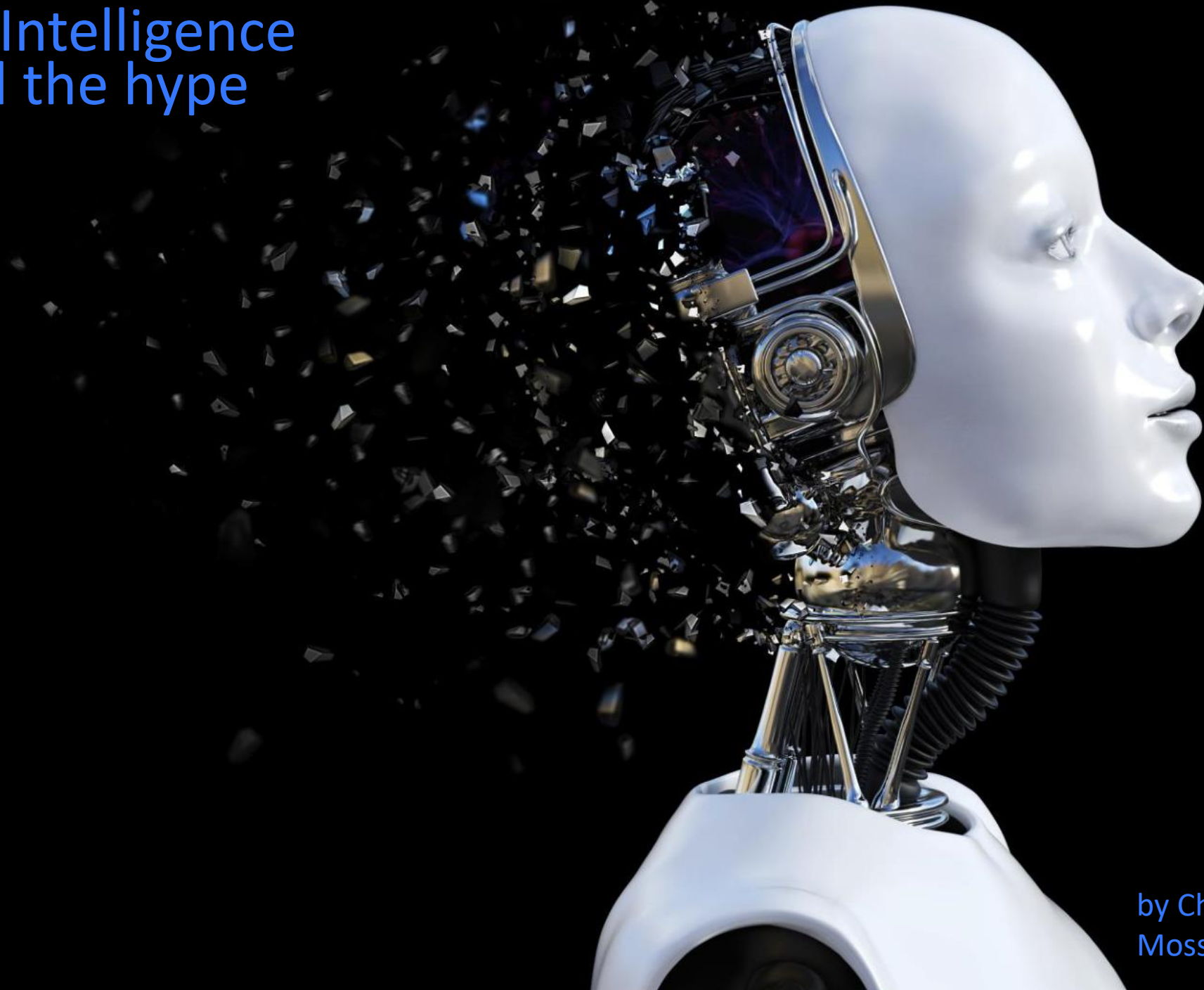


Artificial Intelligence – beyond the hype



ATV Tech Talk
April 3. 2019

by Christian Holmegaard
Mossing, NIRAS

Introduction: Biography + Digital offset

1 HOUR

PART 1:

- Selected highlights from Applied AI Academy 2018
- Introduction to the AI technology and application
 - Impact of AI on the Engineering Industry
 - Global race for AI dominance

PART 2:

- Applied AI in Danish Engineering Consultancy
- Current trends in the Engineering Industry
 - Engineering Consultancy ver. 2.0

My background

Experimentarium 1993 - 1997

M.Sc. Microbiology 1997 (University of Copenhagen/DTU)

Orbicon (1998-2006)

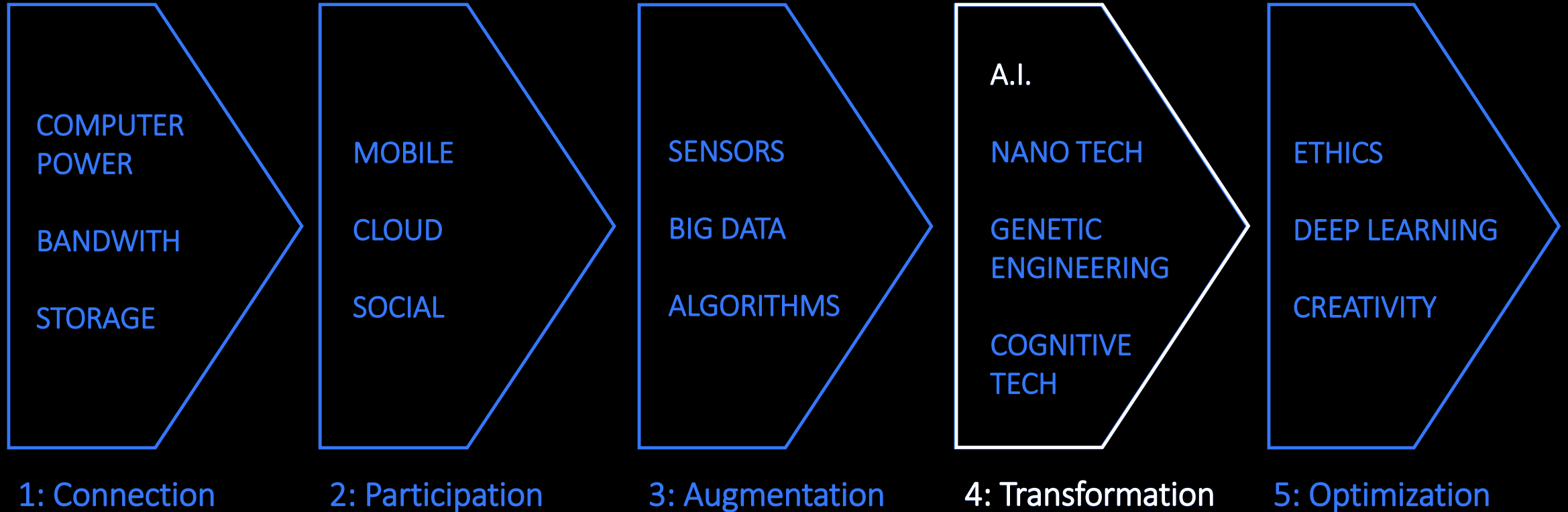
COWI A/S (2006 – 2019)

NIRAS (2019 – d.d.)

The road to become a Digital Ambassador



Five phases of digitalization



Applied AI Academy
November 2018

PART 1



The Participants



A dense programme...

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
	THE PAST, PRESENT AND FUTURE OF AI	APPLIED AI CASE A VC'S PERSPECTIVE	AI EXPO 2018 AI & BIG DATA CONFERENCE	APPLIED AI CASE HANDS-ON AI	HOW TO START THE TRANSFORMATION
Morning	07.30 Welcome Program Kick-off ICDK, Palo Alto				
	08.30				
	10.00 The Future, Faster InnovationLab Keynote TheShop, SF	10.00 Tour of the Gallery Autodesk	08.30	09.00	10.00
	10.45 AI Past, Present, and Future Cisco Systems Keynote TheShop, SF	— Humanizing Customer Support with AI Autodesk	AI Expo 2018, the Leading AI and Big Data Conference and Exhibition	Turning Data into a Timeless Competitive Advantage Palantir	Bringing AI to Every Corner of Your Organization Unity
	11.30 What AI Means for Industries Panel Debate TheShop, SF	<i>Tour & Keynote</i> Autodesk, SF	Enterprise AI and Digital Transformation	<i>Keynotes & Challenges-workshop</i> Palantir, Palo Alto	<i>Keynote</i> Unity, SF
Afternoon	11.30				
	12.15 The Technologies Powering AI Panel Debate TheShop, SF	12.00 Applied AI from a VC's Perspective Bootstrap Labs Keynote The Vault, SF	Big Data Strategies		11.30
	13.15	13.30	Data Analytics for AI & IoT	11.30	11.45 Lunch & Debriefing
	14.00 AI Entrepreneurs and Intrapreneurs Co-creative workshop & pitch TheShop, SF	15.00 The Startup Pitch Roger.ai The Vault, SF	Innovations & Investors' Zone	13.00 Real-life AI Cases Stanford Research Institute (SRI) Menlo Park	12.45 Artificial Creativity InnovationLab Keynote & Demo TheShop, SF
	14.00	15.45	<i>AI Expo 2018, Santa Clara Convention Center</i>	14.30 The Lab Experience VW Automotive Lab (VAIL) Stanford University	14.00
Evening	16.30 Critical Thinking About AI Keynote	16.00 Hands-on: AI-powered shopping Amazon Go, SF		15.00 TechPlomacy Office of the Tech Ambassador, ICDK	
	17.15 Networking Reception incl. Tech Demos Drinks & Demos TheShop, SF	17.00 Debriefing, Drinks & Prep for AI Expo Drinks & Networking The Interval, SF	18.00	16.15	
	17.15	17.15	18.00	16.45	
	18.45		17.30 Conference Networking, Drinks, and Nibbles (Optional) Hyatt Regency, Santa Clara	17.30 Dinner, Drinks & Networking Il Fornaio, Palo Alto	
			23.00	21.00	

A dense programme...

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
IF	THE PAST, PRESENT AND FUTURE OF AI	APPLIED AI CASE A VC'S PERSPECTIVE	AI EXPO 2018 AI & BIG DATA CONFERENCE	APPLIED AI CASE HANDS-ON AI	HOW TO START THE TRANSFORMATION

Morning

Selected sessions...

09.00	Turning Data into a Timeless Competitive Advantage Palantir Keynotes & Challenges-workshop Palantir, Palo Alto	10.00	Bringing AI to Every Corner of Your Organization Unity Keynote Unity, SF
11.30		11.30	

Afternoon

13.30	Applied AI from a VC's Perspective Bootstrap Labs Keynote
15.00	The Vault, SF

... with engineering implications **IF**

Evening

"Applied AI from a VC's perspective"



ABOUT ME



Benjamin Levy, Co-Founder & Managing Partner

Ben is the Co-Founder of BootstrapLabs, a leading venture capital firm, based in Silicon Valley and focused on Applied Artificial Intelligence.

