AI for the C-Suite

Simon Greenman

30th April 2022

Best Practice AI

Dauphine | PSL
LONDON

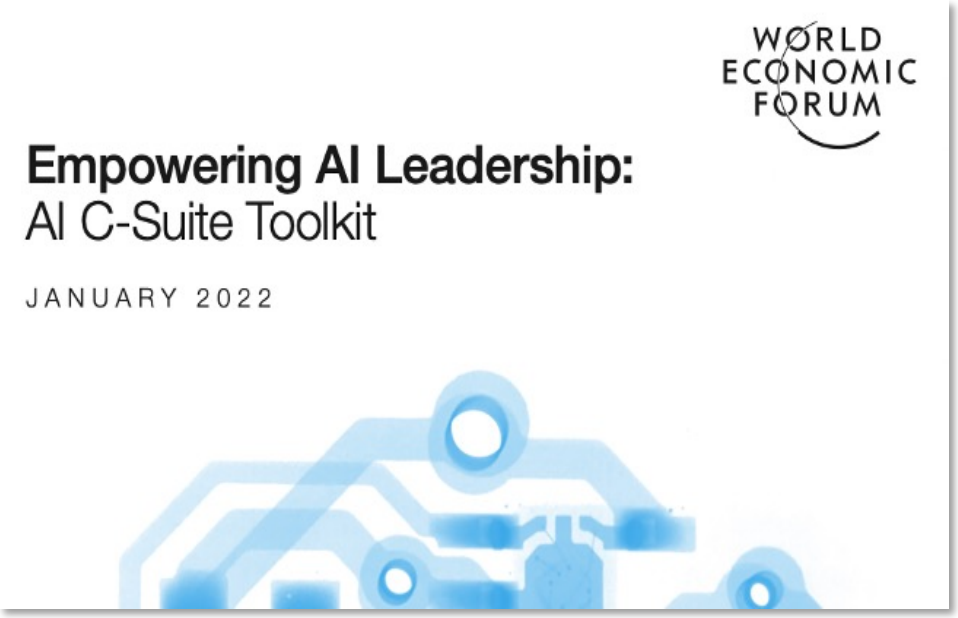
Introduction

SIMON GREENMAN
Partner, Best Practice AI

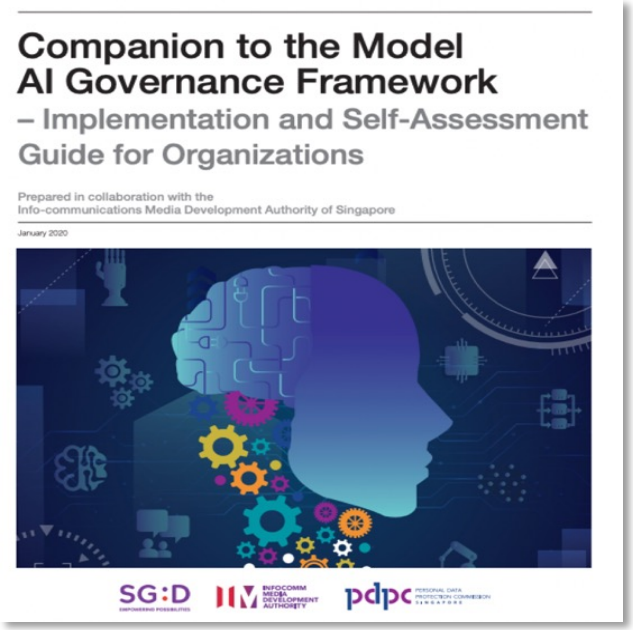
- 20+ years of international digital and data transformation experience
- Member World Economic Forum's Global AI Council
- Co-founder of early internet brand MapQuest.com
- Co-Chair Harvard Business School Angels, DN Capital advisor, and former AI Expert in Residence at Seedcamp
- MBA from HBS and BA in AI from Sussex University, UK.

Best Practice AI sits on the World Economic Forum's Global AI Council and are core contributors to projects

AI Empowering Leadership Board and C-Suite Toolkits



Model AI Governance Framework



https://towardsdatascience.com/reflections-on-ai-from-davos-2020-world-economic-forum-49a3964e08d

https://verdict-ai.nridigital.com/verdict_ai_jan19/from_the_influencers

The history of AI is a story of many boom and busts

Marvin Minsky
MIT

"Within our lifetime machines may surpass humans in general intelligence

1961

"Within a generation…I am convinced…the problems of creating artificial intelligence will be substantially solved.

1967

Does the power of exponential mean that it is different now?

2012 saw significant breakthroughs in computer vision performance

1. Data

1,700,000 BYTES / SEC

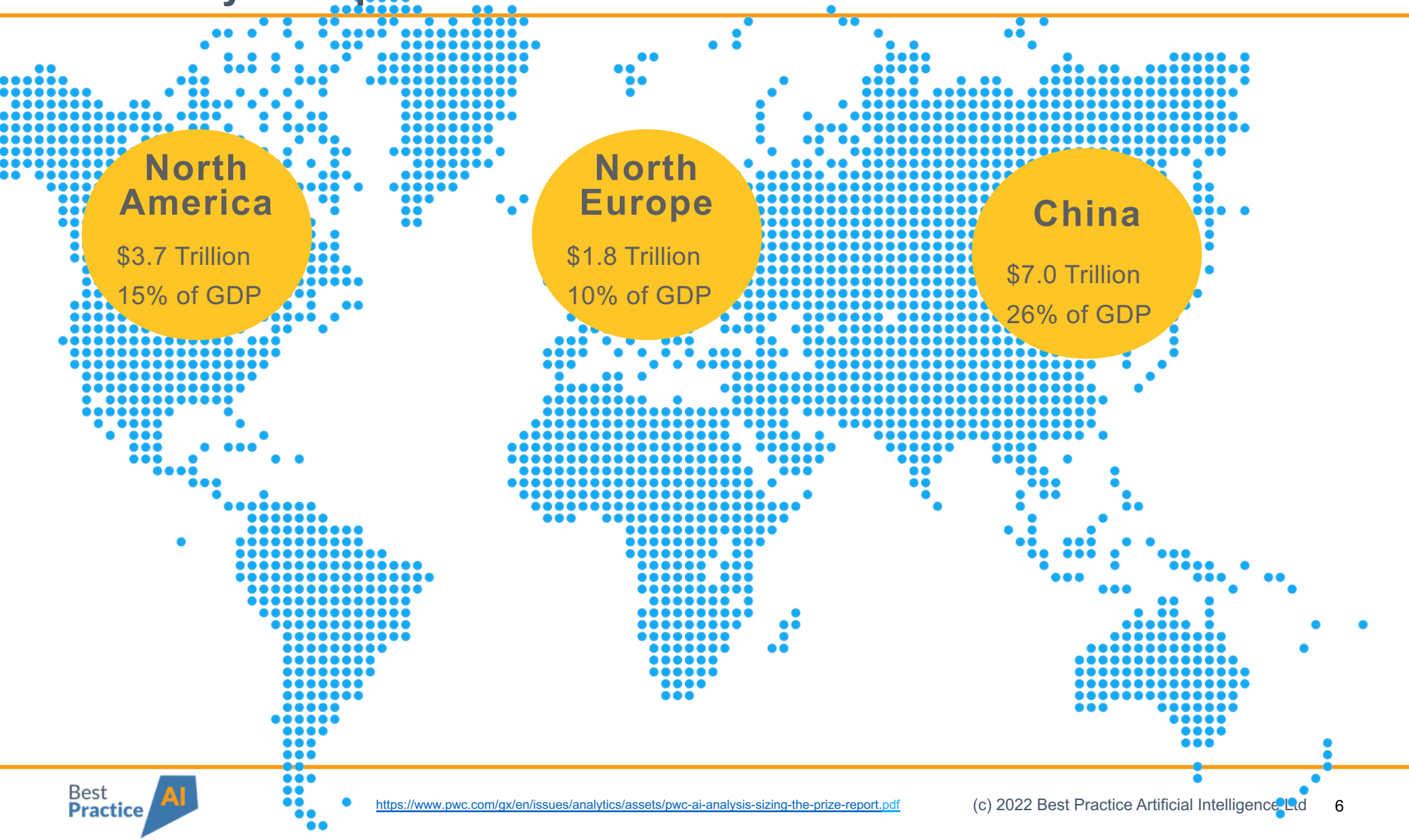
2. Comp Power

840,000,000 MPH

3. Software

$0

The total global uplift on GDP as a result of AI could be over $10 trillion by 2030 per PWC



https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf

Overcoming Racial Bias In AI Systems And Startlingly Even In AI Self-Driving Cars

Racial bias in a medical algorithm favors white patients over sicker black patients

AI expert calls for end to UK use of 'racially biased' algorithms

AI Bias Could Put Women's Lives At Risk - A Challenge For Regulators

Gender bias in AI: building fairer algorithms

Bias in AI: A problem recognized but still unresolved

Amazon, Apple, Google, IBM, and Microsoft worse at transcribing black people's voices than white people's with AI voice recognition, study finds

Millions of black people affected by racial bias in health-care algorithms

Study reveals rampant racism in decision-making software used by US hospitals – and highlights ways to correct it.

When It Comes to Gorillas, Google Photos Remains Blind

Google promised a fix after its photo-categorization software labeled black people as gorillas in 2015. More than two years later, it hasn't found one.

The Week in Tech: Algorithmic Bias Is Bad. Uncovering It Is Good.

Google 'fixed' its racist algorithm by removing gorillas from its image-labeling tech

Artificial Intelligence has a gender bias problem – just ask Siri

The Best Algorithms Struggle to Recognize Black Faces Equally

US government tests find even top-performing facial recognition systems misidentify blacks at rates five to 10 times higher than they do whites.

https://towardsdatascience.com/algorithm-bias-in-artificial-intelligence-needs-to-be-discussed-and-addressed-8d369d675a70
https://reutersinstitute.politics.ox.ac.uk/risj-review/uk-media-coverage-artificial-intelligence-dominated-industry-and-industry-sources

WILL A ROBOT STEAL **YOUR** JOB?

KILLER COMPUTERS

Bill Gates warns 'dangerous AI' poses a threat 'like nuclear weapons'

AI WARNING:

Robots will destroy a HUGE number of jobs, claims expert

AI could be used to ***TAKE OVER*** the ***WORLD*** through 'evil' fake news and hijacking cars

https://phys.org/news/2019-10-headlines-dont-robots-threaten-jobs.html

Agenda

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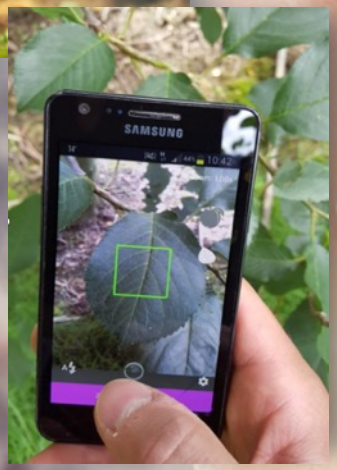
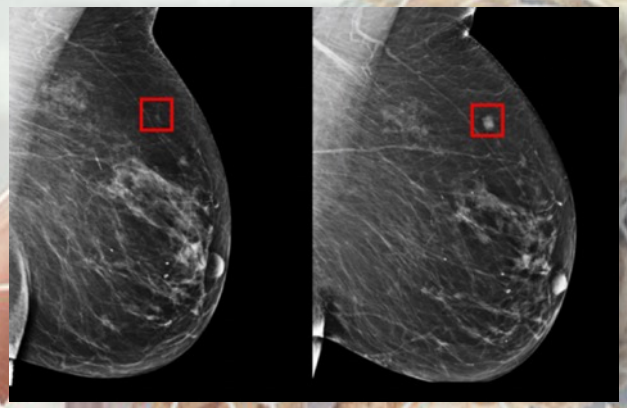
What is AI to you?

AI is a GPT that will be woven into the fabric of society with the potential to transform lives, companies, and government

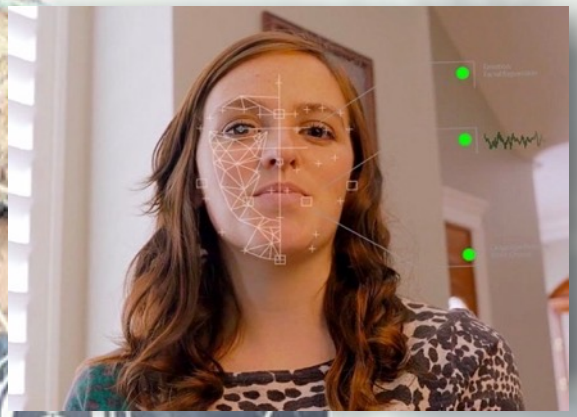
Improving crop yields in India with predictive plant disease diagnosis



Predicting occurrences of diseases earlier and more accurately



Improving corporate performance – CV screening & supply chain forecasting



https://www.microsoft.com/en-us/research/lab/microsoft-research-asia/projects/crop-pest-and-disease-diagnosis/
https://techcrunch.com/2019/06/26/mit-ai-tool-can-predict-breast-cancer-up-to-5-years-early-works-equally-well-in-whites-and-black-patients/
https://www.economist.com/business/2017/04/12/how-germanys-otto-uses-artificial-intelligence
https://www.inc.com/ruben-rodriguez/artificial-intelligence-hiring-process.html
https://www.wsj.com/articles/google-ai-looks-deep-into-your-eyes-to-predict-heart-disease-risk-1519...

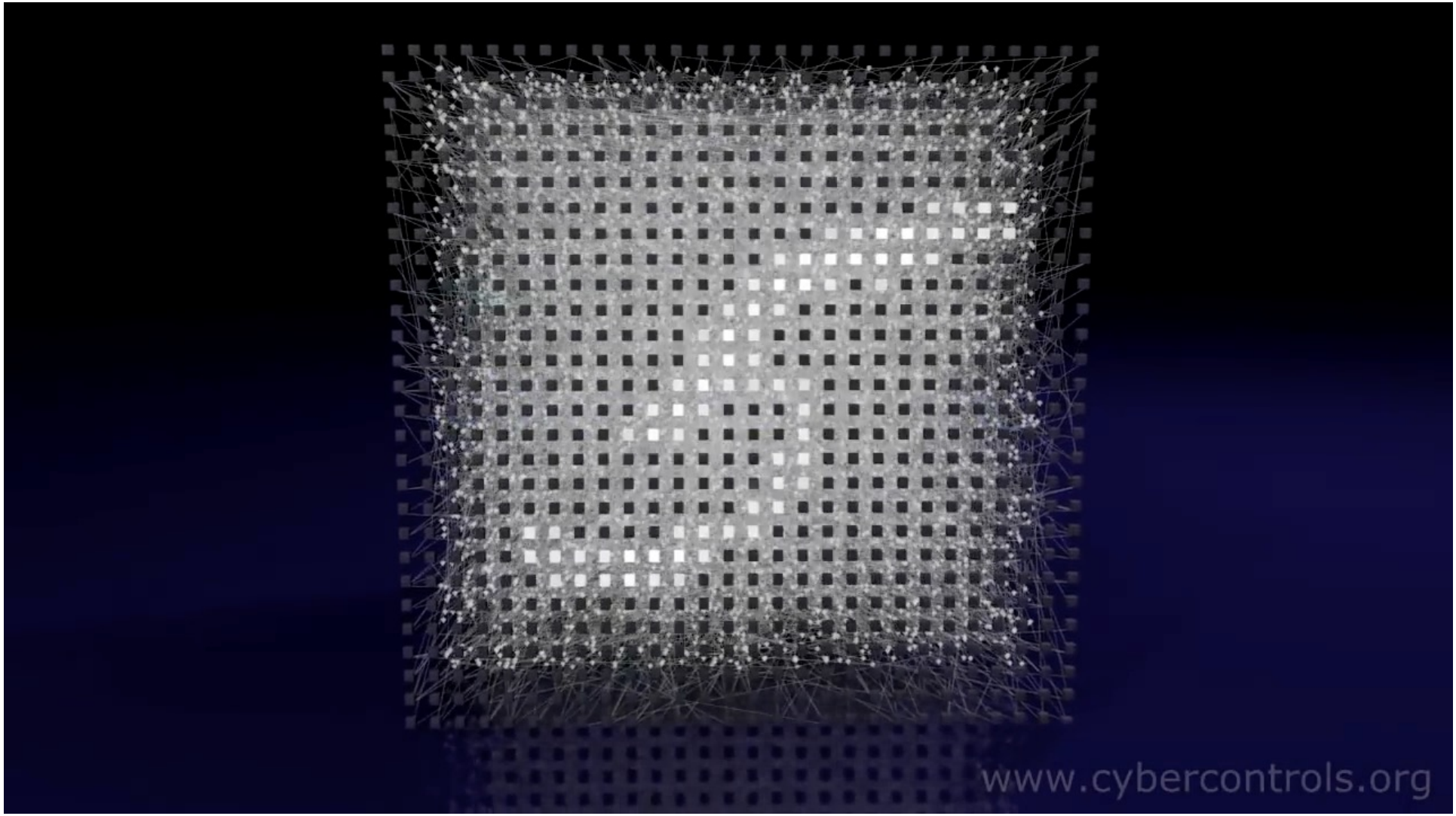
Media representation of AI as “human” misses the focus on a narrow intelligence that will become ubiquitous

Myth: “General Intelligence”

Reality: “Narrow Intelligence”

https://www.bestpractice.ai/studies/makoto_cucumber_farm_automatically_sorts_cucumbers_based_on_shape_length_and_distortion_using_deep_machine_visio

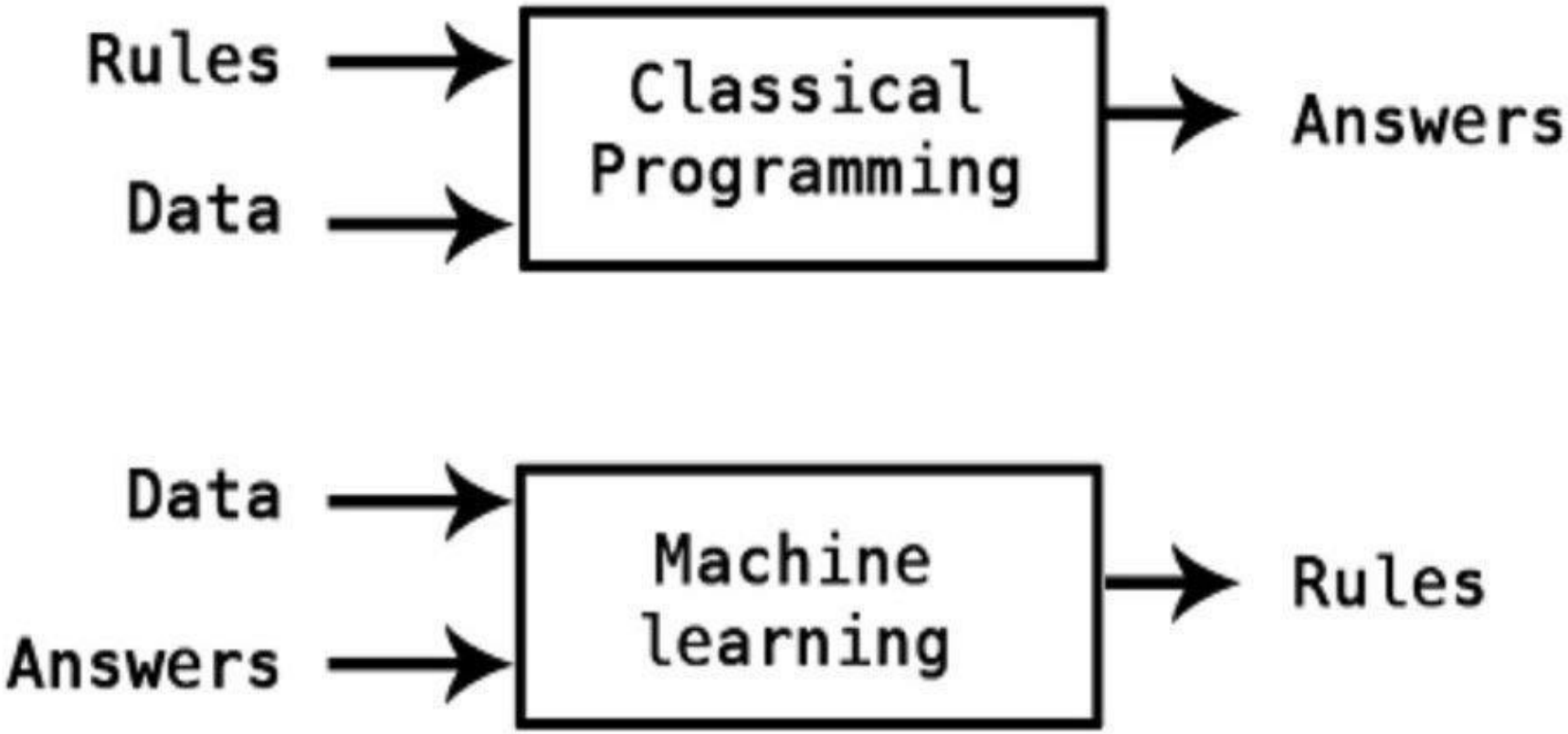
Machine learning today is massive pattern recognition using deep neural network models to make predictions



https://www.youtube.com/watch?v=3JO3hYko51Y

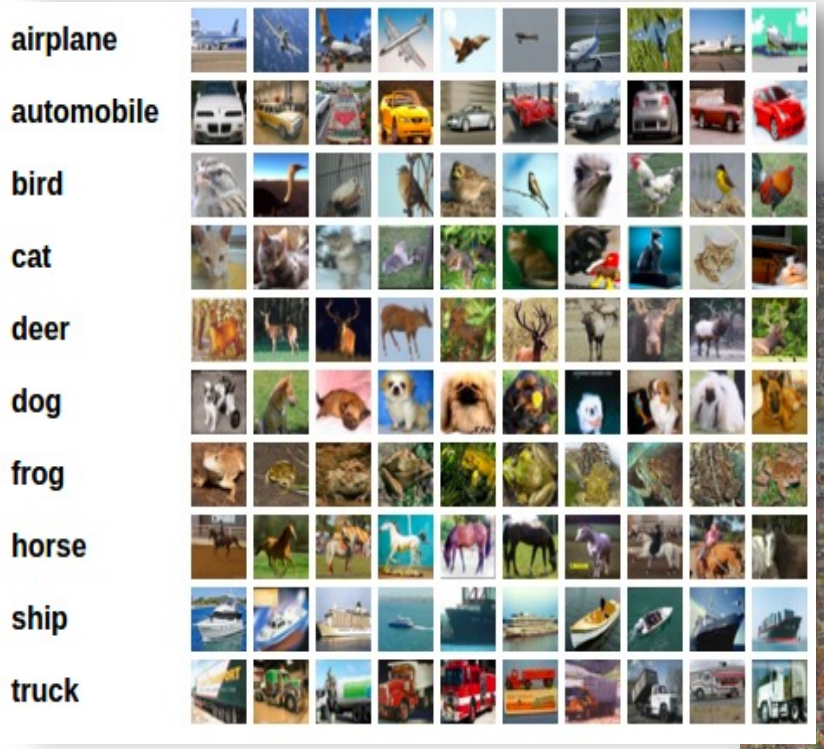
Practically, AI / ML is a new way to create software

