



How frontier technologies will impact on the interoperability of CitiVerse Development

Dr. Christina Yan Zhang
CEO

The Metaverse Institute
3 June 2024

Rotterdam, Netherland



Data is the new Oil-It is about to explode!

The Economist

Theresa May v Brussels

Ten years on: banking after the crisis

South Korea's unfinished revolution

Biology, but without the cells

MAY 6TH-12TH 2017

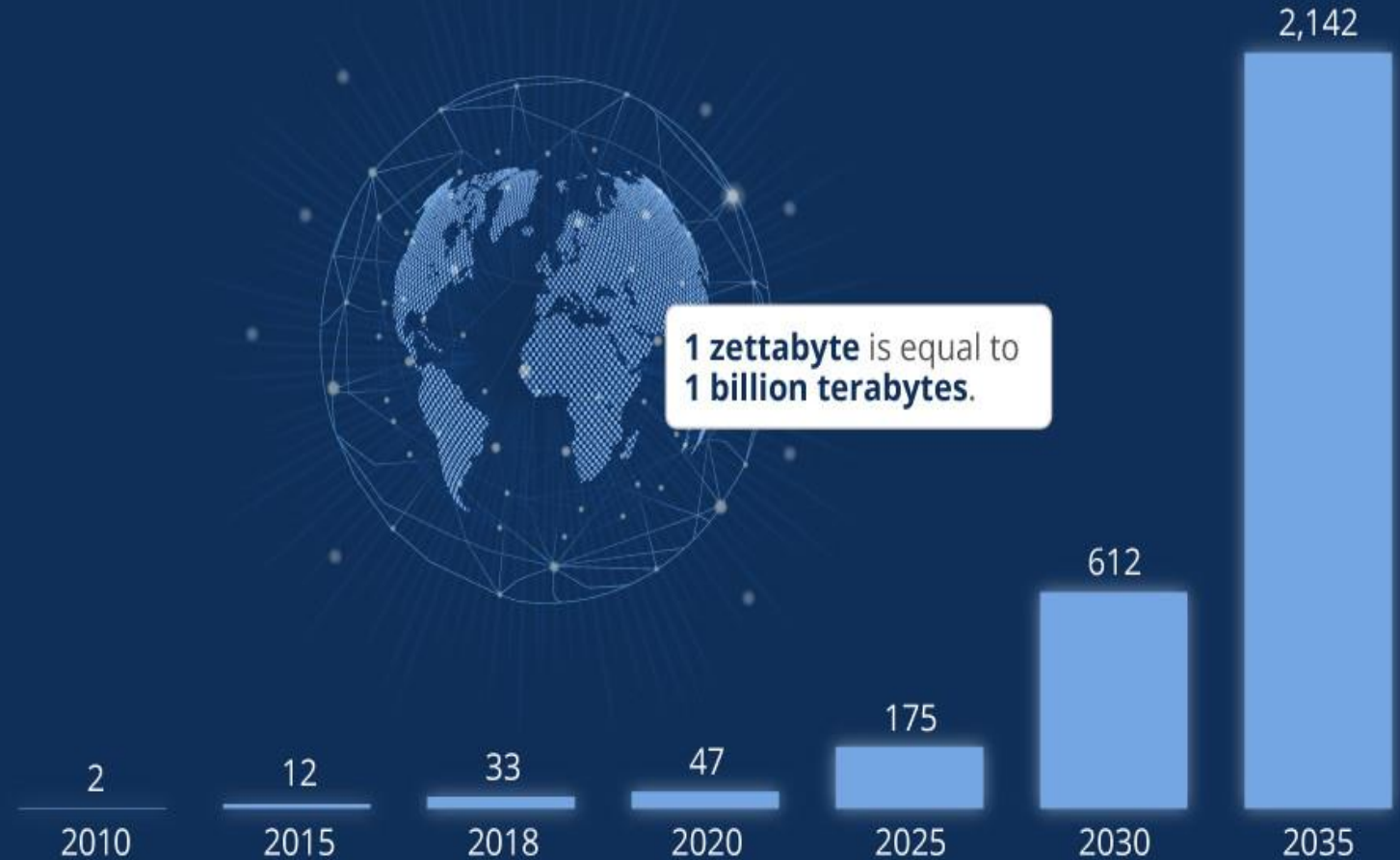
The world's most valuable resource



Data and the new rules of competition

Global Data Creation is About to Explode

Actual and forecast amount of data created worldwide 2010-2035 (in zettabytes)



@StatistaCharts

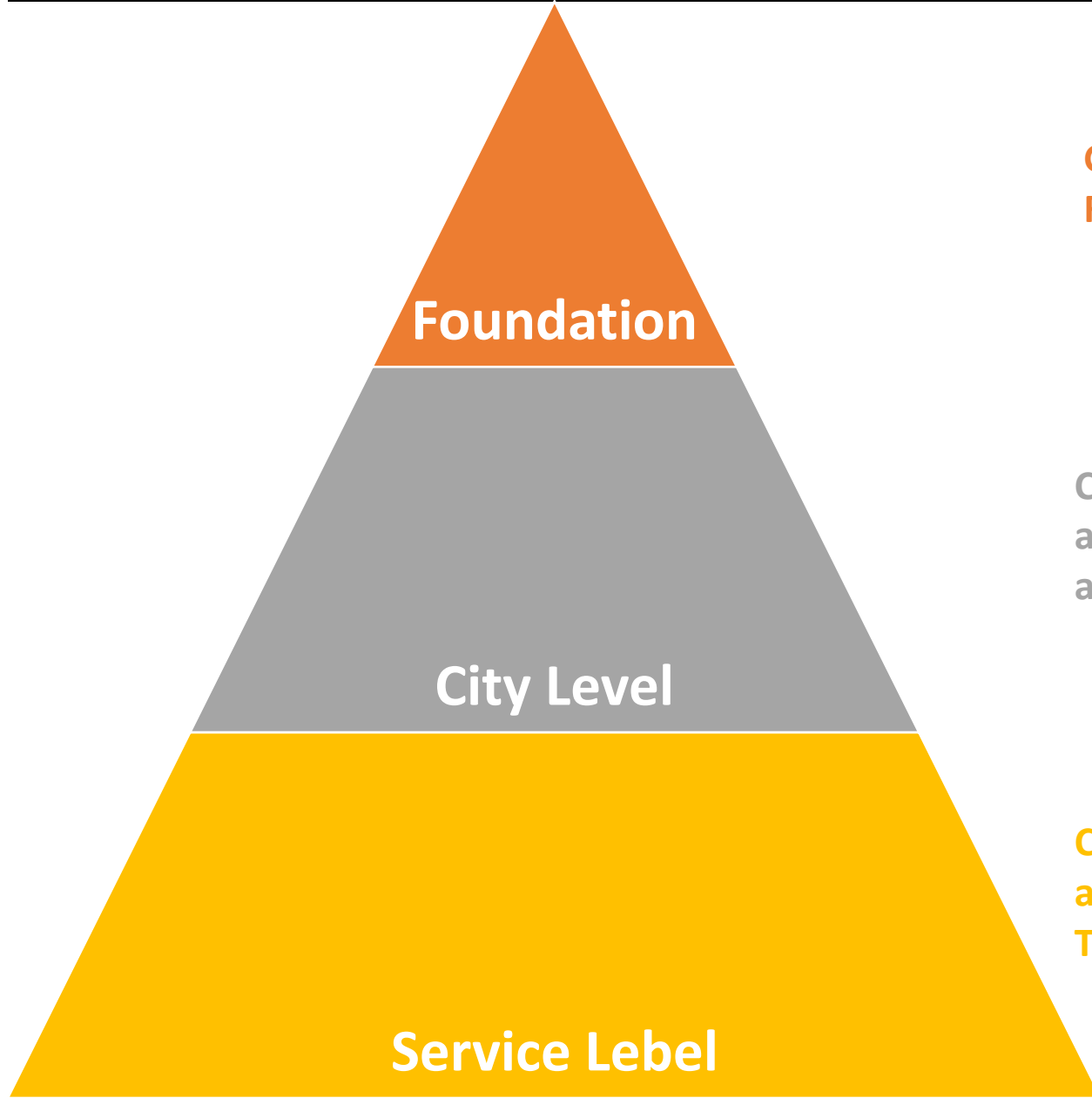
Source: Statista Digital Economy Compass 2019

statista

Interoperability in smart cities-Mission Impossible 8 With Tom Cruise?



Interoperability: City Data Model ISO/IEC 50871: to develop a common data model of city data that can be used to integrate data from across silos



General concepts such as Time, Location, Activity, Events, Resources, and Units of Measure .

Concepts that are general to cities and span all services such as Households, Services, Residents. Data is both produced and consumed by multiple services.

Concepts commonly associated with/produced by one service and shared with/consumed other services. For example, Transport services share Vehicles and Transport network.

CitiVerse starts as an EU Initiative: To develop citizen-centric virtual world for EU cities and communities



English



The European way of digital transformation in cities and communities

Shaping Europe's digital future

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EVENT | Publication 26 April 2023

Info day - Developing CitiVerse

23 May 2023

During this info day, the next Digital Europe Programme (DIGITAL) funding opportunity for Smart and Sustainable Cities and Communities, for the topic Developing CitiVerse, will be presented.

Don't miss this info day session to find out more about the topic Developing CitiVerse ([DIGITAL-2023-CLOUD-AI-04-DEVELOPCITI](#)).