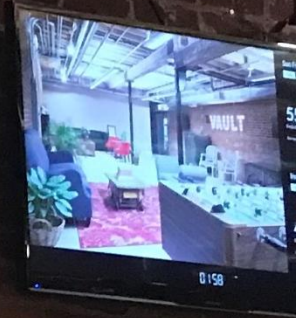
Some of BootstrapLabs' portfolio companies include: Pres, AngelList, Trusted Insight, AGEye, Qurious, Rogeca, Vidora, Plendel, Indus, and Sibly.

@benlevy74

Born in France and living in Silicon Valley for the past 20 years, Ben is a repeat entrepreneur who launched, built, and exited two startups in the financial technology space. Praxidea Solutions, a data mining software company using machine learning and image recognition technology, was acquired by Morgan in 2005, and InsideVenture, a financial social network for the founders of venture-backed pre-IPO startups and long-only institutional investors on Wall Street, was acquired by SecondMarket in 2009 (and is now part of NASDAQ).

Earlier in his career, Ben was a Technology, Media, and Telecom Entrepreneur. Member who advised startup founders and CoOs of Fortune 500 companies on corporate strategy, financing, and M&A. Over a period of 10 years, Ben helped his clients raise over \$100 million in institutional investments and close over \$100 million in M&A. Associate at Lazard, Vice President at Houlahan Lokey, SVP & Head of Technology, Private Equity at SG Cowen, Securities, and Managing Director & Head of US at QuantumWave Capital.

Ben is a frequent speaker on innovation, technology investing, entrepreneurship, artificial intelligence, and globalization in the US, Europe, and Asia.



APPLIED AI IS LEADING
THE 4TH INDUSTRIAL REVOLUTION

**AI IS TRANSFORMING OUR WORLD
FROM AUTOMATED TO AUTONOMOUS**

THE STEPS TO AUTONOMOUS

Analytics



What happened

Predictions



What might happen

Prescription



What might be a good idea to do

Autonomous



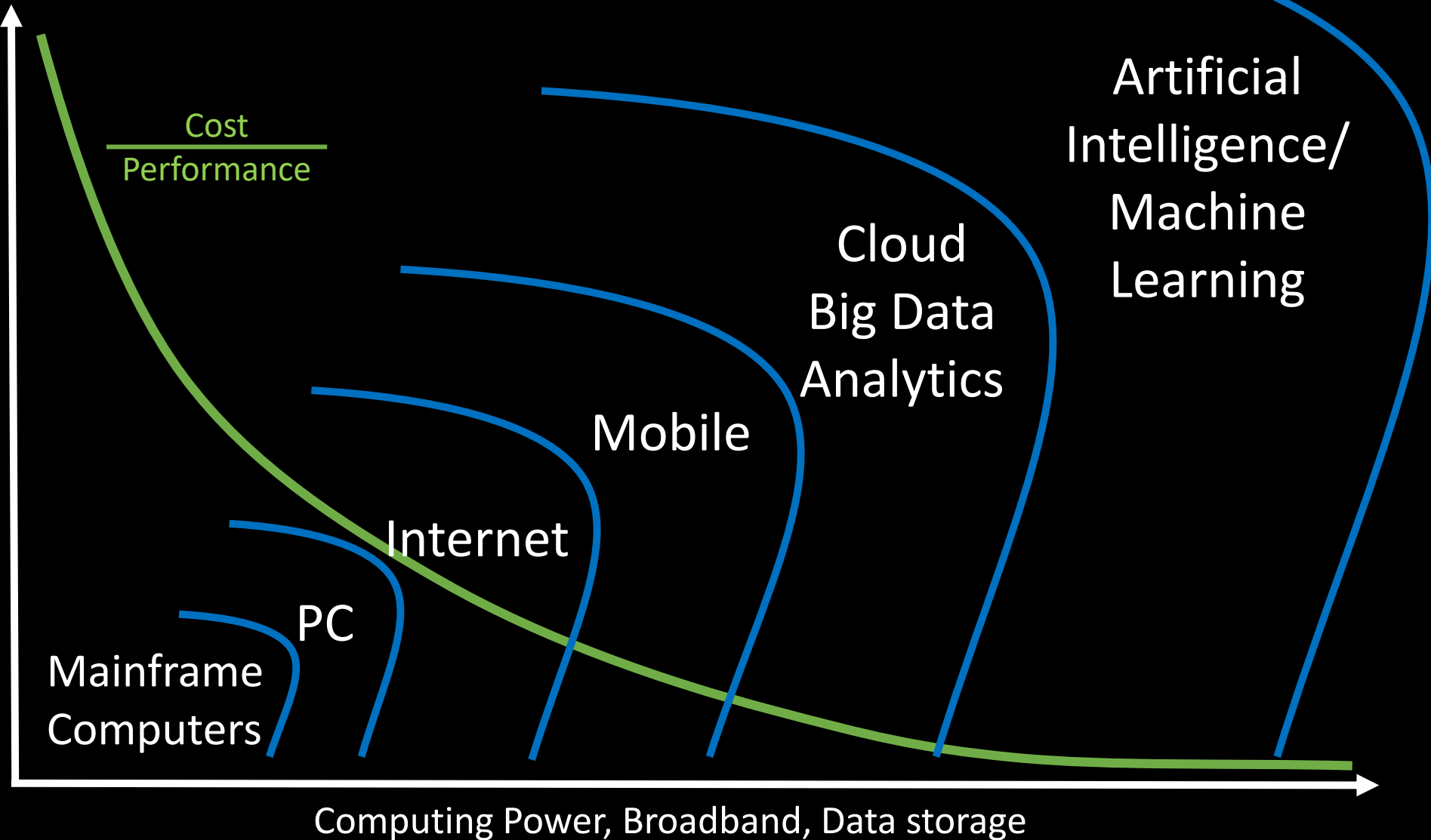
The systems make decisions themselves based on current and past acquired learning

“AI is the alpha trend, because it’s fundamentally changing all other trends we [Accenture] are tracking.”

Paul Daugherty , Chief Technology & Innovation Officer, Accenture

Financial implications...

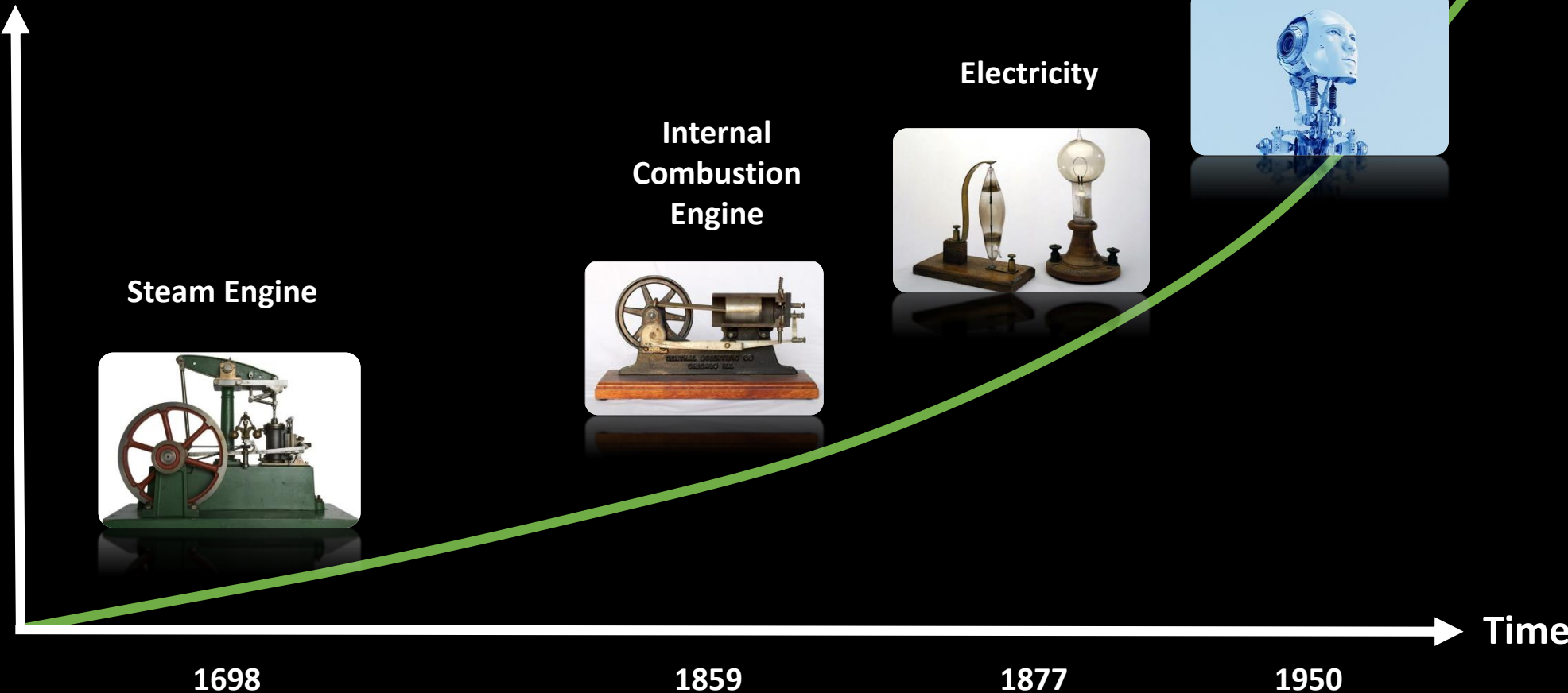
Market Size
(\$ Billions)