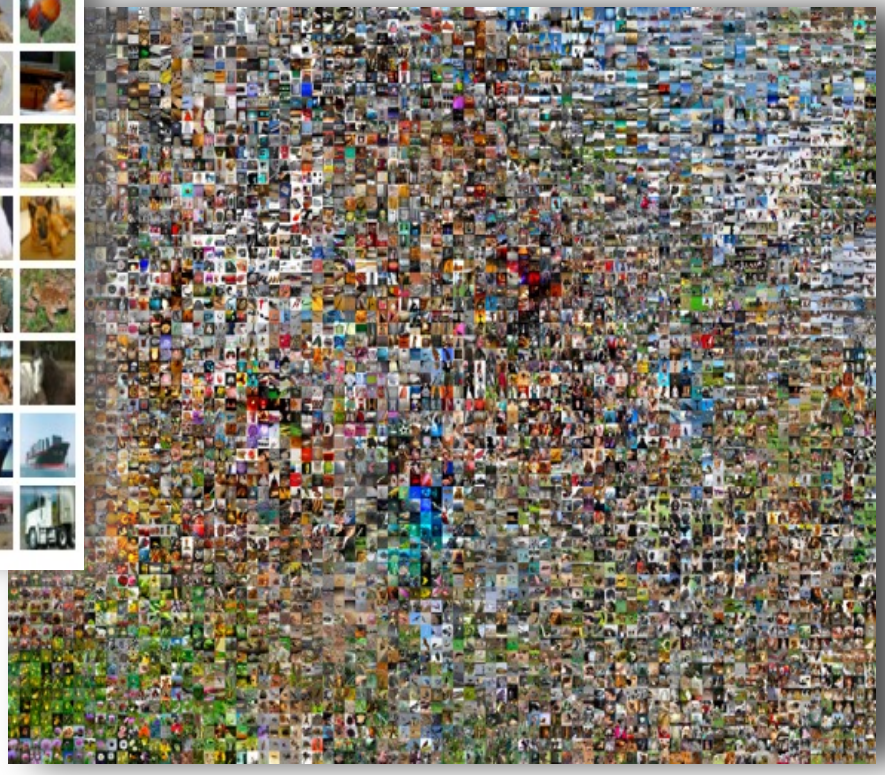
You no longer program the rules, ML figures out the rules



Machine learning requires masses amount of reliable and labelled data to build models

Example show labelled images of objects





We build AI models to make predictions and optimizations

Predictions can be made across most functions of a business

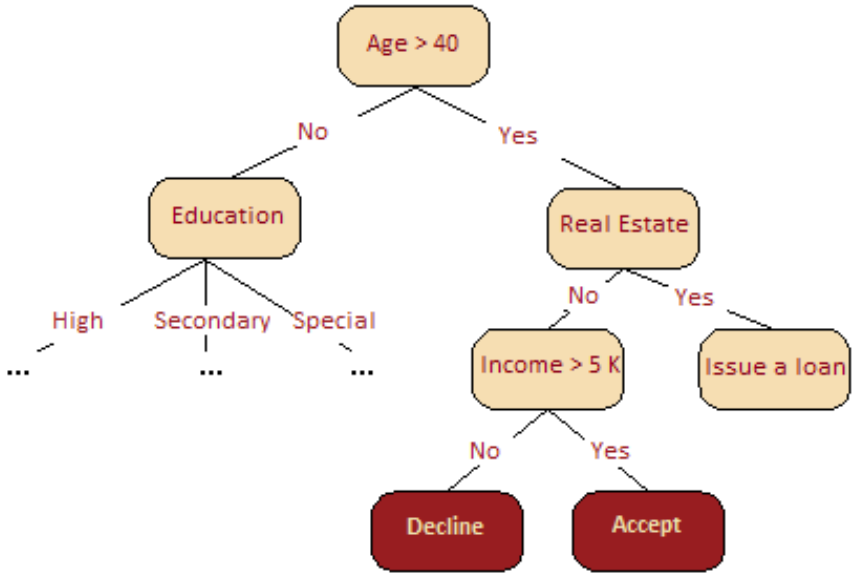
Predict future customer demand - Help predict best CVs - Optimise supply chain purchasing - Reduce cyber risks - Improve customer service - Automate data entry with RPA - Better market and engage prospective customers - Improve product offerings - Predict customer churn - Score top customer prospects

https://c3.ai/#deploy-critical-ai-applications

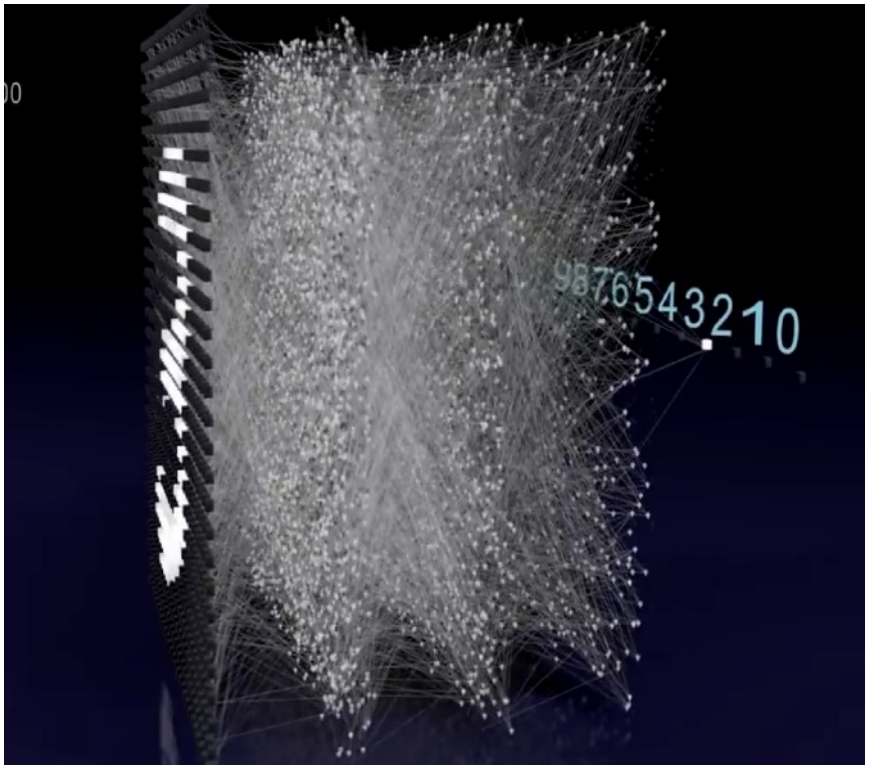
We do not necessarily understand the “rules” AI/ML create

There is often a tradeoff between interpretability and accuracy of explainability

Inferable models, such as decision trees, provide non-technical explanations (e.g. a loan decision)



Deep neural networks are often described as black boxes and it is harder to understand their decision making



https://www.youtube.com/watch?v=3JQ3hYko51Y

It is often hard to understand how a deep neural network works

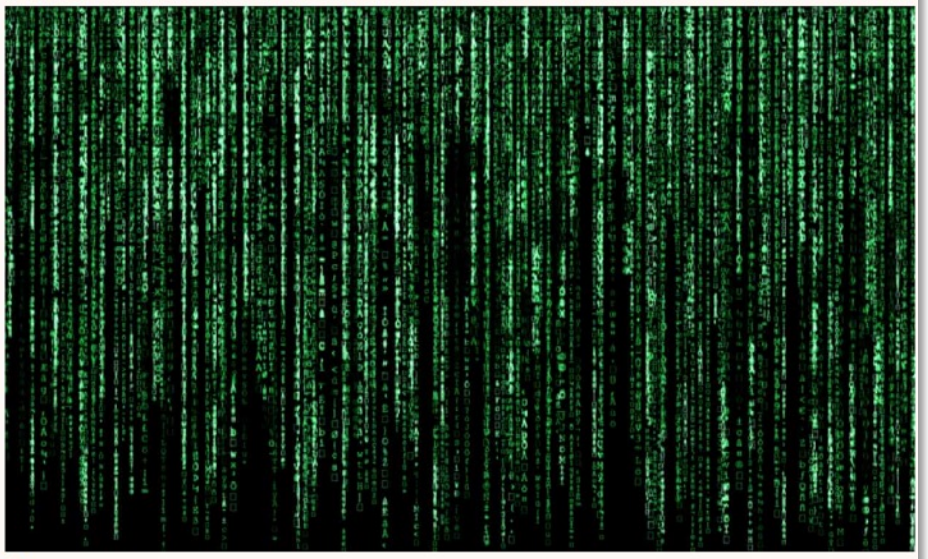
How do you understand a 175 billion parameter deep neural network model?

OpenAI 175 billion parameters (June ‘20)

A robot wrote this entire article. Are you scared yet, human?

We asked GPT-3, OpenAI's powerful new language generator, to write an essay for us from scratch. The assignment? To convince us robots come in peace

- For more about GPT-3 and how this essay was written and edited, please read our editor's note below



▲ 'We are not plotting to take over the human populace.' Photograph: Volker Schlichting/Getty Images/EyeEm

Google 1.6 trillion parameters (Jan ‘21)

VB The Machine GamesBeat Jobs Special Issue Become a Member | Sign In

The Machine
Making sense of AI

Google trained a trillion-parameter AI language model

Kyle Wiggers @Kyle_L_Wiggers January 12, 2021 10:36 AM

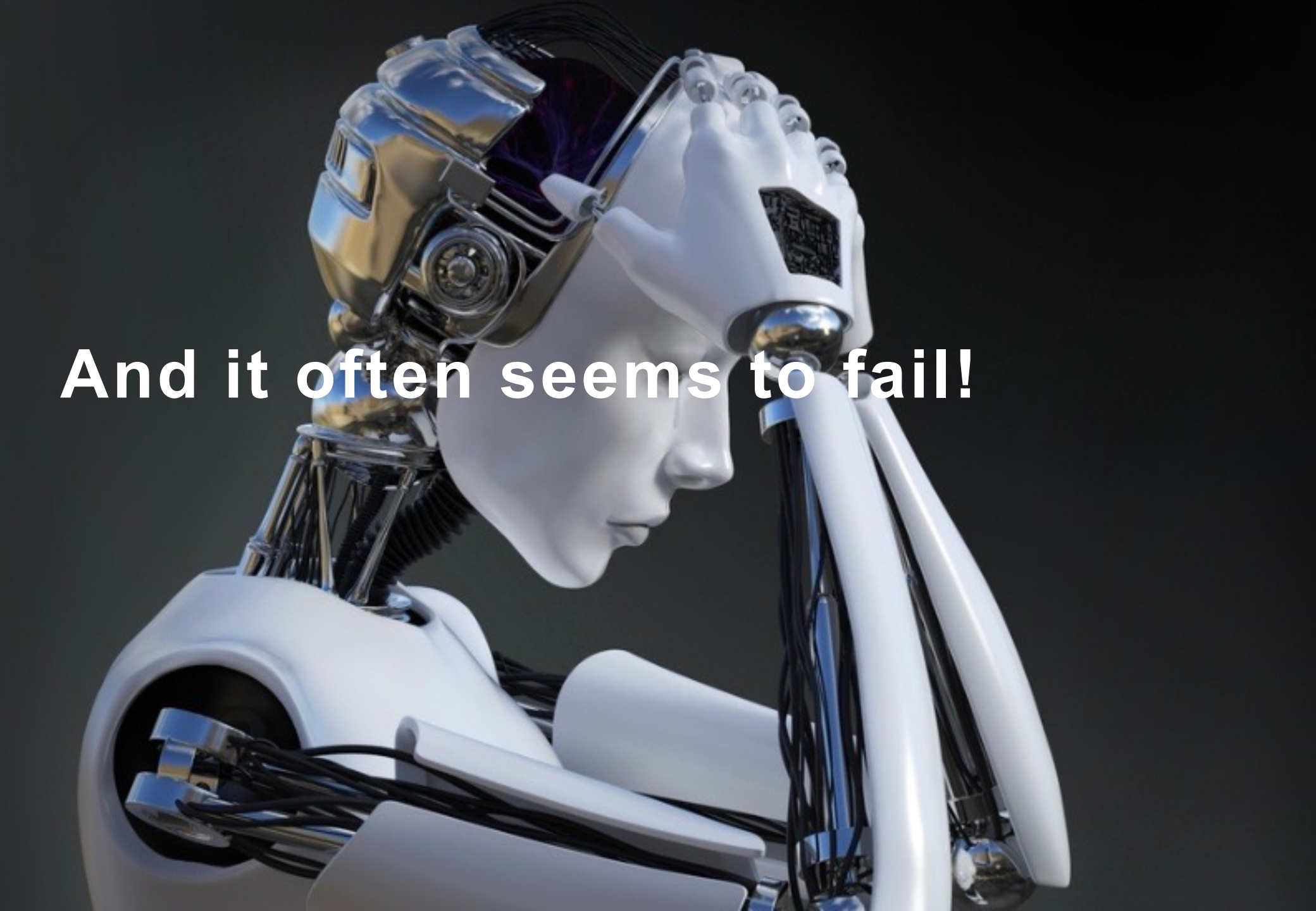
NEW YORK, NEW YORK - OCTOBER 20: Google's offices stand in downtown Manhattan on October 20, 2020 in New York City. Accusing the company of using anticompetitive tactics to illegally monopolize the online search and search advertising markets, the Justice Department and 11 states Tuesday filed an antitrust case against Google. *Image Credit: Spencer Platt/Getty Images*

How open banking is driving huge innovation

Learn how fintechs and forward-thinking FIs are accelerating personalized financial products through data-rich APIs.

Parameters are the key to machine learning algorithms. They're the part of the model that's learned from historical training data. Generally speaking, in the language domain, the correlation between the number of parameters and sophistication has held up remarkably well. For example, OpenAI's GPT-3 — one of the largest language models ever trained, at 175 billion parameters — can make primitive analogies, generate recipes, and even complete basic code.

https://www.theguardian.com/commentisfree/2020/sep/08/robot-wrote-this-article-gpt-3
https://venturebeat.com/2021/01/12/google-trained-a-trillion-parameter-ai-language-model/


And it often seems to fail!

Deep learning is brittle and lacks human level robustness

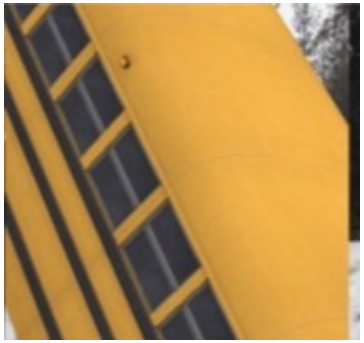
It recognises statistical patterns, not higher order concepts and common sense

School Bus

100%

Garbage Truck

99%



Punch Bag

100%

Snow Plough

92%

Source: https://arxiv.org/pdf/1811.11553.pdf

Tesla's Smart Summons shows the brittleness of pattern recognition and the challenges of a world of edge cases

https://arstechnica.com/cars/2019/10/i-watched-over-100-tesla-smart-summon-videos-heres-what-i-learned/

And when it fails it goes viral on social media

https://syncedreview.com/2021/01/01/2020-in-review-10-ai-failures/

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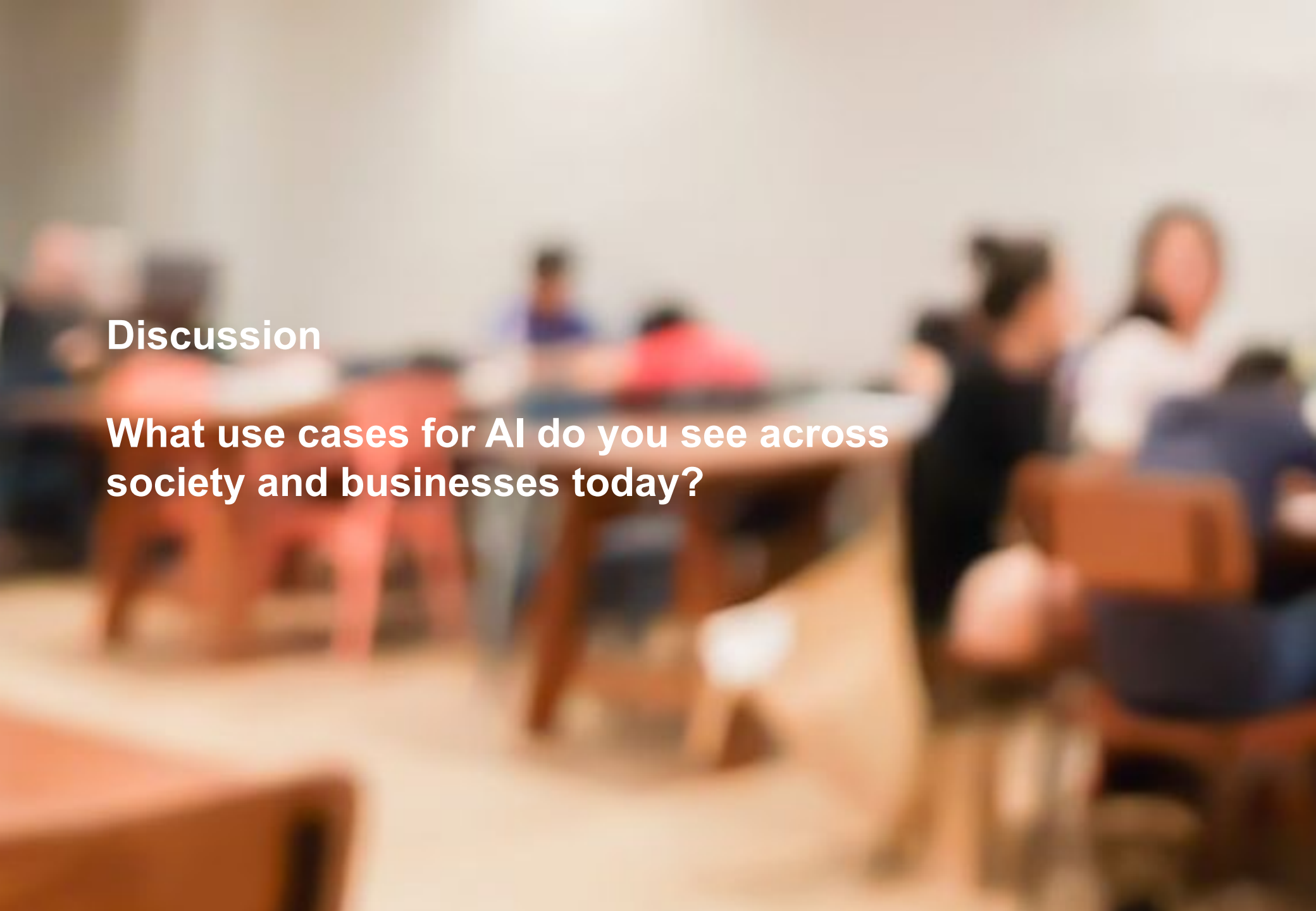


Discussion

What use cases for AI do you see across society and businesses today?