Further information can be found in the [call text](#).

There will be the opportunity to network and present your ideas for a proposal!



[Register here](#)

[Home](#)

CitiVerse: Technical Subgroup Meeting



Sophie Meszaros
Project Manager

On the 4th of September 2023 a virtual workshop was held within the technical sub-group of Living-in.eu led and prepared by Digitaal Vlanderen, Martine Delannoy supported by Sophie Meszaros, OASC.

The focus was a contribution to the pre-standardisation roadmap for the CitiVerse. Through the prioritization of use cases with Living-in.eu the participant contributed to an inclusive, citizen centric and sustainable CitiVerse.

A **CitiVerse** is a series of interconnected and distributed hybrid and virtual worlds representing, and synchronized with, their physical counterparts. It offers new (administrative, economic, social, policymaking, and/or cultural) virtual goods/services/capabilities to city and community actors such as citizens, represented as digital avatars.

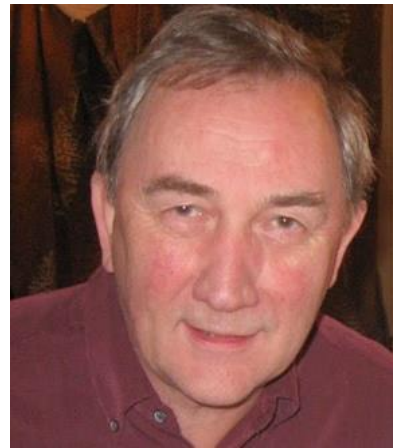
During the workshop 27 Participants contributed valuably. The pre-standardisation initiative was explained by the EU Commission representatives. The similarities and differences between the Metaverse and CitiVerse were highlighted. Followed by a workshop in which all were invited to explore use case contributions by experts, enrich and prioritize these in function of the priorities and needs in the smart and sustainable cities and communities context.

A Metaverse Pioneer since 2006, full scholarship PhD in using digital twins in the metaverse for the AEC industry



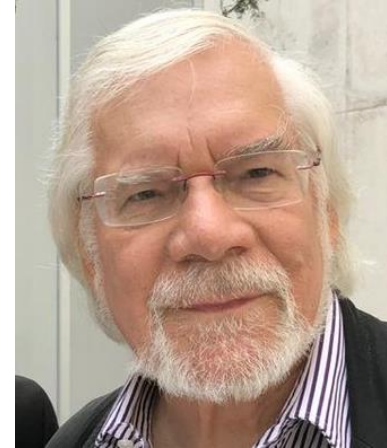
1st for Communication and Media Studies

The Complete University Guide 2024



Prof. Michael Pickering
Emeritus Professor of Media and Cultural Analysis

- ❖ The UK's Arts and Humanity Research Council Peer Review College(2002-2012)
- ❖ Reviews Editor for the European Journal of Communication
- ❖ Editorial board of Memory Studies and the Folk Music Journal
- ❖ Founding member of the Communications and Media Studies course



Prof. Graham Murdock
Professor Emeritus of Culture &Economy

- ❖ World renowned founding expert in critical political economy of culture and communications
- ❖ Vice President of the International Association of Media and Communciation Research (IAMCR) (2016-2020)
- ❖ Member of the European Science Foundation's Expert Panel of Research Proposal Evaluators
- ❖ Founding member of the Communications and Media Studies course



Prof. Peter Golding
Emeritus Professor of Sociology

- ❖ World renowned founding expert in critical political economy of culture and communications
- ❖ Pro-Vice-Chancellor (Research & Innovation) at Northumbria University (2009-2014)
- ❖ Pro-Vice-Chancellor (Research) at Loughborough University (2006-2009)
- ❖ Chair of the communications, media and cultural studies sub-panel for 2008, 2014 REF(Research Exercise Framework).
- ❖ Chair of the Higher Education Funding Council for England Media Studies Advisory Committee.



Dame Shirley Pearce DBE
Emeritus Professor of Health Psychology

- ❖ Vice-Chancellor of Loughborough University 2006-2012
- ❖ The inaugural Chair of the College of Policing (the first professional body for policing) 2013-2016
- ❖ Chair of Governors of the London School of Economics and Political Science 2016-2020
- ❖ Board member at the Higher Education Funding Council for England (HEFCE) 2009 -2015
- ❖ Previous Board member of University of Cambridge, the Healthcare Commission and Health Education England

The Use of Second Life as a Tool for Higher Education Internationalisation



by
Yan Zhang

A research dissertation submitted in partial fulfilment of the requirements of the award of the degree of Master of Arts Of Loughborough University

September 2007

Supervisor: Prof. Graham Murdock
School of Social Sciences

The Use of Massively Multiplayer Online Games to Augment Early-Stage Design Process in Construction

by
Christina Yan Zhang

A Doctoral Thesis submitted in partial fulfilment of the requirements for the award of Doctor of Philosophy of Loughborough University

April 2012
©Christina Yan Zhang, 2012

“The Metaverse has increasingly become a convergence of a whole range of technologies coming together to form the next generation of the internet, which is more interactive, intuitive and immersive.”

Dr. Christina Yan Zhang
Chief executive, The Metaverse Institute

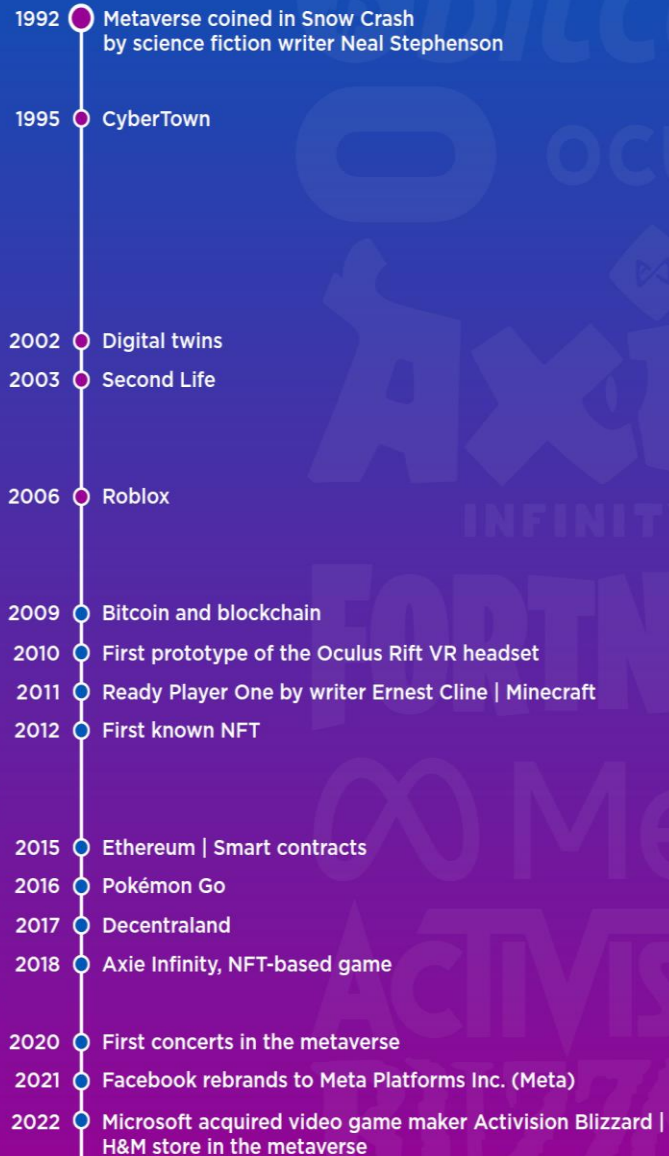


Enterprise Metaverse Summit

June 28th-29th 2023 | London and virtual

What is the Metaverse?

