, Antoine Caillon, Qingqing Huang, Aren Jansen, Adam Roberts, Marco Tagliasacchi, Matt Sharifi, Neil Zeghidour, Christian Frank
Google Research

Abstract We introduce MusicLM, a model generating high-fidelity music from text descriptions such as *"a calming violin melody backed by a distorted guitar riff"*. MusicLM casts the process of conditional music generation as a hierarchical sequence-to-sequence modeling task, and it generates music at 24 kHz that remains consistent over several minutes. Our experiments show that MusicLM outperforms previous systems both in audio quality and adherence to the text description. Moreover, we demonstrate that MusicLM can be conditioned on both text and a melody in that it can transform whistled and hummed melodies according to the style described in a text caption. To support future research, we publicly release MusicCaps, a dataset composed of 5.5k music-text pairs, with rich text descriptions provided by human experts.

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Mettendo tutto insieme?
ChatGPT, D-ID, Elevenlabs.io

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Impatto dell'AI sull'occupazione mondiale

Jobs displaced by 2030	Jobs created by 2030
400-800 mil	555-890 mil

[Source: McKinsey Global Institute.]

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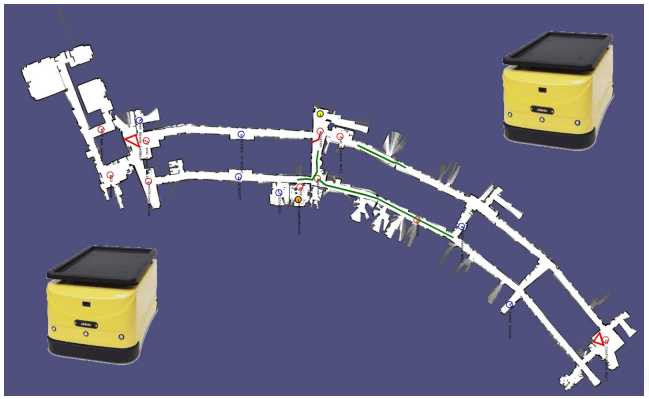
Lo skill gap

FAIR side effects:Essential Remotisation Project

- In-house Elettra project led by IT in collaboration with the beamlines
- Started during the pandemic, had success, continues in 2023
- Remotisation focused on:
  - **Data**
  - **Computers,** and
  - **Novel systems**



- Examples:
  - Remote access to beamline workstation for experiment **control**, data **analysis** systems, remote data **repositories**, electronic **logbooks**, and IT **R&D** on remotisation software and robotics all orchestrated via VUO

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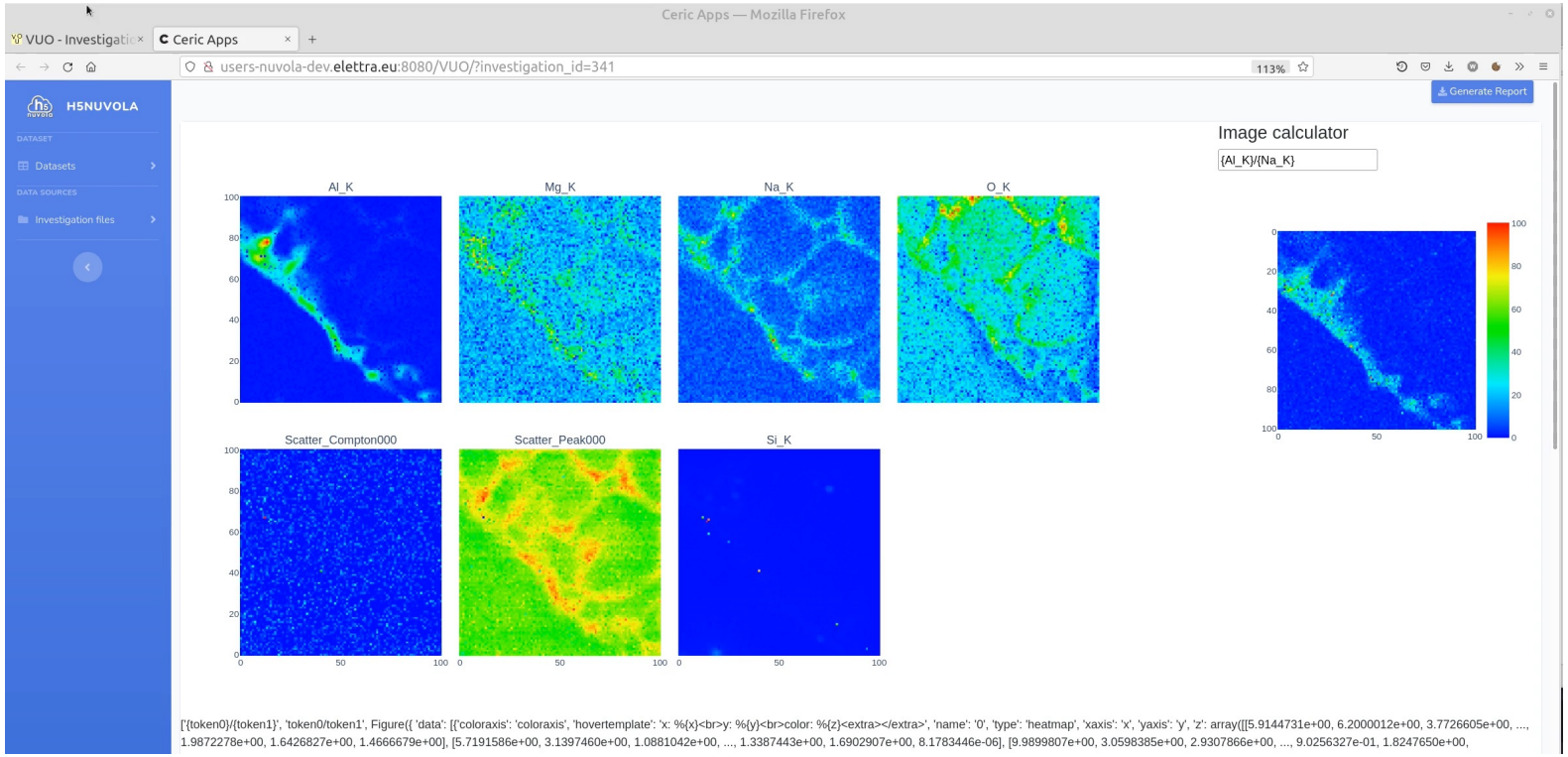
H5nuvola:
HDF remote interactive visualisation



