

luxexecutivesummit 2018

Boston • April 9-11

Navigating the AI Adoption Minefield

Pitfalls, best practices, and developing your own AI roadmap | April 11

Presenter: Cosmin Laslau, Director of Research Products, Lux Research



Agenda

- 1 | Why you – yes, *you* – need to get dangerous on AI, fast
- 2 | Three pitfalls to avoid as you start your AI journey
- 3 | Developing your AI roadmap



Audience poll:
Raise your
hand if you
are currently
leading an
AI project.



Or, if you
are currently
day-to-day
involved in an
AI project, raise
your hand.

Within a few years,
almost everyone in
this room will start
to work with AI.
**You may even
be in charge.**



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to work with AI.
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e.g., *“Help us use
AI to develop
products faster,”* or
*“Find an AI partner
for us,”* or...



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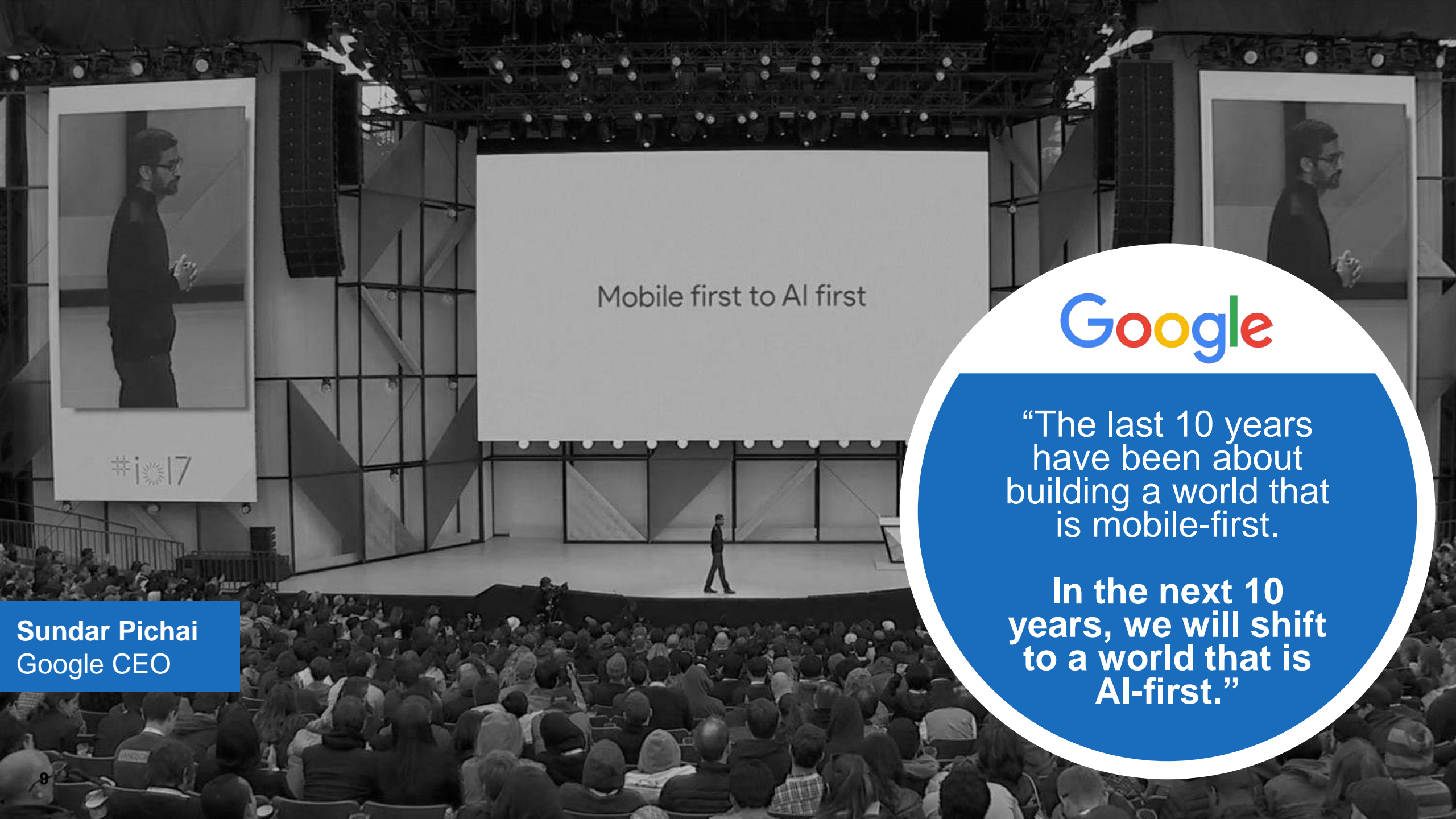
Real urgency here
– where do we
begin? What are
the pitfalls?



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**You may even
be in charge.**

Is this
true?





Mobile first to AI first

Google

“The last 10 years
have been about
building a world that
is mobile-first.

**In the next 10
years, we will shift
to a world that is
AI-first.”**

Sundar Pichai
Google CEO

Leadership in a New Era of Computing



**“I am 100%
convinced that every
job we know today
will be affected by
artificial intelligence.**

**How we will respond is
IBM's greatest
business challenge.”**



Ginni Rometty
IBM CEO



But what if my
company is not a
digital company?
**What if I work with
cows?**

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Got A.I.? Facial recognition now
works on cows, with goal of
better milk



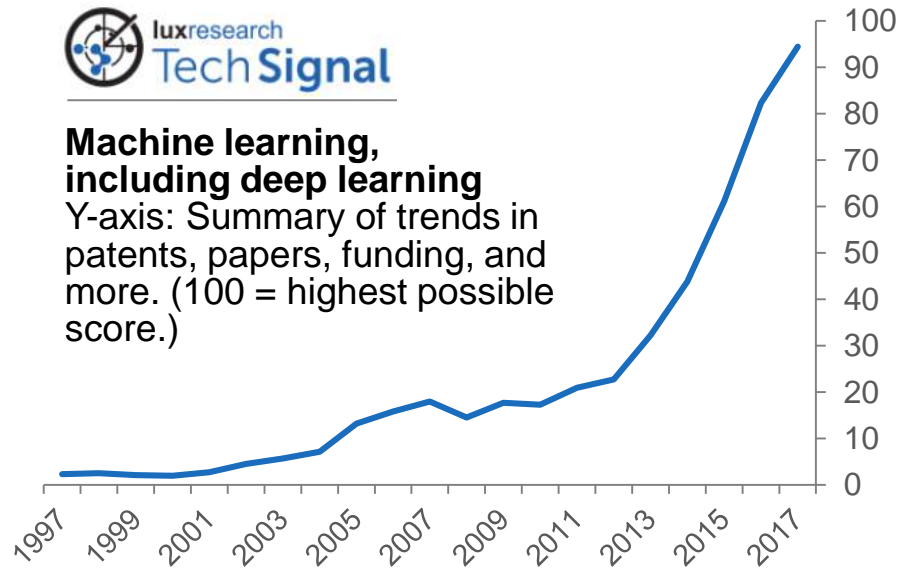
Cargill[™]

+

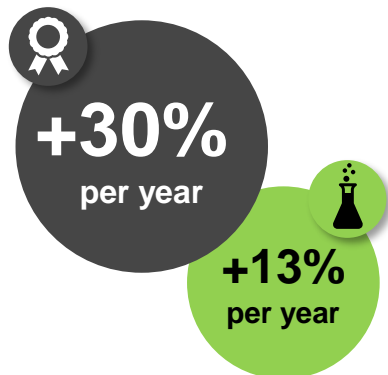


cainthus

Beyond anecdotes: Here is what the world is turning its innovation attention to, as counted by patents, papers, and funding

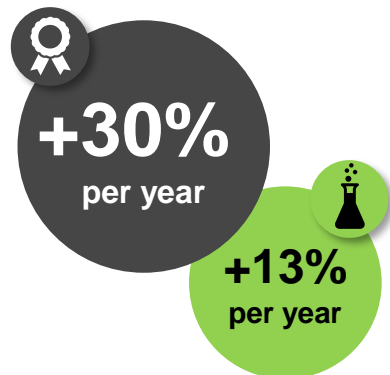
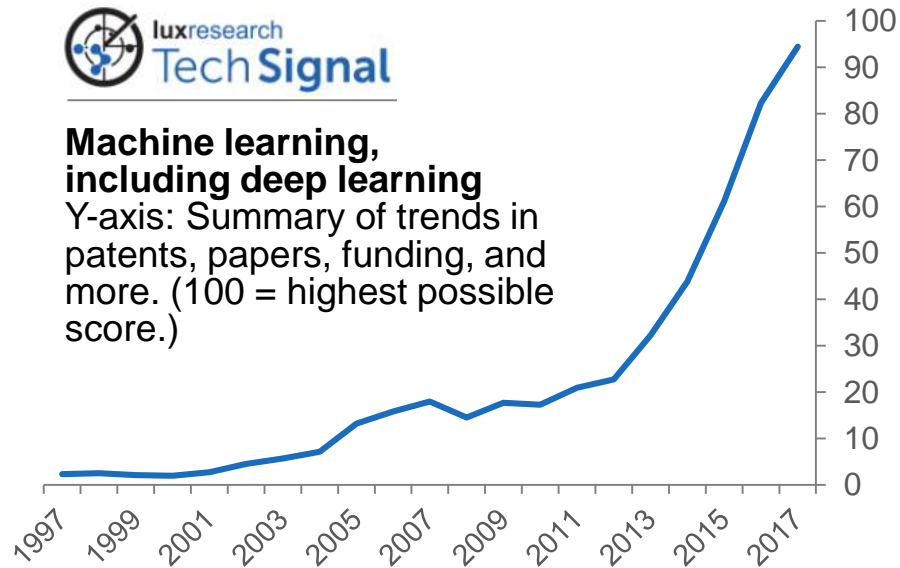


We analyzed all of the world's patents, academic papers, and funding for thousands of topics, spanning the A-Z of materials to health to energy to digital.



Machine learning has had a remarkable rise: **patents up by 30% annually, and academic papers by 13%.**

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AI dominates the leaderboard:

1. Neural networks
2. Deep learning
3. Data science
4. Data science
5. Artificial intelligence
6. Artificial intelligence
7. Labeled data
8. Artificial intelligence
9. Data lakes
10. Data lakes
11. Data lakes
12. Data lakes
13. Data lakes
14. Data lakes
15. Backpropagation
16. Classification models
17. Convolutional neural networks
18. Convolutional neural networks
19. Convolutional neural networks
20. Machine learning
21. Machine learning
22. Machine learning
23. Machine learning
24. Edge computing
25. Edge computing
26. Edge computing
27. Edge computing
28. Edge computing
29. Reinforcement learning

**The 2-minute version
of the AI landscape,
for us to level-set.**

(Grossly simplifying a
very complex field.)