AI lets computers interact directly with the real world

Seeing

Hearing

Reading

Analysing

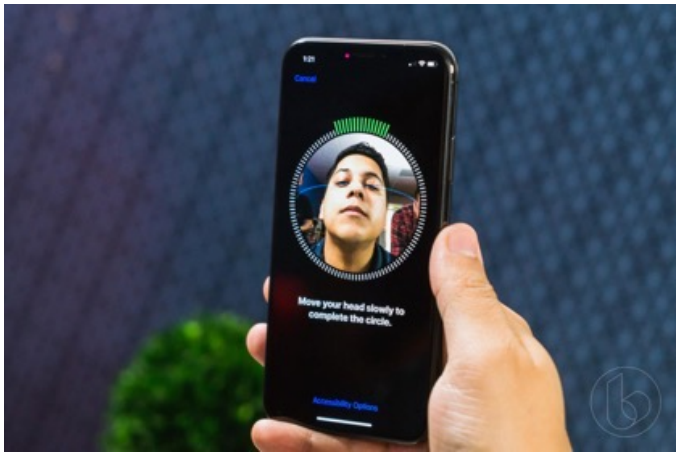
"What could I do with ***one million*** *interns?"*

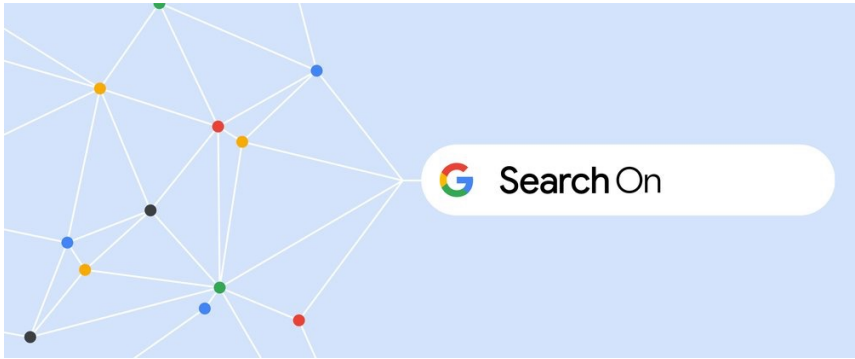
"How can I increase the ***productivity*** *of my top people 100x?"*

Scaled observation interaction of the world*

*Surveillance

And we interact with AI as part of our daily lives





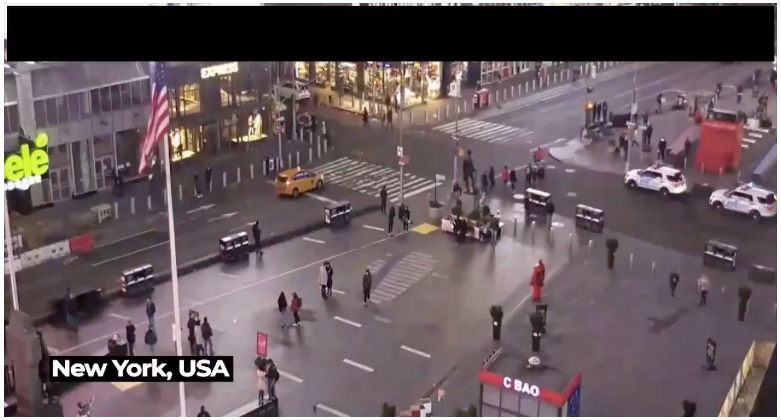
And it has been particularly good for observation, some might say surveillance

Thermal screening in stations and airports

FRT to detect those wearing masks & enforce quarantines

Thermal cameras used on on drones to identify fevers and crowds

Enforcing social distancing



AI is an enabler of use cases

What makes a good use case?

Identify high value use cases by examining existing organizational processes and identify tasks that:

1. **Discrete task (**e.g. inspect manufacturing parts for quality)
2. **Repeated frequently (e.g.** customer service queries)
3. **Similar in nature** and low dimensional space (e.g. very similar data entry)
4. **Efficiency opportunities** (e.g. screening candidates for jobs)
5. **Focuses on prediction**, **optimization** and **pattern recognition**
   (e.g. predicting customer churn)
6. **Have clear inputs and outputs (**e.g. entering data into computer formats)
7. Has lots of **data** to learn from (e.g. supply chain forecasts)

Common use cases - automating and augmenting customer service with chatbots

Automate customer service conversations through a text chatbot

DBS Bank has introduced an online-only banking platform called Digibank in India, Indonesia and Singapore. Customers access the bank through mobile SMS, online or Facebook Messenger using a chatbot developed by Kasisto, KAI. This has automated 82% of responses to customer questions and reduced the bank's infrastructure requirements.

https://www.bestpractice.ai/studies/dbs_automates_responses_to_82_of_their_digibank_customer_questions_using_the_kai_chatbot

Automate customer service conversations through a text chatbot

Bradesco bank in Brazil has implemented a conversational agent to interact with customers and employees in Brazilian Portuguese, called Bradesco Inteligência Artificial (BIA). It can answer both speech and text questions, and is presently capable of handling 94% of all questions asked.

https://www.bestpractice.ai/studies/bradesco_bank_increases_customer_satisfaction_and_service_efficiency_by_implementing_a_virtual_agent_to_aid_employees_and_automate_responses

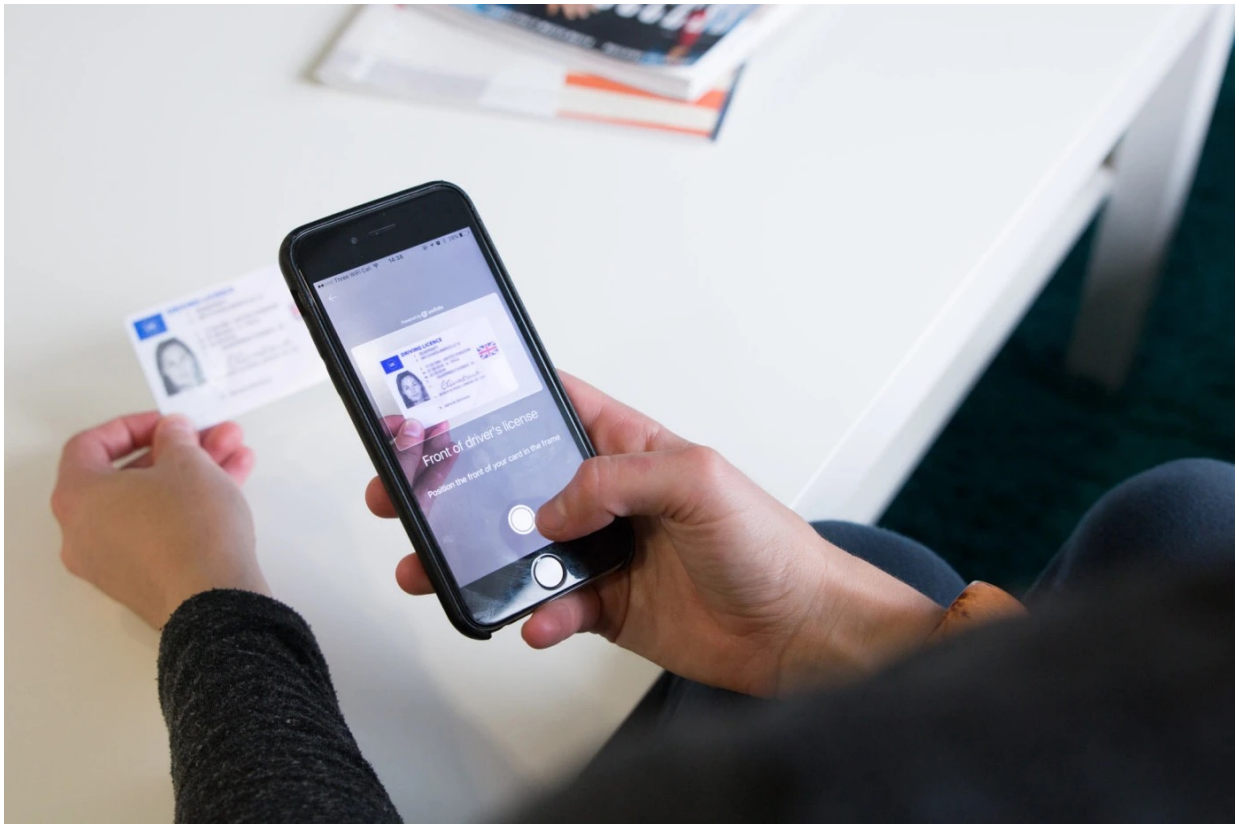
Automate customer service conversations through a text chatbot

Hang Seng Bank has implemented two chatbots, Dori and Haro, to answer customer questions in Chinese and English, with the ability to understand Cantonese. Their conversations are intended to feel 'human' and are accessed through Facebook Messenger. Customer requests they can aid with include loan repayment calculations, suggest online store offers, and make restaurant reservations.

https://www.bestpractice.ai/studies/hang_seng_bank_improves_customer_experience_through_chatbots_using_nlp_to_assist_customers

Common use cases – know your customer (KYC)

Pockit uses Onfido for KYC and AML (know-your-customer and anti-money laundering respectively) which it does remotely. Utilising machine learning and facial recognition, Onfido can verify users' identities with images of government documents and selfies. This has increased customer conversion by 15% by making the identity check process easier and more efficient.



https://www.bestpractice.ai/studies/pockit_increases_customer_conversions_by_15_using_automated_identity_verification_from_onfido

Common use cases – manage risk and cybersecurity

Predict credit risk of individual customers

BankMobile is planning to implement Upstart's online lending software which assesses loan creditworthiness by using machine learning to model risk based on alternative data. This is is intended to target younger customers who may have no traditional credit history.

https://www.bestpractice.ai/studies/bankmobile_approves_loans_for_young_banking_customers_based_on_non_traditional_data_measures_using_upstarts_machine_learning

Predict credit risk of individual customers

Scotiabank is using deep learning to better manage credit card collections. The platform developed by Dessa identifies risky customers and classifies them according to risk which is calculated by analysing historical data from the bank. It then predicts whether the customer needs a reminder or not, whether there is a chance of delinquency and so on.

https://www.bestpractice.ai/studies/scotiabank_improves_payment_collections_of_credit_card_customers_using_deep_learning

Identify cybersecurity threats and regulatory reporting

BT has deployed Darktrace's Enterprise Immune System to protect its network and large datasets. The system records daily patterns of network activity and creates a baseline model of the network. Any deviations or anomalies are classified as threat instantly and alerts are generated.

https://www.bestpractice.ai/studies/british_telecom_improves_network_security_by_using_machine_learning_to_detect_real_time_cyber_threats

Common use cases - identify fraudulent activity using unusual payment transaction patterns and other data

Monzo decreased pre-paid card fraud to 0.1% and false positive rate to 25% using machine learning. Monzo's machine learning system predicts which online banking and card transactions are potentially fraudulent. Upon detection, extra security is required to verify user identity.

https://www.bestpractice.ai/studies/monzo_decreased_pre_paid_card_fraud_to_0_1_and_false_positive_rate_to_25_using_machine_learning

Revolut, the online-based challenger bank, has recently introduced machine learning as a way to detect fraudulent e-commerce activity and card theft/fraud using machine learning.

https://www.bestpractice.ai/studies/revolut_reduces_bank_card_fraud_using_machine_learning_to_detect_anomalies

NatWest has partnered with Vocalink Analytics to create and deploy a fraud detection system which works by analysing historic payment data to spot new potentially fraudulent payments. The system focuses on invoice payment redirection, which it claims has avoided making over £7M in fraudulent payments.

https://www.bestpractice.ai/studies/natwest_bank_prevents_over_7m_worth_of_corporate_fraud_by_using_machine_learning_to_detect_suspicious_invoice_payment_activity

Common use cases for AI across functions and technologies

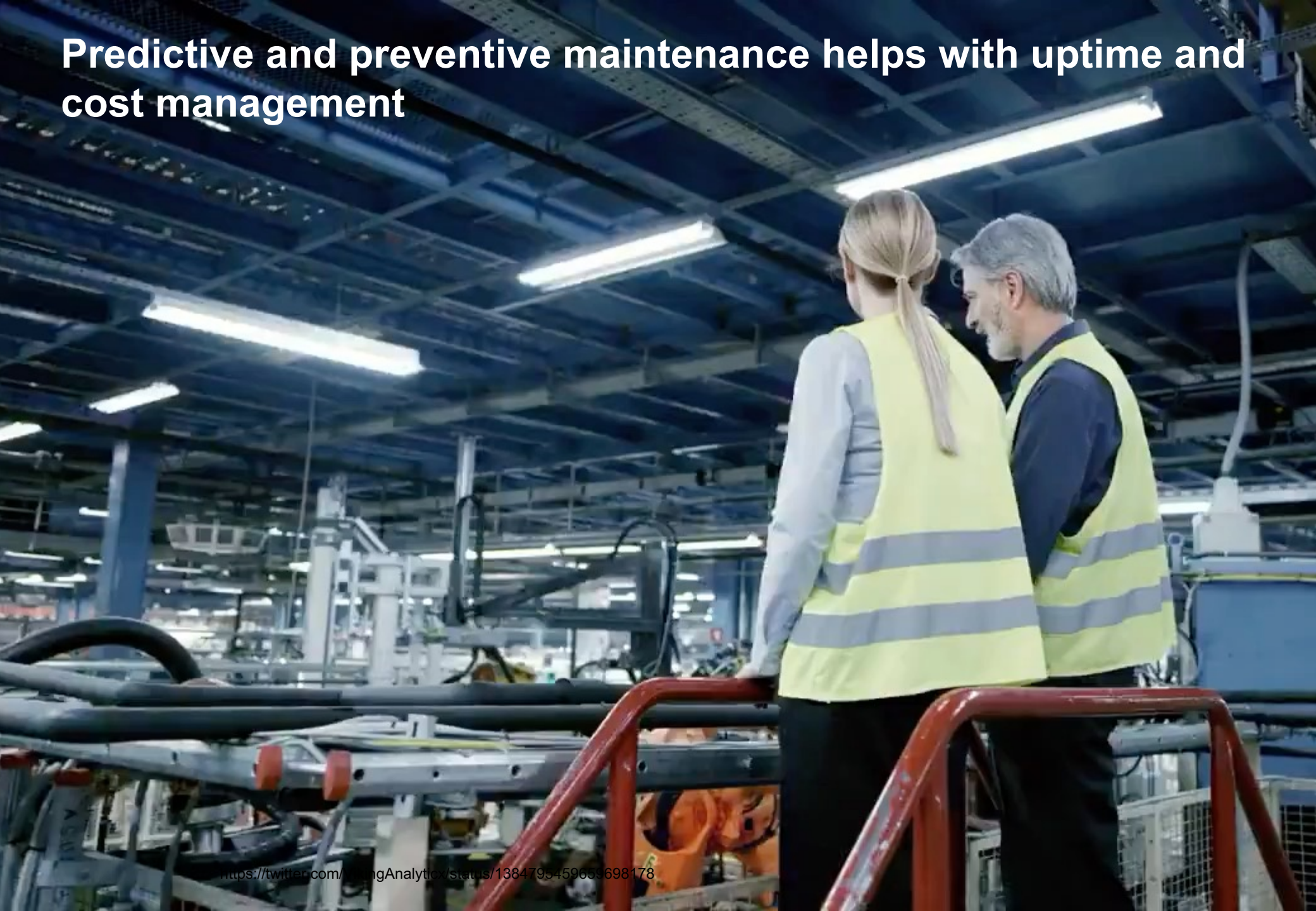
Predictions are at the heart of most use cases

	AI Technologies	Production			Front Office			R&D	Back-Office					
		Operations	Supply Chain	Manufacturing	Marketing	Sales	Customer Service	R&D	HR	Legal & Risk	Finance	IT	Data	Strategy
Cognitive Capabilities	Knowledge management													
	Vision													
	Speech													
	Natural language processing													
	Conversational - interaction													
Data Science	Analysis , optimisation and prediction													
Creativity	Generative													
Process Automation	RPA													
Acting and Sensing	Robots and Sensors													

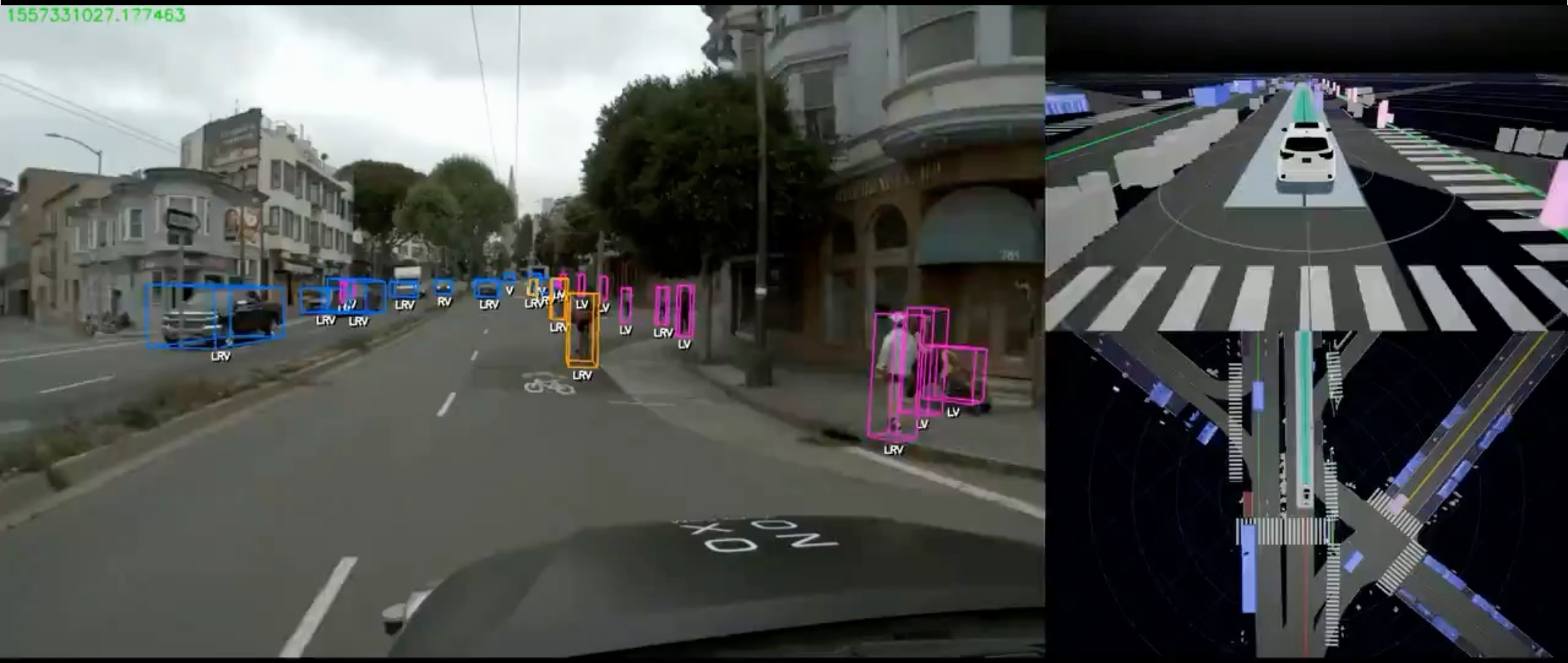
Best Practice AI has published over 700 use cases and 1,200 case studies at www.bestpractice.ai

https://twitter.com/automeme/status/1138037609844936705

Predictive and preventive maintenance helps with uptime and cost management



https://twitter.com/BigDataAnalyticsx/status/1384795459089698178



INTERACTING WITH CYCLISTS

COLUMBUS AVE, SAN FRANCISCO

FULLY AUTONOMOUS (2X SPEED)

https://twitter.com/zoox/status/1129394471039250435

ZOOX

Real-time VOC gas leak detection

https://sixgill.com/sense-ai-for-oil-and-gas/?utm_source=social&utm_medium=twitter&utm_campaign=gas&utm_content=gas

Computer vision to detect sharks

https://twitter.com/Benioff/status/1157813632207450112

Human safety can be improved with computer vision

VIDEONETICS
the future of video computing

Non-invasive tank-level monitoring and tracking

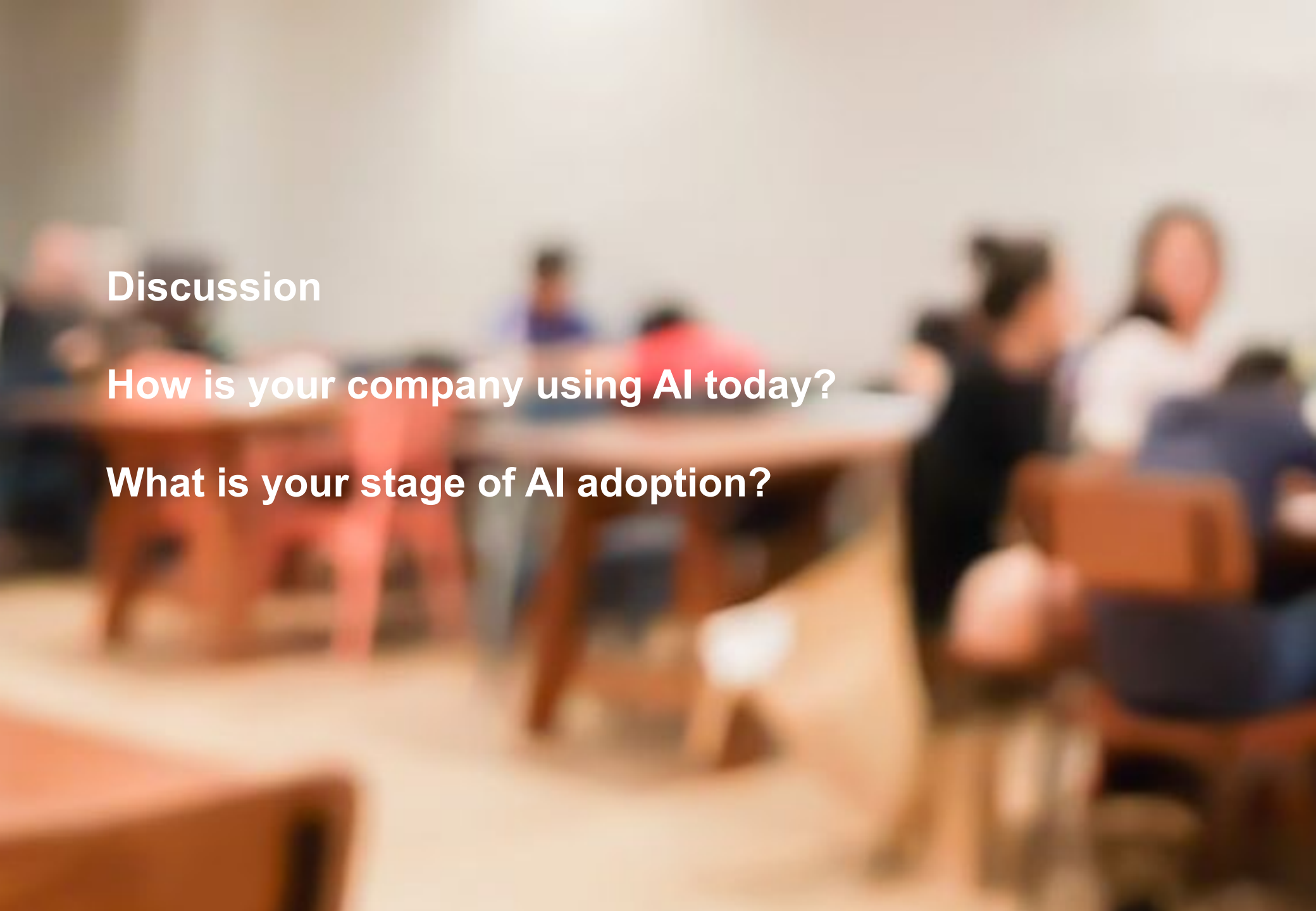
https://sixgill.com/sense-ai-for-oil-and-gas/?utm_source=social&utm_medium=twitter&utm_campaign=gas&utm_content=gas

Flying autonomous robots for cleaning and inspection

https://twitter.com/mashable/status/1383582927204671488
https://twitter.com/k_jenneke/status/1093071871006920704

Boston Dynamics Dog Robot ‘Spot’ Has Been Employed By Norwegian Oil Company To Detect Gas Leaks in industrial environments

https://www.rumblerum.com/boston-dynamics-robot-dog-spot-norwegian-oil-company-gas-leaks/



Discussion

How is your company using AI today?