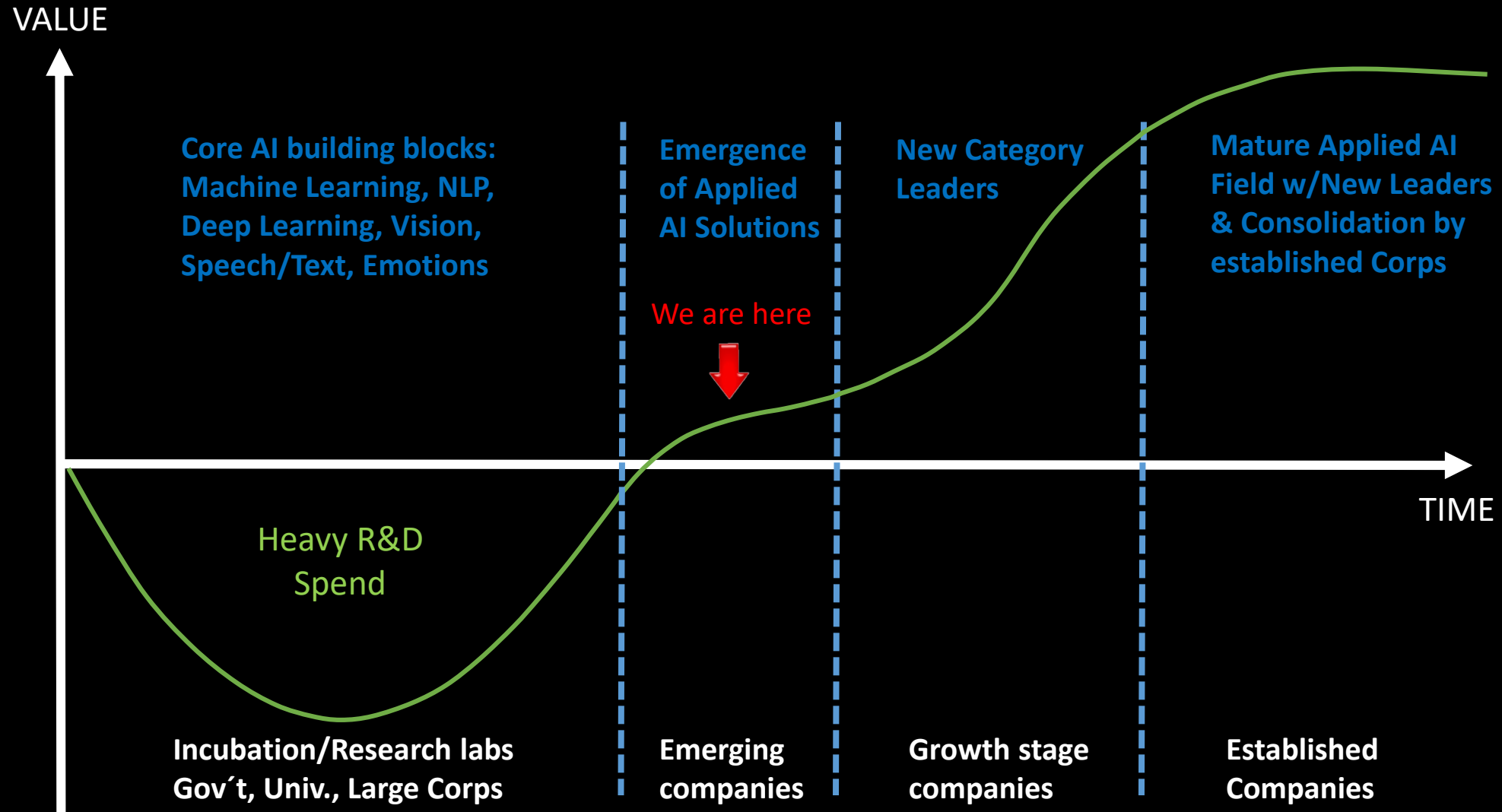
Over the last 250 years...

General purpose technology innovation have generated massive economic and productivity growth

Economic Growth & Productivity



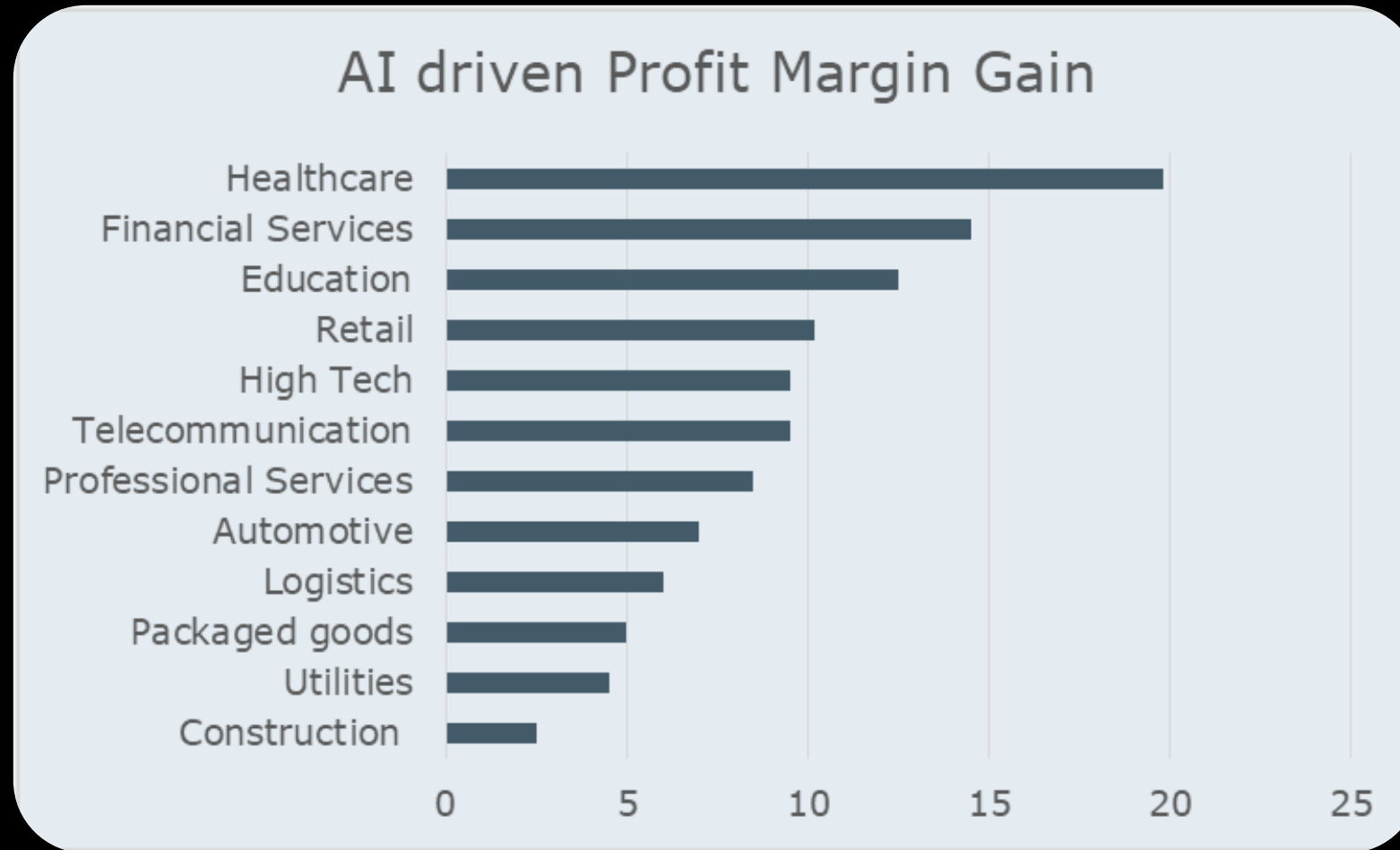
AI – where are we now?



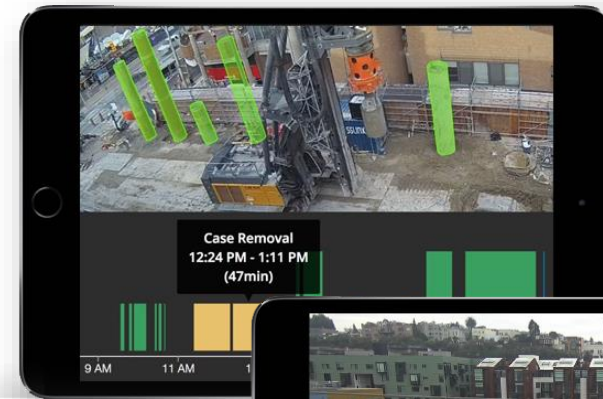
"AI has the potential to boost rates of profitability by an average of 38% and could lead to an economic boost of US\$14 trillion in additional gross value added (GVA) by 2035"

Accenture

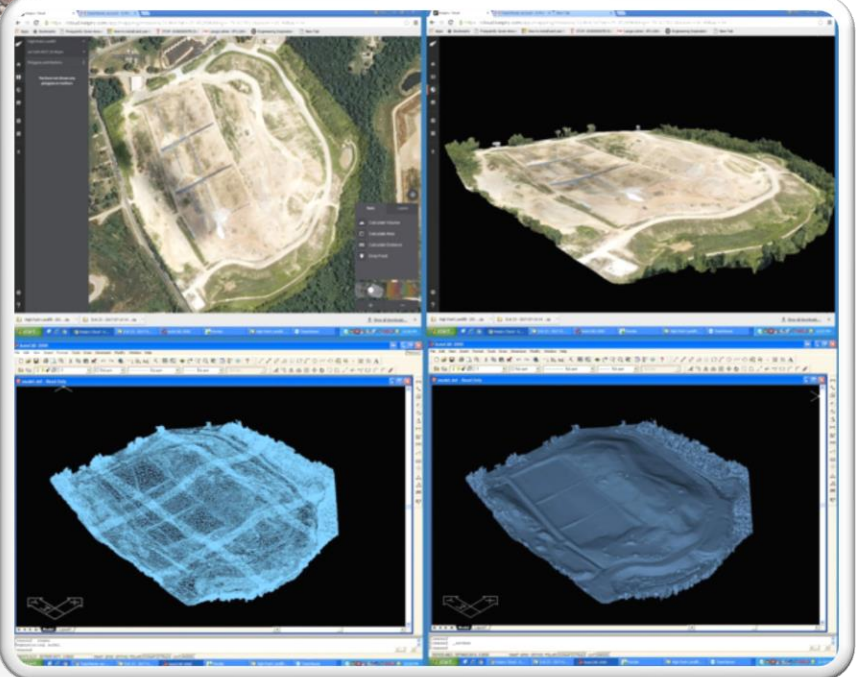
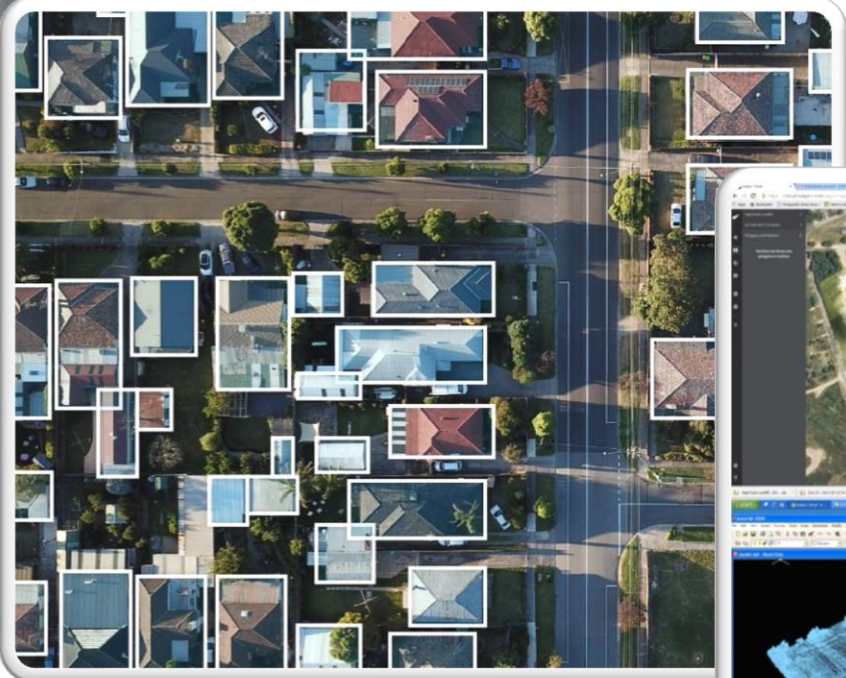
Applied AI potential in different Industries