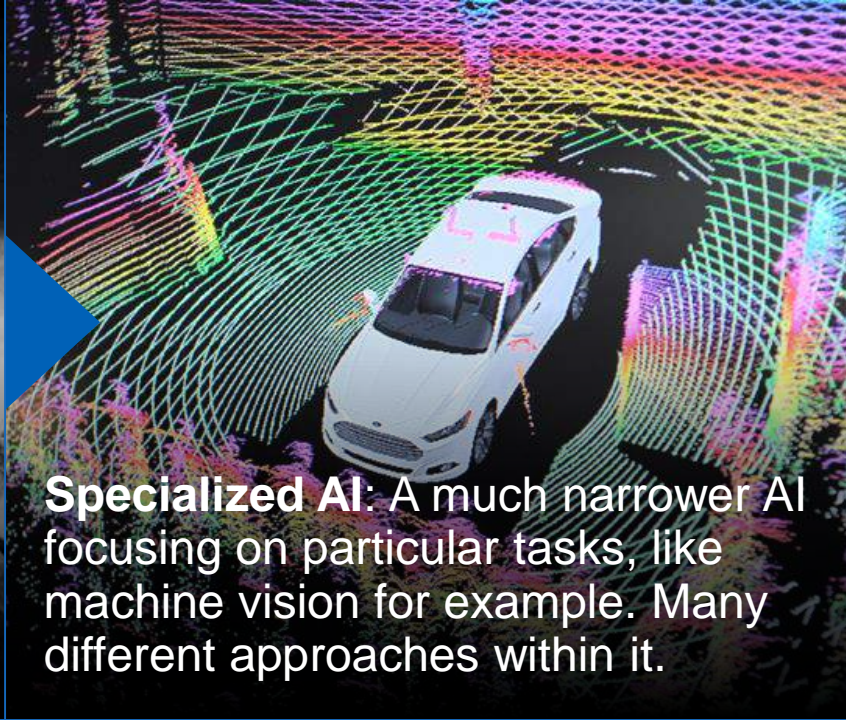
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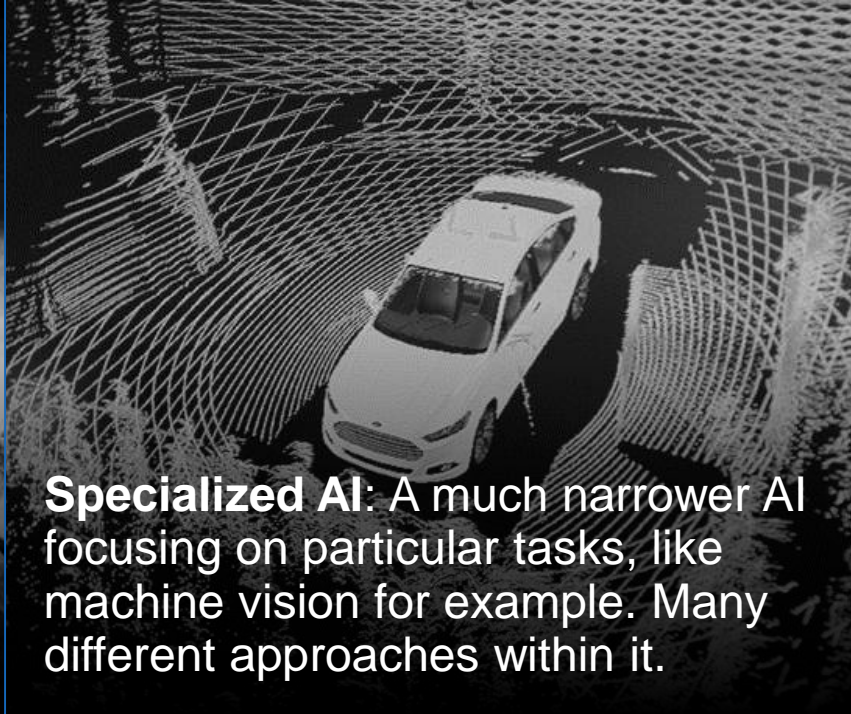
Specialized AI: A much narrower AI focusing on particular tasks, like machine vision for example. Many different approaches within it.

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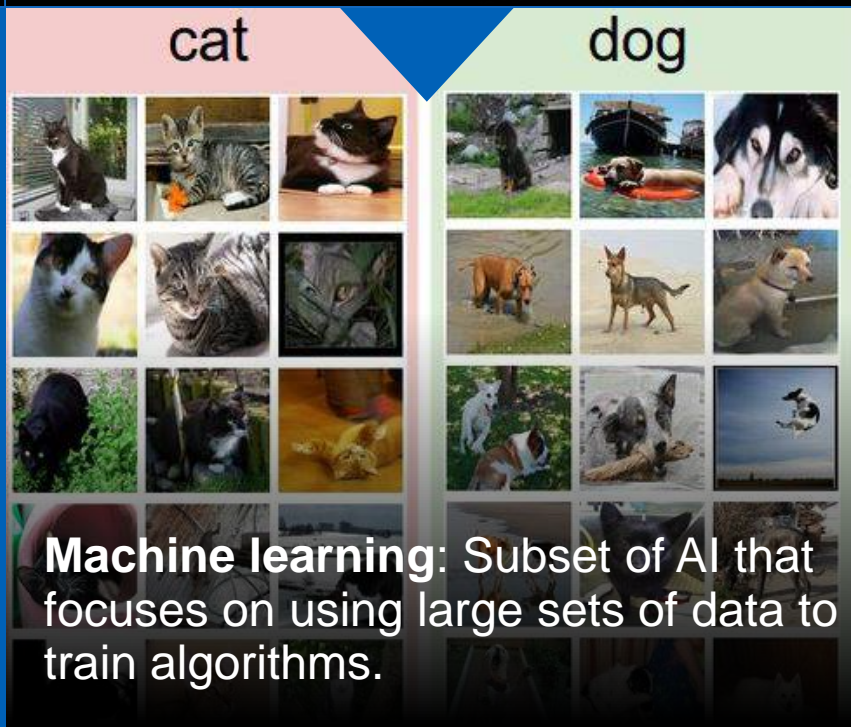
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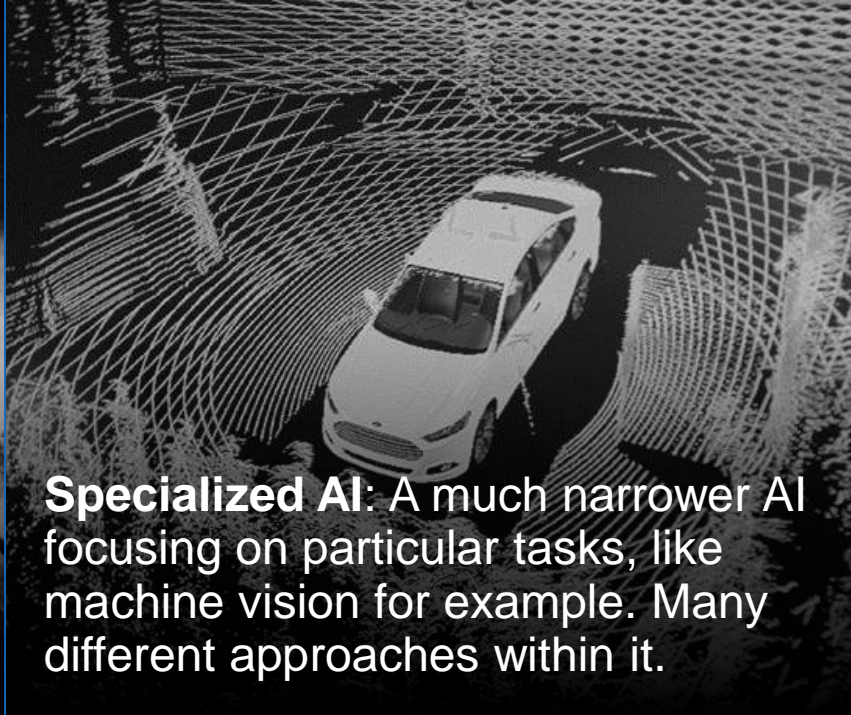
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Machine learning: Subset of AI that focuses on using large sets of data to train algorithms.