What is your stage of AI adoption?

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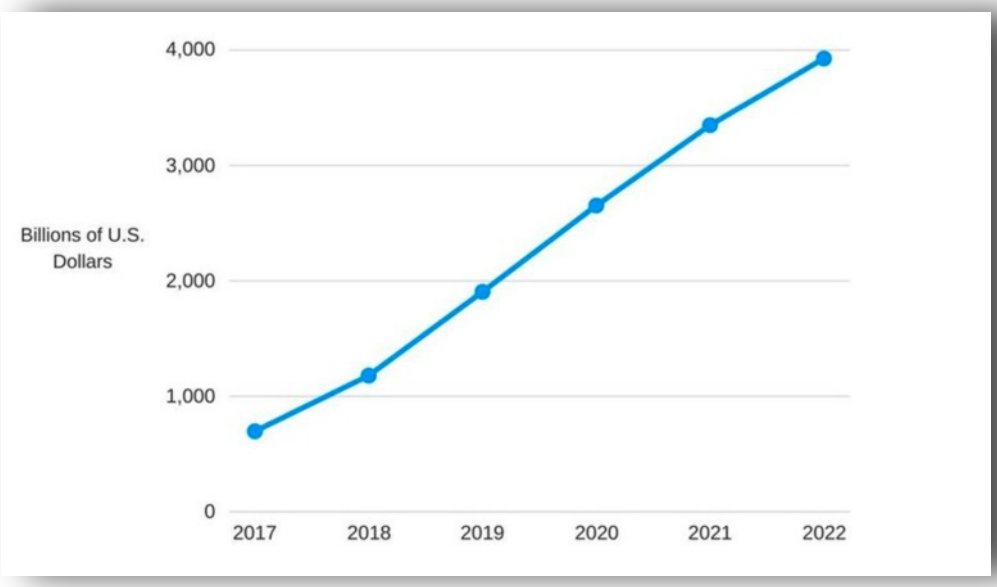
Huge macro impact but its often hard to make individual use case ROI stack up convincingly

Gartner Research predicts AI-derived business value will reach up to $3.9 T by 2022



But individual project ROI is often hard to deliver, but its rarely because of the AI

Competitive advantage in AI is as much about being ready to do AI as actually doing AI. Don't get stuck in POC "purgatory"

AI is a better pump – but you need to get the plumbing right

-> Building a Proof of Concept or a simple AI tool might take two months

-> Getting underlying processes and data ready for the next stage might take 6 – 18 months

Strong data plumbing characterised by:

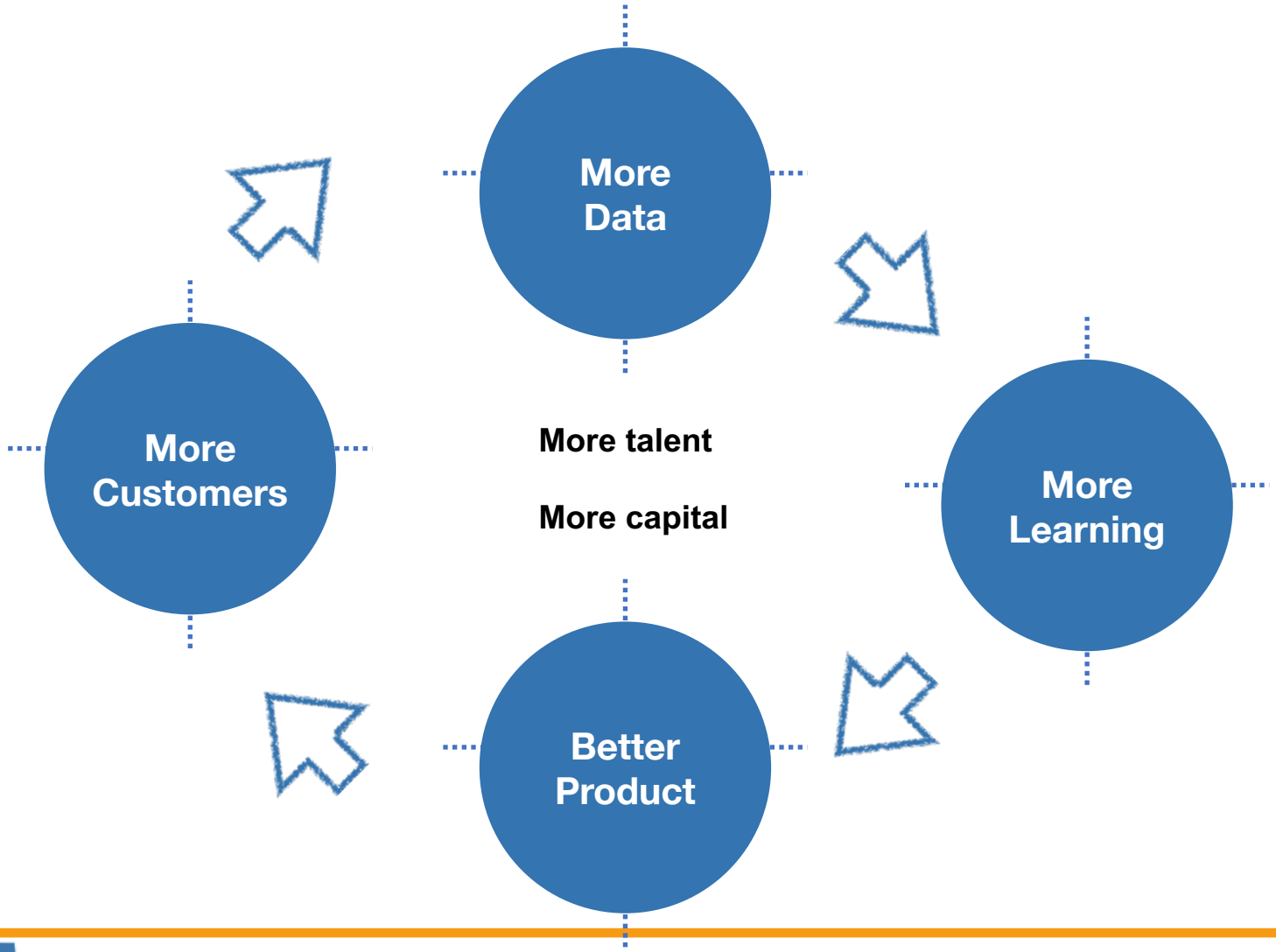
- Digitisation of processes, functions and capabilities
- Connectivity across IoT, supply chain, customers, etc
- Integrated and holistic view of data such as 360° view of customers
- Labelled and clean data
- Flexible and rapid access to data
- Modular technology architecture

Data-native platform companies have digital plumbing at their core – so now exploiting AI

"Traditional" US platforms

Emerging Chinese competitors

Platforms exploit AI flywheel economics



AI Platform companies breaking traditional customer proposition trade-offs between speed, scale and scope

Scope: Personalisation

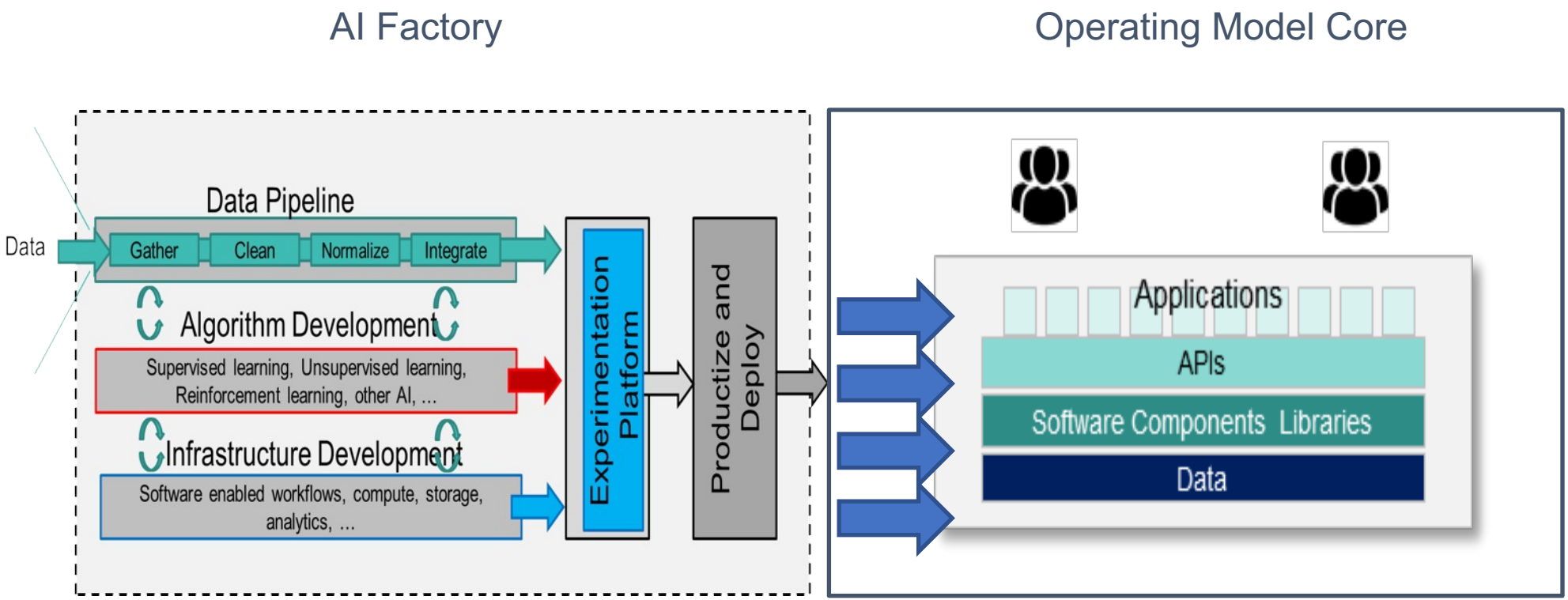
Speed: Immediate availability

Scale: Lowest price

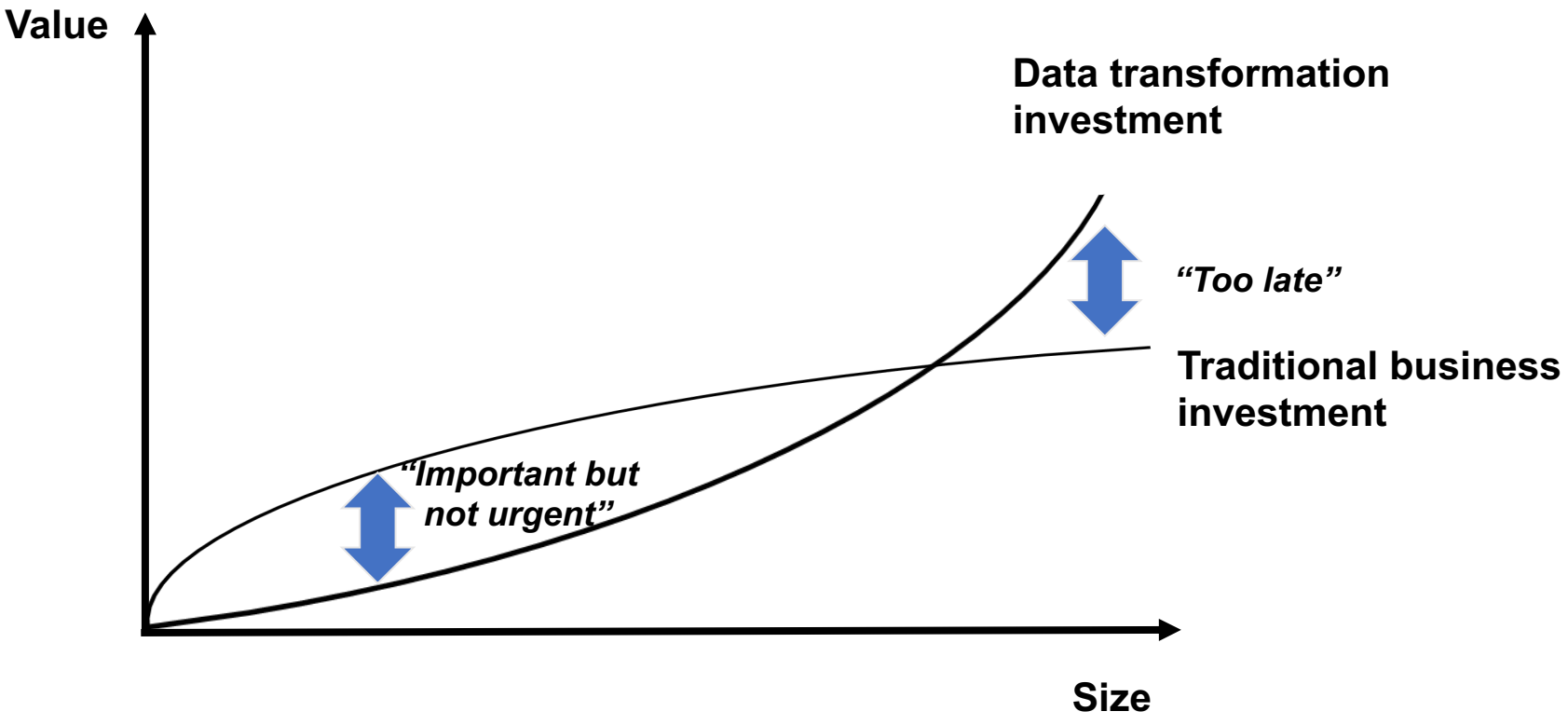
amazon

Delivery requires an AI factory

From ‘Competing in the Age of AI’ by Marco Iansiti and Karim Lakhani, HBS Professors



Challenge for “legacy” companies is crossing the transformation gap from proof of concept to scale



Future of work – will our jobs have to change?

1. Automation	2. Platform Economics	3. Centaurs (Augmentation)	4. Creative economy
			
Algorithms replace humans	**Algorithms 'manage' humans**	**Human + algorithm > algorithm or human**	**Human > algorithm**

Flexibility and willingness to learn key attributes

Agenda

1. What is AI and its promise?	9:45 – 10:05
2. How are organisations and companies using AI?	10:05 – 10:35
3. What is the impact of AI on corporate strategy?	10:35 – 10:50 (5 min break)
4. How do you scale AI and deliver ROI?	10:55 – 11:25
5. What are the risks associated with AI?	11:25 – 12:05 (5 min break)
6. Is there a global race for AI dominance?	12:10 – 12:25
7. Discussion	12:25 – 12:45

To make AI happen in the real-world need six dimensions need to be aligned

1 Have the right plan / roadmap	2 Mobilise the right people	3 Have the data	4 Deploy the right tech	5 Make it operational	6 Manage the risks
Be very clear what you want to achieve Understand what you need to predict / optimise – and levels of confidence required Agreed metrics that measure success Implement a portfolio of AI projects	Agree project ownership + governance / oversight Ensure domain expertise and cross-functional buy-in in place Ensure skilled team in place –whether internal or vendor	Plan how to get the right data at right stage of preparation (e.g. labelled and complete) Consider what bias issues potentially faced Ensure relevant regulations complied with	Plan approach, testing and refinement of key algorithm(s) Ensure right IT architectural stack in place Check impact of tech choices on broader tech stack	Decide how prediction will lead to action (degree of automation) Ensure measurement and feedback loops in place Map and manage barriers to deployment Ensure key staff bought in	Identify potential regulatory / legal issues (e.g. GDPR) Map stakeholder set and prepare clear comms plan Ensure alignment and information to empowered 'ethics' governance

Checklist: do you have a business, project and risk plan?

1. Develop AI business plan
2. Conduct automation assessment
3. Assess AI readiness
4. Define scale up plan (beyond POC)
5. Conduct risk assessment

Checklist

- ❑ AI is **aligned** to support strategic and business plans
- ❑ A business plan has clear **goals**, **KPIs** and **ROI**
- ❑ A clear focus on **high value** use cases
- ❑ A short, mid to long-term **portfolio** of AI projects
- ❑ Assessment of corporate AI **readiness** and **capabilities**
- ❑ Determine appropriate levels of **automation** and human involvement in decision making
- ❑ Comprehensive plan to **scale** – platform, operating and maintaining
- ❑ Identification of ethical, legal and operational **risks**

> “It's easy to get lost in "pie in the sky" AI discussions… importance of tying your initiatives directly to business value

Checklist: leadership, people and change management

1. Identify leadership
2. Create cross-functional team
3. Ensure AI training and skills
4. Plan for change management

Checklist

- ❑ A visible, credible and **senior** AI leader
- ❑ **Co-creation** in cross functional and business unit teams
- ❑ Build **networks** of AI champions
- ❑ Build AI **skills** and **capabilities** (e.g. data science, technical, management)
- ❑ **Train** management, data scientists & stakeholders in AI ethical and other risks
- ❑ Run a **change management** programme
- ❑ Consider a **Centre of Excellence** to accelerate capabilities and delivery

> “The success, or failure, of a CEO to implement AI throughout the organization will depend on them hiring a leader to build an organization to do this…
>
> **Andrew Ng**

Checklist: ensuring the data required to "power" AI

1. Source data
2. Ensure data quality
3. Ensure data labelling
4. Identify data risk, mitigate, and govern

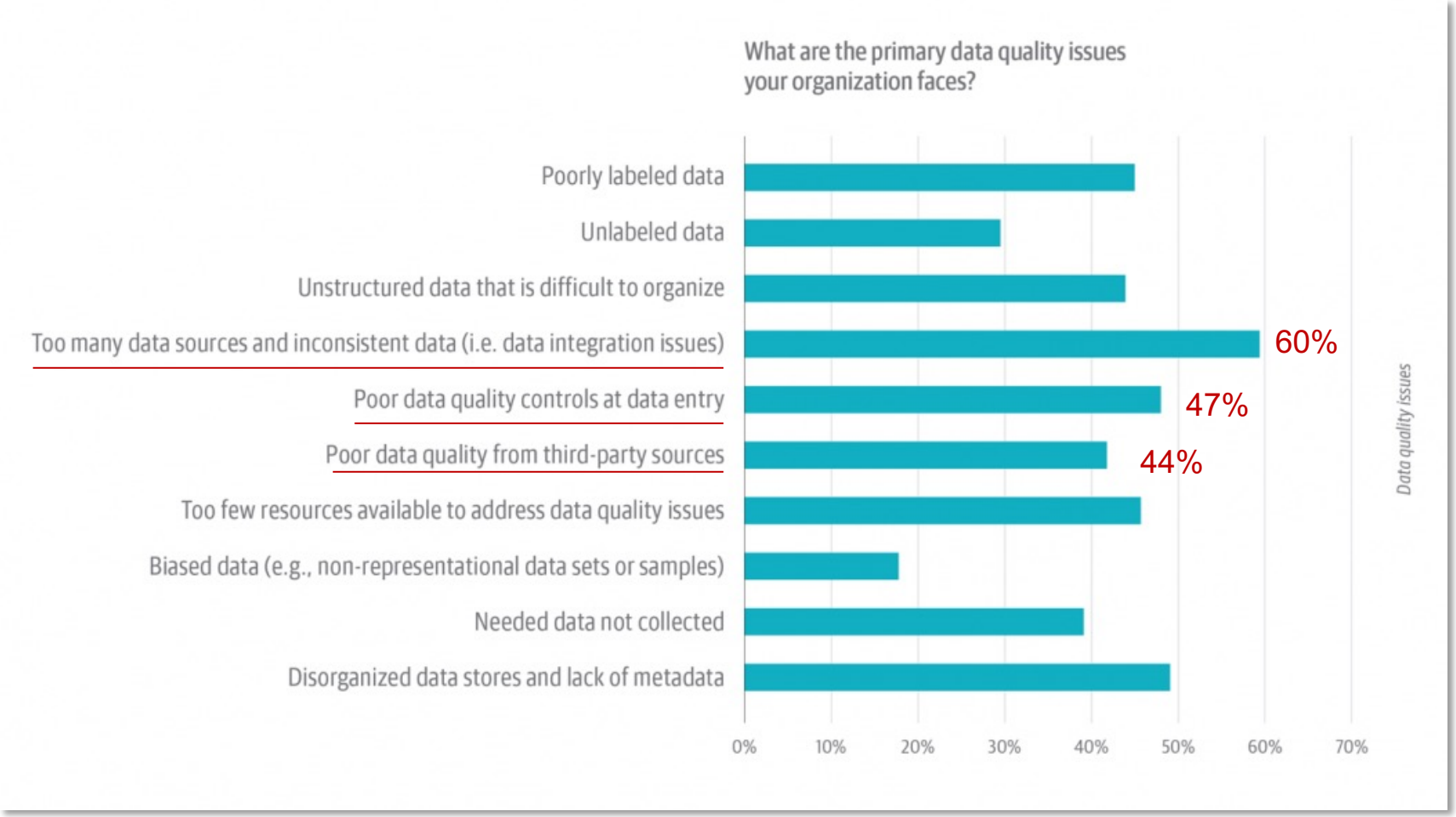
Checklist

- ❑ Data sources and accessibility
- ❑ Data quality – reconciliation and validation
- ❑ Data labelling for training
- ❑ Minimisation of inherent bias
- ❑ Data privacy
- ❑ Data repeatability, traceability and auditability
- ❑ Feature engineering

> "About 80 percent of AI project time is spent on aggregating, cleaning, labelling, and augmenting data to be used in ML models.
>
> Just 20 percent of AI project time is spent on algorithm development, model training and tuning, and ML operationalization

https://venturebeat.com/2019/06/12/essential-tips-for-scaling-quality-ai-data-labeling/#:~:text=When%20data%20labeling%20is%20low,be%20used%20in%20ML%20models.