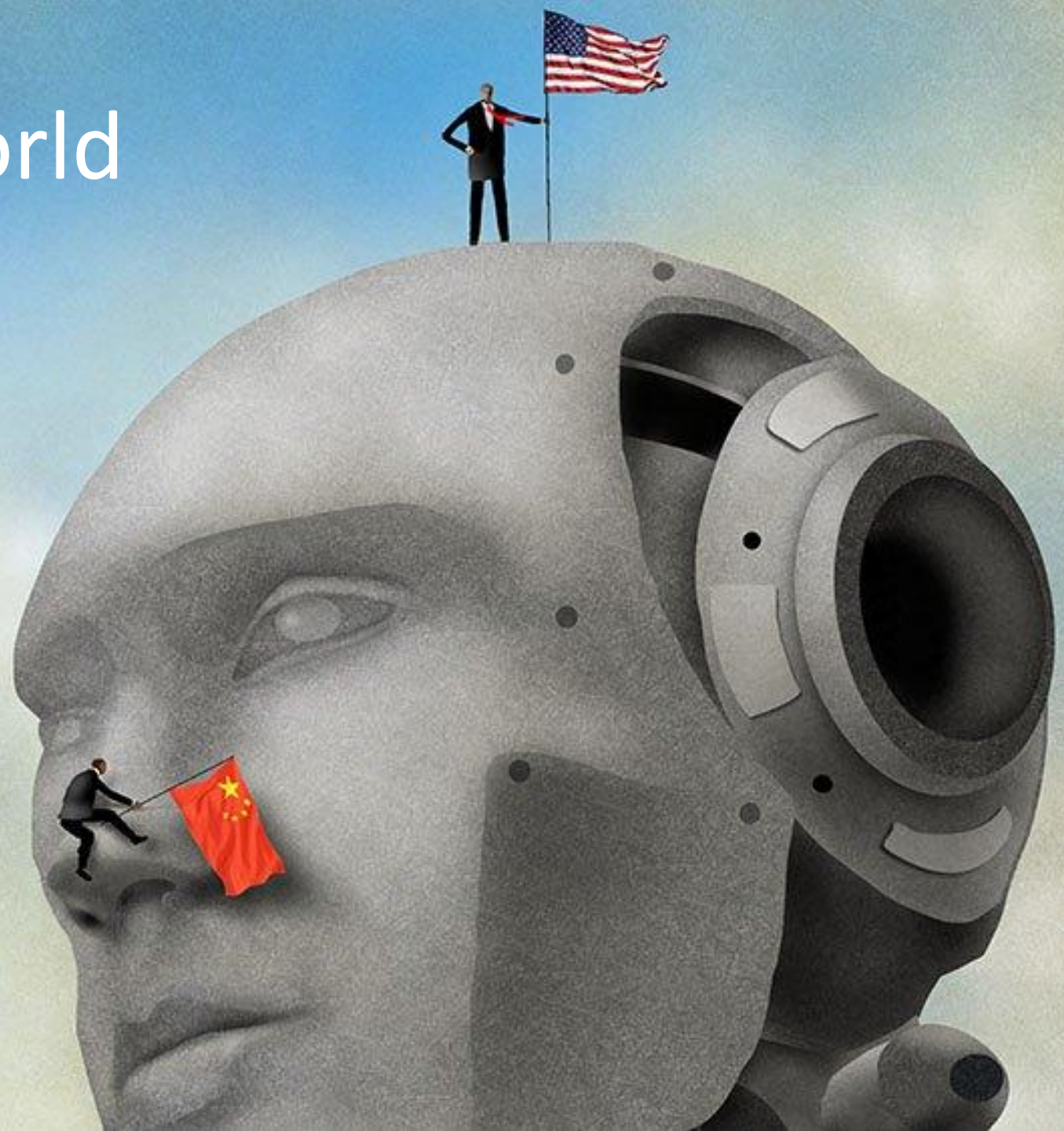
Applied AI disrupting the Construction Industry...



Applied AI disrupting Inspection, Maintenance & Testing...



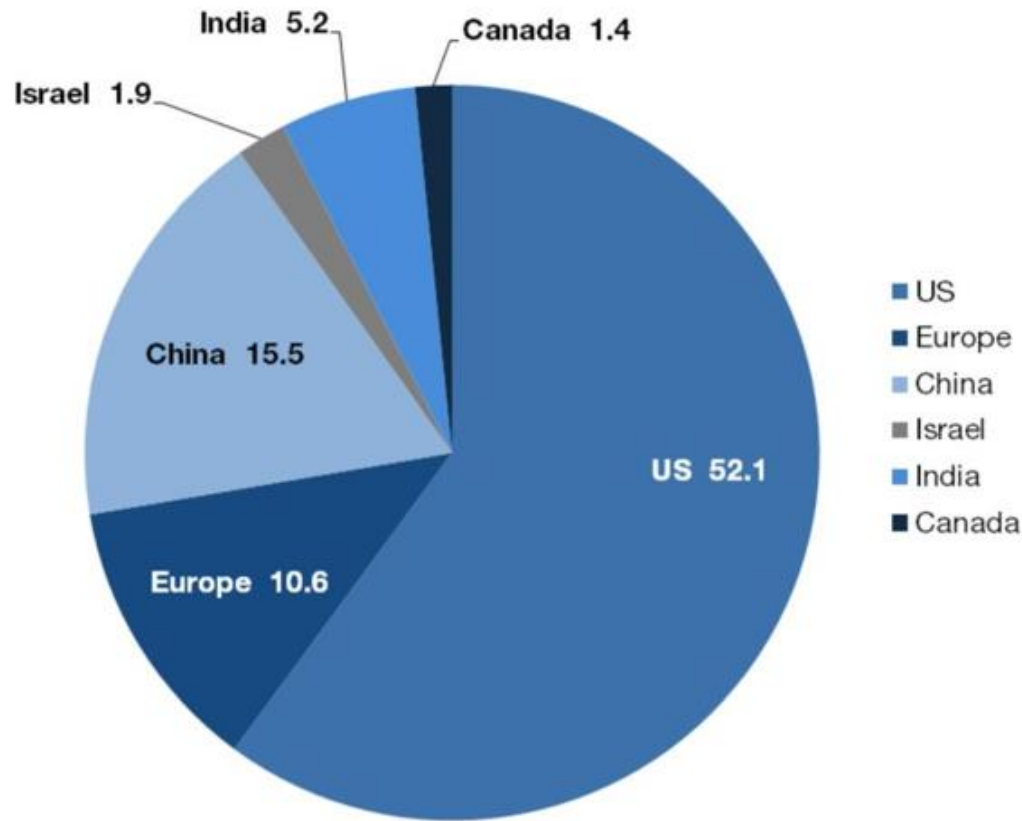
The battle for AI world
dominance is on...



VC Capital invested in 2014...

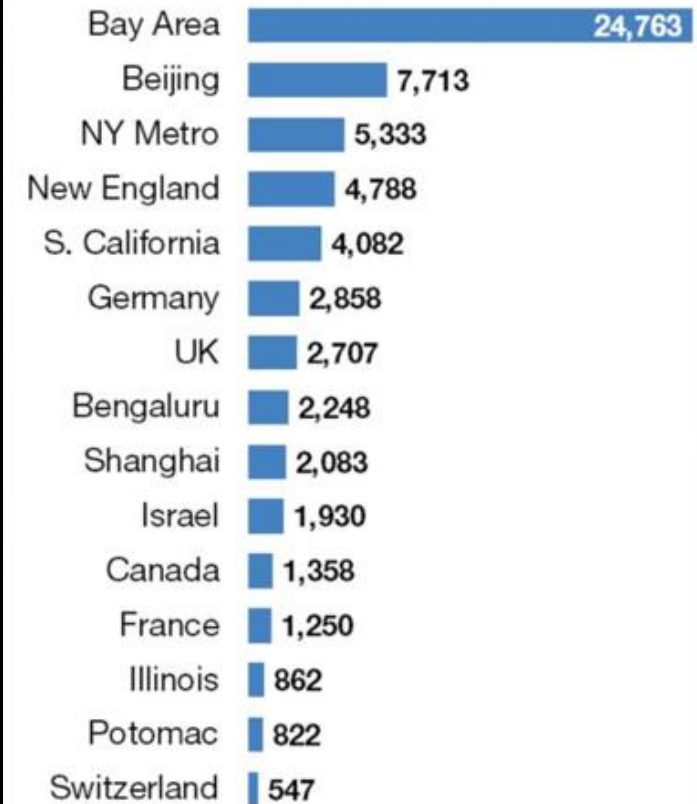
Top countries for total venture capital invested

Share of total venture capital invested 2014, \$ billions



Source: Ernst & Young

Where is venture capital going? 2014, US\$m



Source: World Economic Forum Collaborative Innovation report 2015



Global investments in Artificial Intelligence in 2017: \$15,2 billion

China | 48%

USA | 38%

Rest of
the world | 14%

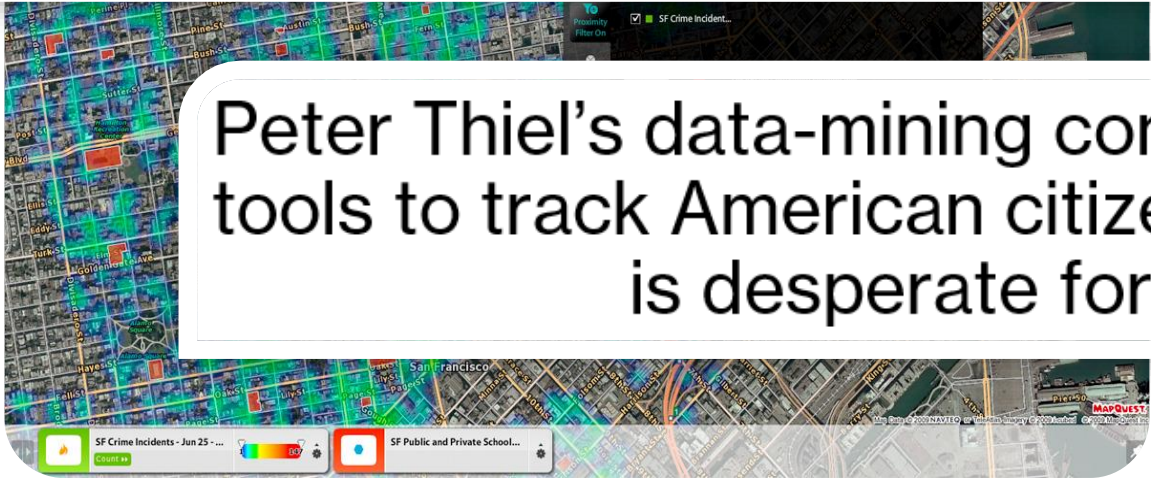
Venture
Capital

"Turning Data
into a Timeless
Competitive
Advantage"





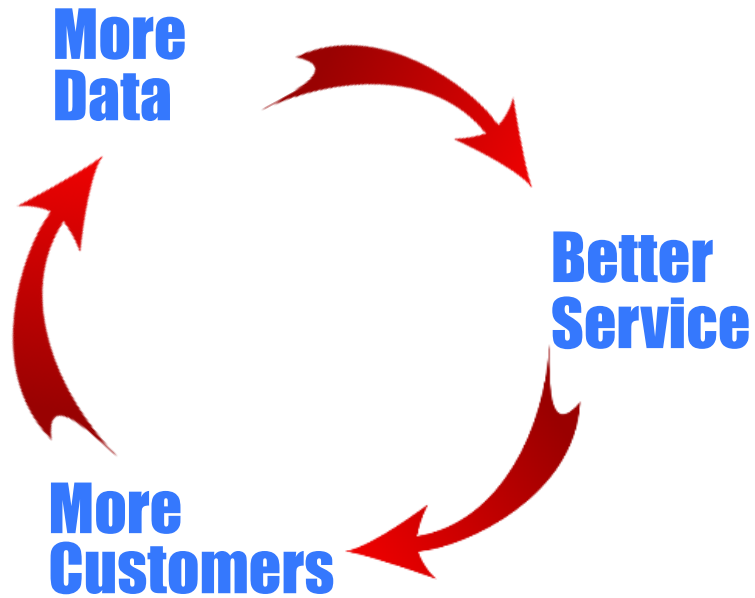
»Det er et firma med et meget dårligt ry blandt borgerretsorganisationer, fordi Palantirs systemer typisk bruges til håndtering af oplysninger om store grupper af ikke mistænkte borgere, altså masseovervågning. Det gør mig meget skeptisk overfor, hvad det er for et system, man ønsker at købe,« siger Jesper Lund, der er formand for IT-Politisk Forening, til Information.