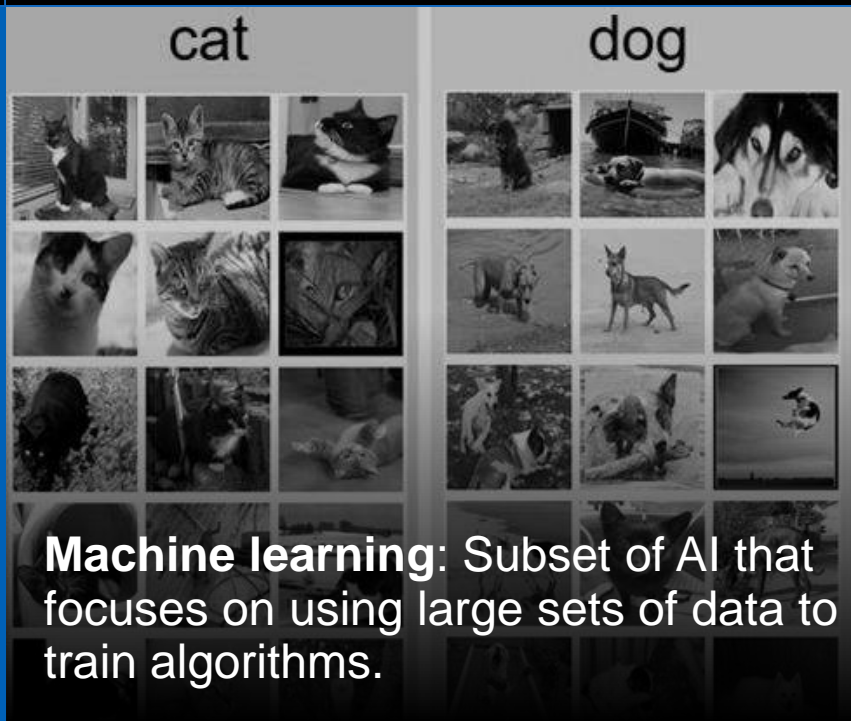
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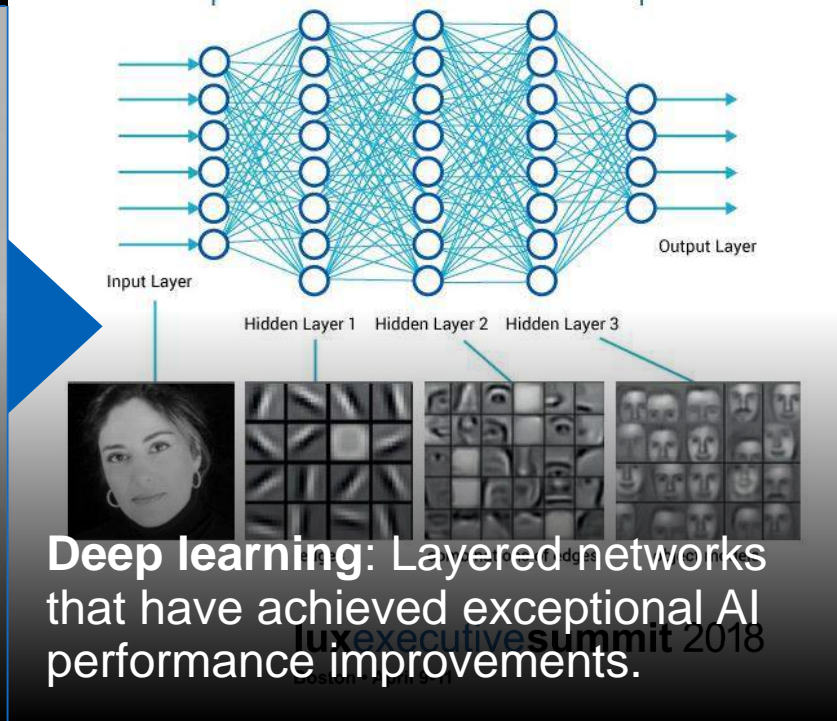
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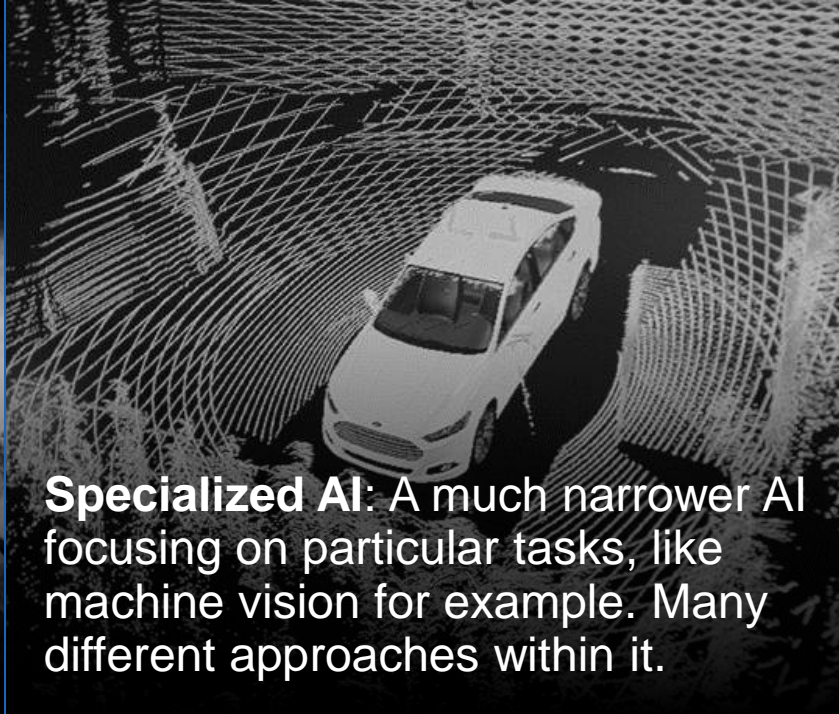
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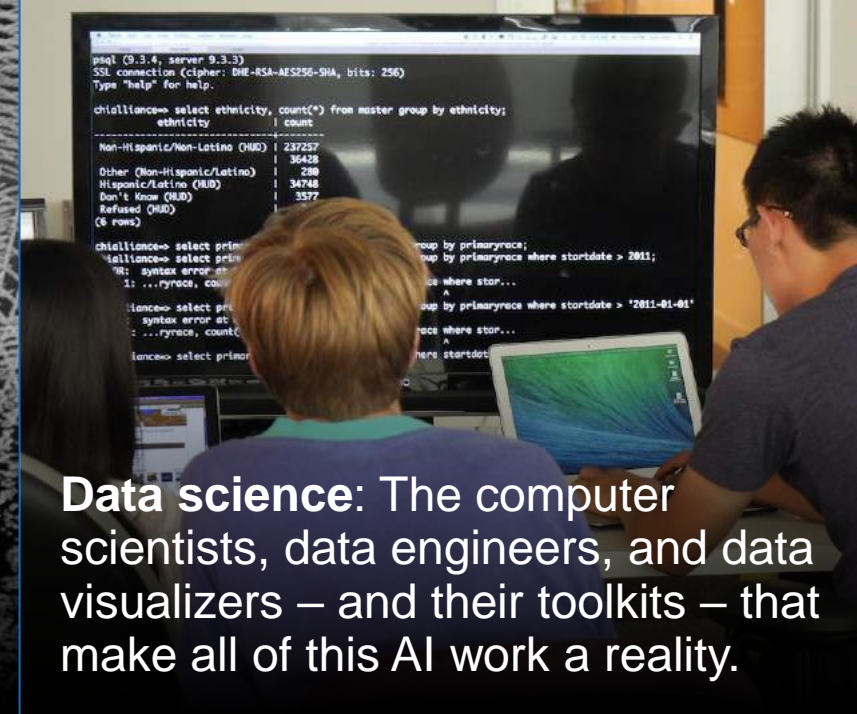
Deep learning: Layered networks that have achieved exceptional AI performance improvements.



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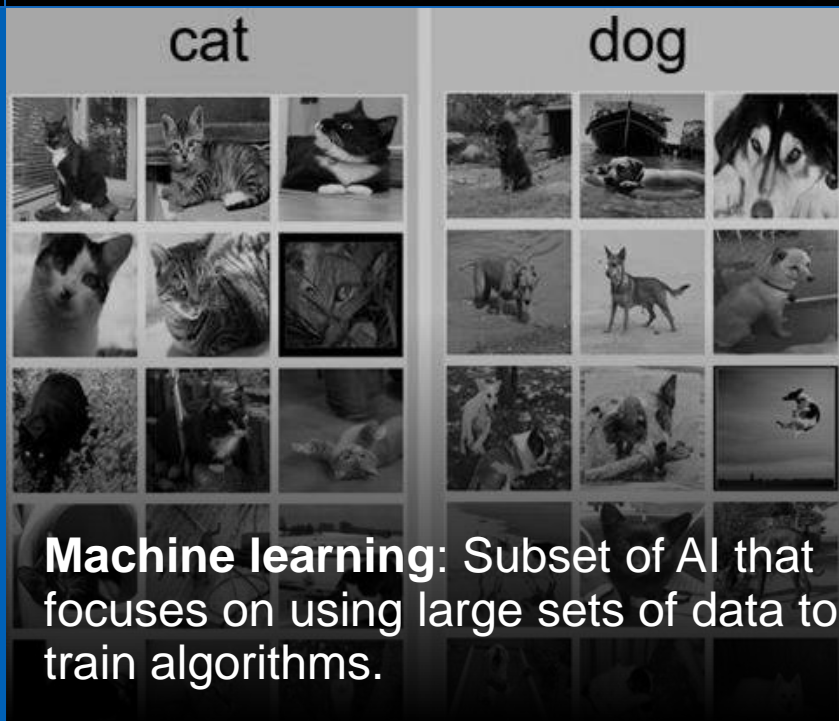
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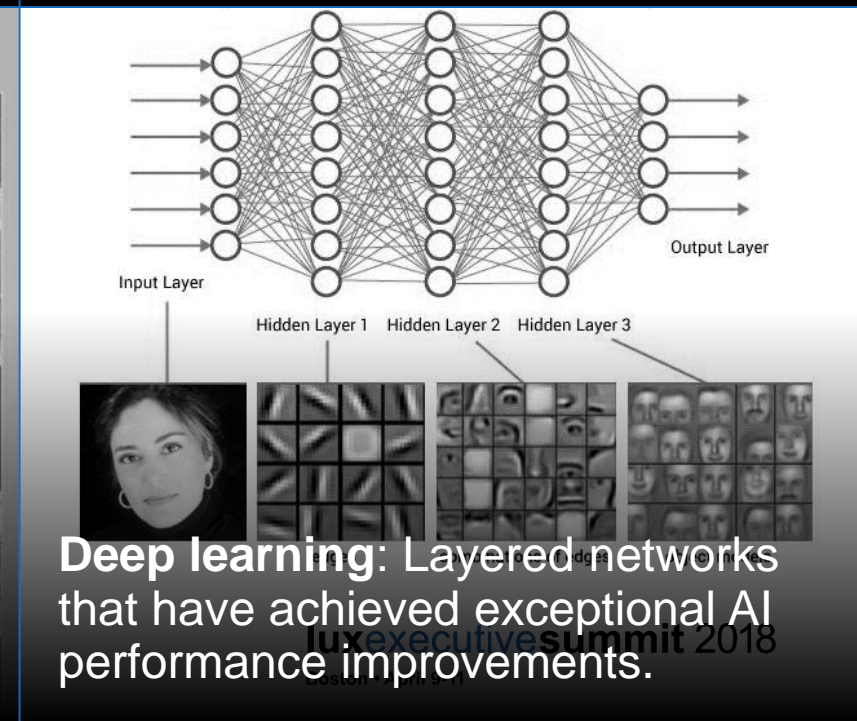
Data science: The computer scientists, data engineers, and data visualizers – and their toolkits – that make all of this AI work a reality.