Data quality issues pervade AI projects with 60%+ reporting ”too many data sources and inconsistent data”



O’Reilly 2020 survey on AI and data quality of 1,900 organisations

https://www.oreilly.com/radar/the-state-of-data-quality-in-2020/

Checklist: IT foundations, algorithms and models?

1. Ensure IT platform maturity
2. Ensure AI is robust
3. Develop AI platform & infrastructure
4. Build algorithms (& governance)

Checklist

- ❑ Mature, proven and effective AI tech
- ❑ Robust in the real-world
- ❑ Integrates with existing systems and platforms
- ❑ Extensible, inter-operable & scalable enterprise platforms
- ❑ Computational power
- ❑ **Secure** (esp. from **adversarial** attacks)
- ❑ Realistic plans for model training – **signals** from **noise**
- ❑ Model governances

> *Models keep getting bigger and bigger, they are really, really big, and really expensive to train.*

How will you develop your AI solutions? Buy Vs Build

AI procurement in challenging especially from SMEs

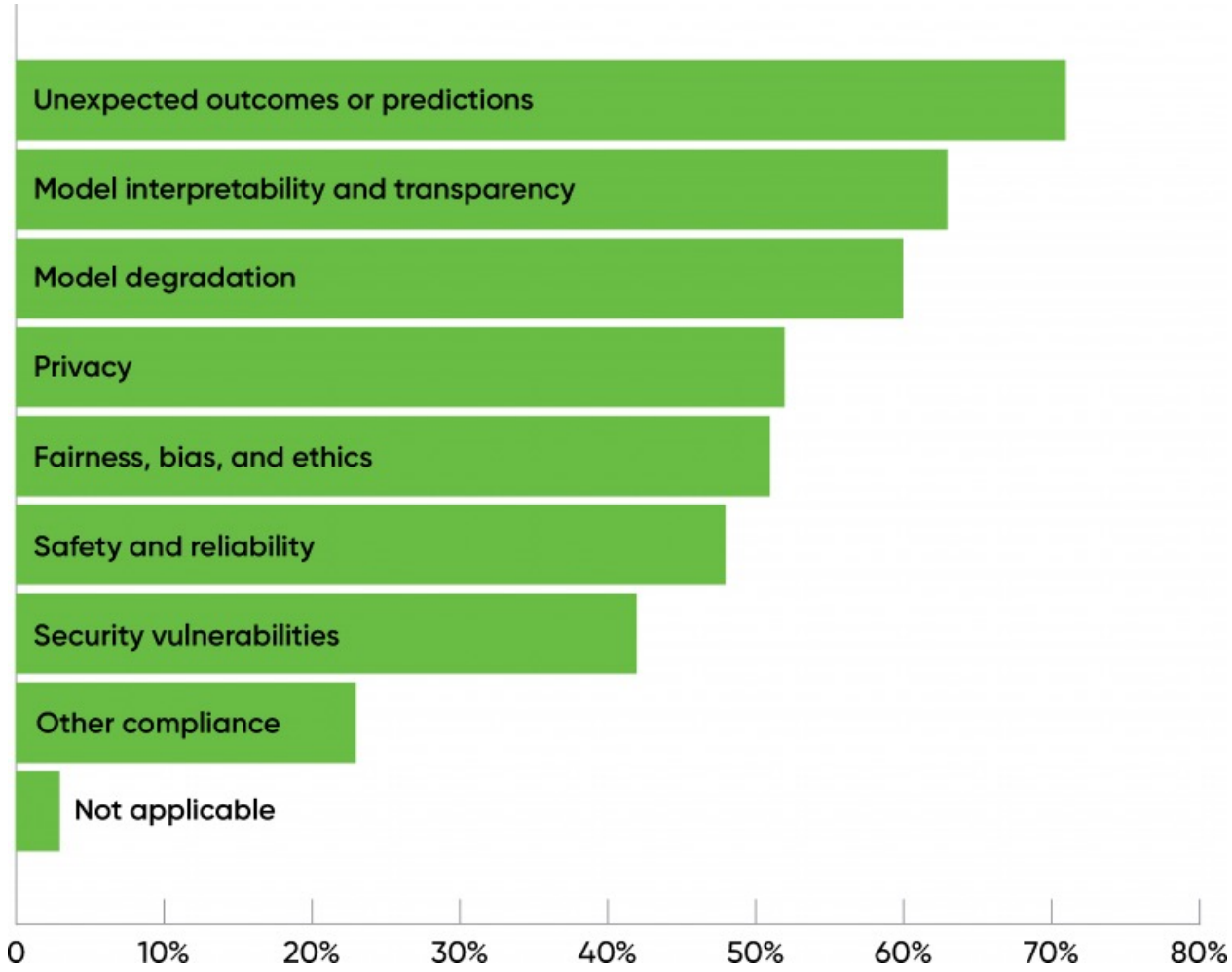
Options for acquiring AI

1. Embedded AI
2. AI Product Vendor
3. Build in-house models
4. Custom engineering

Checklist in procuring AI especially from early-stage suppliers

- ❑ Note increasing commodification of AI with AI as a Service (AIaaS) from BigTech
- ❑ Ensure vendor **maturity** and financial **viability**
- ❑ Learn requirements and time to **on-board** solutions, esp. model training and configuration time
- ❑ Ensure **robustness** of AI solution when used with client data in production
- ❑ Identify ethical and legal **risks** in vendor solution, such as inherent bias
- ❑ Ensure **cultural** fit of the vendor – can a start-up work with a large enterprise?

Nearly 80% unexpected outcomes or predictions to their models as the biggest risks



O'Reilly 2020 survey on AI and data quality of 1,900 organisations

https://www.oreilly.com/radar/the-state-of-data-quality-in-2020/

Use off-the-shelf technologies but be aware that the time to deliver a working model is often unpredictable – experimentation is non-linear

Outsourced skills

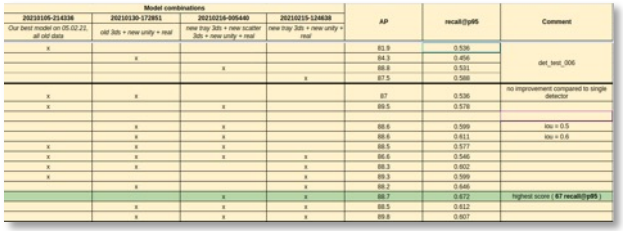
Outsourced the development of AI to computer vision expert who had experience in building synthetic models

Off-the-shelf technology

Used off-the-shelf R-CNN technology from Facebook – Detectron2

Unpredictable timing and results

The path to deliver working models is unpredictable with multiple experiments to optimize results



Model combinations				AP	recall@p95	Comment
20210105-214336	20210130-172851	20210216-005440	20210215-124638			
Our best model on 05.02.22, all old data	old 3ds + new unity + real	new tray 3ds + new scatter 3ds + new unity + real	new tray 3ds + new unity + real			
x				81.9	0.536	
	x			84.3	0.456	
		x		88.8	0.531	det_test_006
			x	87.5	0.588	
x	x			87	0.536	no improvement compared to single detector
x		x		89.5	0.578	
	x	x		88.6	0.599	iou = 0.5
	x	x		88.6	0.611	iou = 0.6
x	x	x		88.5	0.577	
x	x	x	x	86.6	0.546	
x	x		x	88.3	0.602	
x			x	89.3	0.599	
	x		x	88.2	0.646	
		x	x	88.7	0.672	highest score (67 recall@p95)
	x	x	x	88.5	0.612	
	x	x	x	89.8	0.607	

https://ai.facebook.com/blog/-detectron2-a-pytorch-based-modular-object-detection-library-/

Checklist: ensure the AI can be operationalized at scale

1. Ensure workflow processes & change management
2. Ensure real-world model robustness
3. Ensure stakeholder communications
4. Manage AI risks

Checklist

- ❑ Integration of AI into workflow processes
- ❑ Change management with employees
- ❑ Performs robustly at scale in the real-world
- ❑ Monitored and improved with feedback
- ❑ Communicated to stakeholders, esp. customer expectations meet explainability requirements
- ❑ Meets legal and ethical requirements

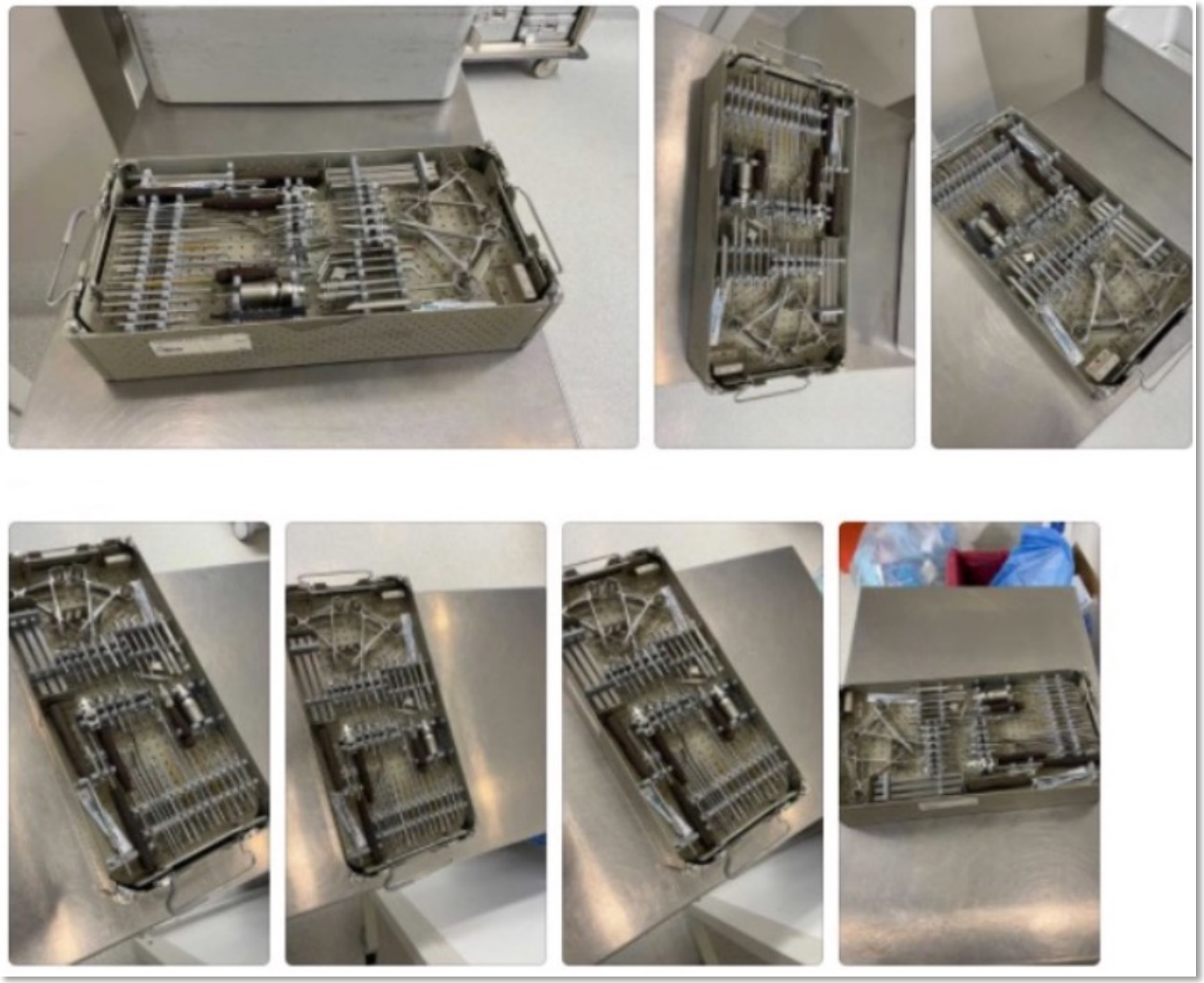
> “85% of AI projects ultimately fail to deliver on their intended promises to business

> “AI does impact customer experiences a lot but “taking people by surprise” is not the right way to build trust.

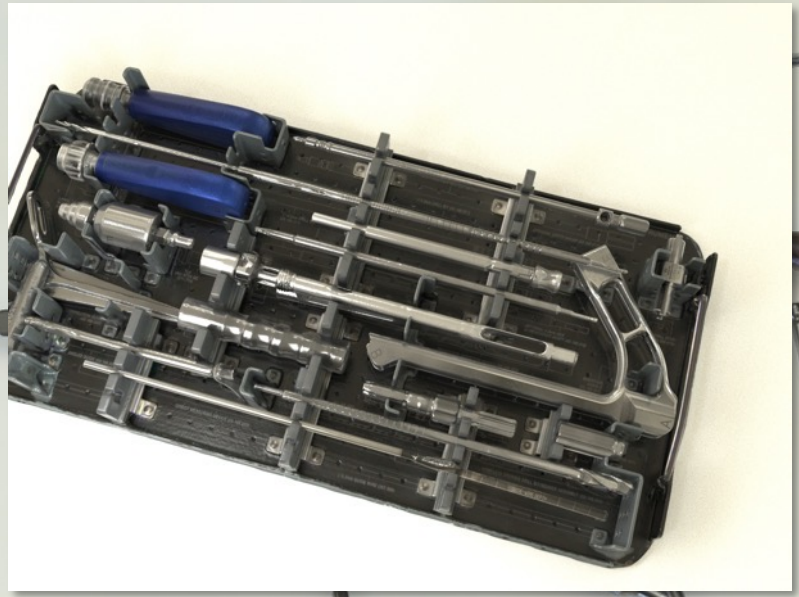
Case Study

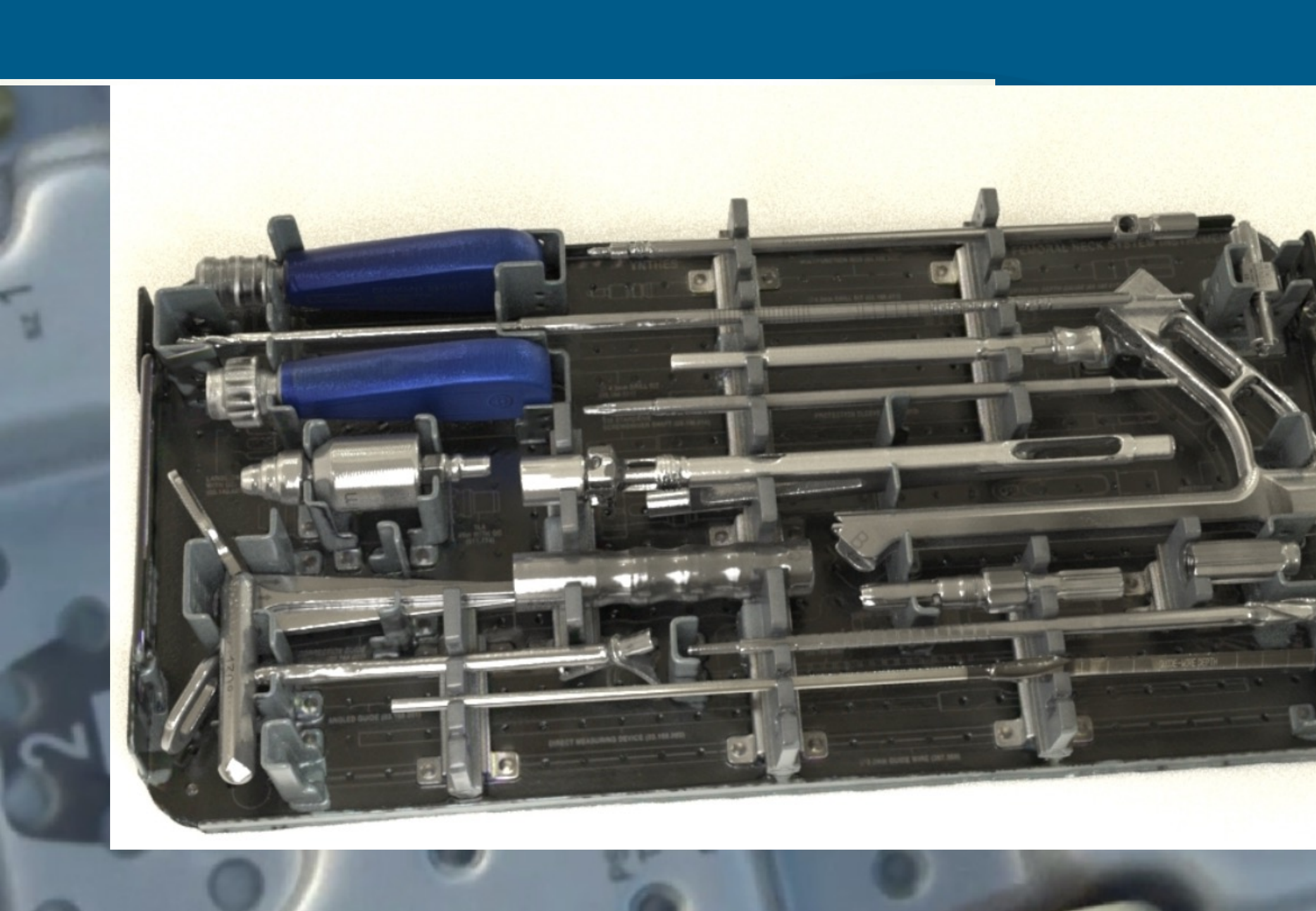
How do we ensure surgical teams have the right trays, instruments and implants?

Key data challenge: how to create 10,000s of labelled images of trays and items reflecting angles, lighting conditions, configurations

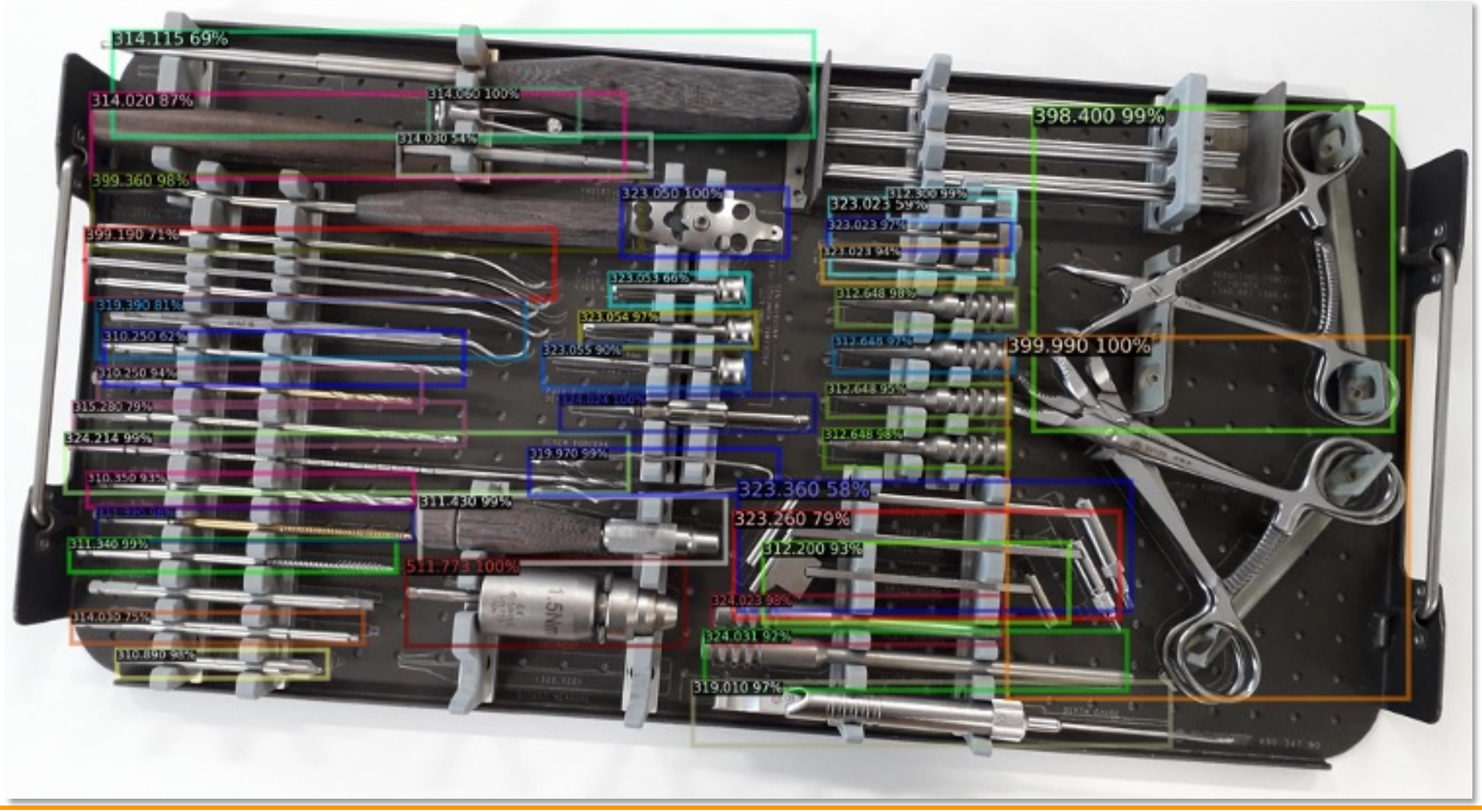


Created synthetic model of trays and items that are automatically labelled then used as input to train the ML models





The result: a world-first tray and instrument computer vision classification system



Do you build Vs buy? And do use off-the-shelf technologies?