A screenshot of the Palantir software interface showing a map of San Francisco with various data overlays. A legend at the bottom identifies 'SF Crime Incidents - Jun 25' and 'SF Public and Private School...'.

Peter Thiel's data-mining company is using War on Terror tools to track American citizens. The scary thing? Palantir is desperate for new customers.

As shown in the privacy breaches at Facebook and Cambridge Analytica, the pressure to monetize data at tech companies is ceaseless

Why this thirst for data?

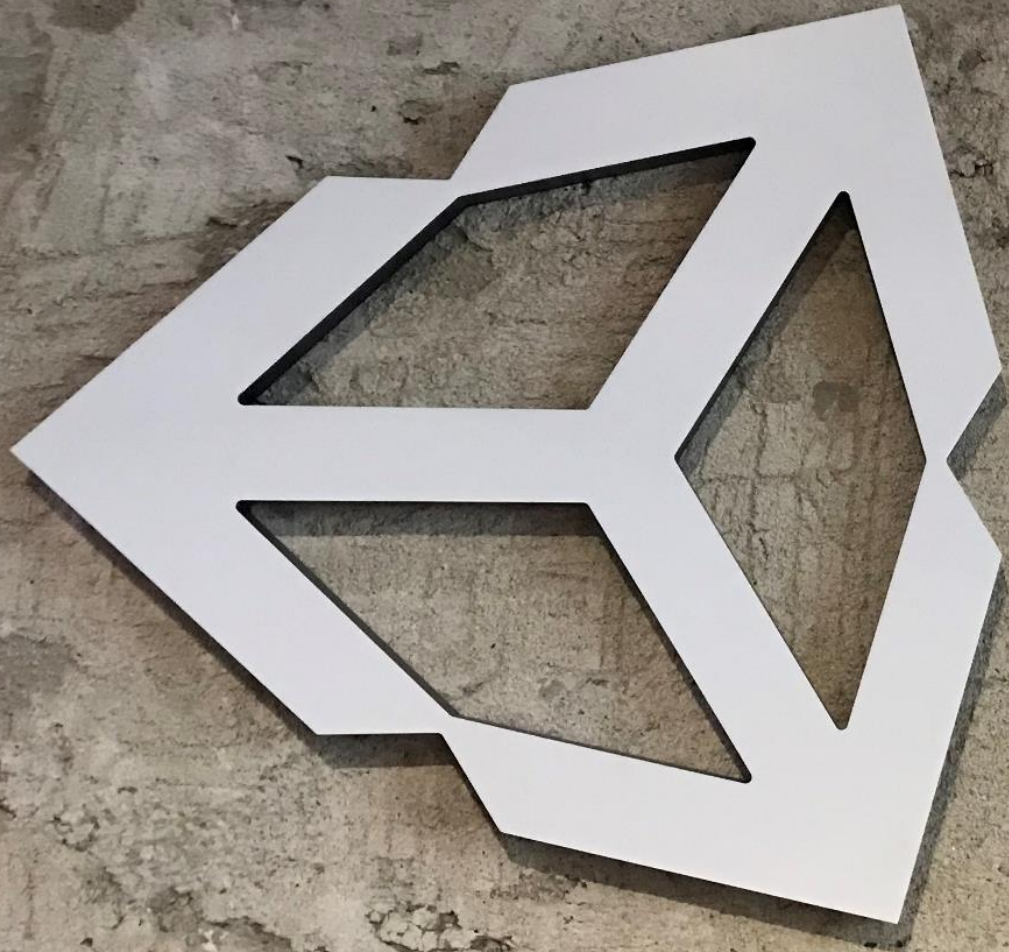


STAY AHEAD!

Google

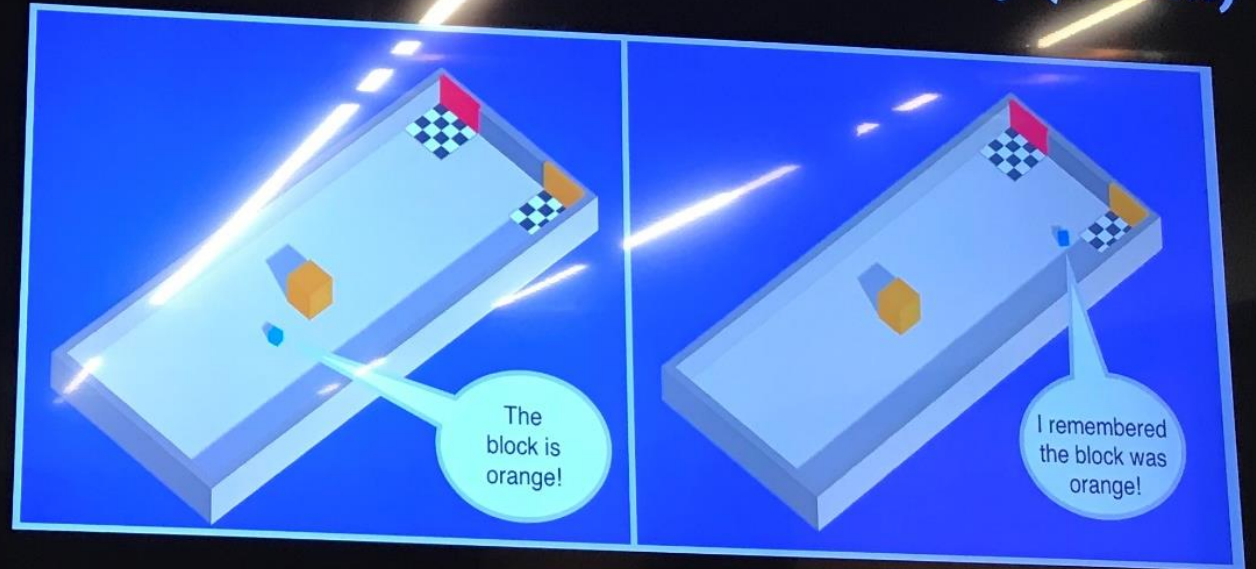


"Bringing AI to
every Corner of
your Organisation"



unity

Enabling Long Short-Term Memory (LSTM)



About Unity Technologies

- Real-time 3D Development Platform
- Game, AR/VR, film, automotive
- 60% of top 1,000 games
- On over 3 billion unique devices
- 1.5 billion monthly active players
- 2,000 employees with HQ in San Francisco

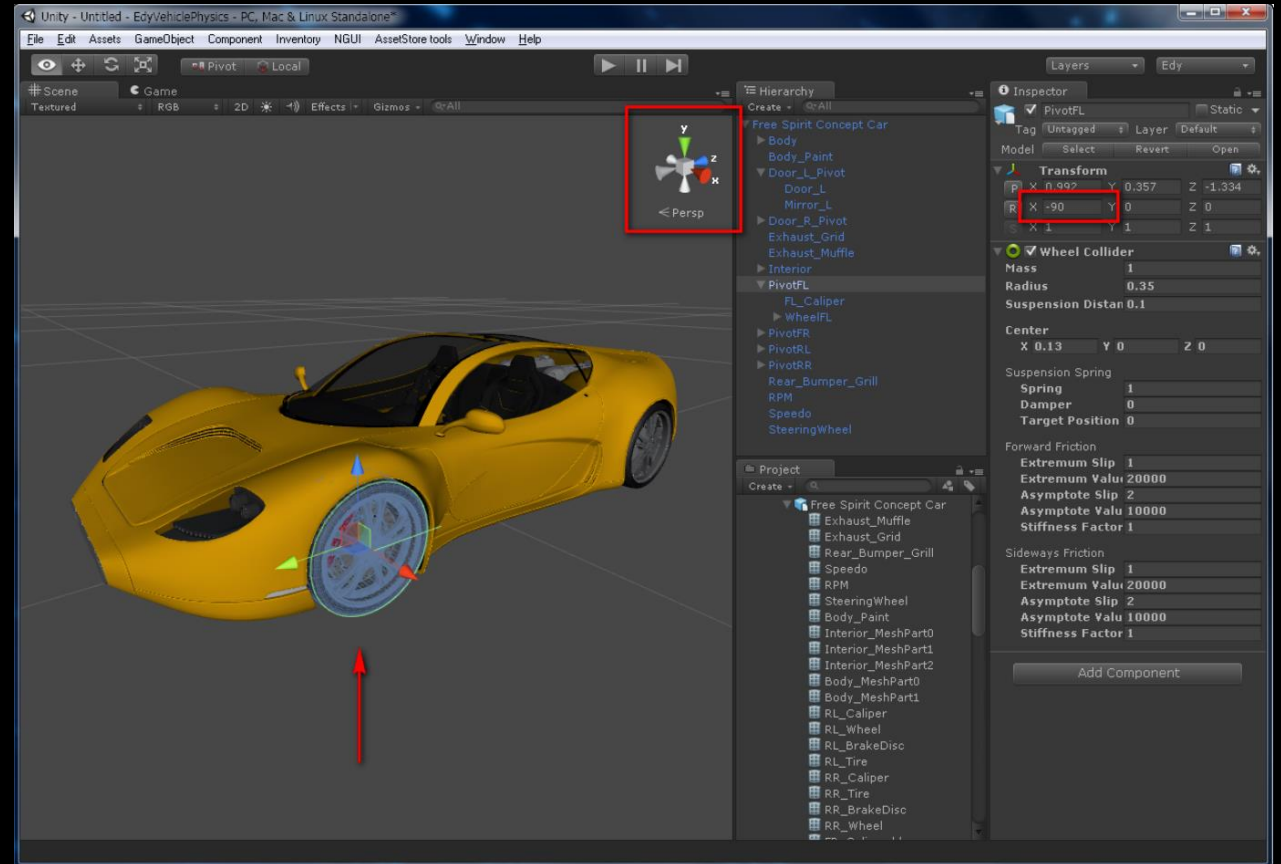


UNITY 3D: One Game Engine to Rule Them All

Before: 3D objects from AUTODESK
-> UNITY (games)

Future: 3D engine in AUTODESK ->
simulate physics in real time and
realistically directly in AUTODESK

Will AUTODESK be able to make
designs in the future based on
machine learning from thousands
of previous designs and physical
laws?