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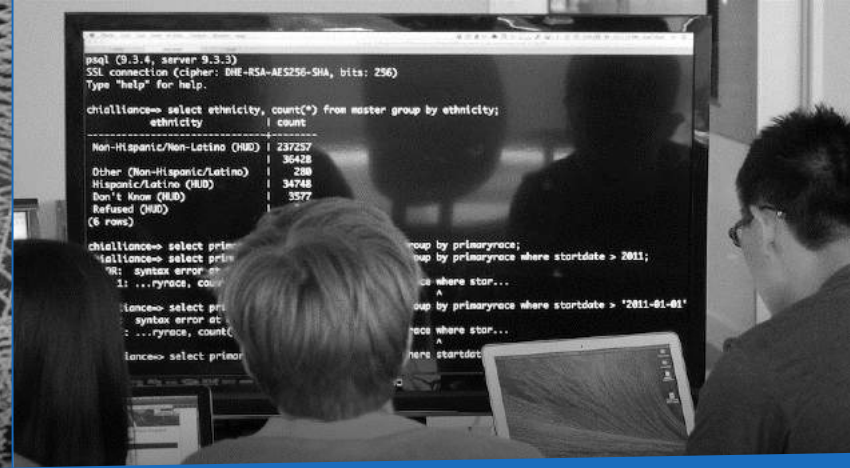
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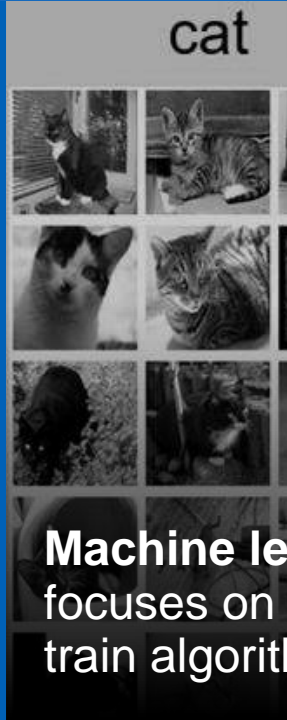


Specialized focusing on machine vision different applications



Want more details? Be the first to see our new Tech Pages. Check the Lux Executive Summit app for a preview:

The 2-minute version of the AI landscape, for us to level-set.
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Machine learning focuses on training algorithms

The screenshot shows the 'LARGE PLAYERS' section of the app, featuring logos for Microsoft, Qualcomm, IBM, and Google. Below this is a 'Case Studies: How Firms use Deep Learning' section, which includes a sub-section for 'GE Healthcare' with a 'LUX TAKE' and an introduction to their partnership with Nvidia.

State of AI for many:
“Nobody in the department had a clue how to properly buy, field, and implement AI.”

– Organization that spends billions on software

Why?

“There is no ‘black box’ that delivers the AI system [we need], at least not now. Key elements have to be put together.”



That deer in the headlights moment is coming: **“Can you lead this new AI project for us?”**

We need to get good at managing AI deployments, fast. Let's start with some common pitfalls.

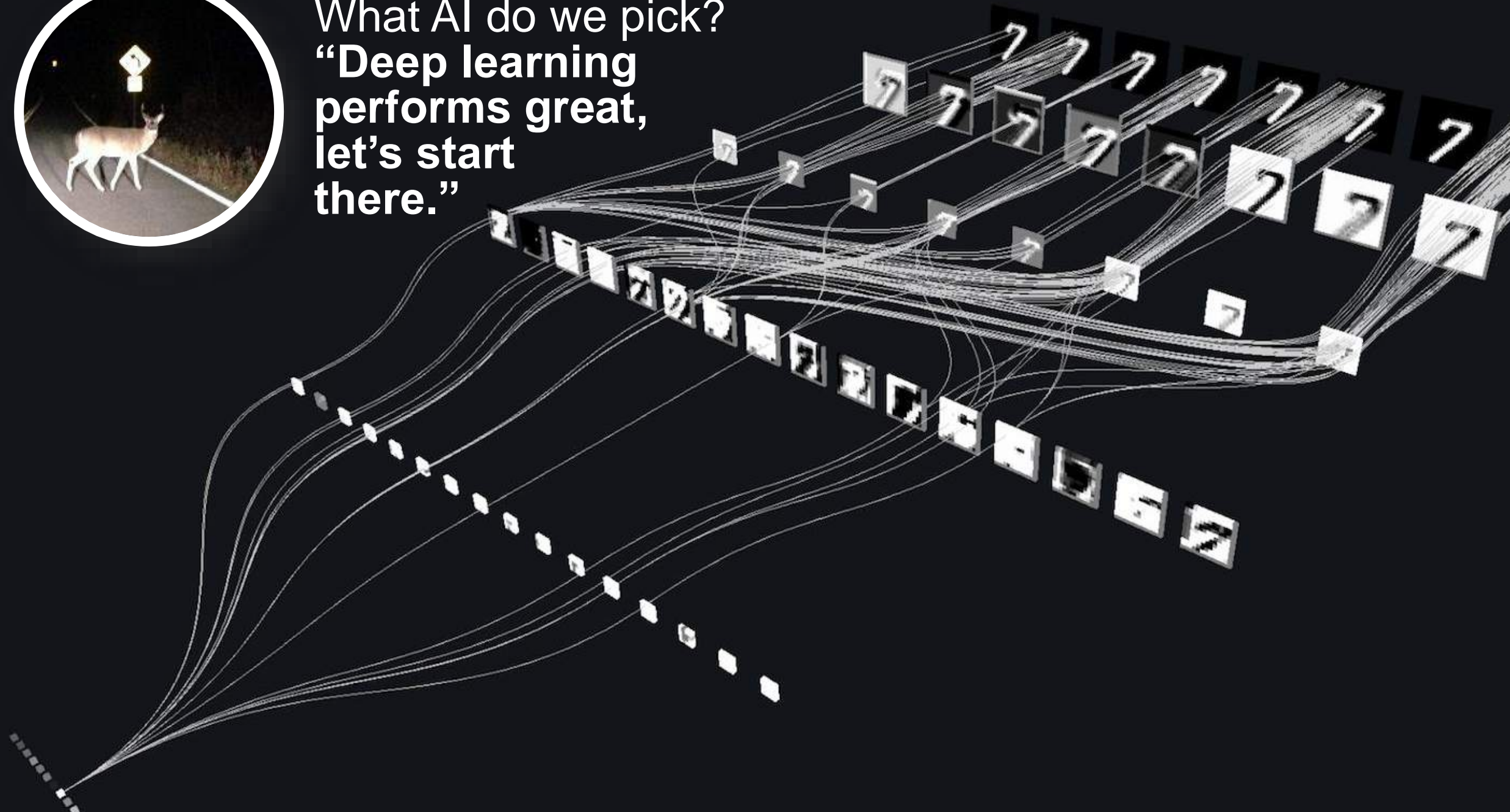
Agenda

- 1 | Why you – yes, *you* – need to get dangerous on AI, fast
- 2 | **Three pitfalls to avoid as you start your AI journey**
- 3 | Developing your AI roadmap

Be careful which
flavor of AI you jump into.



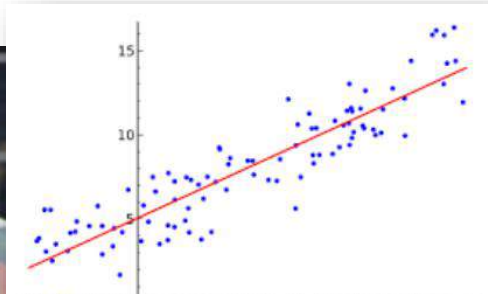
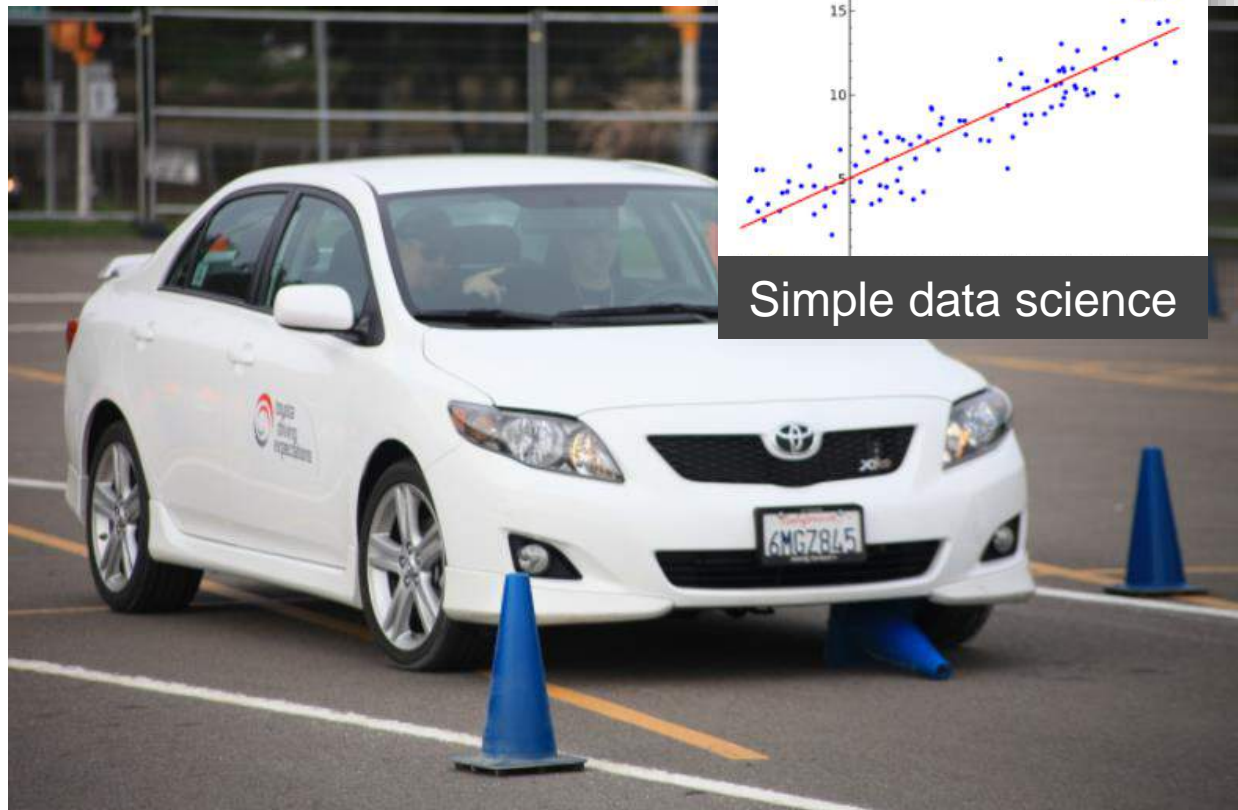
What AI do we pick?
“Deep learning
performs great,
let’s start
there.”



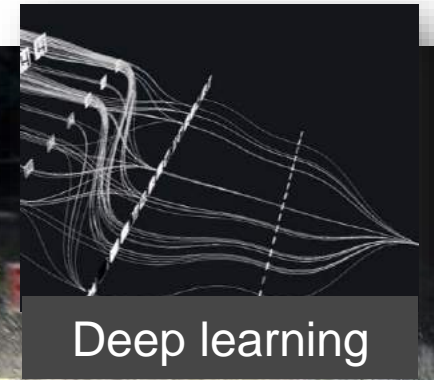
Pitfall #1: You likely don't need the most advanced AI to start; foundational data science is more important, and useful

Applied data science is incredibly useful – and about as friendly and easy to start as a Toyota Corolla.

- Deep learning can be much higher performance (think F1 car), but also inscrutable and requires immense talent to do well.



Simple data science



Deep learning

1. Start with data science fundamentals



Design high-performance alloys
– like ultra-high strength steels
for **SpaceX** – using materials
property databases and
predictive models.

Founded **1996**.