TIMELINE OF THE METaverse



The Seven Layers of the Metaverse



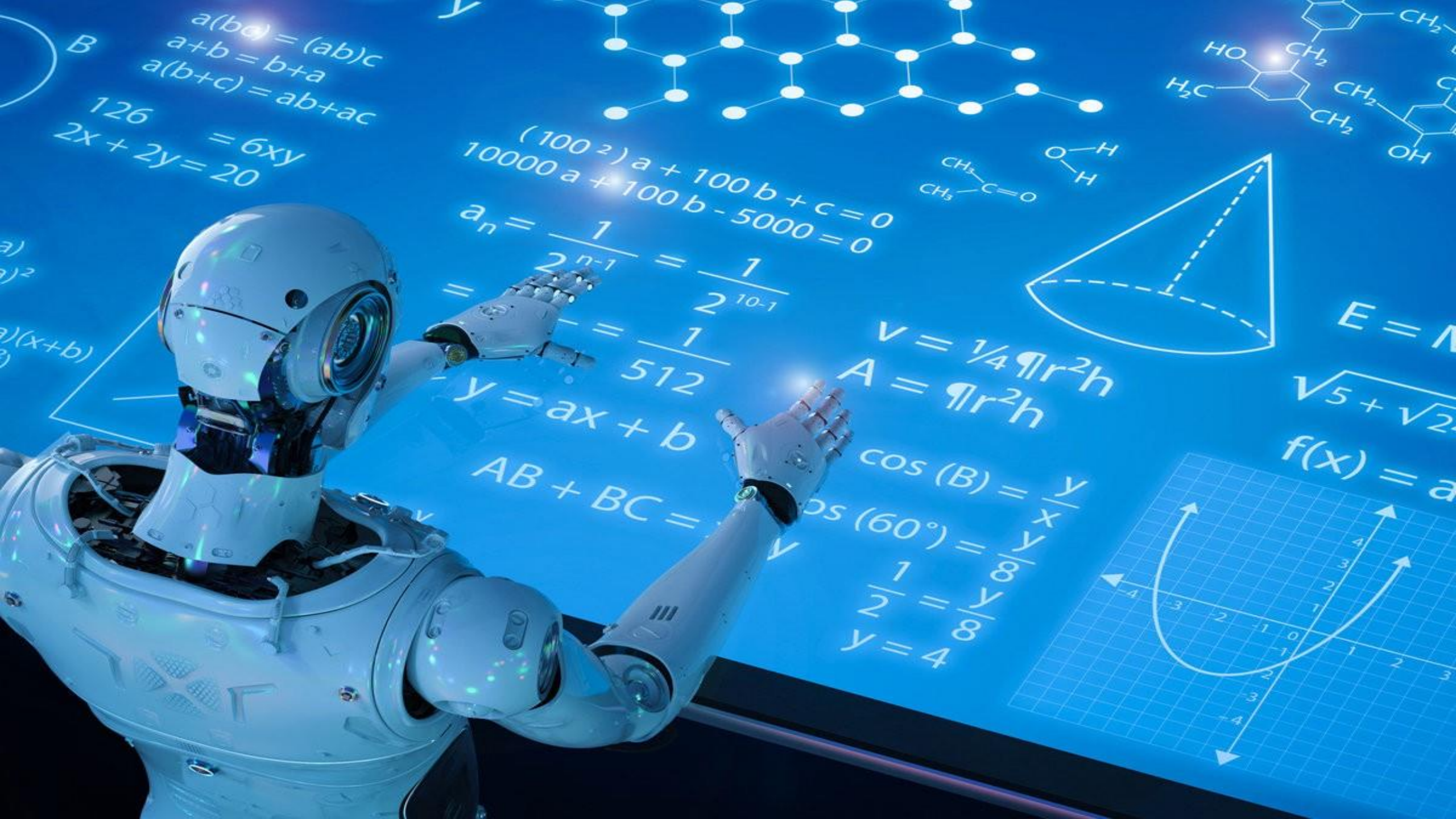
Courtesy: Jon Radoff / Building The Metaverse

Convergence of Our Physical and Digital Worlds





**DIGITAL
TWIN**



$a(bc) = (ab)c$
 $a+b = b+a$
 $a(b+c) = ab+ac$
126 = 6xy
 $2x + 2y = 20$

$(100^2)a + 100b + c = 0$
 $10000a + 100b - 5000 = 0$
 $a_n = \frac{1}{2^{n-1}} = \frac{1}{2^{10-1}}$
 $= \frac{1}{512}$

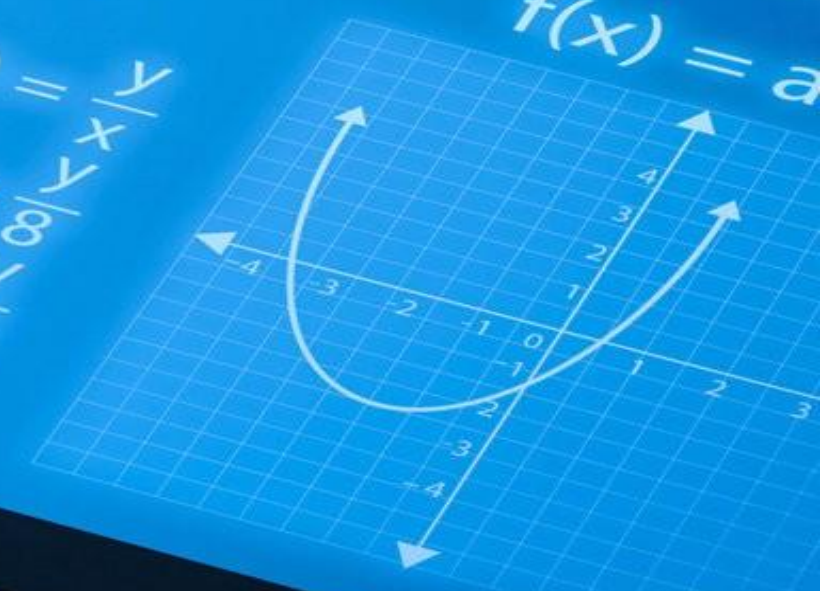
$y = ax + b$
 $AB + BC = \dots$

$V = \frac{1}{4}\pi r^2 h$
 $A = \pi r^2 h$

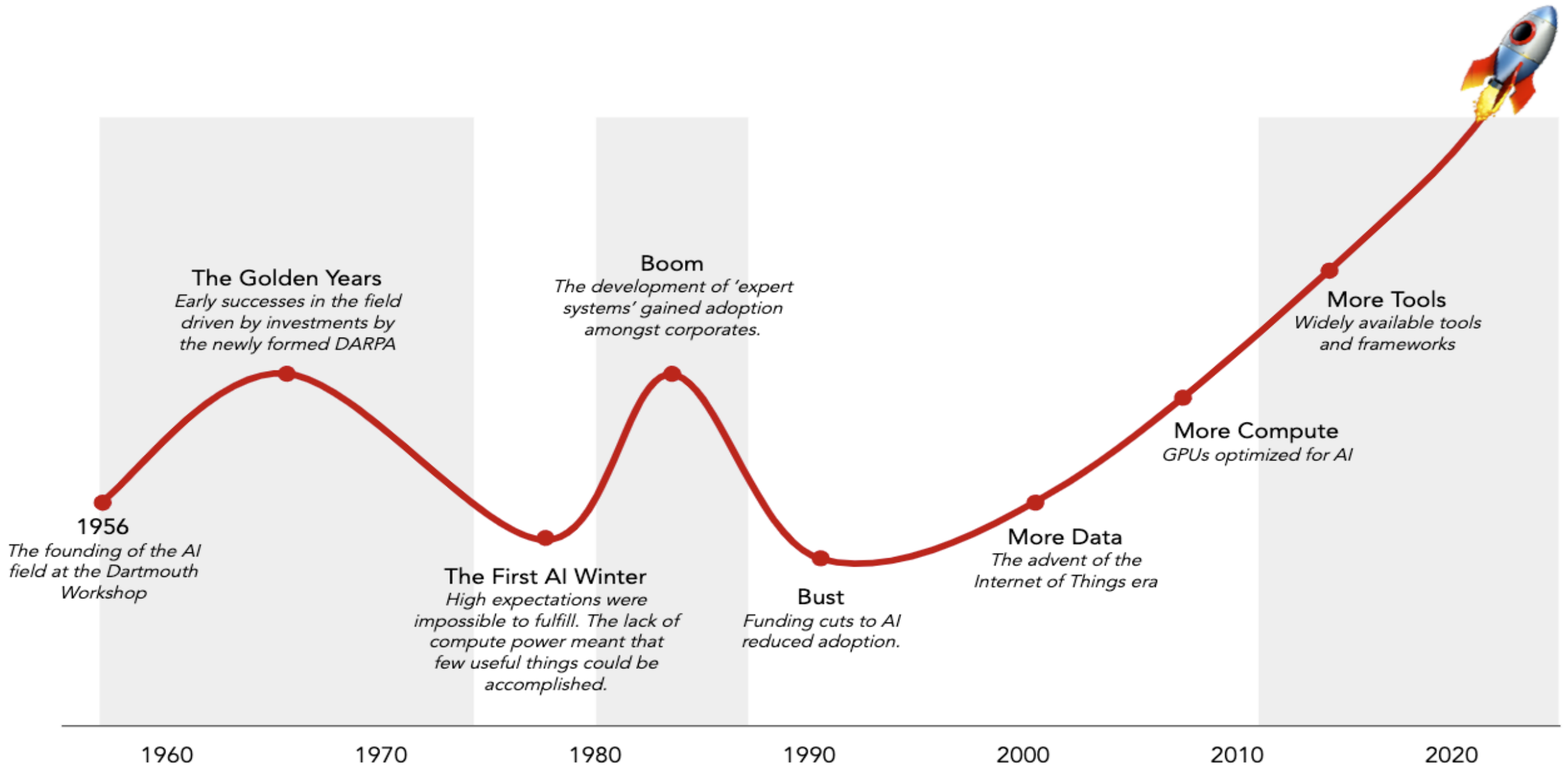
$\cos(B) = \frac{y}{x}$
 $\cos(60^\circ) = \frac{y}{8}$
 $\frac{1}{2} = \frac{y}{8}$
 $y = 4$



$E = M$
 $\sqrt{5 + \sqrt{2}}$
 $f(x) = a$



History of AI- Two winters(1974-80,1987-1993)



Sequoia: Generative AI's output across text, code, images, video, 3D models is expected to improve exponentially through 2030, surpassing what human workers can produce.