So how does AI work?



And how mature is the technology?

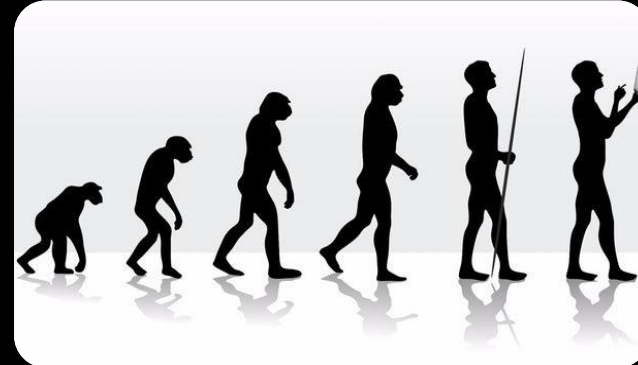
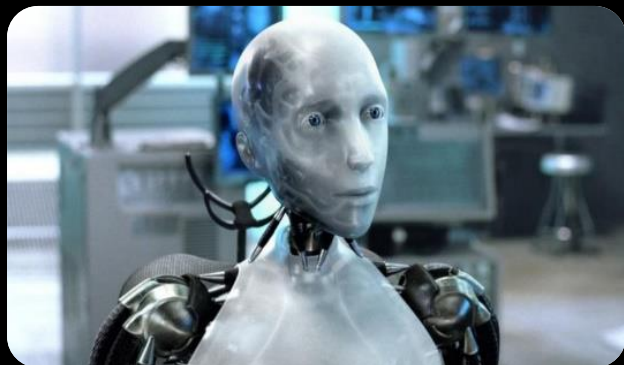
REGZA

It might
look goofy ...



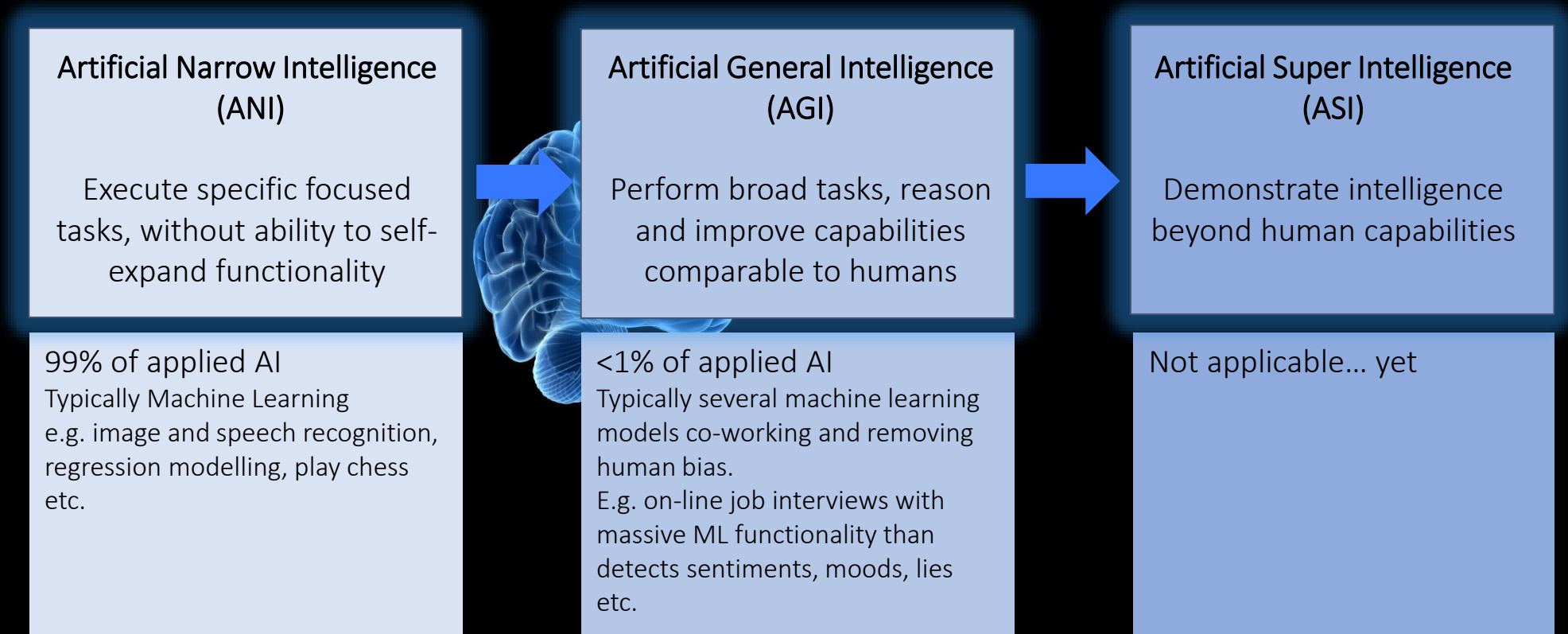
TOSHIBA

Machine learning resembles Human learning



So how widespread is AI today?

AI stages:



Even narrow AI can struggle...

The Chihuahua vs.
Muffin challenge



The Gaming Industry is leading AI development...

AI maturity



Kasparov loses Chess Match to IBM's Deep Blue computer



Google Deepmind's AlphaGo beats Lee Sedol



Google Deepmind's AlphaGo Zero crushes AlphaGo and every other opponent in just 40 days



Google Deepmind beats world's best players in Starcraft II



UNITY launches new challenge to combine several types of Machine Learning



"No scalable AI without solid data management"

"3D models of the future will be intelligent"

"AI today is mostly machine learning in a narrow application"

Conclusions on PART 1

"Anything that can be automated will be automated"

"Most AI algorithms are open source/free, data is the asset you want to protect"

PART 2

Application of AI in Danish Engineering Consultancy

The Application of Machine Learning – 3 cases:

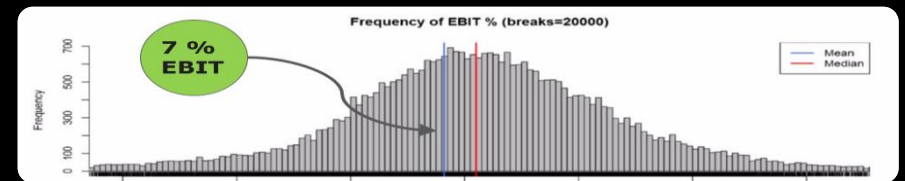
Predictive maintenance of sewer systems
- HOFOR and Energi Viborg, NIRAS



Prediction of High Shallow Groundwater
- Region Midt, COWI/GEUS



Prediction of Project performance
based on ERP data – COWI internal



Predictive maintenance of sewer systems

What sewer pipes need urgent replacement?

For **all** sewer pipes we have “asset data”:

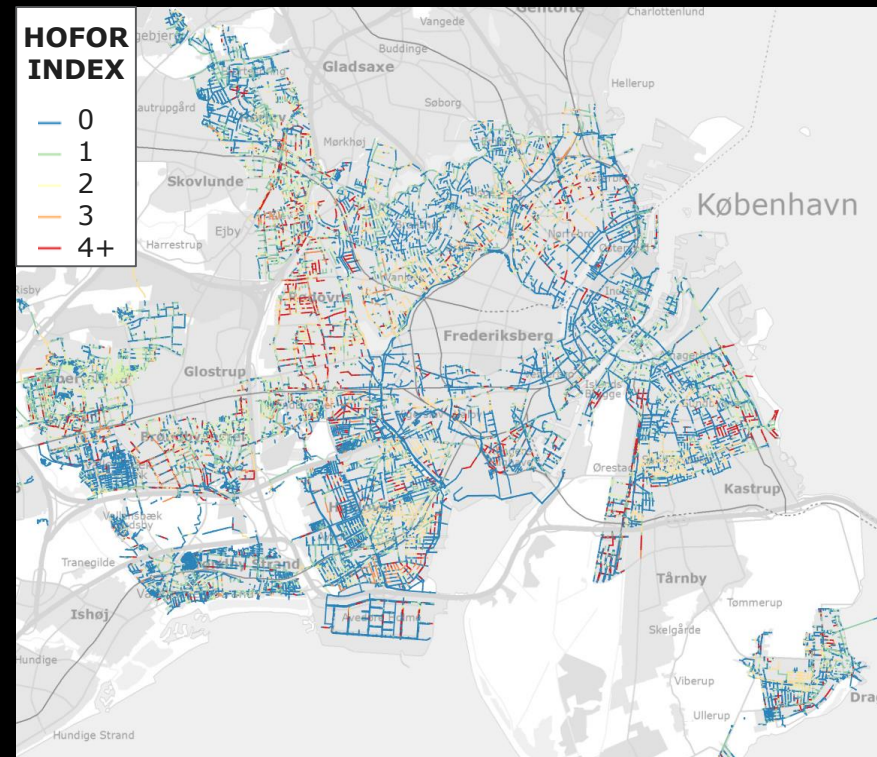
- Metadata (age, material, dimensions, length)
- Information about groundwater, soil type etc.
- Proprietary information (BBR etc.)

For **most** sewer pipes we have:

- TV-inspections (ground truth) => used to calculate a physical index.

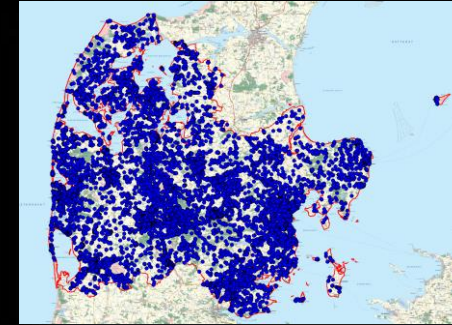
We have trained ML algorithms by combining “asset data” and TV-inspections to:

- Calculate a physical index where TV-inspection have never been done
- Update a physical index based on age extrapolation of the pipes



Prediction of High Shallow Groundwater

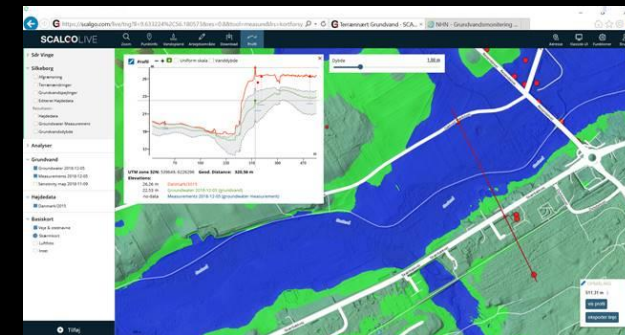
Water levels from +15.000 sampling points
Heavy statistical computation/normalisation
of data (COWI Connect platform)



Patterns in areas with data is used to
predict water levels in areas with no
data (Random Forrest ML)