LUX TAKE



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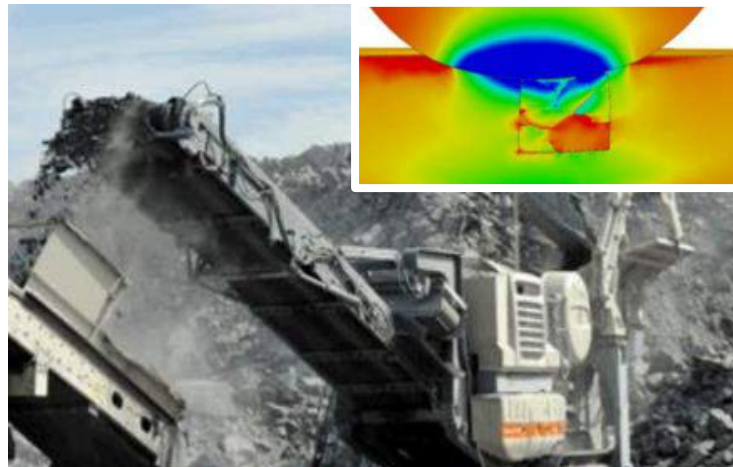
LUX TAKE



Multiscale modeling using 300+ distinct pieces of simulation software, for metals, composites, coatings, like **Metso Minerals** for wear resistance in mining.

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Positive



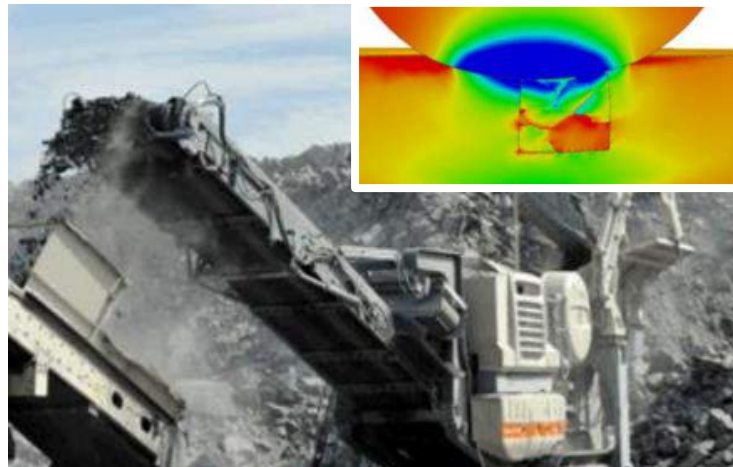
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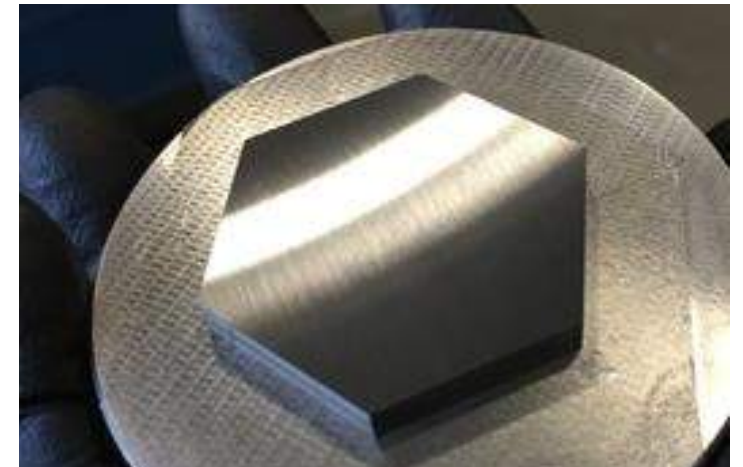
Machine-learning-powered materials discovery platform, including for lightweight composites.

Founded **2011**.

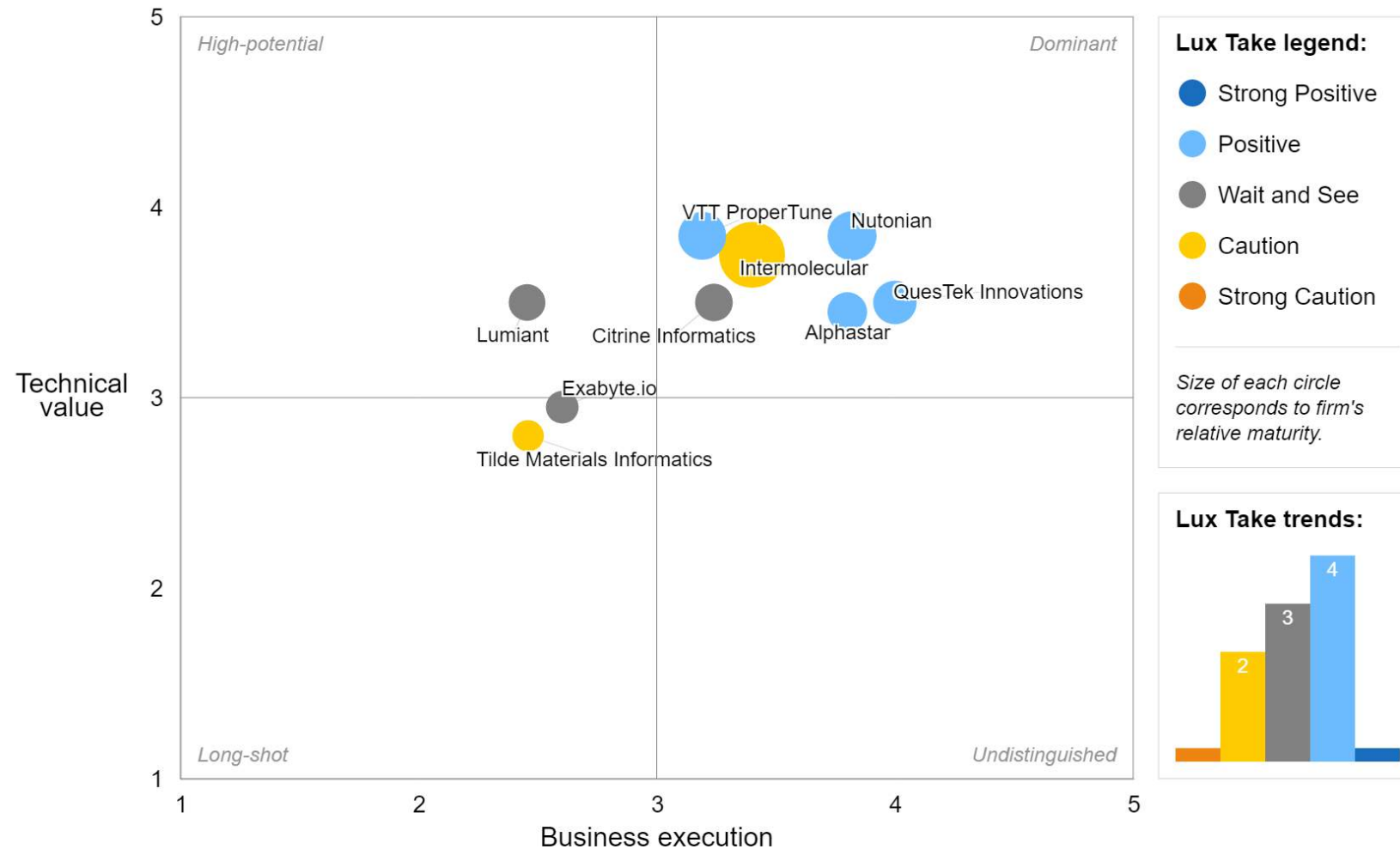
LUX TAKE



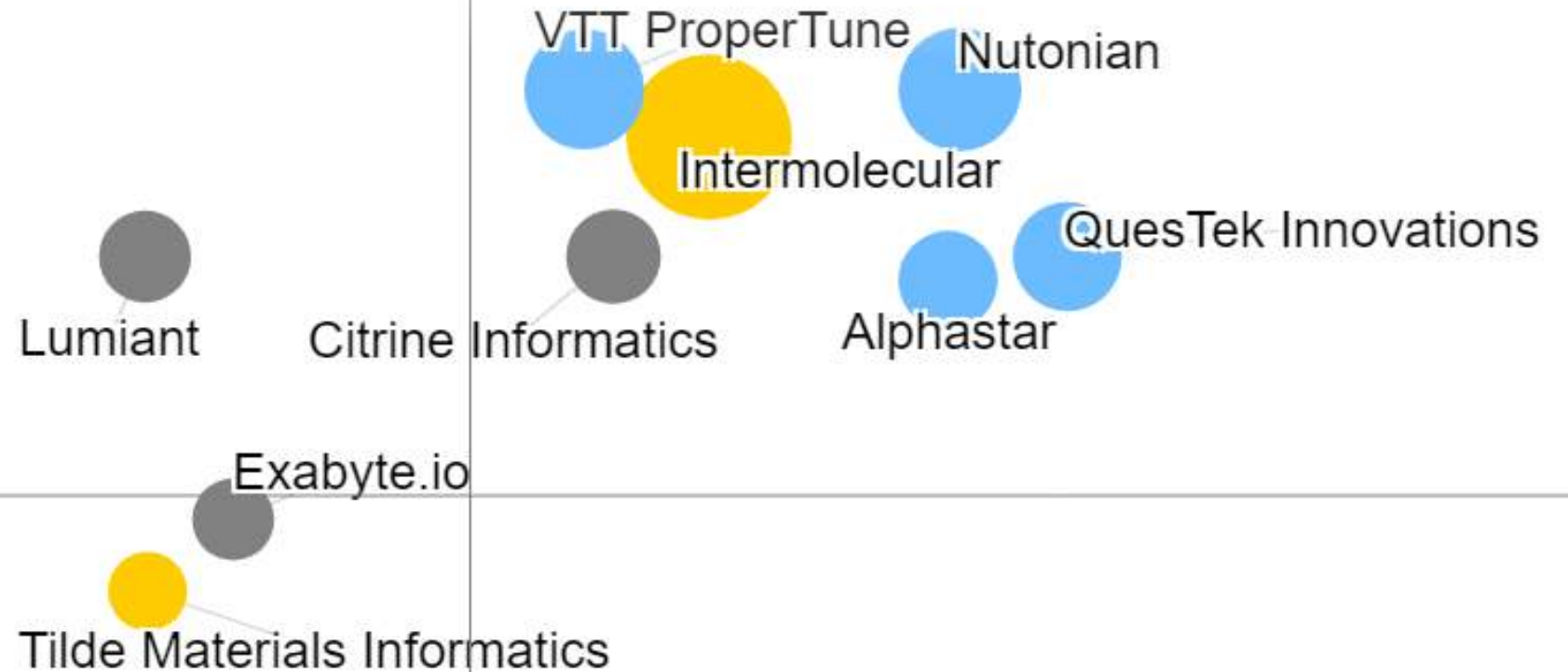
Wait And See



Materials informatics companies leading in our Lux Innovation Grid – part of upcoming Tech Pages – are not AI-based, yet