SEQUOIA

	Pre-2020	2020	2022	2023 ?	2025 ?	2030 ?
Text	Spam detection Translation Basic Q&A	Basic copywriting First drafts	Longer form Second drafts	Vertical fine-tuning gets good (scientific papers, etc.)	Final drafts better than the human average	Final drafts better than professional writers
Code	One-line auto-complete	Multi-line generation	Longer form Better accuracy	More languages More verticals	Text to product (draft)	Text to product (final), better than full-time developers
Images			Art Logos Photography	Mock-ups (product design, architecture, etc.)	Final drafts (product design, architecture, etc.)	Final drafts better than professional artists, designers, photographers
Video/ 3D/ Gaming			First attempts at 3D/video models	Basic/first draft videos and 3D files	Second drafts	AI Roblox Video games and movies are personalized dreams

Large model availability: ● First attempts ● Almost there ● Ready for prime time

Generative AI For Metaverse- Text to 3D

- Security
- Data Infrastructure
- Automation
- Enterprise Analytics
- More

- HOME
- AI
- DATA CENTER
- DRIVING
- GAMING
- PRO GRAPHICS
- AUTONOMOUS MACHINES
- HEALTHCARE
- STARTUPS
- AI PODCAST

Synthesis AI debuts high-resolution text-to-3D capabilities with synthesis labs

Victor Dey

April 18, 2023 6:00 AM



MDM: Human Motion Diffusion Model

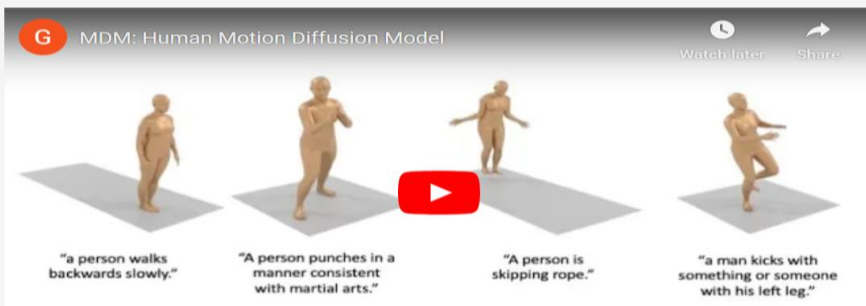
ICLR2023 (Top-25%)

Guy Tevet, Sigal Raab, Brian Gordon, Yonatan Shafir, Daniel Cohen-Or, Amit H. Bermano
Tel Aviv University, Israel

arXiv

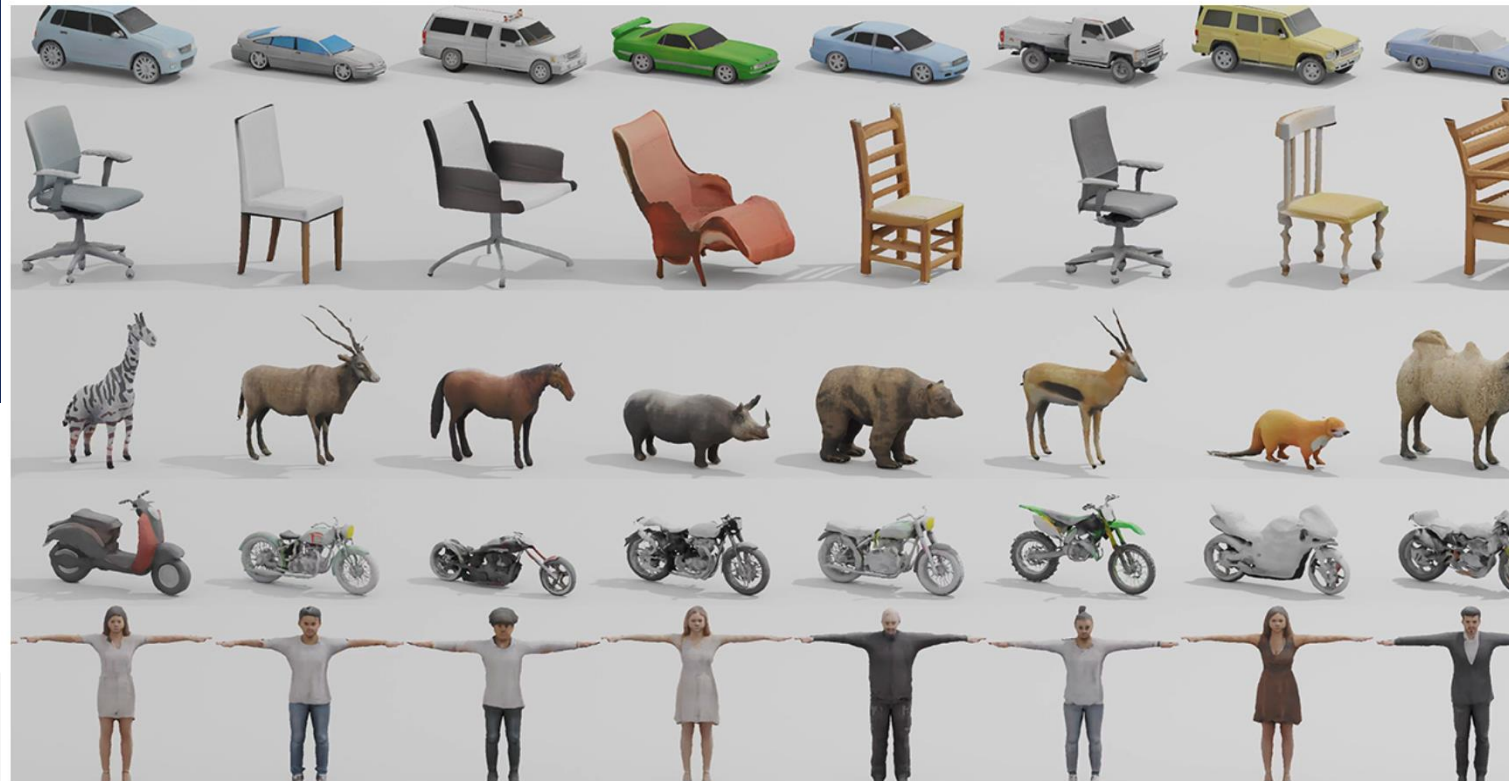
Code

Demo



World-Class: NVIDIA Research Builds AI Model to Populate Virtual Worlds With 3D Objects, Characters

September 23, 2022 by ISHA SALIAN



Share

Reading Time: 3 mins



The massive virtual worlds created by growing numbers of companies and creators could be more easily populated with a diverse array of 3D buildings, vehicles, characters and more — thanks to a new AI model from NVIDIA Research.

Trained using only 2D images, NVIDIA GET3D generates 3D shapes with high-fidelity textures and

Don't Miss This Defining Moment in AI

Watch Now



A close-up, high-contrast photograph of a Terminator robot's face. The robot is wearing dark, wrap-around sunglasses. Its skin is a metallic, textured grey. The lighting is dramatic, with strong highlights on the right side of its face and deep shadows on the left. The background is dark and out of focus.

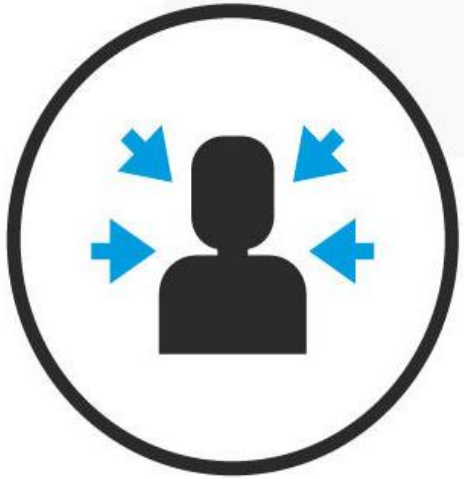
THE TERMINATOR (1984)

I'LL BE BACK

SCENE

THE
TERMINATOR
FANS

People Centred Digital Future



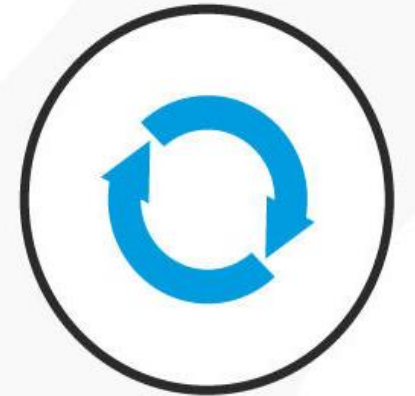
People-Centered



**Solve the
Right Problem**



**Everything is
a System**



**Small & Simple
Interventions**

The World's first People Centred Metaverse Strategy, using emerging technologies to achieve the five priorities of the government by 2040: happiness, sustainability, equality, governance, wellbeing and healthcare, as well as opportunities and risks of AI

Tampere Metaverse Vision 2040

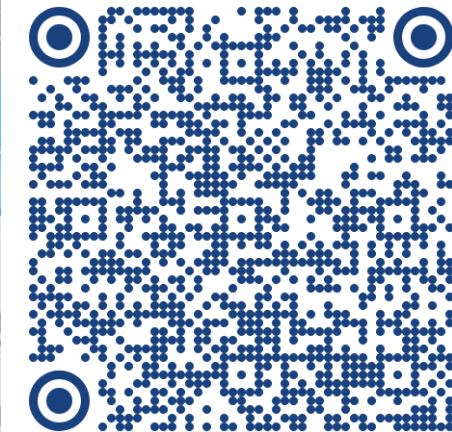
The World's First People Centred Metaverse Strategy

1st June 2023

- ❖ Finland is a Nordic welfare state aims to be carbon neutral by 2035
- ❖ Finland is No.1 happiest country in the world
- ❖ Tampere is the third largest city in Finland, with 250 000 inhabitants
- ❖ Nokia is founded in Tampere nearly 160 years ago.
- ❖ Tampere is a fast growing city with largest age group 20-34 years old.
- ❖ City of Tampere will invest over €6 bn in city development by 2030.
- ❖ The Tampere Region is known for its expertise in AI, imaging, circular economy and the creative industries.