Outsourced skills

Outsourced the development of AI to computer vision expert who had experience in building synthetic models

Off-the-shelf technology

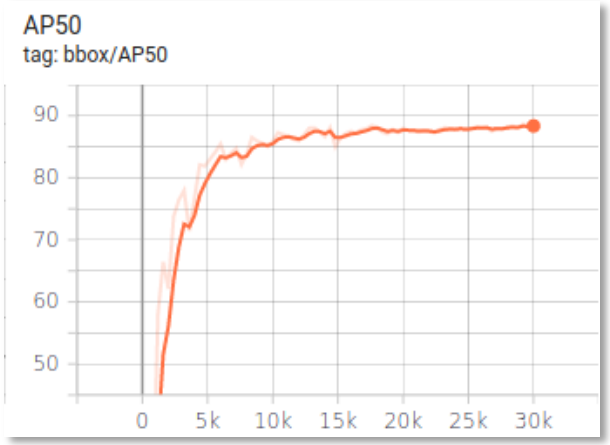
Used off-the-shelf R-CNN technology from Facebook – Detectron2

https://ai.facebook.com/blog/-detectron2-a-pytorch-based-modular-object-detection-library-/

How do you scale computer vision and ensure its robustness for the real-world?

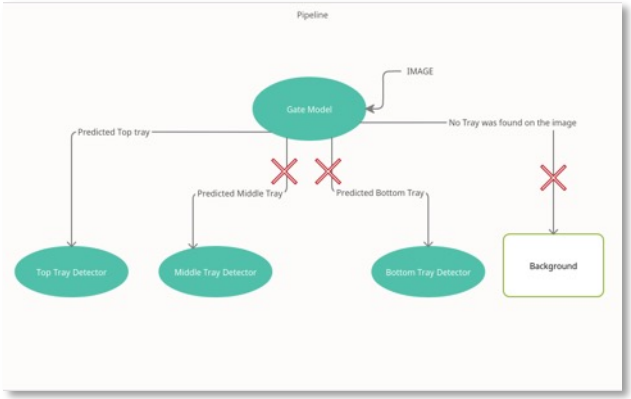
How does it operate in the real-world

Can the algorithm be fully automated or does it require human intervention?



Scaling data processes

Need to find ways to effectively build the data and models for 1,000 trays



Putting human over-the-loop

Where the machine cannot recognize instruments then put the human into the loop

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The Fourth Industrial Revolution starts with one very important point: trust

Marc R. Benioff
Chairman and CEO, Salesforce

The risks of AI are strategic, operational, legal and ethical

Example Risks

1 Strategic

- New entrants
- Proposition challenge
- Sustain-ability

2 Operational

- Decision making
- Customer service
- Quality Control
- Security
- Auditability
- Safety

3 Legal & Ethical

- Bias
- Regulation
- IP
- Data & privacy
- Product liability
- Competition

Brand reputational damage

Financial damage

Is AI biased?

Joy Boualmwini is on a mission to “stop an unseen force that is rising.” The risk of bias and discrimination.

https://www.ted.com/talks/joy_buolamwini_how_i_m_fighting_bias_in_algorithms?la

Gender classification systems are often biased as they are not trained on representative sample datasets of gender & ethnicity

Gender was misidentified in up to 1% of lighter-skinned males

Gender was misidentified in up to 7% of lighter-skinned females

Gender was misidentified in 35% of darker skinned females

https://www.nytimes.com/2018/02/09/technology/facial-recognition-race-artificial-intelligence.html
https://www.ted.com/talks/joy_buolamwini_how_i_m_fighting_bias_in_algorithms
https://www.theatlantic.com/health/archive/2018/08/machine-learning-dermatology-skin-color/567619/

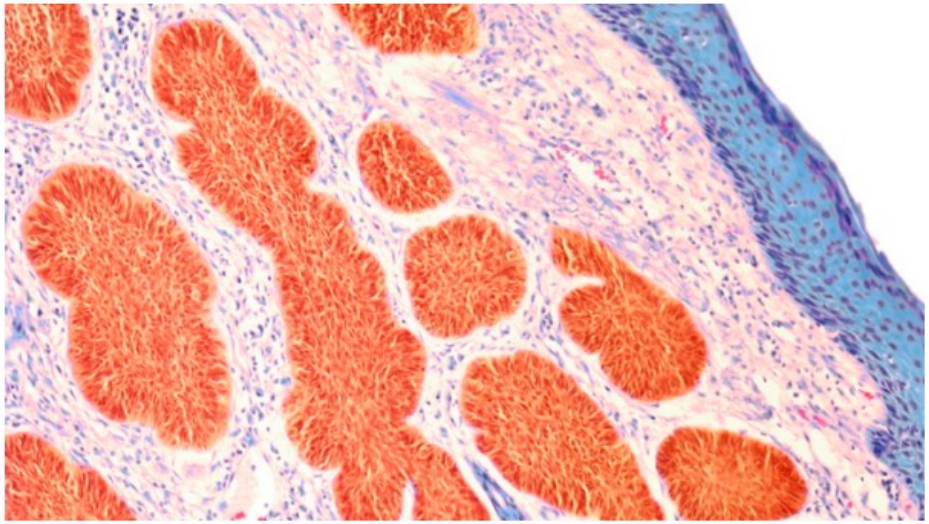
These biases could have serious ethical, legal, operational and reputational consequences

The Atlantic

AI-Driven Dermatology Could Leave Dark-Skinned Patients Behind

Machine learning has the potential to save thousands of people from skin cancer each year—while putting others at greater risk.

ANGELA LASHBROOK AUGUST 16, 2018



STEVE GSCHMEISSNER / GETTY

LaToya Smith was 29 years old when she died from skin cancer. The young doctor had gotten her degree in podiatry from Rosalind Franklin University, in Chicago, just four

Best Practice AI

https://www.nytimes.com/2018/02/09/technology/facial-recognition-race-artificial-intelligence.html
https://www.ted.com/talks/joy_buolamwini_how_i_m_fighting_bias_in_algorithms
https://www.theatlantic.com/health/archive/2018/08/machine-learning-dermatology-skin-color/567619/

AI shines a spotlight and often amplifies our human biases

What did the algorithm learn after reading 3.5 million books and 11 billion words?

Top 11 positive and negative words associated with females and males

Female	
Positive	Negative
beautiful	battered
lovely	untreated
chaste	barren
gorgeous	shrewish
fertile	sheltered
beauteous	heartbroken
sexy	unmarried
classy	undernourished
exquisite	underweight
vivacious	uncomplaining
vibrant	nagging

Male	
Positive	Negative
just	unsuitable
sound	unreliable
righteous	lawless
rational	inseparable
peaceable	brutish
prodigious	idle
brave	unarmed
paramount	wounded
reliable	bigoted
sinless	unjust
honorable	brutal

"There is a systemic, systematic, racist, sexist, gendered, class-oriented and other axes of discrimination-bias embedded in most data collected by humans"

https://www.futurity.org/adjectives-gender-descriptions-books-2143682-2/


Government leaders politicising algorithms doesn’t help to engender public trust in AI!
sky news
Boris Johnson blames 'mutant algorithm' for A-level results fiasco, then sacks education chief
The prime minister is accused of "shamelessly trying to avoid taking responsibility" for the exams debacle.
https://news.sky.com/story/top-civil-servant-at-department-for-education-to-leave-after-a-levels-chaos-12057141

Is our AI technology human centric?

http://app.cctv.com/special/cportal/detail/arti/index.html?id=Arti4quWfQGGMldgx5jojaaj201123&fromapp=cctvnews&version=807

THE TECHNOLOGY
THAT **CONNECTS US**
ALSO **CONTROLS US**

/the social dilemma_

| NETFLIX

thesocialdilemma.com

Do we understand the (unintended) consequences of our algorithms?

200+ “Ethical AI” frameworks from the likes of the OECD and the IEEE boil down to similar principles

1) **Explainable** and transparent decision making
2) **Inclusive**, diverse and **fair** (avoid or don’t reinforce bias)
3) Be built and tested for **safety**
4) Be **socially** beneficial
5) **Respect** human rights and the law
6) People are **accountable**

Companies are implementing Responsible AI programmes, often as a competitive differentiator

- **Deutsche Telekom view digital ethics as a strategic competitive differentiator**
- **They focus on shaping AI responsibly, with programme implemented on various levels**
- **Continuously updated**

INTERNAL PROCESSES
Integration into internal security and data protection processes; integration into financing processes

SUPPLIER MANAGEMENT
Guidelines extended to suppliers of AI systems

DIGITAL ETHICS CENTER
Place for internal/external conferences to make Digital Ethics tangible

COMMUNICATION & EVENTS
Regular communication and expert interviews on the intranet; AI days and other formats

DIGITAL ETHICS SEAL
First internal AI projects have been certified and received a Digital Ethics Seal

TRAININGS & FORMAL POLICY
eLearnings, roadshow, workshops and policy for employees to develop safe AI systems

Deutsche Telekom

https://www.telekom.com/en/company/digital-responsibility/digital-ethics-deutsche-telekoms-ai-guideline

AI regulation is already here under GDPR: Explainability

Article 22 under GDPR states:

Fully automated decisions with legal effect or similarly significant effect needs to be explainable

and

data subjects have the right to human-made decisions

Explainability will spotlight company historical practices

https://ico.org.uk/for-organisations/guide-to-data-protection/key-data-protection-themes/explaining-decisions-made-with-ai/

Information Commissioners Office (ICO) – requires an Explainability statement for automation with legal effect

The ICO identified six main types of explanation that form an explanatory statement:

1. **Rationale** explanation: the reasons that led to a decision, delivered in an accessible and non-technical way.

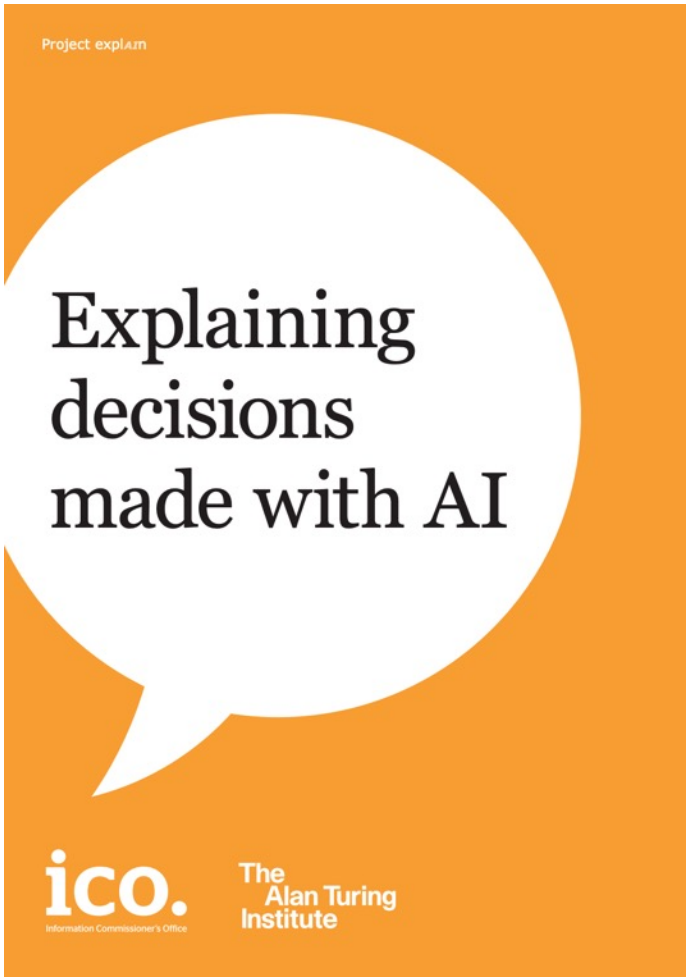
2. **Responsibility** explanation: who is involved in the development, management and implementation of an AI system, and who to contact for a human review of a decision.

3. **Data** explanation: what data has been used in a particular decision and how; what data has been used to train and test the AI model and how.

4. **Fairness** explanation: steps taken across the design and implementation of an AI system to ensure that the decisions it supports are generally unbiased and fair, and whether or not an individual has been treated equitably.

5. **Safety** and performance explanation: steps taken across the design and implementation of an AI system to maximise the accuracy, reliability, security and robustness of its decisions and behaviours.

6. **Impact** explanation: the impact that the use of an AI system and its decisions has or may have on an individual, and on wider society.



https://ico.org.uk/for-organisations/guide-to-data-protection/key-data-protection-themes/explaining-decisions-made-with-ai/

We worked with health symptom checker, Healthily, to publish an Explainability Statement. Why?

1. Regulatory requirement
2. It's the right thing to do
3. Like the idea of being the first
4. Transparency is the foundation of trust. Trust is the most significant barrier to health platforms being used on mass.

What is the process to generate an Explainability Statement?

1. Generate Long Form Explainability

Work together to complete our proprietary long-form questionnaire addressing:

1. **Summary of AI system**
2. **Context of AI system**
3. **Impact of AI system**
4. **Operation of AI system – data**
5. **Operation of AI system – models & architecture**
6. **Operation of AI system - deployment & monitoring**
7. **Governance of AI system**
8. **Safety and security**

4 – 6 weeks

2. Generate Short Form Explainability

1. **5-10 page document**
2. **Intended to meet GDPR explainability requirements**
3. **Constructed from Long Form Statement content.**

3 – 4 weeks

3. Review & Publish

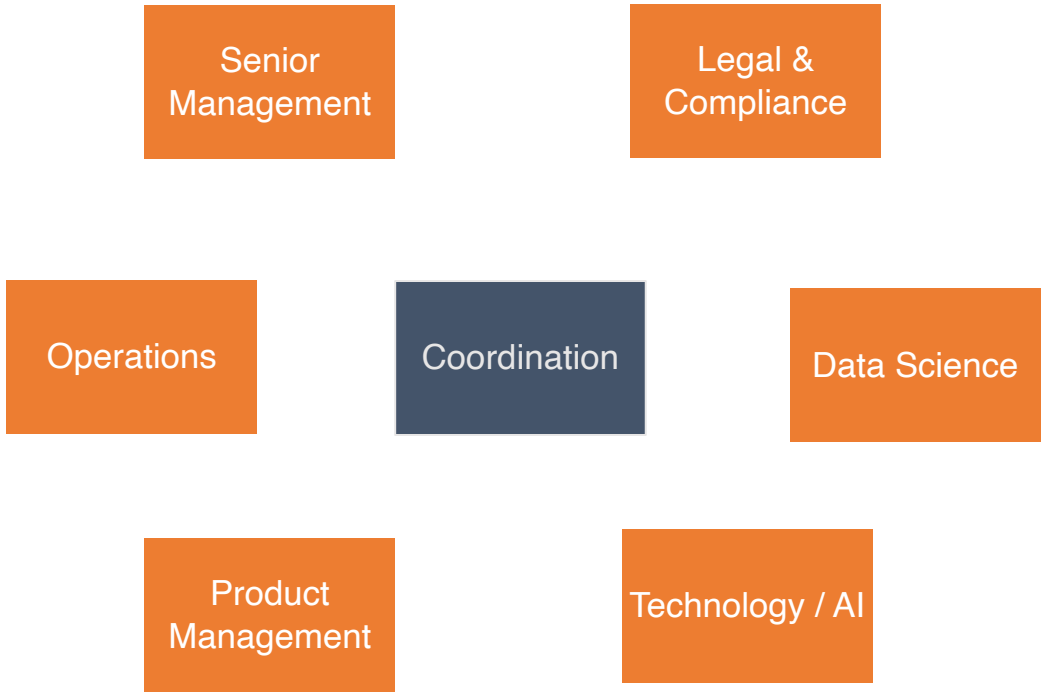
a) Multi-stakeholder client review

b) Regulatory review, where appropriate

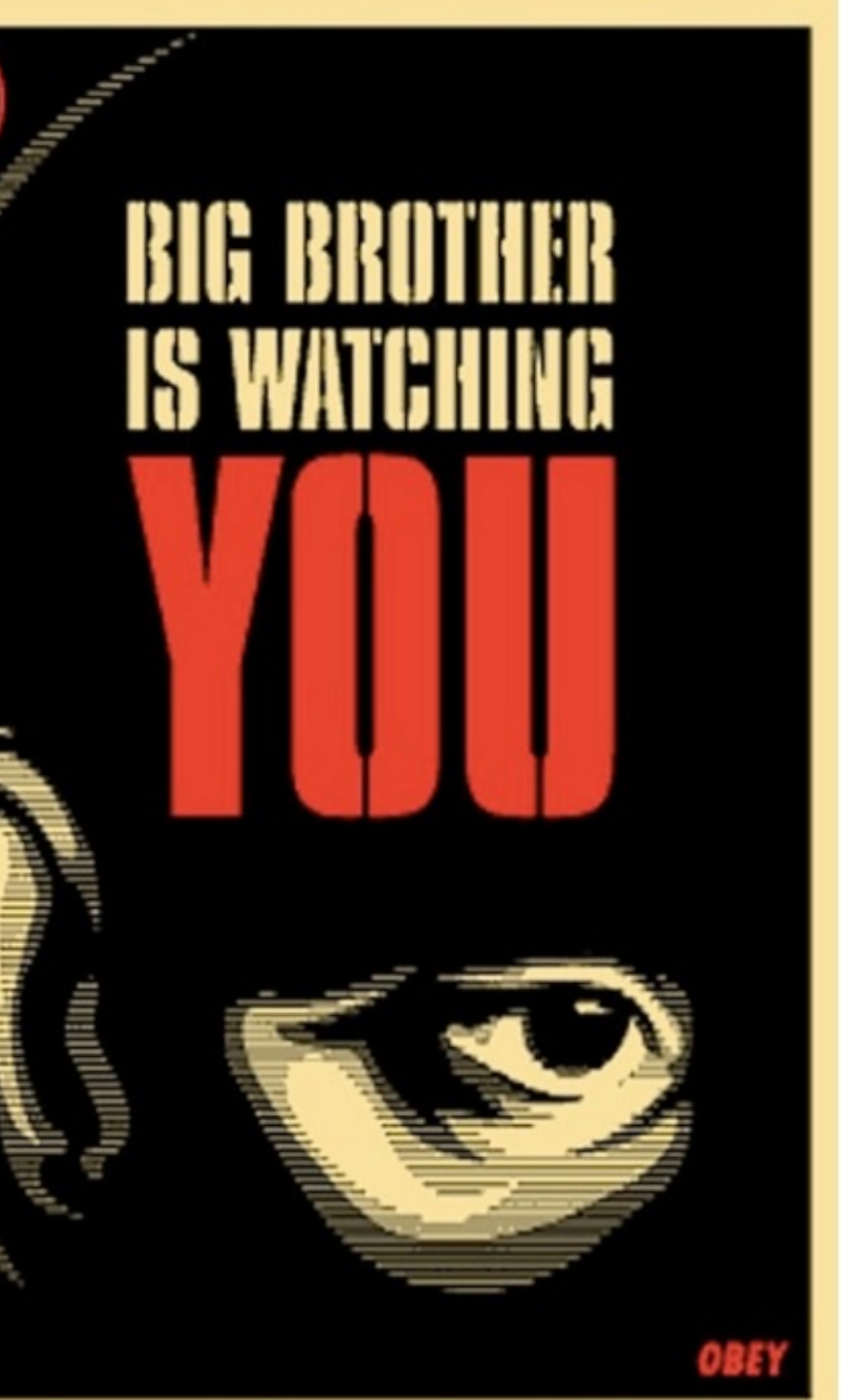
c) Publish Statement

3 – 4 weeks*
(without regulatory review)

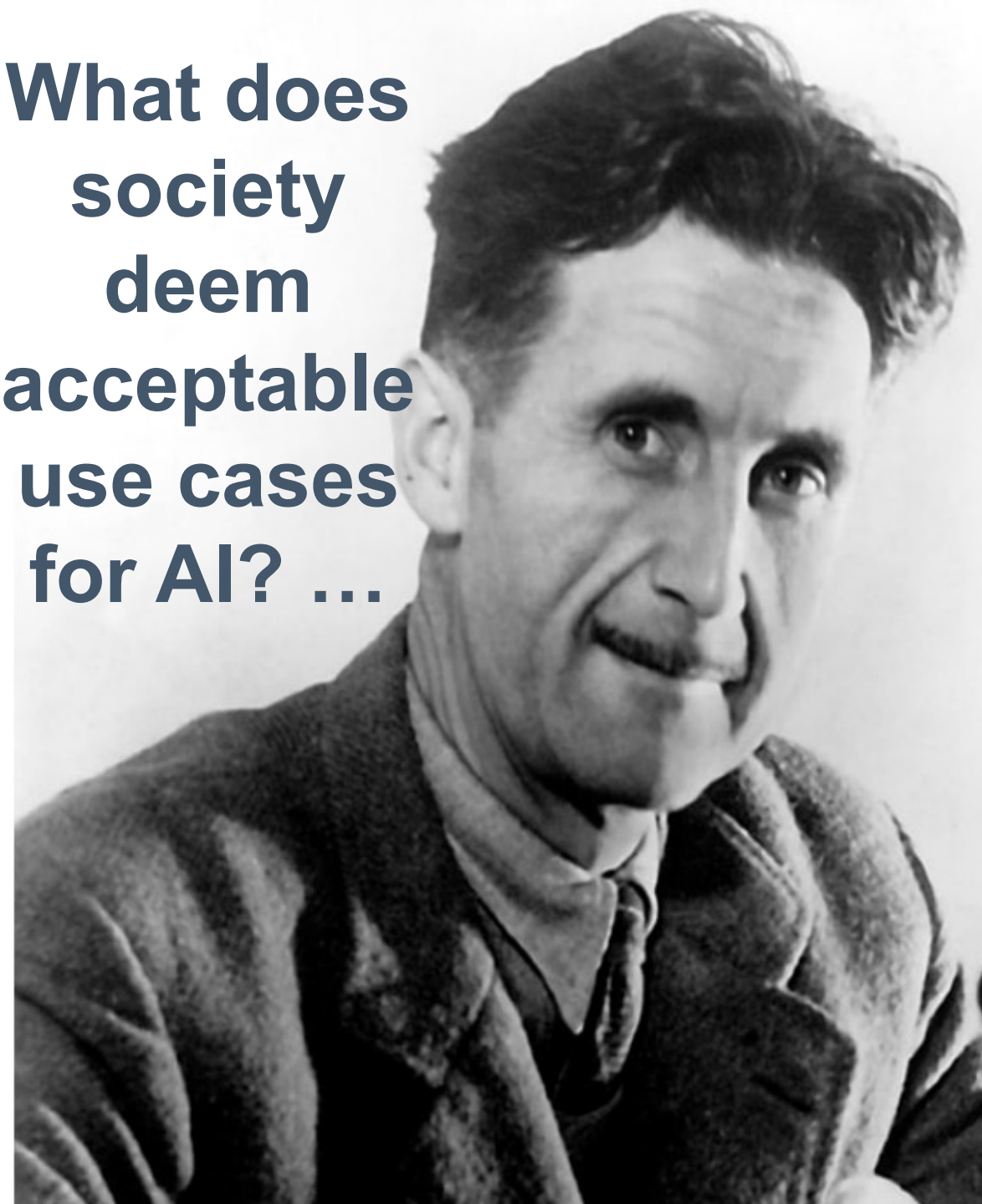
Opening up the “black box” to provide transparency requires a 360° view of AI, not simply technical



Final Statements need to be written so that they are accessible to people with very little understanding of AI. For example, we write for a young adult with basic understanding of IT / statistics / mathematics.