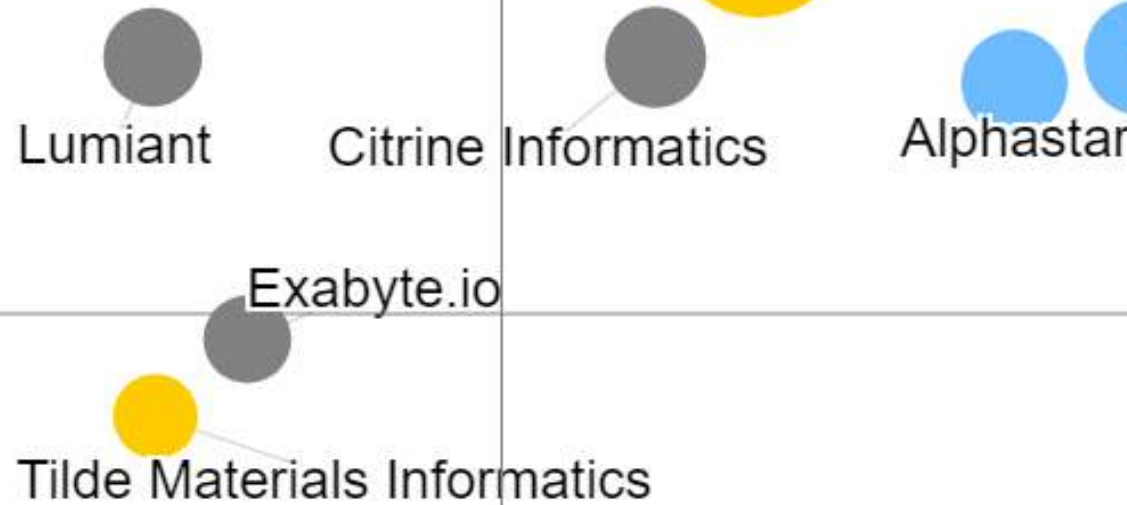
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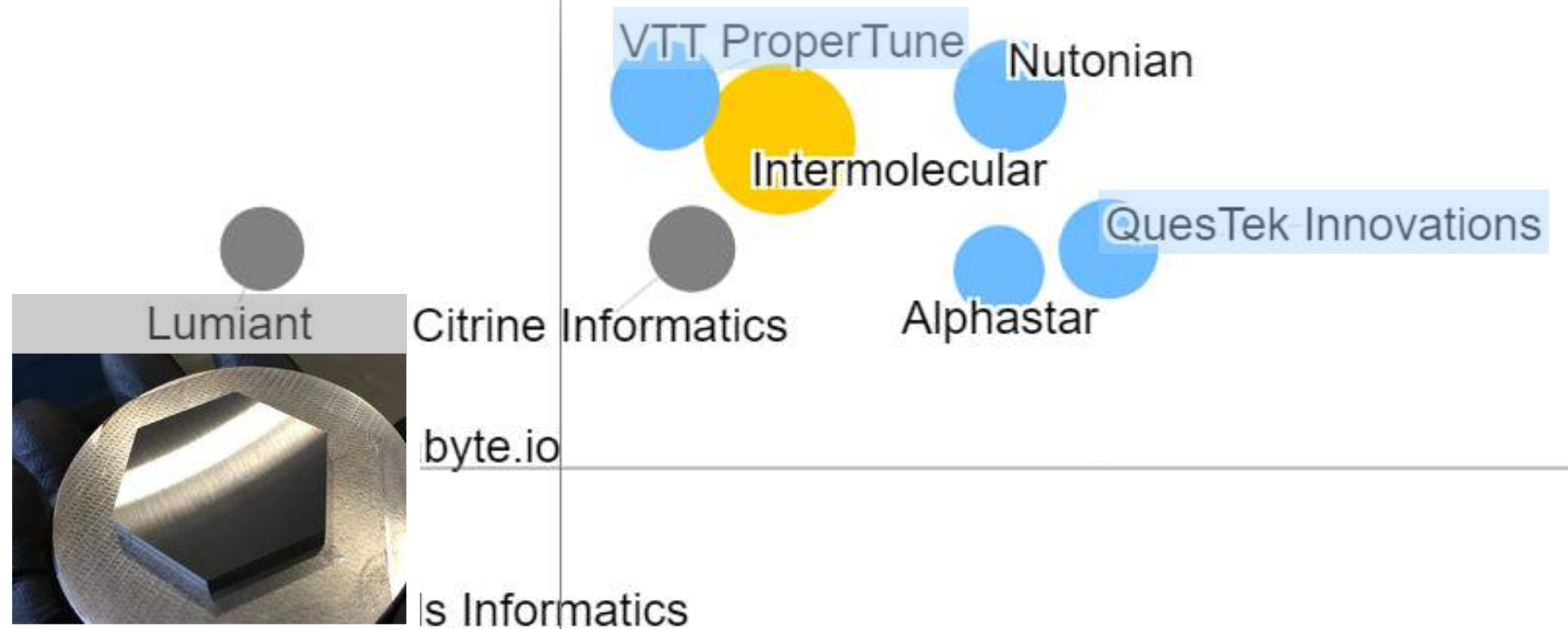
Materials informatics companies I Grid – part of upcoming Tech Pag



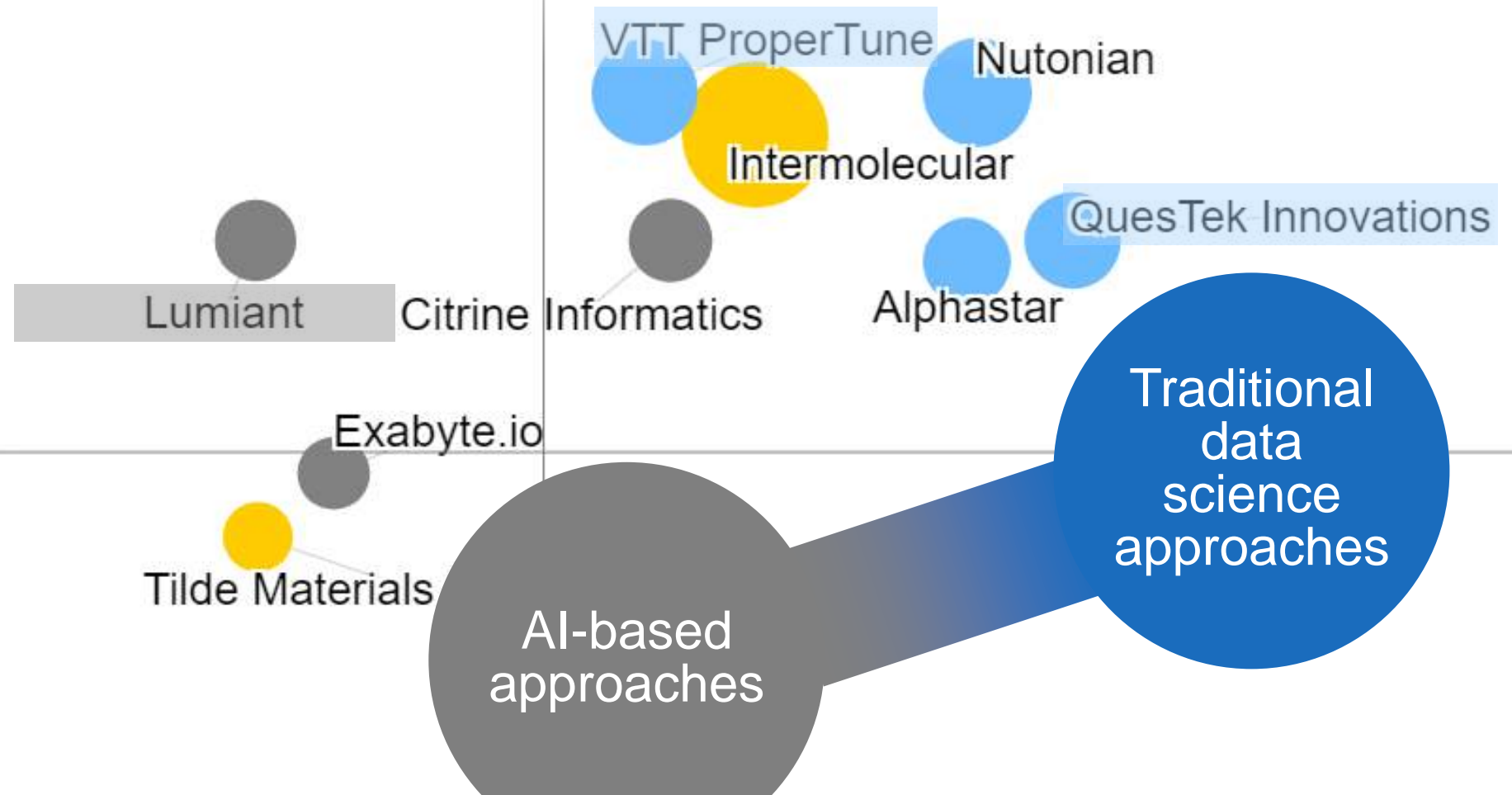
or Lux Innovation AI-based, yet



Materials informatics companies leading in our Lux Innovation Grid – part of upcoming Tech Pages – are not AI-based, yet



Materials informatics companies leading in our Lux Innovation Grid – part of upcoming Tech Pages – are not AI-based, yet



Independent AI is
not smart enough yet.