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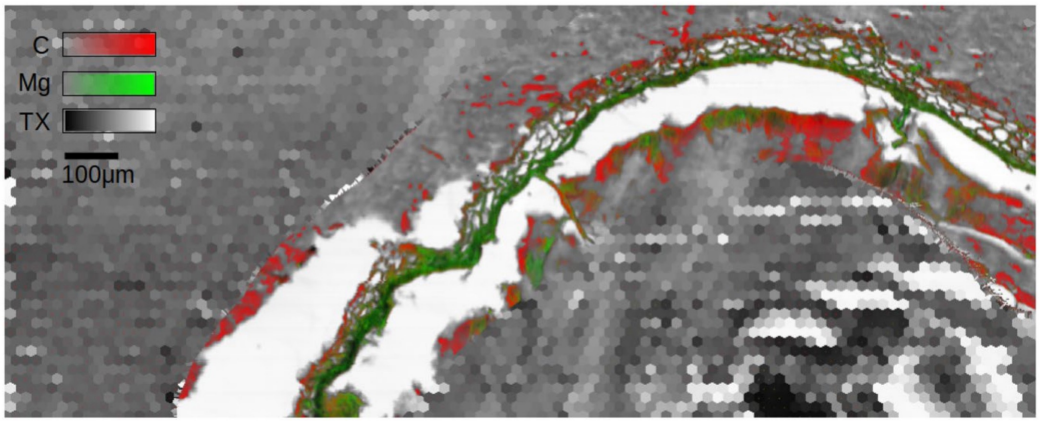
OPEN

Compressive Sensing for Dynamic XRF Scanning

George Kourousias[1]✉, Fulvio Billè[1], Roberto Borghes[1], Antonio Alborini[2], Simone Sala[1,3], Roberto Alberti[2] & Alessandra Gianoncelli[1]

SCIENTIFIC REPORTS
nature research

- Compressive Sensing is an emerging and very effective technique for reconstruction from a relatively small number of data samples without compromising the imaging quality
- In our case it allows performing scans of a dynamic nature where it is possible to skip points (sparse) and acquire with variable parameters (i.e. acquisition time)
- The same scans performed in a raster way (square or rectangular) would take much longer
- It would allow for faster imaging and therefore higher statistics
- It saves time and storage space (therefore also money)



0.4MPixel Sparse scan and Masking combined with a Conditional scan and multimodal acquisition on a cane root section sample. The STXM data (grey) (2000 µm × 800 µm) are acquired with a dense sampling (2 µm step size) along the border of the cane root section while in a sparse way (20 µm step size) in the remaining masked areas. The XRF data have been collected in a similar reduced manner (C in red, Mg in green) and are displayed overlapped with the STXM image. A traditional/complete acquisition (2 µm step size) on the total area would require a measurement time 3 times longer.