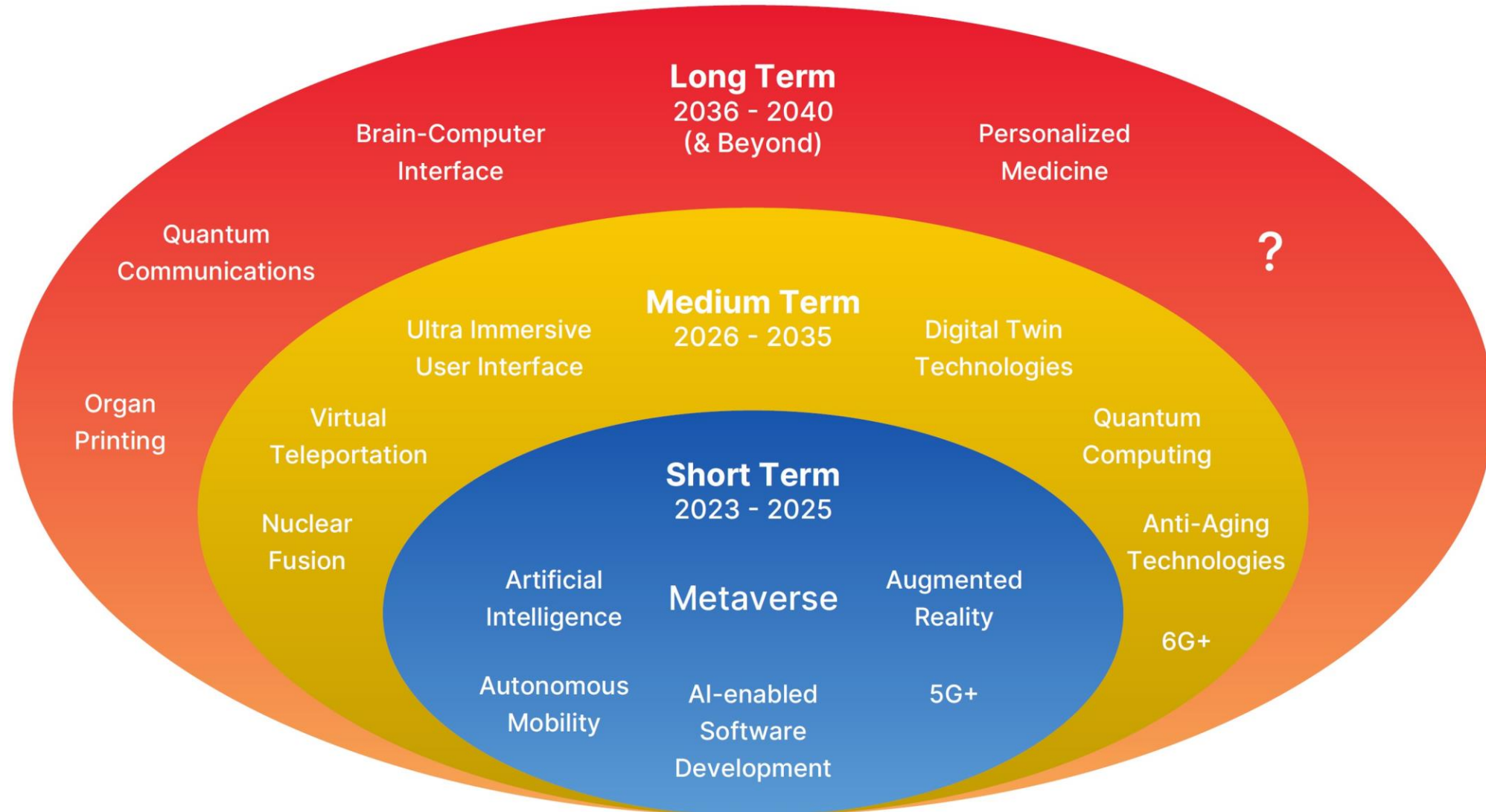


NOKIA



Tampere Metaverse Vision 2040 Technology Map

We have formed a “technology map” depicting when certain technologies mature, which covers key technology applications for different industries along with their ethical and societal implications.



Tampere Metaverse Cognitive City 2040

The Metaverse

(Public, Private, Personal, Centralized, Decentralized ...)



Human Digital Twins

(Different perspectives and personas)



Object Digital Twins

(Public, industrial, personal, mobile, fixed assets)

Cognitive City Brain



Cognitive Digital Thread Engine



Smart Applications Engine



Intelligent Sensing Networks

(Raw data, contextualized data and knowledge)



Legal & Ethics Framework Engine

(Data protection, ethics ...)



Common Technology Infrastructure

(Dynamically updated and augmented)



Public Infrastructure

(Under and over ground)

City Management Smart Applications

Smart Business Applications

Residents Smart Applications

Cognitive City

A woman with her hair in a ponytail is shown from the chest up, looking intently at a glowing digital interface. Her right hand is raised, with fingers spread, as if she is touching or manipulating the interface. The background is a complex, futuristic digital environment with various data visualizations. On the left, there are several panels with charts, a world map, and a circular gauge. In the center, a large world map is visible with glowing points. To the right, there are more charts and a list of business-related terms. The overall color scheme is blue and white, with a high-tech, digital aesthetic. The text 'User Interface' is prominently displayed in the center of the image.

User Interface

/Administration
/Human Resources
/Legal
/Accounting
/Finance
/Marketing
/Publicity

/Protection
/Research
/Business
/Development
/Engineering
/Manufacturing
/Planning

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Introducing

 **Vision Pro**

29 Jan 2024: First human to receive Elon Musk's Neuralink Brain Computer Chip

Elon Musk Said Neuralink's 1st Product 'Telepathy' Implanted in Human Brain For First Time



Elon Musk @elonmusk

Subscribe

The first human received an implant from @Neuralink yesterday and is recovering well.

Initial results show promising neuron spike detection.

NBC NEWS

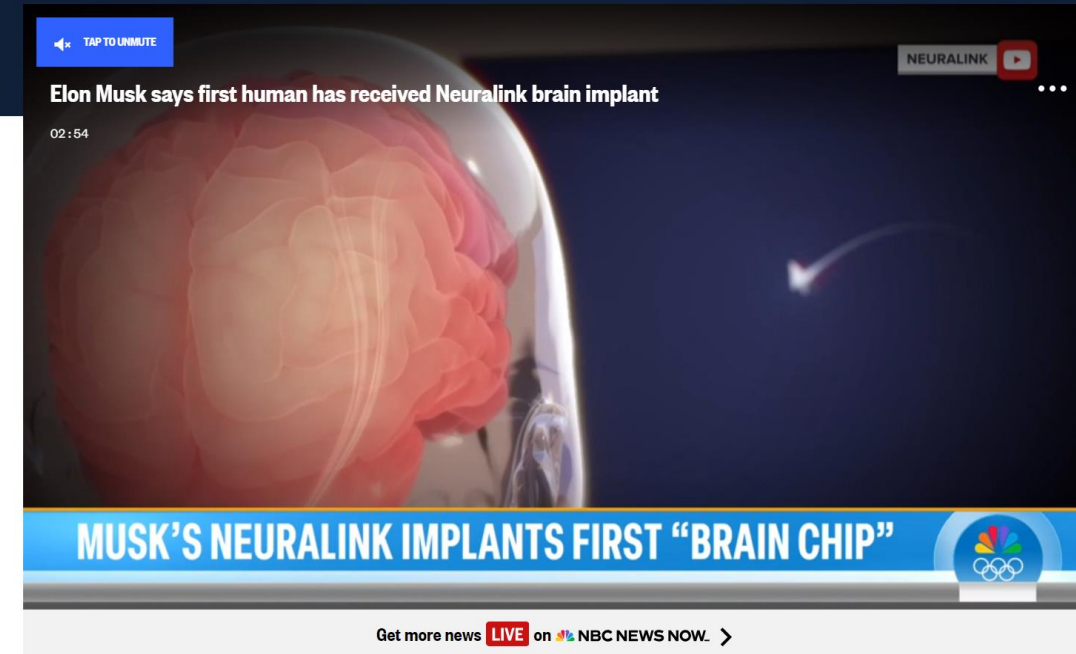
Elon Musk says his startup Neuralink has implanted a device in its first human

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TECH NEWS

Elon Musk says his startup Neuralink has implanted a device in its first human

Musk said the first product from the brain-science startup is called Telepathy and it will let people control their phones "just by thinking."



Get more news **LIVE** on NBC NEWS NOW. >

Jan. 30, 2024, 1:49 AM GMT

By David Ingram

Tech billionaire Elon Musk said Monday that his brain-science startup company, [Neuralink](#), had implanted a device in a human for the first time, a possible step toward a product that he said would allow people to control almost any external device "just by thinking."

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Empty Antarctica Cruise Cabins Cost Almost Nothing

None Invasive Brain Computer Interface- the ultimate solution for human to survive the technological singularity?