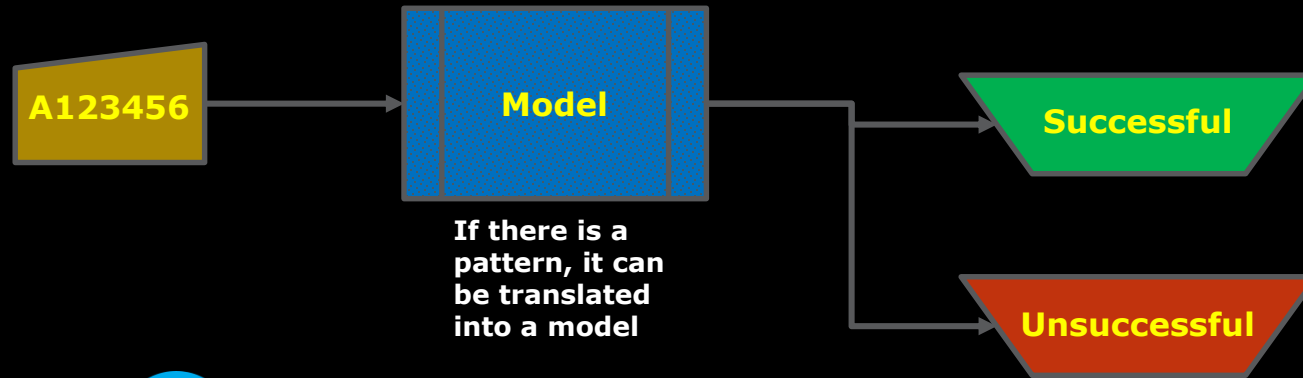


Flooding prediction using a highly
advanced 3D terrain flooding model
(SCALGO LIVE)



Prediction of Project Performance based on ERP data

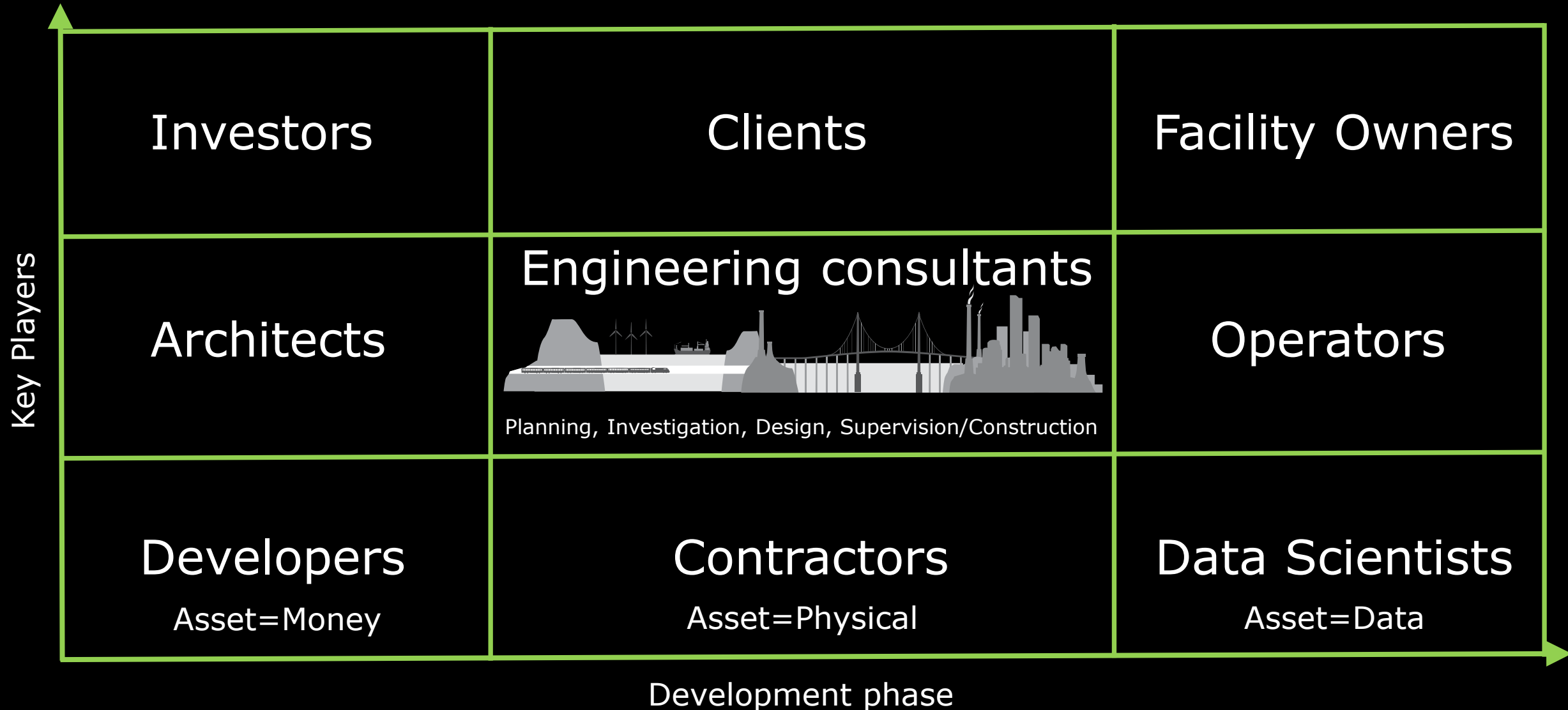
Is it possible to find a pattern identifying successful projects?



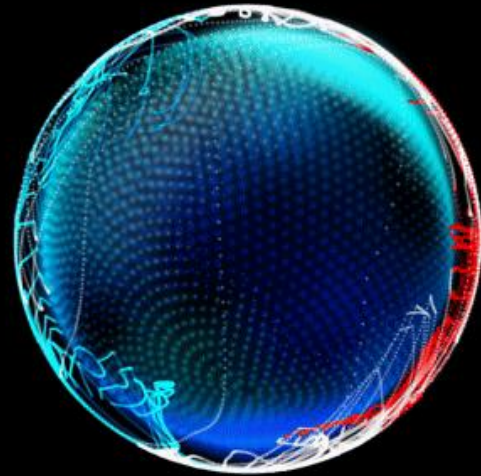
Using standard  ML tools on 50.000 executed projects, we got a 75% prediction accuracy indicating that:

1. Who is **Project Manager** matters most
2. Who is **Customer** matters a lot
3. Which **COWI region** matters
4. Effect of the **degree of distributed work** is uncertain

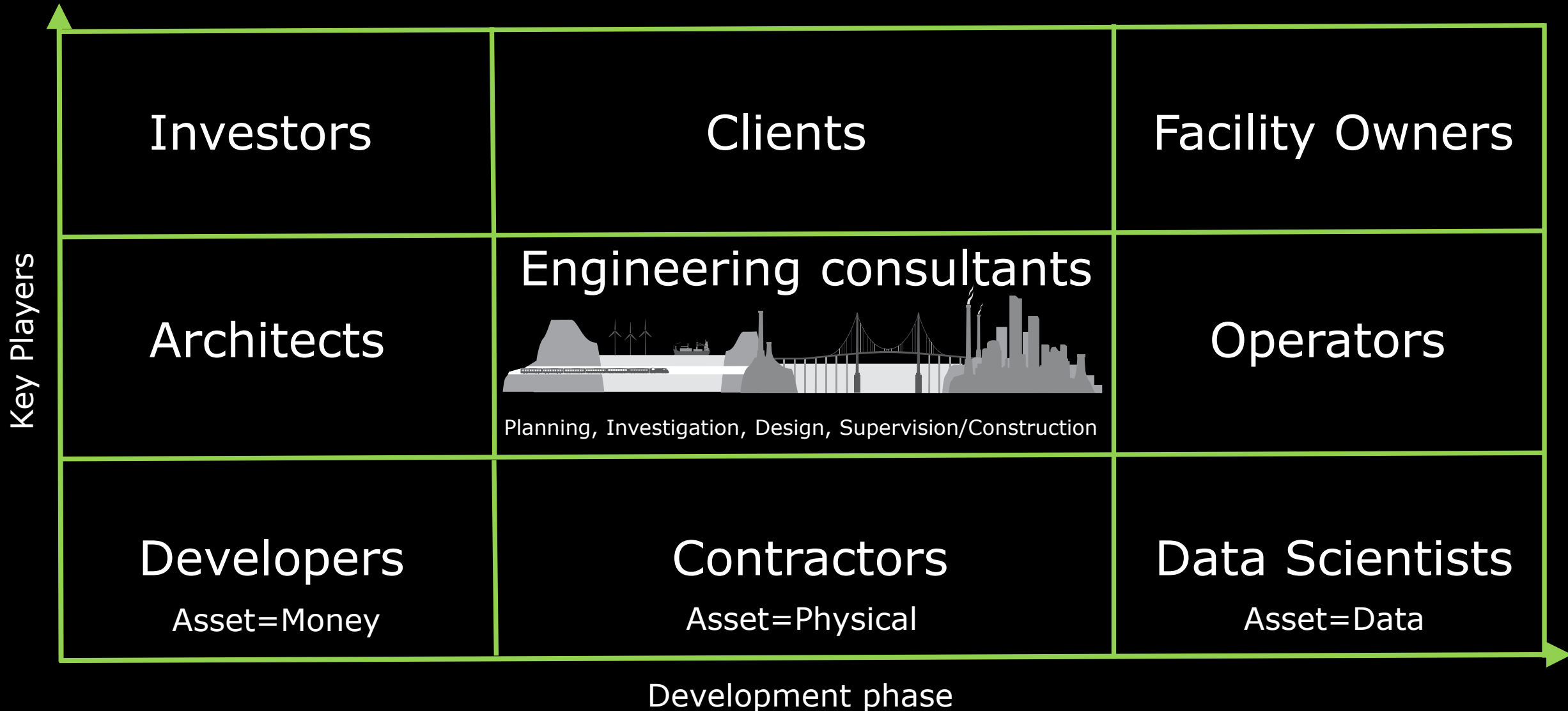
The role of Engineering Consultants today