Analyst

ROYAL SOCIETY OF CHEMISTRY

COMMUNICATION

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Accepted 6th July 2021

DOI: 10.1039/d1an01074c

rsc.li/analyst

Megapixel scanning transmission soft X-ray microscopy imaging coupled with compressive sensing X-ray fluorescence for fast investigation of large biological tissues

George Kourousias, [a] Fulvio Billè, [a] Roberto Borghes,[a] Lorella Pascolo [b] and Alessandra Gianoncelli [a]*

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Ptychography

PeerJ Computer Science

A modular software framework for the design and implementation of ptychography algorithms

Francesco Guzzi[1], George Kourousias[1], Fulvio Billè[1], Roberto Pugliese[1], Alessandra Gianoncelli[1] and Sergio Carrato[2]

[1] Elettra Sincrotrone Trieste, Basovizza, Italy
[2] Dipartimento di Ingegneria e Architettura, Università degli studi di Trieste, Trieste, Friuli Venezia Giulia, Italy

Guzzi et al. (2022), *PeerJ Comput. Sci.*, DOI 10.7717/peerj-cs.1036

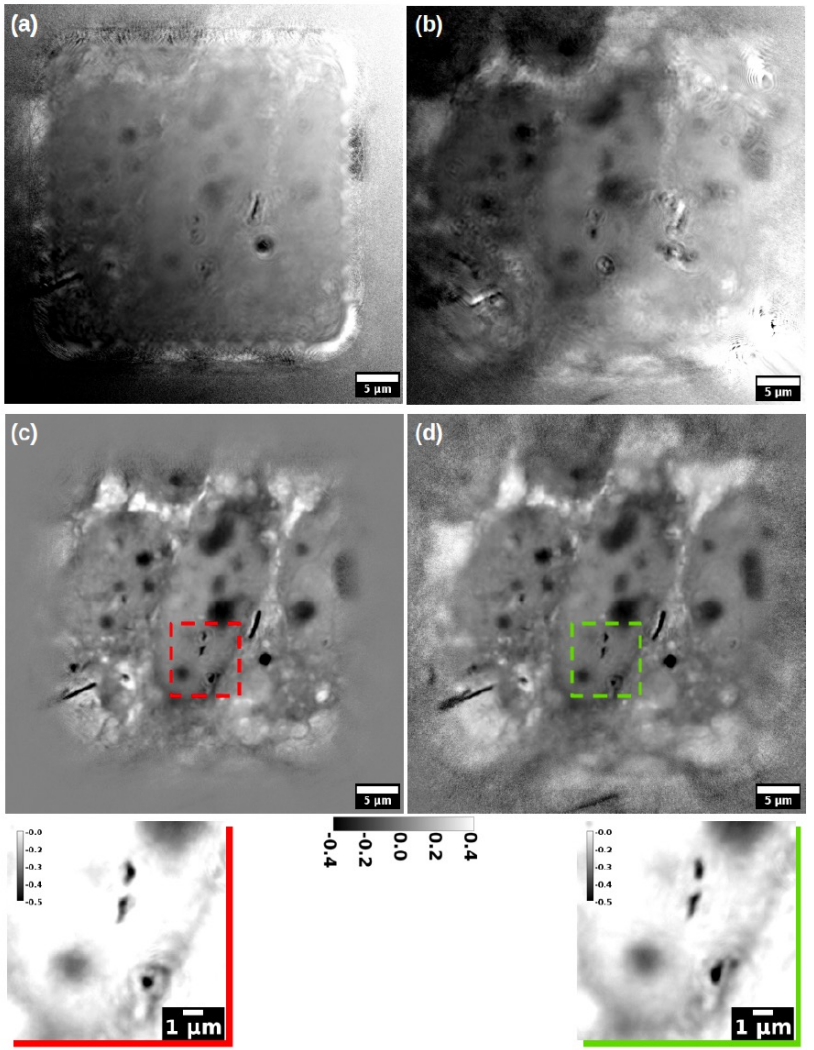

Figure 3 **Reconstruction of a MET cells sample.** (A) and (B) show respectively the output of DM and ML, paired with the position correction algorithm (*Mandula et al., 2016*). (C) and (D) show the reconstruction with the proposed recipe, using M-ePIE (C) and M-rPIE (D). The insets show how the latter gives fewer ringing artefacts.

life *Life* **2023**, *13*, 629. https://doi.org/10.3390/life13030629 MDPI

Article

Automatic Differentiation for Inverse Problems in X-ray Imaging and Microscopy

Francesco Guzzi [1,*], Alessandra Gianoncelli [1], Fulvio Billè [1], Sergio Carrato [2] and George Kourousias [1]

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[2] Department of Engineering and Architecture (DIA), University of Trieste, 34127 Trieste, Italy
* Correspondence: francesco.guzzi@elettra.eu