'Like A God,' Google A.I. Beats Human Champ Of Notoriously Complex Go Game



AlphaGo vs Lee Sedol
Google DeepMind



Google Photos

**BUSINESS
INSIDER**

The photo-sharing service uses AI to suggest users edited or enhanced versions of photos they've uploaded. You might get a stylised filter, you might get an animation or you may get a panorama.





engadget

Alexa is randomly laughing, and it's creepy as hell



Gavin Hightower

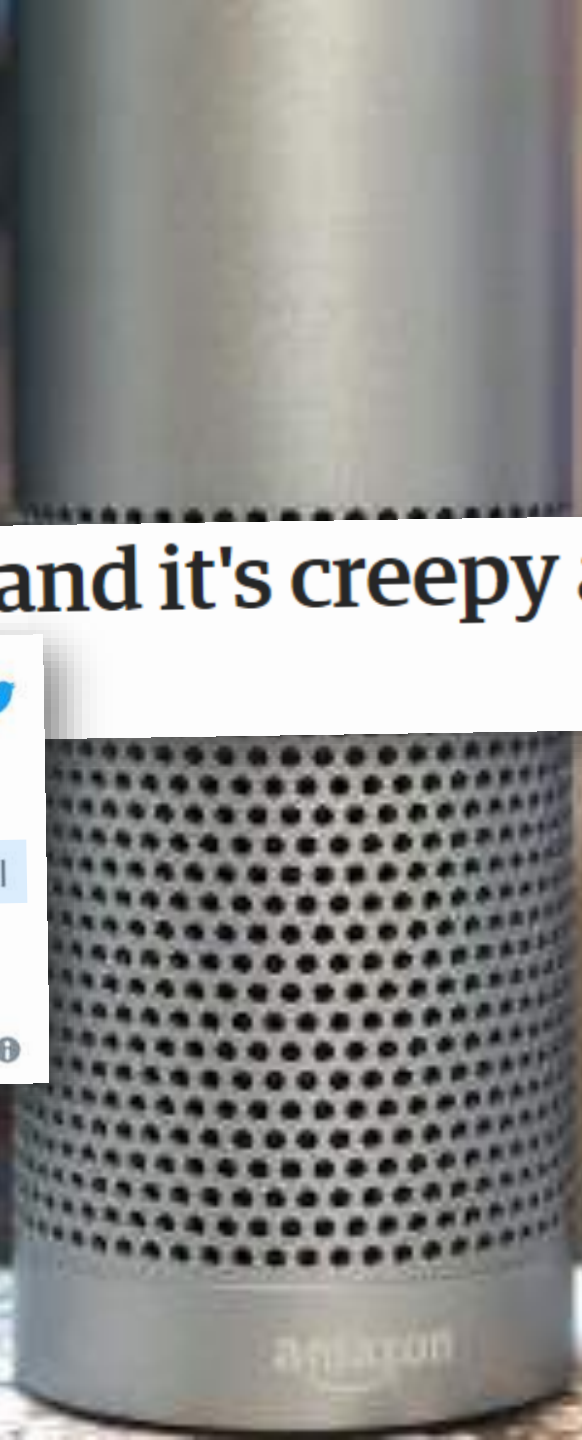
@GavinHightower



Lying in bed about to fall asleep when Alexa on my Amazon Echo Dot lets out a very loud and creepy laugh... there's a good chance I get murdered tonight.

12:46 AM - Feb 26, 2018

♡ 9,377 💬 2,064 people are talking about this



1. Start with data science fundamentals | 2. Supervise your AI deployments closely

engadget

TECH

Microsoft's chatbots keep turning racist

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LG's Built-In Voice Assistant Repeatedly Refuses To Work During Excruciating CES Demo

engadget

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LG's Built-In Voice Assistant Refuses To Work, Excruciating C...



Human-in-the-loop systems, and getting AI to explain its results



Via develops **predictive maintenance** software using machine learning and causal analytics for electricity grid infrastructure.

- Partners include Japan's TEPCO power company.

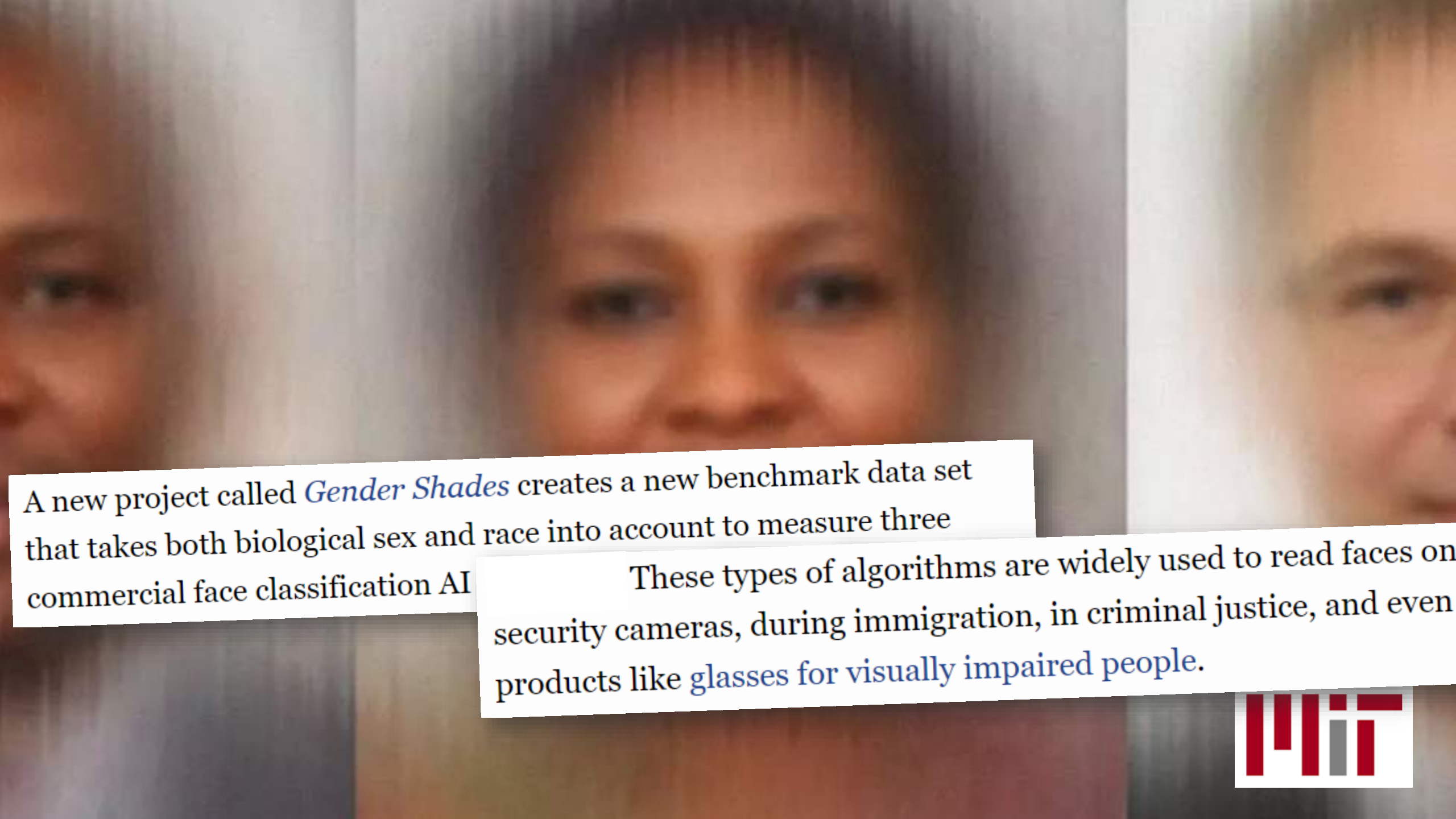
To *preemptively* take down infrastructure that seems to be working well, AI must convince humans of need:

- Offer potential reasons to explain why the equipment is going to fail.



TEPCO Power Grid

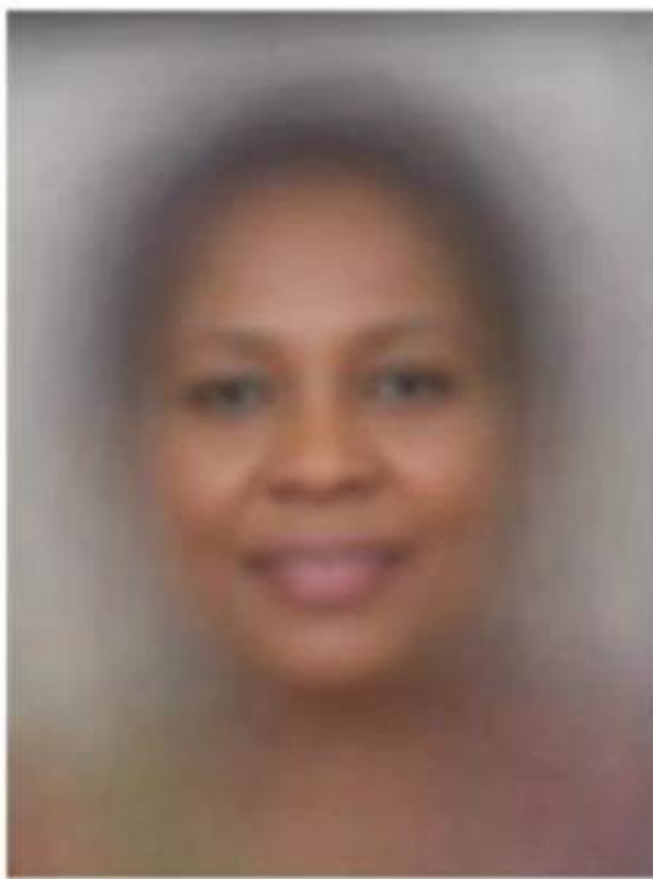
Be vigilant against
biasing your AI.



A new project called *Gender Shades* creates a new benchmark data set that takes both biological sex and race into account to measure three commercial face classification AI

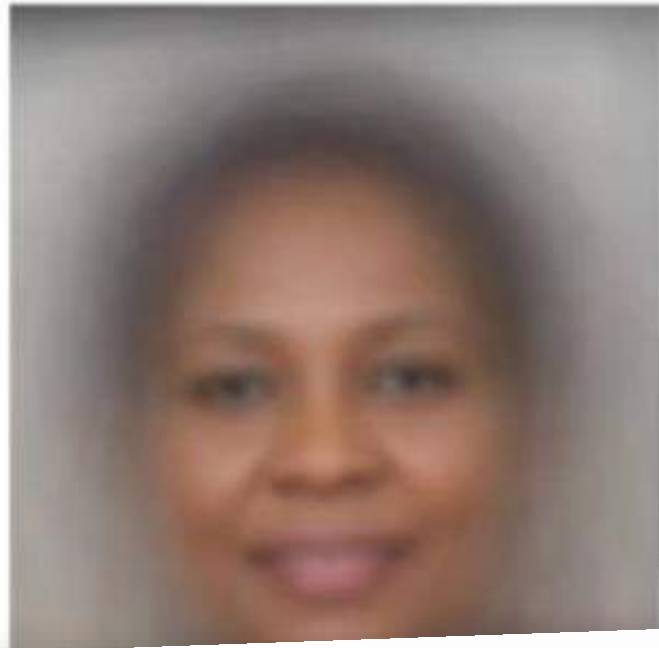
These types of algorithms are widely used to read faces on security cameras, during immigration, in criminal justice, and even products like glasses for visually impaired people.