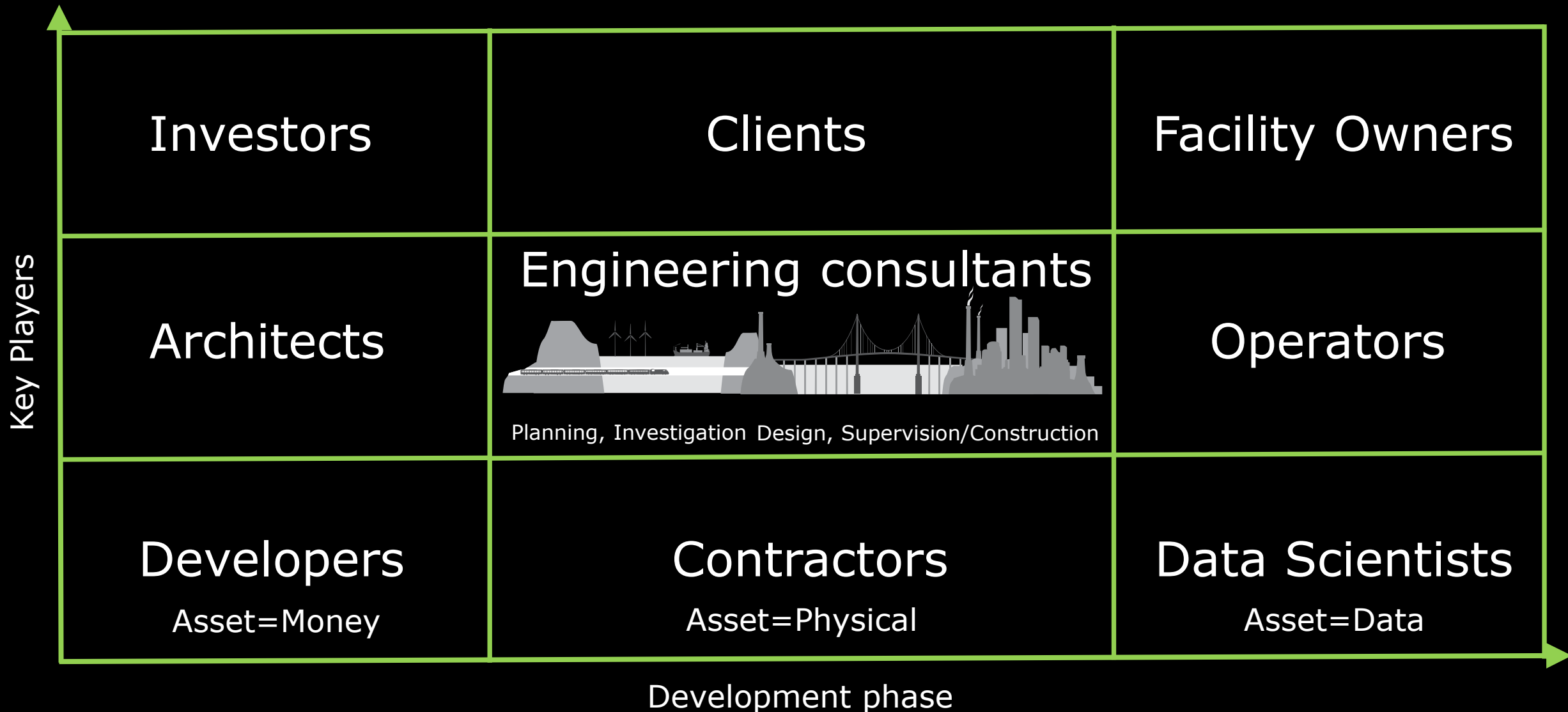
What is The Future for Engineering Consultancy?



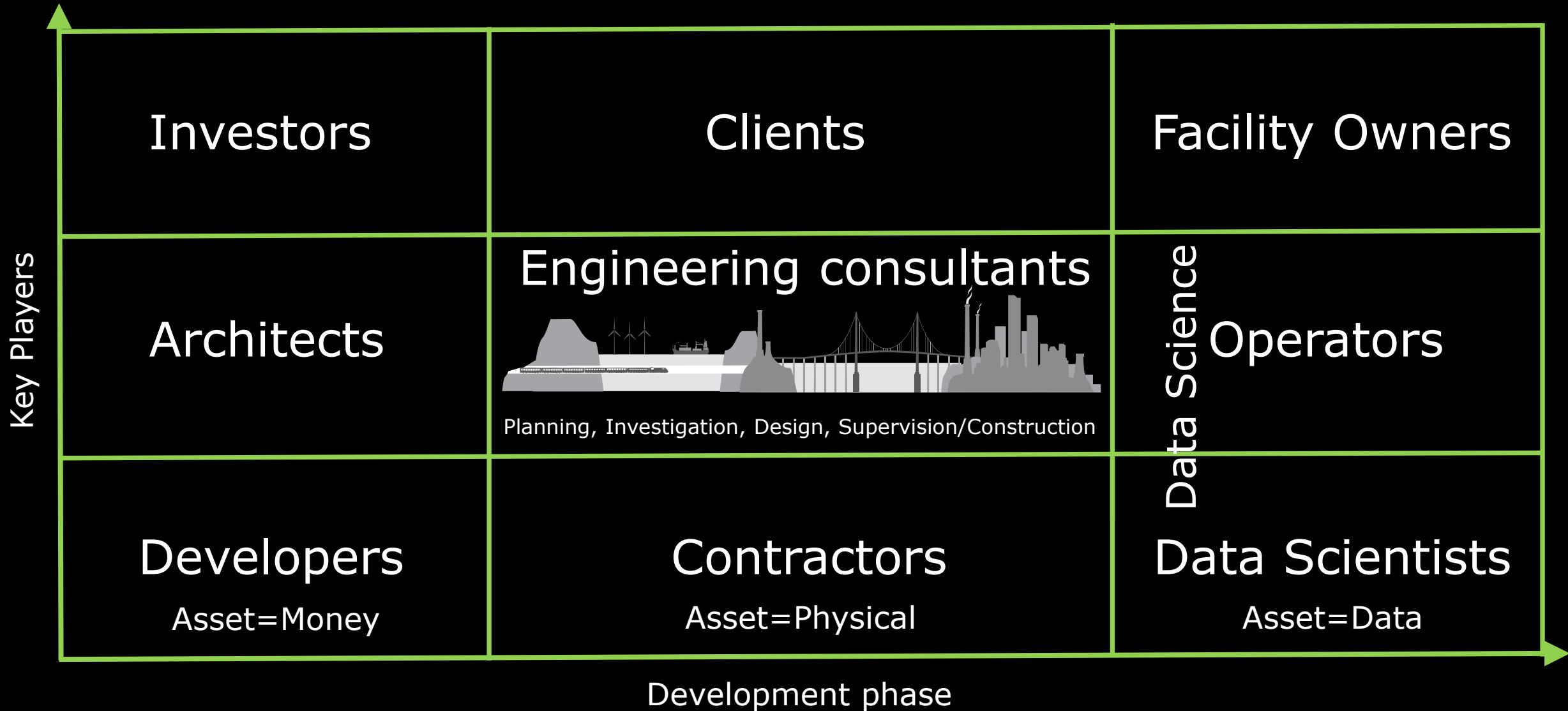
Trend 1: Acquisition of Architect Companies



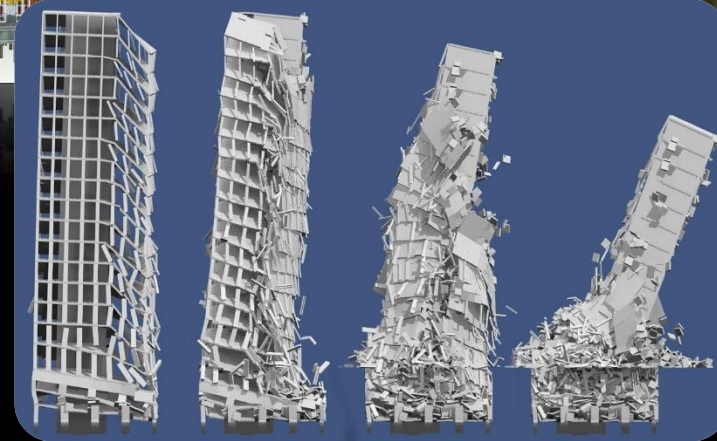
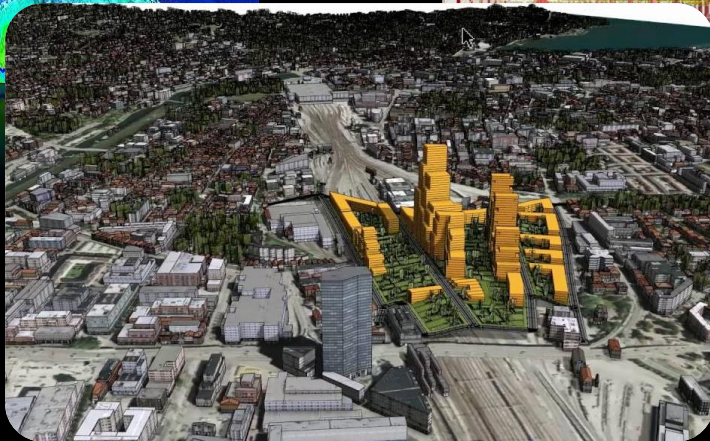
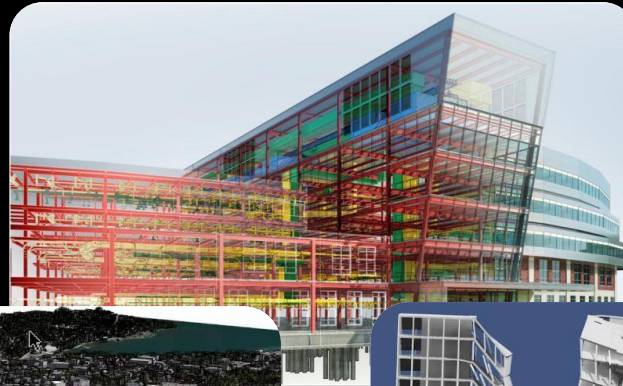
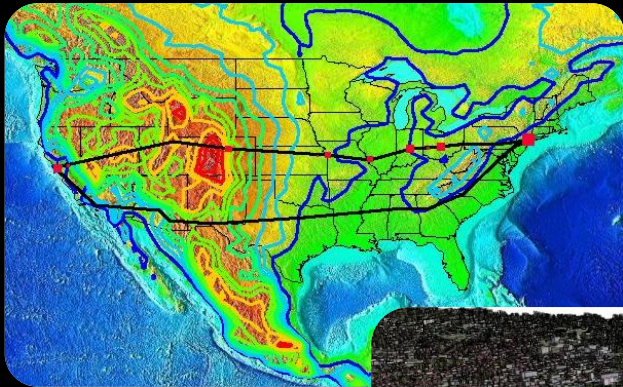
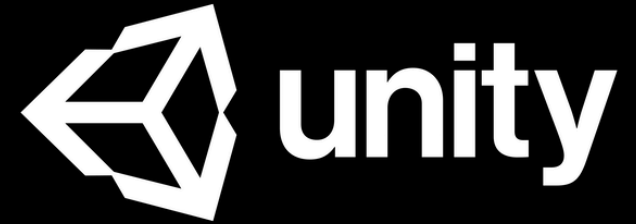
Trend 2: Contractors take up Design and Supervision



Trend 3: Engineering Consultants acquire Data Science



Digital Partnerships that will change the world of engineering...



This will ultimately lead to a complete “digital twin world”



The Digital Development
is changing the Business
Landscape...



... so we need to
find new ways
of moving forward

"Machine learning can compete with traditional modelling"

"Traditional Engineering Consultancy will be challenged by both Tech Companies and Management Consultants"

"Most Engineering Consultants are broadening their digital value chain"

Conclusions on PART 2

"Data Science capabilities will be in demand – both internally and as consulting services"

"Digital partnerships between AUTODESK, ESRI and UNITY is going to change the E&C industry dramatically"

And remember...

No Industry...

No Organisation...

No Individual...

- will be left untouched by Artificial Intelligence

THANK YOU



And remember...

No Industry...

No Organisation...

No Individual...

- will be left untouched by Artificial Intelligence



THANK YOU



Machine Learning is a lot like teenage sex...

Everybody talks about it.

Only some really know how to do it.

Everyone thinks everyone else is doing it.

So, everyone claims they are doing it.