Brain implant startup backed by Bezos and Gates is testing mind-controlled computing on humans

PUBLISHED SAT, FEB 18 2023-9:00 AM EST

Ashley Capoot
@ASHLEYCAPOOT

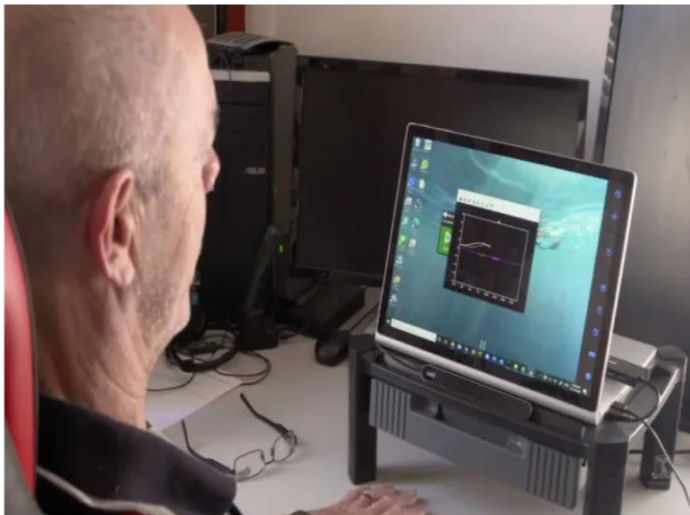
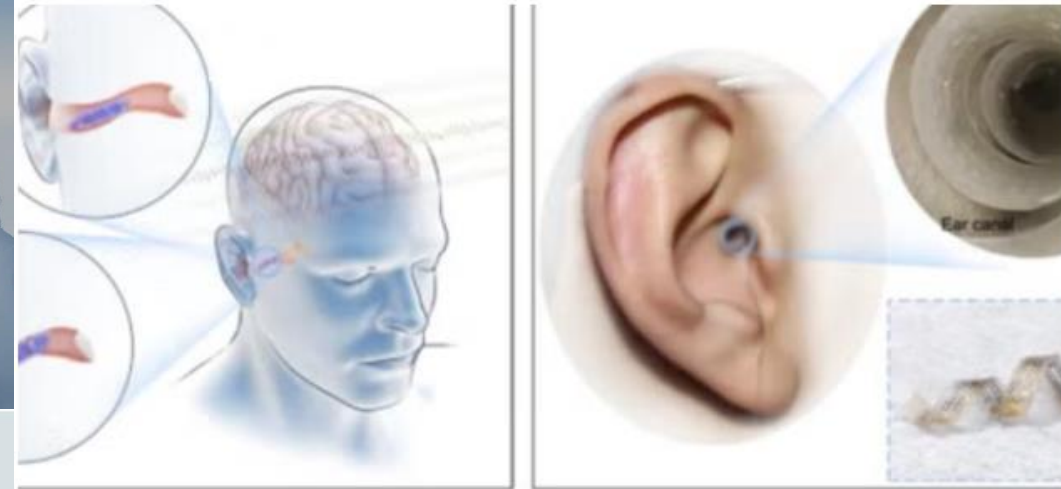
SHARE f t in

KEY POINTS

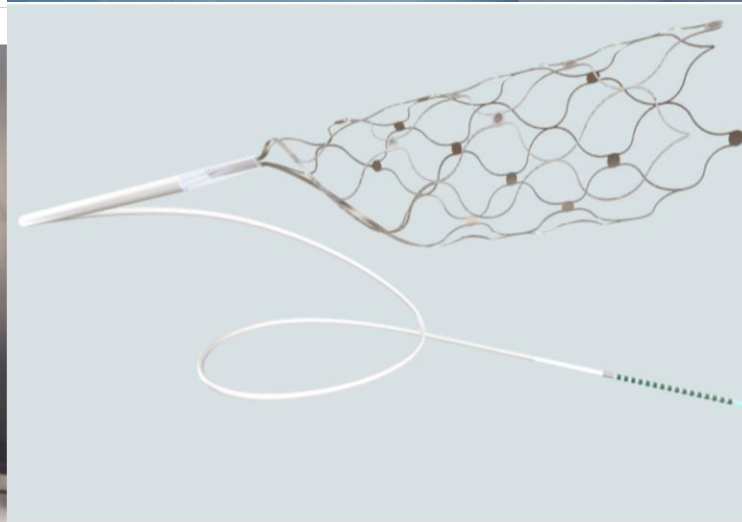
- Synchron is part of an emerging crop of companies testing technology in the brain-computer interface industry.
- The system is implanted through the blood vessels and allows patients to operate technology using only their minds.
- "It helps them engage in ways that we take for granted," Synchron CEO Tom Oxley said.



清华大学
Tsinghua University

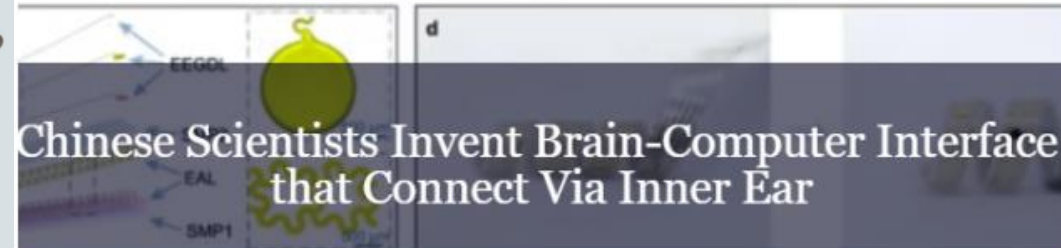


Philip O'Keefe, one of Synchron's patients in the SWITCH clinical trial, using his BCI.



The Stentrod™ Endovascular Electrode Array.

source: Synchron

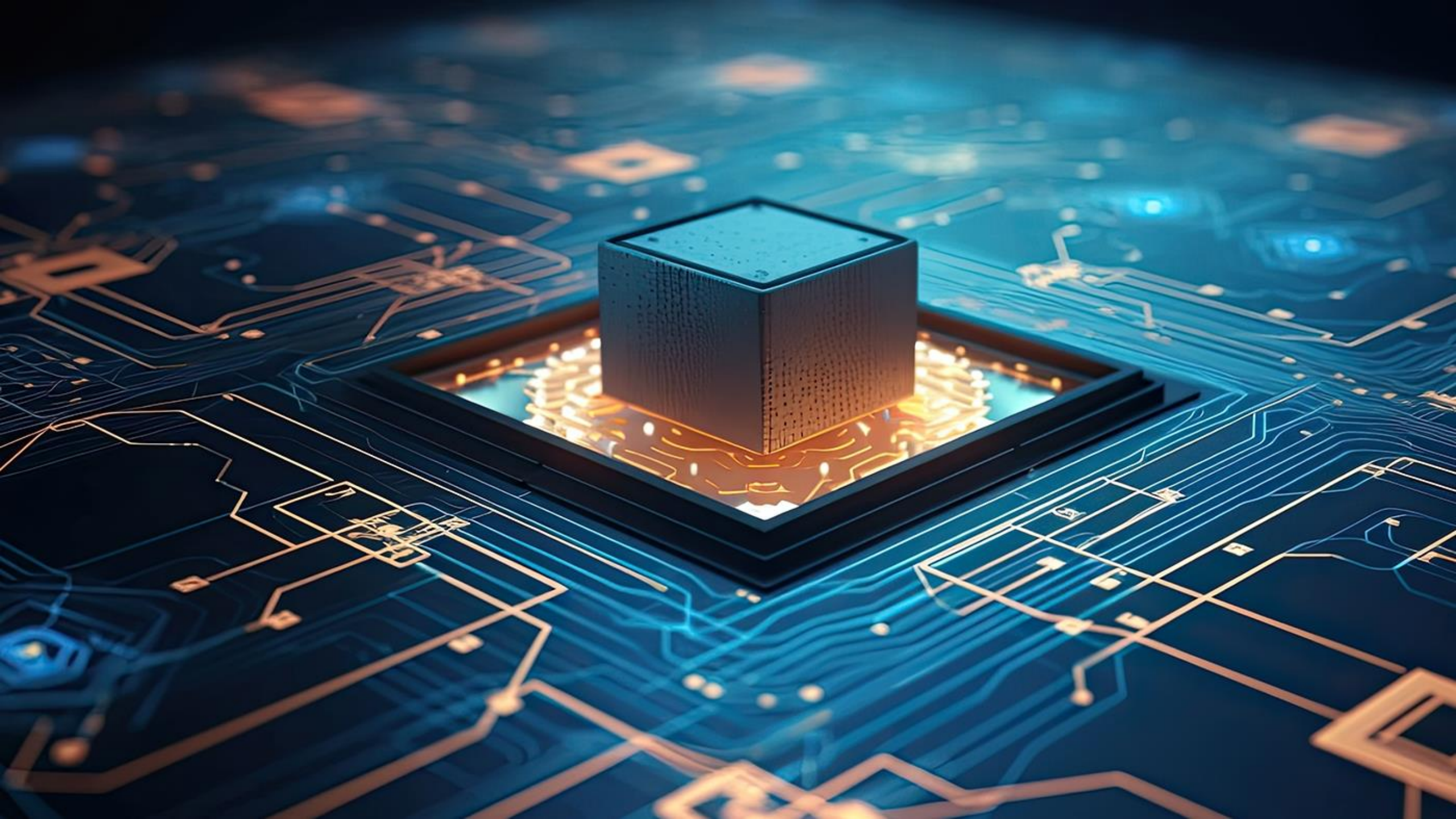


Chinese Scientists Invent Brain-Computer Interface that Connect Via Inner Ear

Researchers in China have invented a brain-computer interface (BCI) that can connect people's brains to a computer via their inner ear. Image Credit: Tsinghua University/ Nature Communications

In a groundbreaking development, researchers from Tsinghua University in Beijing, China, have invented the SpiralE brain-computer interface (BCI), a device that connects people's brains to a computer through their inner ear.