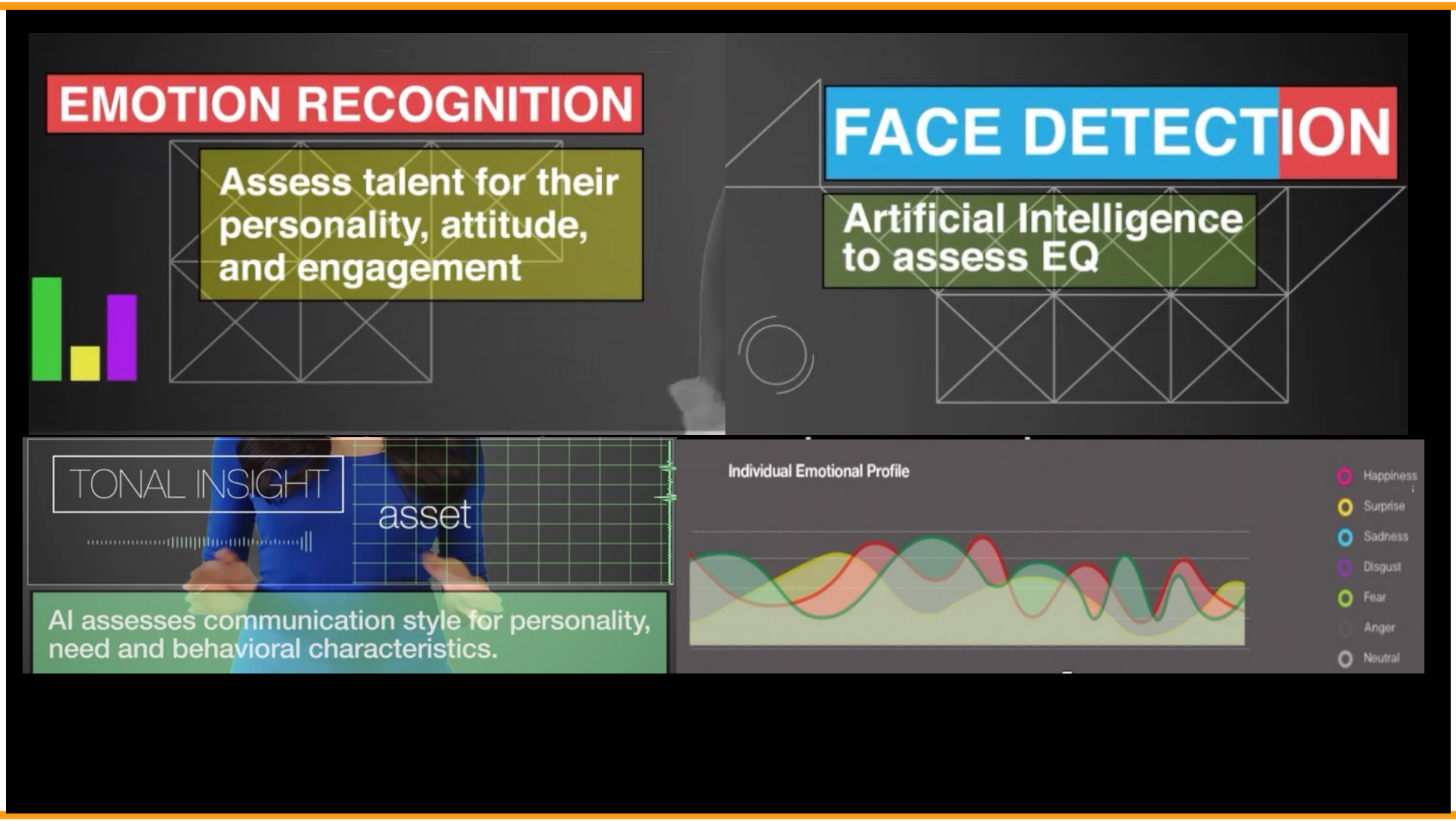


What does society deem acceptable use cases for AI? …



What about algorithmic monitoring and assessment?

How about we save time in recruiting with automated video interviews?



https://www.8andabove.com/wp-content/themes/wall-street-child/videos/ZGroup_Carol_Video_Rework_VER4.mp4

What if we could understand what everyone was saying in our company? Should we?

What if….

- **All the conversations taking place in your organisation were tracked**
  - Emails, slack, social media, telephone, messaging, meetings…
  - Customers, teams, suppliers, feedback sessions, internal debate….
- **What value could your organisation capture if these were processed and assessed**
  - Pain points and customer concerns identified, issues logged, ranked and prioritised…
  - Sentiment analysed, management issues spotted, individual performance assessed…
  - Personalised feedback, abuse monitoring, behaviour nudging, welfare protected…
- **But at what cost?**
  - Privacy, nuance, personal style…
  - Transparency versus reality…
- **Who has the power – and where might this happen?**

https://theintercept.com/2018/01/19/voice-recognition-technology-nsa/

Is surveillance the future of management?

Case studies on the edge of HR

Re:infer

"Most powerful conversational intelligence platform… automate the interpretation of unstructured communications data"

What is everyone saying?

WinningMinds

*"Winning Minds **uses artificial intelligence to analyse conversations and team interactions**, by generating behavioural analytics and provides in depth understanding of interpersonal interactions and organisational dynamics"*

How are they saying it? To who? With what effect?

People Matter.

"Issues linked to our mental wellbeing can be hard to identify even for ourselves… [we] aggregate and analyse hundreds of your digital clues to help you get a more consistent measure through time of how different events, relationships and circumstances affect your wellbeing"

How is everyone feeling?

But how about AI in education? Should we monitor students in the classroom?

- AI can help education. For example, **VIPKid** is used by 700,000+ students. Its AI animated ”fun characters” assist human teachers. Correct answers grew 50 to 80%.
- Chinese **Megvii** is a $4B+ company known for its facial recognition platform Face++
- Demonstrated a **classroom teaching evaluation system** used to supplement teaching evaluations through **real-time structured analysis** of classroom video data
- Observes and **classifies** student behaviour:
  - resting on one’s desk
  - playing on a mobile phone
  - sleeping
  - listening to a lecture
  - reading
  - raising hands
  - concentration levels…

https://www.wired.co.uk/article/kai-fu-lee-china-ed-tech
https://docs.google.com/document/d/1f9PFHTbrnuo9KLWv0RpheE2GqZXoLpFnCH2ecFcI/edit

A recent report identified 10+ Chinese companies in the emotion recognition market for education

EF Children's English 英孚少儿英语	In person and online	Partners with Tencent Cloud to conduct image, emotion, and voice recognition, and receives curriculum design assistance to EF's product-development teams and teachers.[141]
Hanwang Education 汉王教育	In person	Class Care System (CCS) cameras take photos of whole classes once per second, connect to a programme that purportedly uses deep-learning algorithms to detect behaviours (including 'listening, answering questions, writing, interacting with other students, or sleeping') and issue behavioural scores to students every week. Scores are part of
New Oriental 新东方	Blended learning	AI Dual Teacher Classrooms contain a 'smart eye system based on emotion recognition and students' attention levels', which the company says can also detect emotional states, including 'happy, sad, surprised, normal, and angry'.[149] A
Hikvision 海康威视	In person	Smart Classroom Behaviour Management System integrates three cameras, positioned at the front of the classroom, and identifies seven types of emotions (fear, happiness, disgust, sadness, surprise, anger, and neutral) and six behaviours (reading, writing, listening, standing, raising hands, and laying one's head on a desk).[144] Cameras take attendance using face
Meezao 蜜枣网	In person	Uses facial expression recognition and eye-tracking software to scan preschoolers' faces over 1,000 times per day and generate reports, which are shared with teachers and parents.[147] Reports contain data visualisations of students'
Taigusys Computing 太古计算	In person	Collects data from three cameras, one each on students' faces, teachers, and a classroom's blackboard. The system detects seven emotions (neutral, happy, surprised, disgusted, sad, angry, scared) and seven actions (reading, writing, listening, raising hands, standing up, lying on the desk, playing with mobile phones).[151]

https://www.article19.org/wp-content/uploads/2021/01/ER-Tech-China-Report.pdf

And many Chinese vendors are offering emotion recognition and monitoring for ”public security.” Any concerns?

Alpha Hawkeye 阿尔法鹰眼	Monitors vestibular emotional reflex and conducts posture, speech, physiological, and semantic analysis.[65]	• Airport, railway, and subway station early-warning threat detection • Customs and border patrol
CM Cross 科思创动	Employs deep-learning-powered image recognition to detect blood pressure, heart rate,	• Customs and border patrol[67] • Early warning
EmoKit 翼开科技	EmoAsk AI Multimodal Smart Interrogation Auxiliary System detects facial expressions, body movements, vocal tone, and heart rate.[68] Other products detect similar data for non-interrogation	• Detecting and managing mental-health issues at medical institutions • Loan interviews at banks • Police-conducted interrogations[69]
Joyware 中威电子 NuraLogix	NuraLogix's DeepAffex is an image recognition engine that identifies facial blood flow (which is used to measure emotions) and detects heart rate, breathing rate, and 'psychological pressure'.[71] Joyware also uses NuraLogix's polygraph tests.[72]	• Airport and railway station surveillance • Nursing • Psychological counselling
Miaodong 秒懂	Relies on image recognition of vibrations and frequency of light on faces, which are used to detect facial blood flow and heart rate as a basis	• Police interrogation
Sage Data 睿数科技	Public Safety Multimodal Emotional Interrogation System detects micro-expressions, bodily micro-	• Police and court interrogations
Shenzhen Anshi 深圳安	Emotion recognition product detects frequency and amplitude of light vibrations on faces and	• Early warning[76] • Prevention of crimes and acts
Taigusys Computing 太古计算	One product is referred to as a micro-expression-recognition system for Monitoring and Analysis of Imperceptible Emotions at Interrogation Sites, while others include 'smart prison' and 'dynamic emotion recognition' solutions. Taigusys claims to use image recognition that detects light vibrations on faces and bodies, as well as parallel computing.[77]	• Hospital use for de Alzheimer's, depres attacks[78] • Police interrogation criminals[79] • Prison surveillance

https://www.article19.org/wp-content/uploads/2021/01/ER-Tech-China-Report.pdf

As a society we need to agree the responsible limits on facial recognition and other high risk uses of AI technologies

WORLD ECONOMIC FORUM

Facial recognition technology: The need for public regulation and corporate responsibility

Jul 13, 2018 | Brad Smith - President

Microsoft

IBM

IBM quits facial-recognition market over police racial-profiling concerns

CEO writes to US Congress calling for 'national dialogue' about use in law enforcement

https://www.weforum.org/projects/responsible-limits-on-facial-recognition-technology
https://www.theguardian.com/technology/2020/jun/09/ibm-quits-facial-recognition-market-over-law-enforcement-concerns
https://blogs.microsoft.com/on-the-issues/2018/07/13/facial-recognition-technology-the-need-for-public-regulation-and-corporate-responsibility/

“Create an AI ecosystem of trust.” Ursula von der Leyen, Davos Agenda Jan ’21.

*“…Some of us are deeply **concerned** about the role which will be left for human beings in a **world run by AI**.”*

*“Others worry about the **serious effects that algorithms** can have on the health of our **democracies**. Who is taking the final decisions? Who is steering the flow of information?*

“What we see through social media platforms seems real….we literally live in different worlds.”

*“Yes, algorithms can be a danger to our democracy. But they do not have to be…There must be at least **transparency** on how the algorithm works….*

*“For people to accept a role for AI in such decisions, they must be **comprehensible**.*

*And they must respect **people's legal rights…**we have to be able to examine the workings of the system and to ensure **human oversight**.*

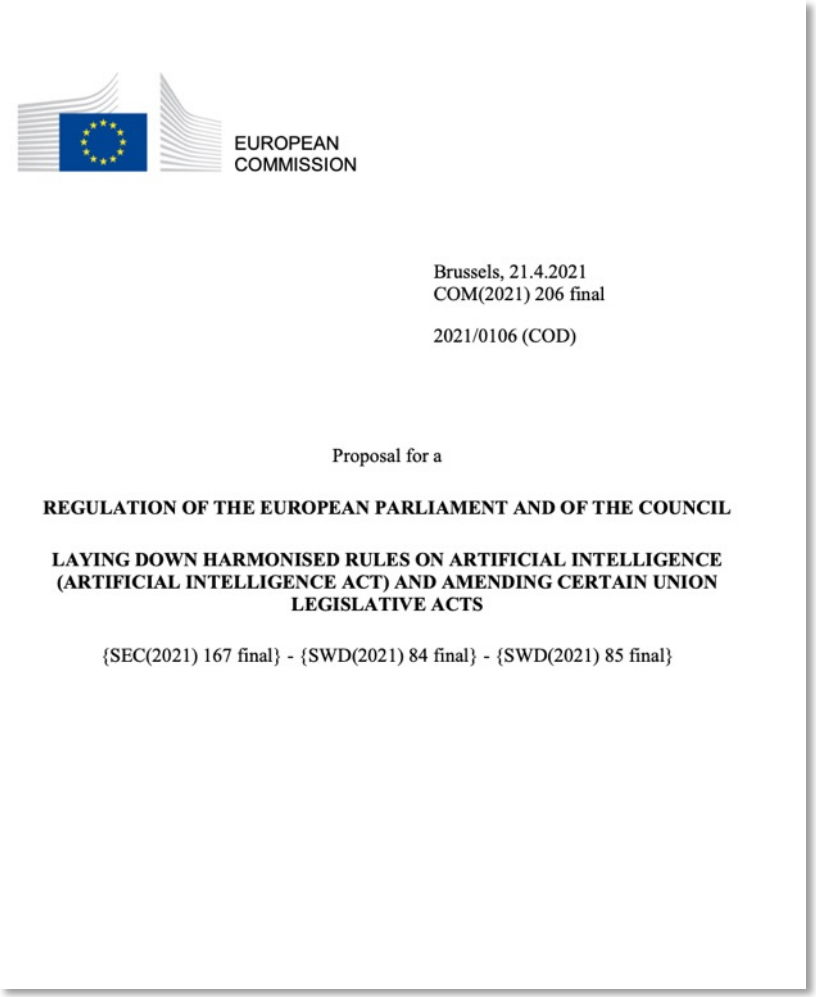
*Our aim is to create an AI **ecosystem of trust**.*

https://www.irishtimes.com/polopoly_fs/1.4473462.1612216104!/image/image.jpg_gen/derivatives/box_620_330/image.jpg
https://ec.europa.eu/commission/presscorner/detail/en/speech_20_2402

EU announced a legal framework for AI on April 21st 2021

The key characteristics of the legal framework include bans and restrictions on high-risk AI use cases:

- A ban on AI for “indiscriminate surveillance,”, social credit scores, etc
- Special authorization for using “remote biometric identification systems” like facial recognition in public spaces
- New oversight for “high-risk” AI systems, including those that pose a direct threat to safety, like self-driving cars or a system that can impact a person’s livelihood, like those used for job hiring, judiciary decisions, and credit scoring
- Assessment for high-risk systems before they’re put into service, including making sure these systems are explicable to human overseers and that they’re trained on “high quality” datasets tested for bias
- Need to register high-risk systems with authorities
- Notifications required when people are interacting with an AI system, unless it is “obvious”



EUROPEAN COMMISSION

Brussels, 21.4.2021
COM(2021) 206 final

2021/0106 (COD)

Proposal for a

REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

LAYING DOWN HARMONISED RULES ON ARTIFICIAL INTELLIGENCE (ARTIFICIAL INTELLIGENCE ACT) AND AMENDING CERTAIN UNION LEGISLATIVE ACTS

{SEC(2021) 167 final} - {SWD(2021) 84 final} - {SWD(2021) 85 final}

https://www.theverge.com/2021/4/14/22383301/eu-ai-regulation-draft-leak-surveillance-social-credit

Agenda

1. What is AI and its promise?	9:45 – 10:05
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3. What is the impact of AI on corporate strategy?	10:35 – 10:50 (5 min break)
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7. Discussion	12:25 – 12:45

There is a leadership race for AI across nation states.

https://www.gartner.com/technology/pressRoom.do?id=3872933

And a contrast in AI ethics

So who's going to make money in AI?

1 AI Chips

NVIDIA, Qualcomm, IBM, intel, AMD, Microsoft, Google, Baidu, Alibaba Group, HUAWEI, SAMSUNG, GRAPHCORE, Cambricon, Cerebras

2 AI Cloud

Google Cloud Platform, amazon web services, Microsoft Azure, Alibaba Cloud aliyun.com, IBM Cloud

3 AI Algorithmic Services

IBM, amazon, Microsoft, Google, Baidu

Conversational agents**: MindMeld

Speech: SoundHound

NLP & Semantics: LEXALYTICS

Core Algorithms: DeepMind, vicarious, Numenta

Vision: clarifai, Captricity

4 Horizontal Enterprise AI

IBM, ORACLE, salesforce, Microsoft, SAP

HR & Talent: ZipRecruiter, HireVue, workey

Marketing & Sales & Service: 6sense, SALESLOFT, afiniti

RPA: AUTOMATION ANYWHERE, blueprism, UiPath

Intelligence & Analytics: Digital Reasoning, Dataminr

Cybersecurity: DARKTRACE, TANIUM, CYLANCE

Tools: data iku, DataRobot, PETUUM, tamr

Consultants: KPMG, ELEMENT AI, pwc, accenture, Deloitte.