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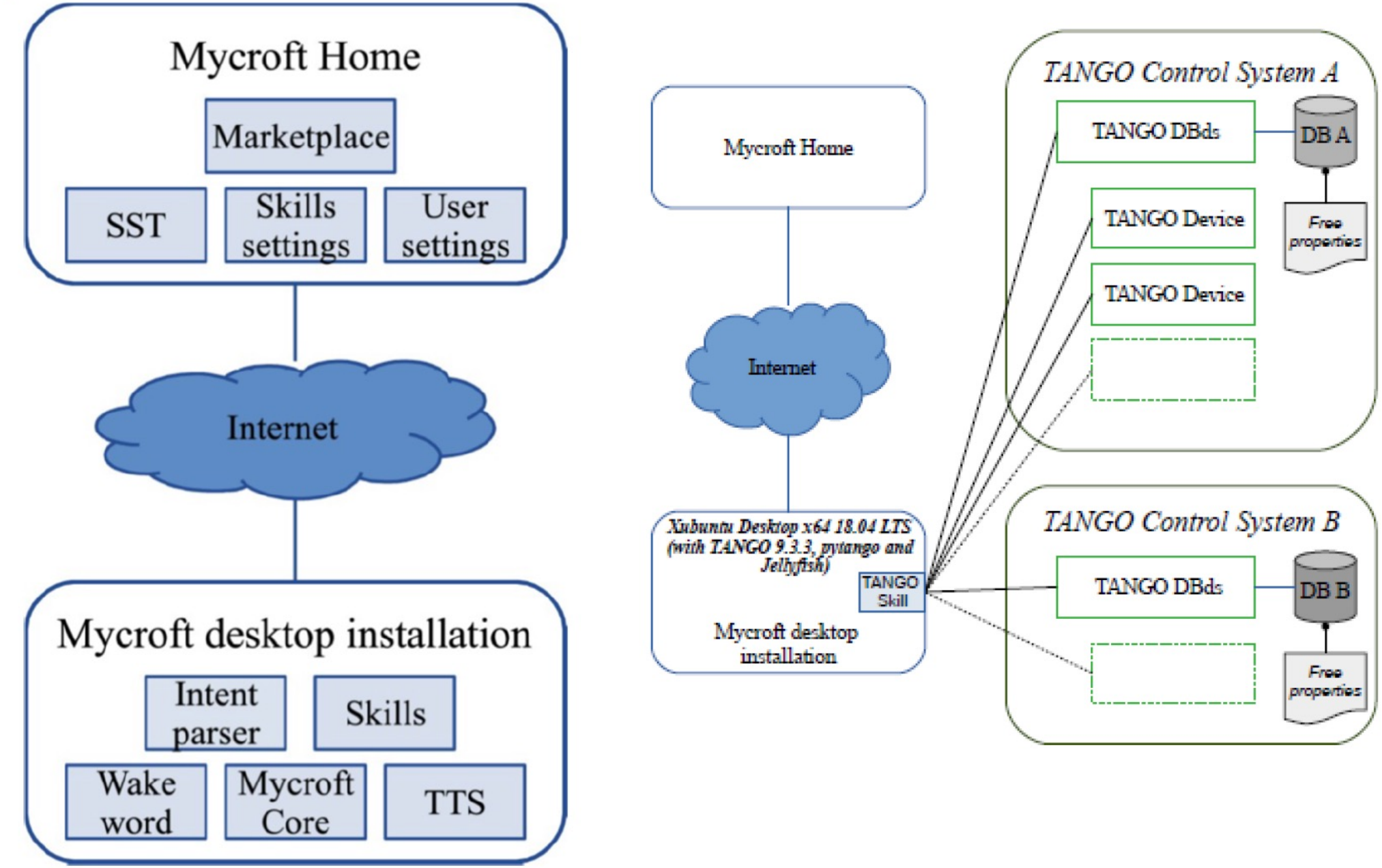
Summary of LDM Experiment from remote

Results:

1) Testing the Telerobot: It worked but…
   - The quality of the connection was poor. We heard informally that this is a known limit of the Wi-Fi infrastructure in FERMI-ExpHall, which will be upgraded.
   - The high level of acoustic noise in FERMI-ExpHall may be in part responsible for the frequent audio gaps.
   - connection software is inferior to Zoom: limited number of participants (5); no clear participants' list. Need to generate and email a new link every time the connection is broken and re-made.
   - Let us note that in our case quality of the connection prevails over mobility, so a cabled connection can be considered.
   - Impossible to switch back from Down Camera to Front Camera (known issue).
   - Screen sharing is not possible. The resolution of the Camera



VOICE USER INTERFACES FOR CONTROL SYSTEM AND EXPERIMENT CONTROL



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