Unlike previous BCI technologies that required invasive surgical procedures, the SpiralE BCI uses a flexible in-ear material, making it suitable for daily use without compromising the wearer's hearing. The technology could enable "full-bandwidth data streaming" to the brain, offering potential applications like translating thoughts into text, controlling digital objects through thought alone, or even enhancing human memory.



Quantum Computing will unleash the true potential of the future CitiVerse

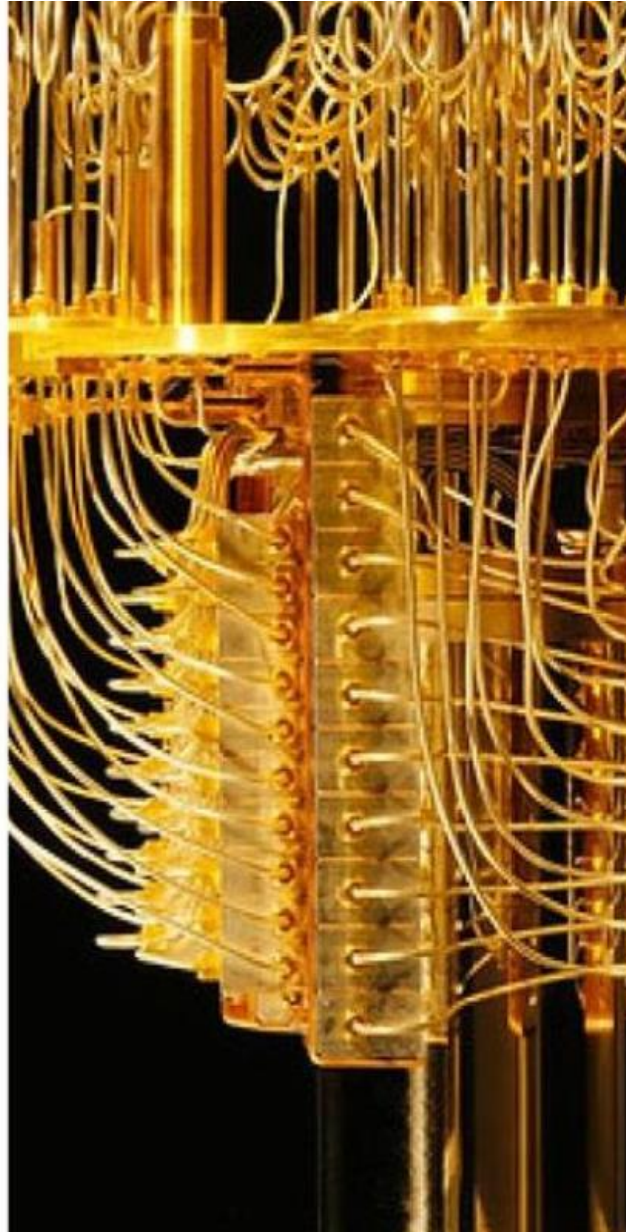
2019

QUANTUM COMPUTING

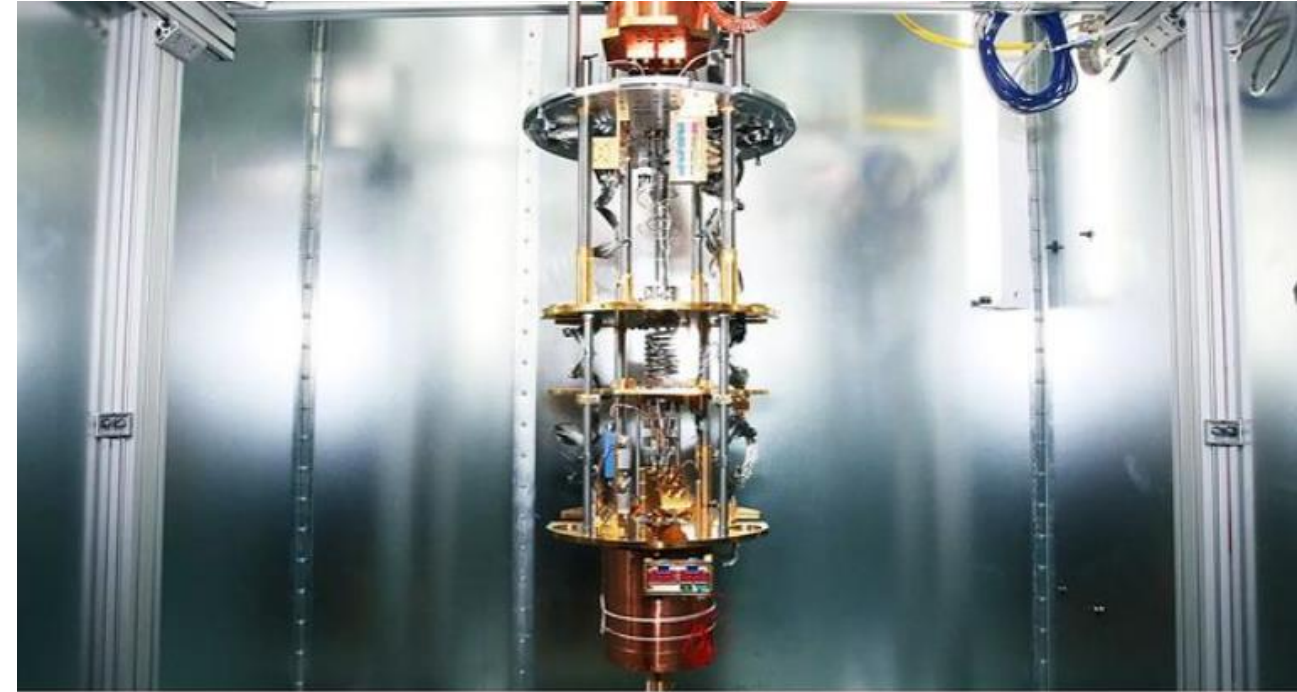
is a computing system that harnesses the laws of quantum mechanics to solve problems too complex for conventional computers.

Quantum computers are **158 MILLION TIMES FASTER** than a traditional computer.

4 minutes to finish calculation that would take **10,000 years**



2023



GOOGLE'S SYCAMORE QUANTUM COMPUTER

- ▶ Google launched its new Sycamore quantum computer in July
- ▶ It's **241 million times faster** than its predecessor
- ▶ It can make instant calculations that would take **47 years** to other quantum computers (IBM and Intel being their biggest competitors.)

2022 Sorbonne University in France used a computer simulation to assess whether existing quantum technology could turn Paris into a functional quantum city. In a quantum city, telecommunications and institutions that deal with vast quantities of data would be connected in a network that uses quantum devices instead of modems and routers. These devices would take advantage of quantum effects to make information exceptionally secure.



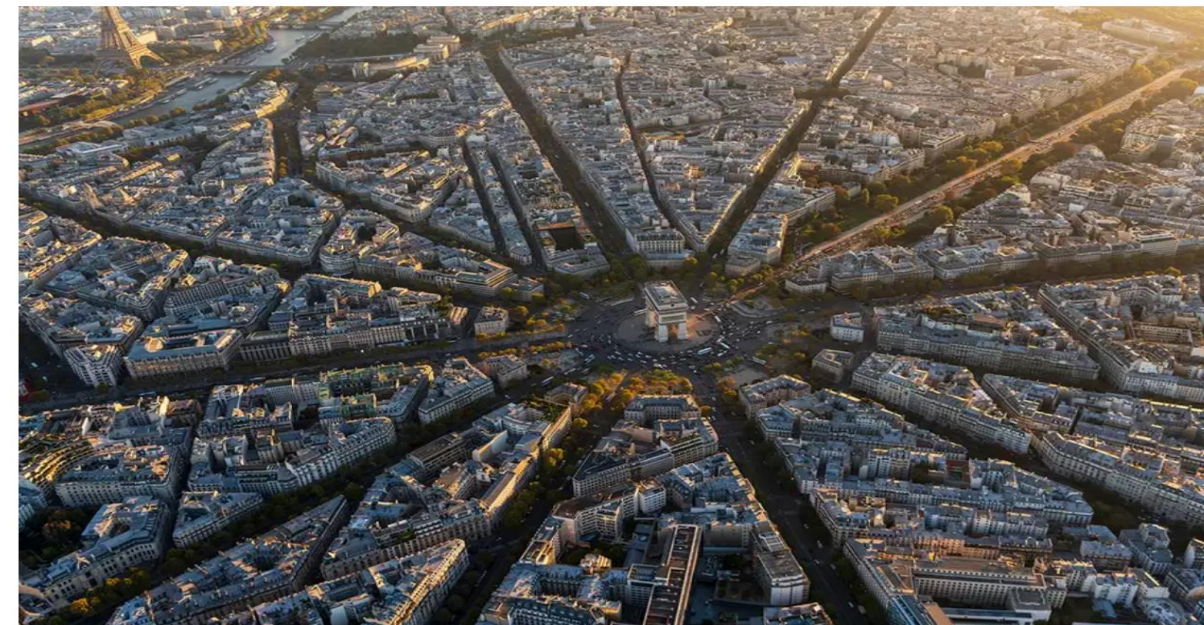
Technology

Quantum city simulation shows how to make Paris-sized quantum internet

A simulated version of Paris where universities and telecommunication hubs are connected by a quantum communication network suggests that existing technology is already nearing the ability to create functional "quantum cities"