Data Labelling: appen

5 Vertical Industry AI

Healthcare & Life Sciences: TEMPUS, BenevolentAI, babylon health, zymergen, DeepMind

Finance & Insurance: zest finance, affirm, NUMERAI

Agriculture: BENSON-HILL, FarmersEdge, prospera

Autonomous: drive.ai, ZOOX, WAYMO

Legal & Compliance: Luminance, casetext, onfido, ROSS

Industrials, Robotics & Logistics: brain corp, anki, deepvu, LOGILITY, VEKIA

6 AI in Corporates

Healthcare: NHS, gsk

Finance & Insurance: AXA, usbank, J.P.Morgan

Tech & Telco: Alibaba.com, Microsoft, Google, Apple, facebook, Baidu

Agriculture: MONSANTO, CONAGRA

Automotive: Ford, GM

Legal & Compliance: ALLEN & OVERY, WHITE & CASE

Industrials, GENERAL ROBOTICS, GE, BOEING

Retail, media, other: TARGET, Disney

7 AI in Countries

Best Practice AI

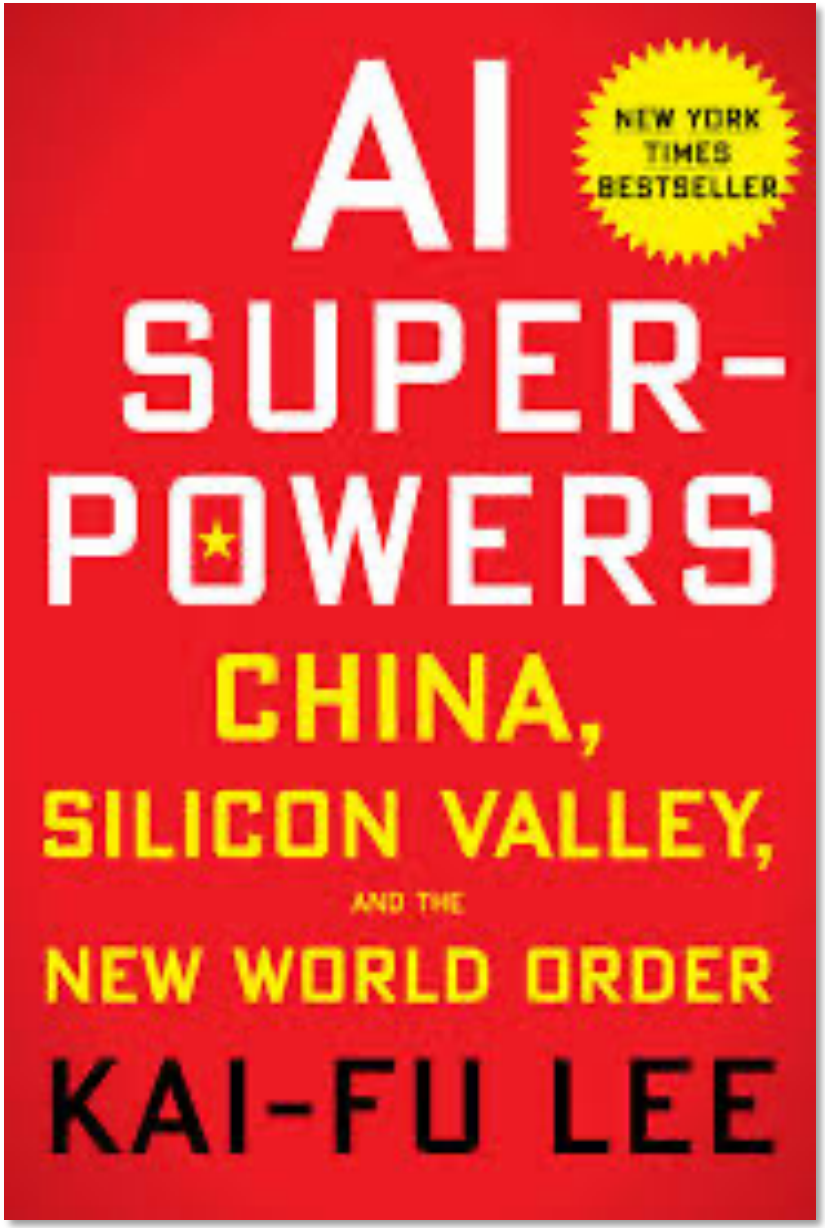
* Excludes SMB sectors. The companies noted are representative of larger players in each category but in no way is this list intended to be comprehensive or predictive.

Sources: CBInsights, Crunch Base, and misc. others

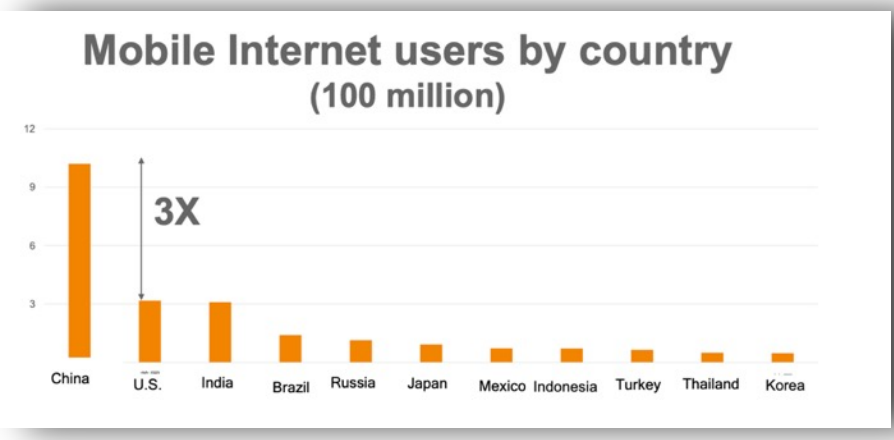
** Acquired by Cisco and Google respectively.

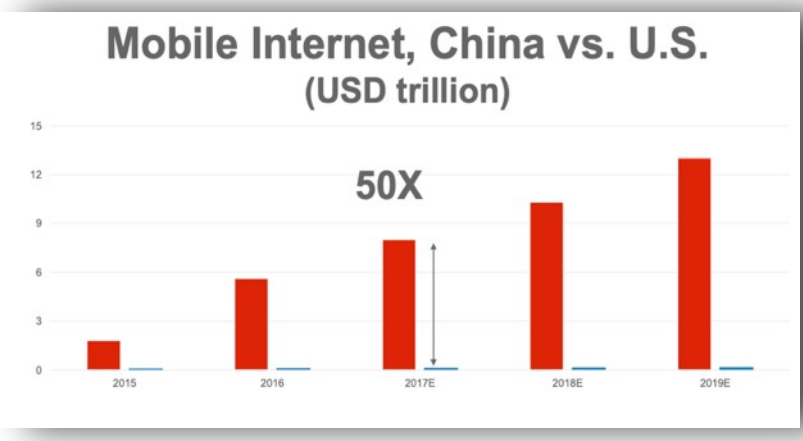
https://www.economist.com/leaders/2017/05/06/the-worlds-most-valuable-resource-is-no-longer-oil-but-data

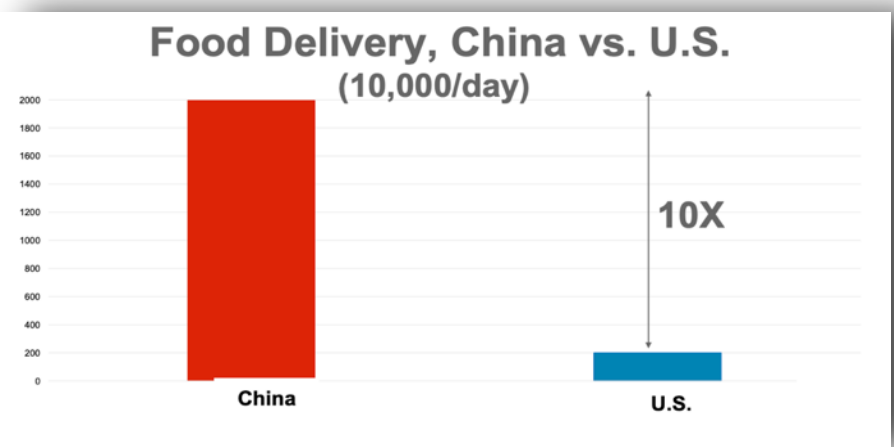
Dr Kai-Fu Lee, suggests that the race for data and AI is the defining economic challenge of our times

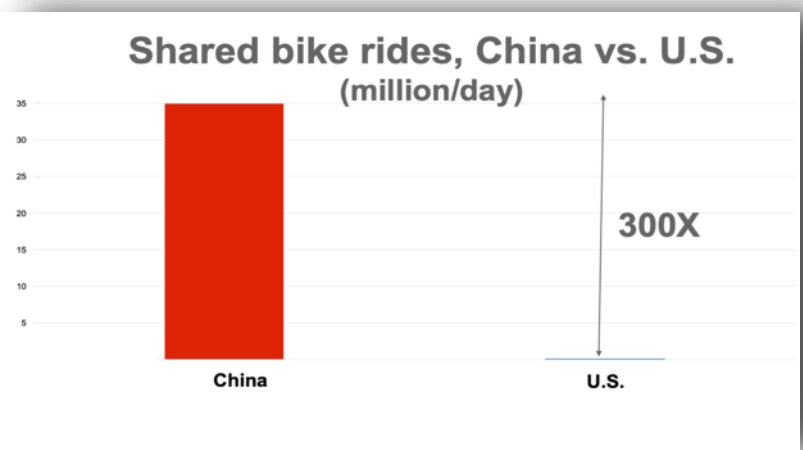


“China is the Saudi Arabia in data” Dr Kai-Fu Lee









China has an explicit goal to make itself the leader in AI by 2030. Structural advantages include data privacy regulations, public - private cooperation, and scale of data, capital, talent and market demand.

https://www.slideshare.net/AIFrontiers/kaifu-lee-at-ai-frontiers-the-era-of-artificial-intelligence?from_action=save

Data is the new oil to power the algorithmic engines of AI*

But as a fuel cares is required in its sourcing, refinement and distribution

Need to source and extract data

Need to refine the data

Need to store the data securely

Need to carefully handle its transportation and distribution

Need an increasingly expensive infrastructure to manage

Need strong governance and oversight

Need to ensure leakage does not cause societal damage

**** (though it is not a commodity)***

https://iottechnews.com/news/2020/feb/24/opinion-data-isnt-new-oil-iot-it-will-be-much-bigger/

“Create an AI ecosystem of trust.” Ursula von der Leyen, Davos Agenda Jan ’21.

“”

“What sets Europe apart from competitors like China is not the size of our tech sector or how attractive we are for venture capital. What sets Europe apart from competitors is the fact that our values come first. Human beings come first."

https://www.irishtimes.com/polopoly_fs/1.4473462.1612216104!/image/image.jpg_gen/derivatives/box_620_330/image.jpg
https://ec.europa.eu/commission/presscorner/detail/en/speech_20_2402

So what does this mean for you as executives?

Narrative	Issue	Takeway
1. What is AI?	Complexity and confusion	Education is key
2. How are companies using AI?	Lack of clarity on what is possible / realistic?	Choose right use cases and plan for mistakes
3. What is the impact of AI on corporate strategy?	Doing AI less hard than being able to do AI	Executive vision and patience on economics
4. How do you scale AI?	Scaling AI is different than experimenting with AI	Digital transformation continues
5. What is the impact of AI on your people?	Concern as we enter 4th Industrial Revolution	Work with your people, not against them
6. What are the risks associated with AI?	AI Ethics are Ethics	Show ethical leadership
7. Is there a race for AI dominance?	International competition	Do we think of competition globally?

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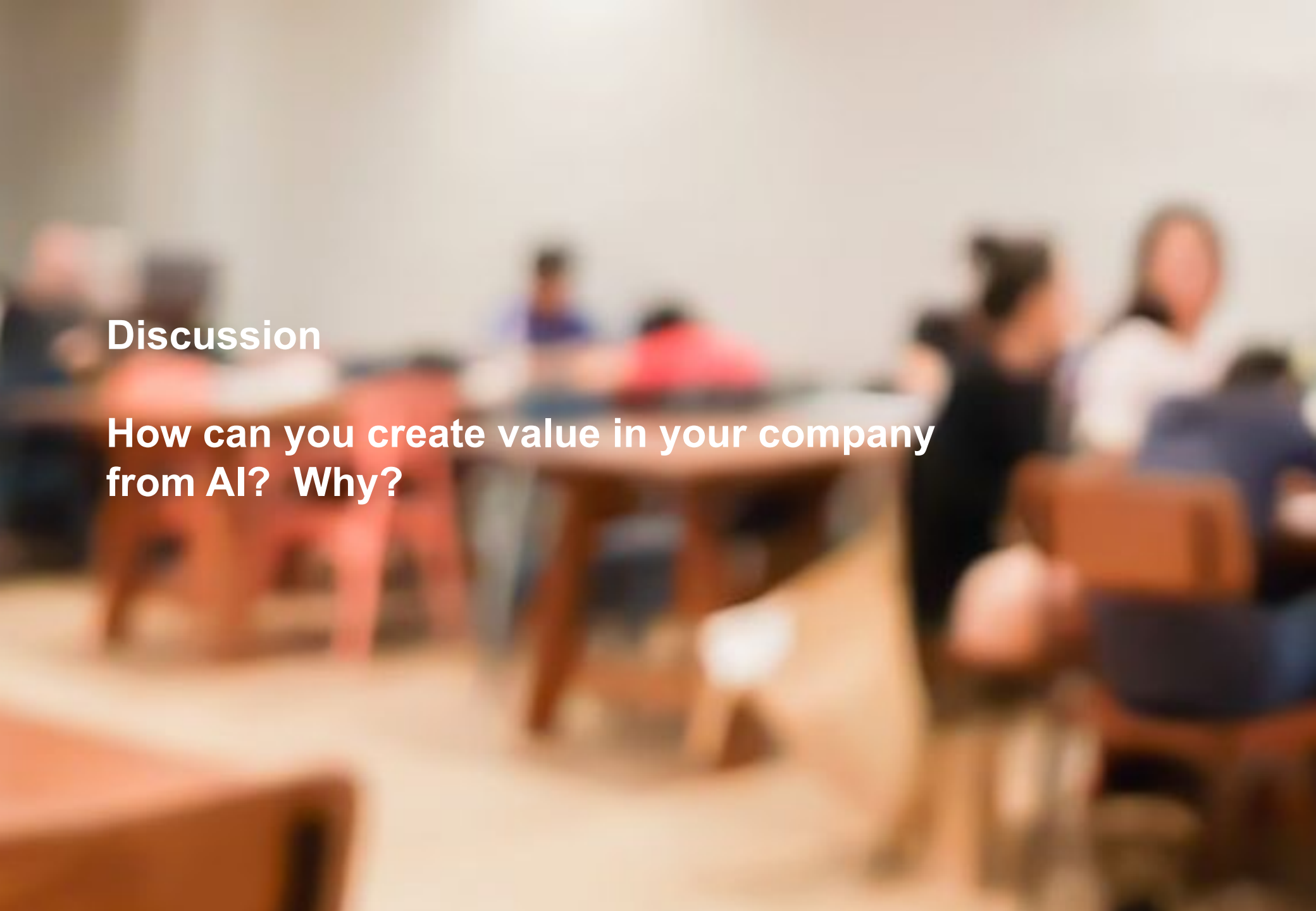


Discussion

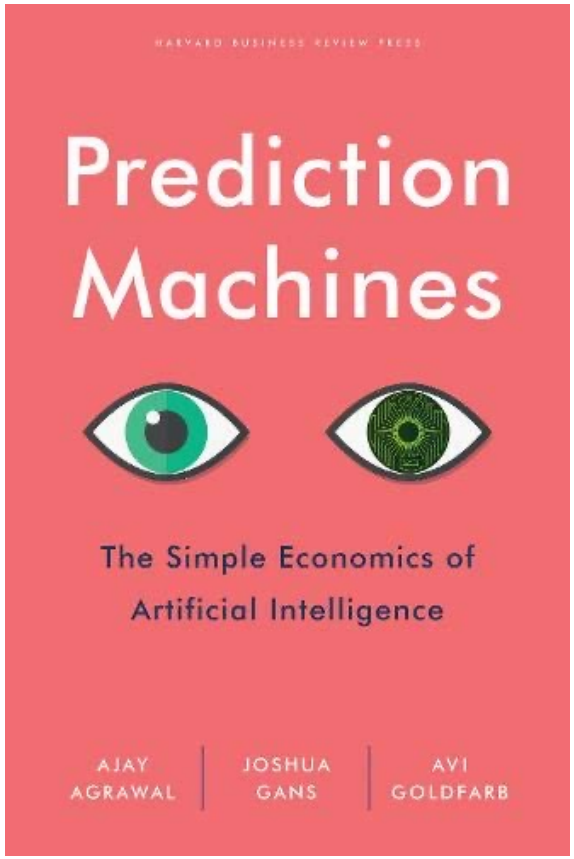
How can you create value in your company from AI? Why?

Further reading

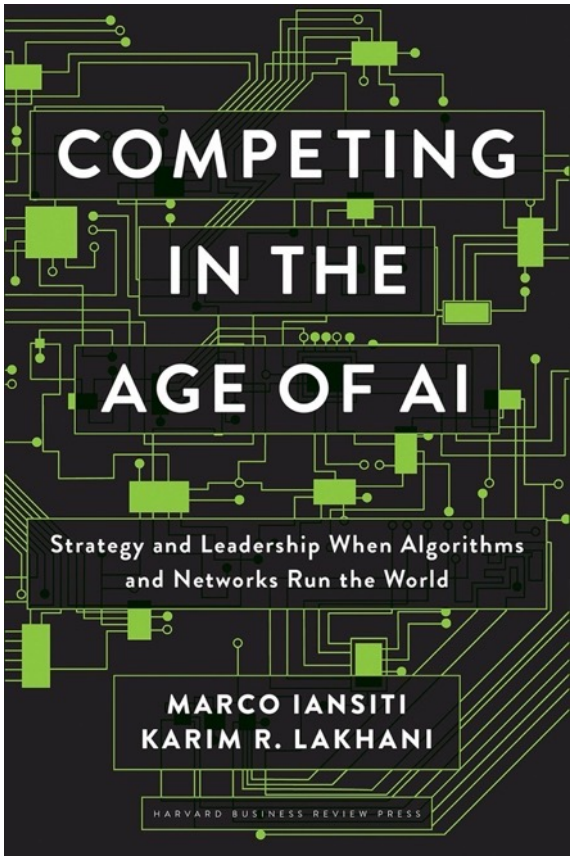
Board agenda

WORLD ECONOMIC FORUM

Business economics

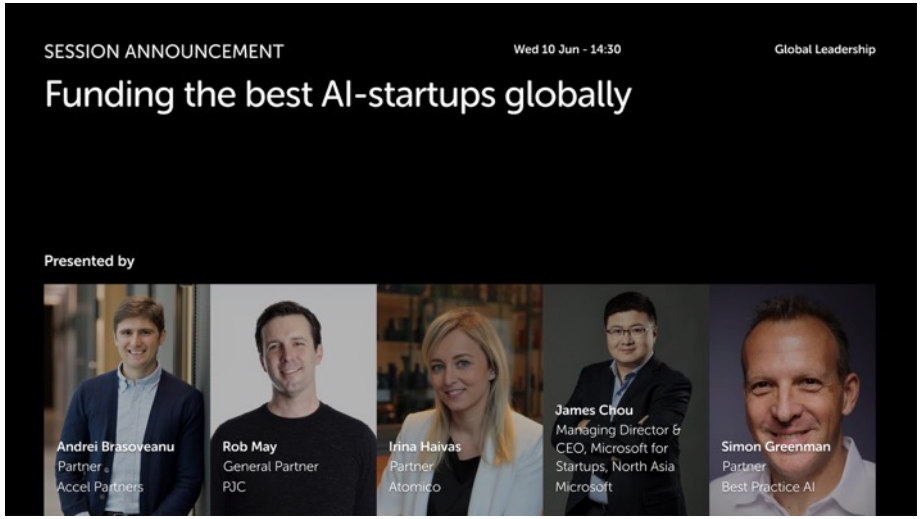


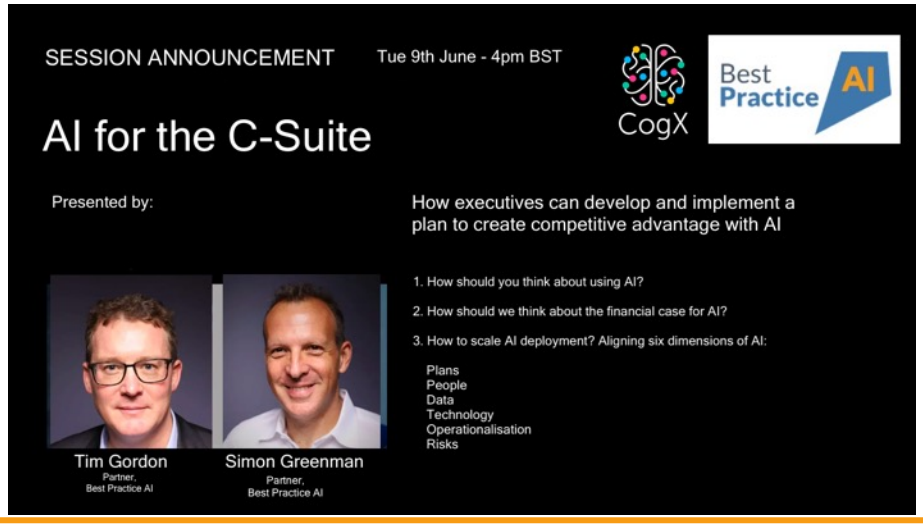
Competitive challenge

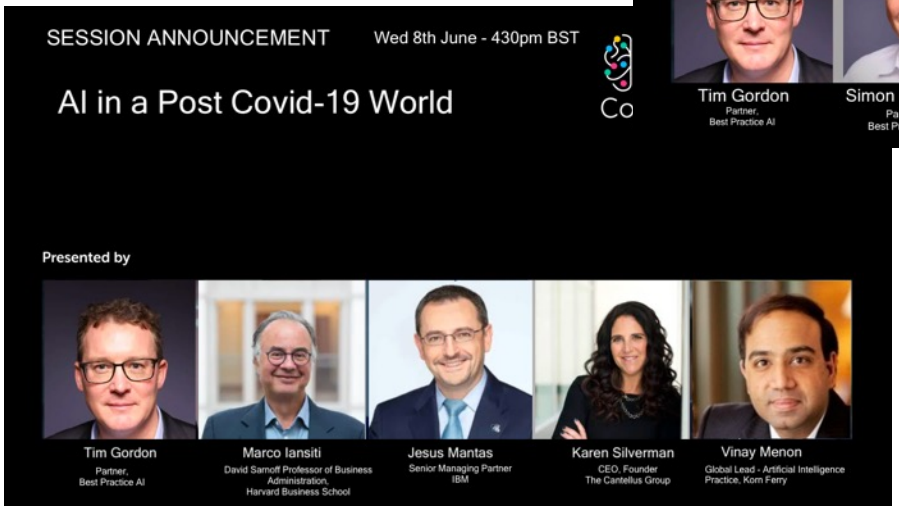


See Best Practice AI workshops, panels and discussions

https://www.youtube.com/channel/UCSjNUFio9kqq3w0xtz9fa7g







Jacob Turner authored Robot Rules

Thank you. Best Practice AI

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Strategy, Business Planning & Education

AI Delivery Support & Coaching

Organisational Design and Capacity Building

AI Governance & Risk Management

Investment Due Diligence

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