By Karmela Padavic-Callaghan

📅 21 November 2022



🚩 **Researchers recently simulated a quantum network larger than the city of Paris, France**

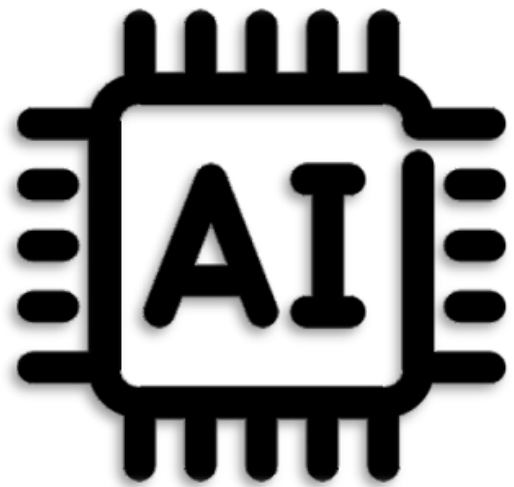
Nisian Hughes/Getty Images



OCED(Nov 2023) "How much water does AI consume? The public deserves to know" article quote Cornell University findings(Oct 2023) that the global AI demand may be accountable for 4.2 -- 6.6 billion cubic meters of water withdrawal in 2027, which is more than the total annual water withdrawal of 4 – 6 Denmark.

Global AI's Scope 1 & 2 Water Withdrawal in 2027

Est. **4.2~6.6** Billion Cubic Meters

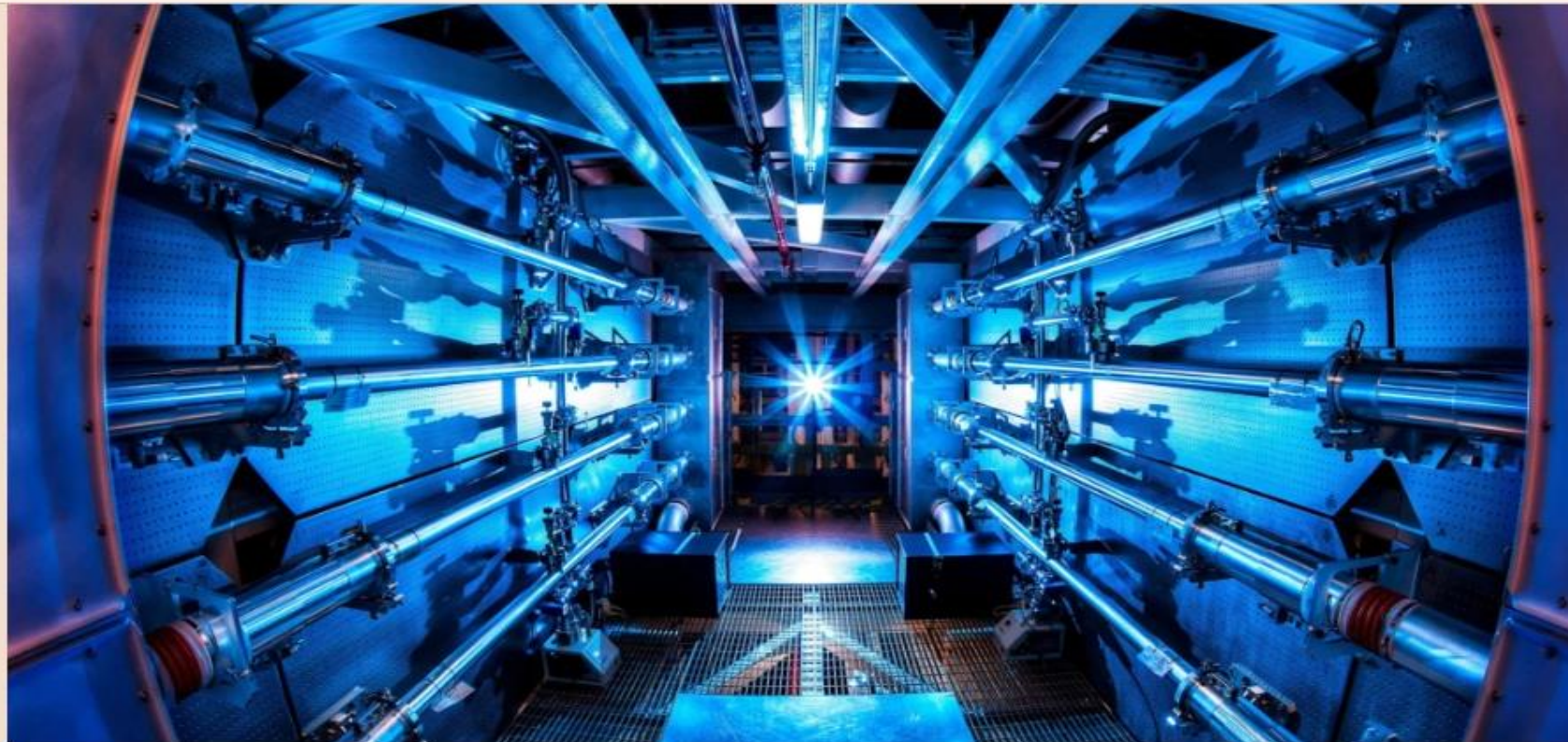


4~6x Annual Water Withdrawal of Denmark

Renewable energy [+ Add to myFT](#)

Governments join race for commercial fusion power

Goal of abundant, zero-carbon electricity from fusing atoms brings together private and public sector



an energy source © Damien Jemison/Lawrence Livermore National Laboratory/Reuters

-
-
-
-

Tom Wilson in London YESTERDAY

119

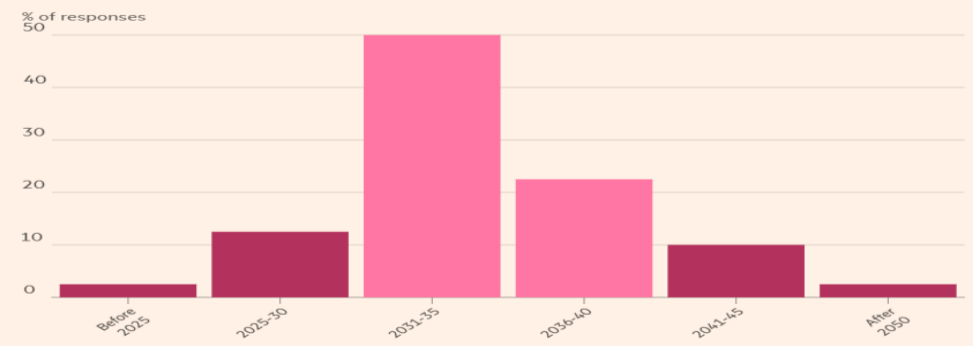
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We'll send you a *myFT Daily Digest* email rounding up the latest Renewable energy news every morning.

From the US to the UK and Japan, governments are launching initiatives to help public and private sector scientists work in tandem — in some cases for the first time — on the tantalising goal of fusing atoms to produce safe, zero-emissions power.

Companies are aiming for commercial fusion power in the 2030s

Question: when will the first fusion plant...



Source: Fusion Industry Association survey of 40 fusion companies

Feedback

Co-Chair of the UN ITU Task Group on Pre-standardisation for CitiVerse: work with members states to develop the first UN definition and roadmap on how emerging tech such as AI, Digital Twins, Web3, Quantum, 5G, 6G etc can be used to create People-centred future cities that are inclusive, sustainable and participatory, and to achieve UN Sustainable Development Goals.

ITU Webinars

Digital Transformation Webinar series
Episode 35

How to successfully develop People-Centred citiverse?

30 October 2023

15:00-17:00 CET



Bilel Jamoussi

Deputy Director
Telecommunication
Standardization Bureau, ITU



Luis Nava Guerrero

Mayor
Queretaro, Mexico



Jung Sook Park

Secretary General
WeGO



Edlam Abera Yemeru

Chief of Knowledge & Innovation
Branch
UN-Habitat



Moderator

Christina Yan Zhang

CEO and Founder
The Metaverse Institute



Roland van der Heijden

Program Manager Digital City
Rotterdam, The Netherlands



Marwan Alzarouni

Strategic Advisor
Dubai Department of
Economy and
Tourism



Teppo Rantanen

Executive Director
City of Tampere, Finland



Nicholas You

Executive Director
Guangzhou Institute for
Urban Innovation



Ian Oppermann

Chief Data
Scientist, NSW
Government,
Australia



Ralf Ma

Chair, IEEE Metaverse
Standards Working
Group



Cristina Bueti

Counsellor
ITU Focus Group on
metaverse (FG-MV)





SUSTAINABLE DEVELOPMENT GOALS

1 NO POVERTY

2 ZERO HUNGER

3 GOOD HEALTH AND WELL-BEING

4 QUALITY EDUCATION

5 GENDER EQUALITY

6 CLEAN WATER AND SANITATION

7 AFFORDABLE AND CLEAN ENERGY

8 DECENT WORK AND ECONOMIC GROWTH

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

10 REDUCED INEQUALITIES

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

14 LIFE BELOW WATER

15 LIFE ON LAND

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

17 PARTNERSHIPS FOR THE GOALS

SUSTAINABLE DEVELOPMENT GOALS



Christina@metaverse-institute.org



Christina Yan Zhang



ChristinaYZhang