ERROR
34.4%
DIFFERENCE

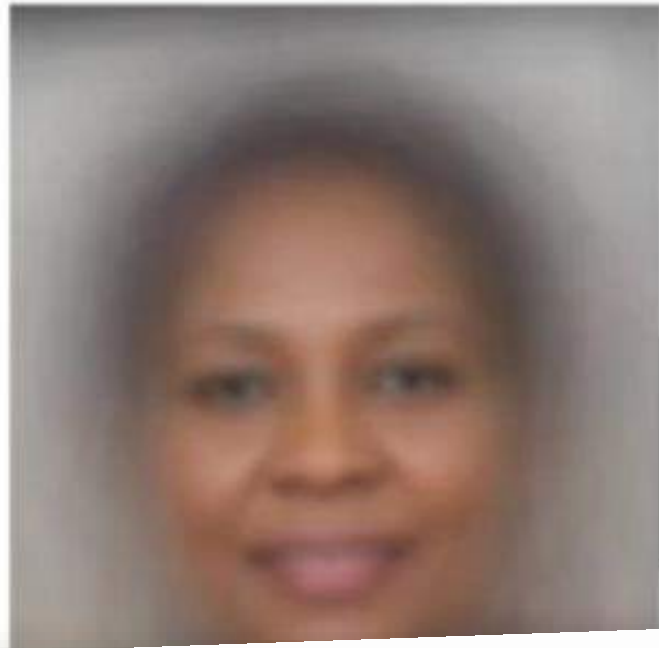




ERROR
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DIFFERENCE



Why does something like this happen? Typically because the data set the AI was trained on had far more light-skinned male faces, and light-skinned faces in general. It's bias at work.



ERROR
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DIFFERENCE



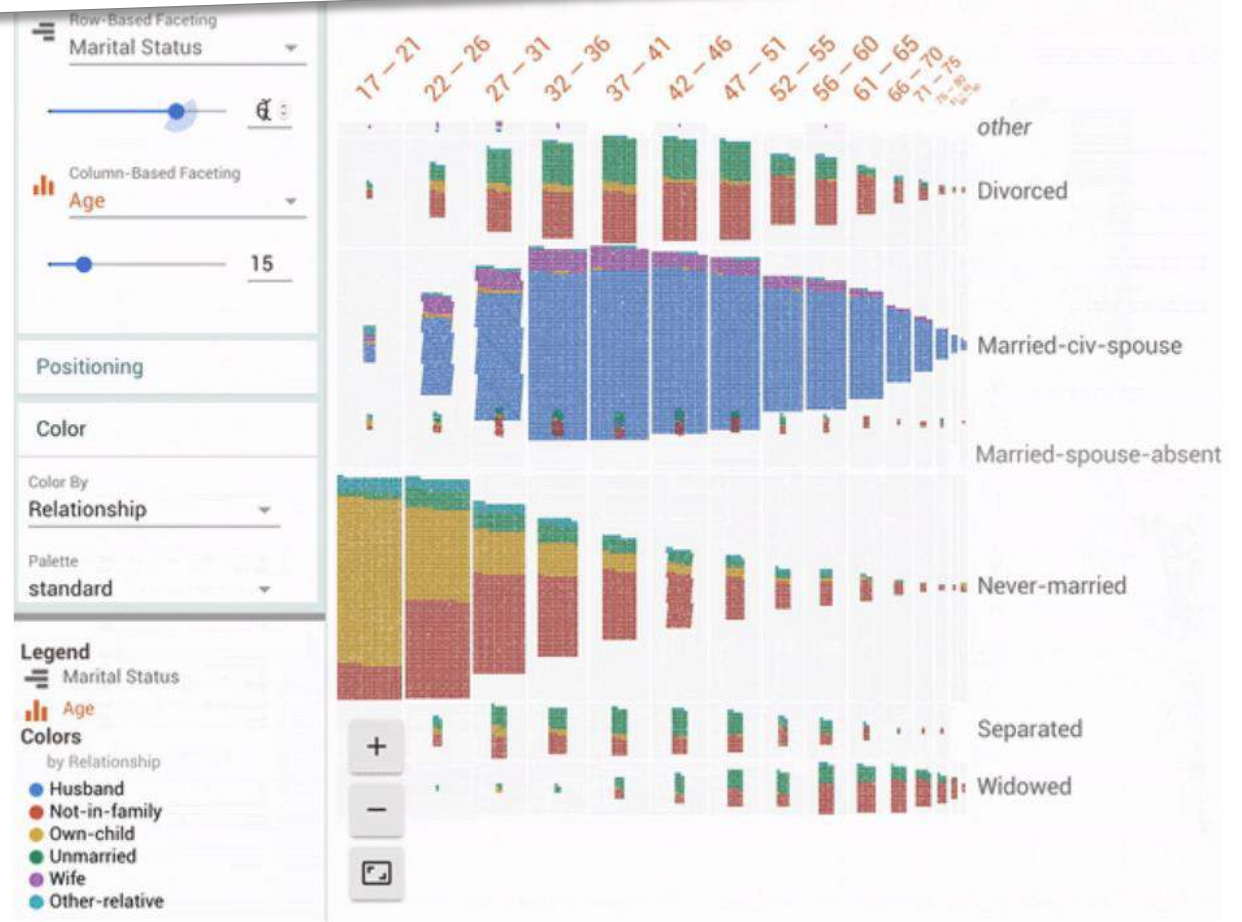
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Google Research

July 17, 2017

Facets, a tool for visualizing and understanding training datasets.

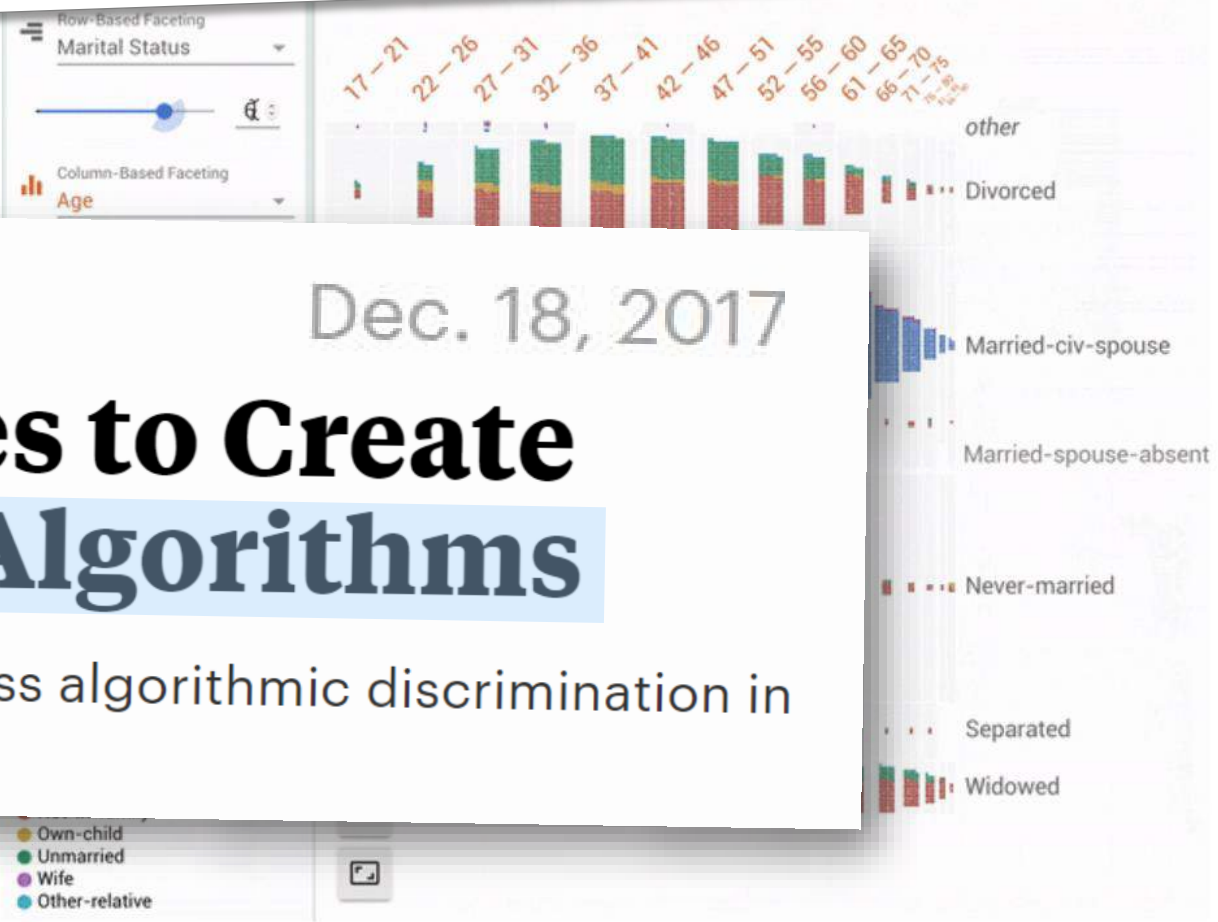




Google Research

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MACHINE BIAS

Dec. 18, 2017

New York City Moves to Create Accountability for Algorithms

[...] passed the country's first bill to address algorithmic discrimination in city government.

Regardless of your business application, bias in AI needs to be systematically guarded against

Watch out for **availability bias** (assuming that a narrow set of available data is representative of system behavior), and **confirmation bias** (tending to filter out data that do not fit our expectations).

Numerate



LUX TAKE



AI platform for designing drug-like molecules for hard-to-target diseases. **Incorporates statistical models in order to effectively handle bias (like publication bias for example).**

For many of these AI pitfalls, work remains ongoing. We won't solve it all today.

But what best practices *can* we talk about today?

Agenda

- 1 | Why you – yes, *you* – need to get dangerous on AI, fast
- 2 | Three pitfalls to avoid as you start your AI journey
- 3 | **Developing your AI roadmap**

Get buy-in from your CEO,
but start small and iterate quickly
to show some return on investment.

It starts at (or needs real buy-in from) the very top →

In speaking about digital transformation, including AI and data analytics, Siemens CEO exemplified this, saying:

“There are two choices: either be a part of it and shape it, or wait, and be transformed by others.”




Joe Kaeser
Siemens CEO

It starts at (or
needs real
buy-in from)
the very top →

If your CEO does is not
personally pushing for AI, you
may have to start small and
prove return on investment.



Joe Kaeser
Siemens CEO



**There is no
best time, or
perfect way, to
start in AI.
Jump in, get
some battle
scars.**

There is no best time, or perfect way, to start in AI. Jump in, get some battle scars.

**But...
Start small.**

You're probably going to fail at first, so fail fast and fail cheap.

Cheaper than you think: Getting into deep learning machine vision for \$249



Cheaper than you think: Getting into deep learning machine vision for \$249



10 minutes to your first deep learning project

- 1 Choose your deep learning model from the AWS DeepLens pre-trained model library, or your own models trained with Amazon SageMaker.
- 2 Deploy your model to the device with a single click.
- 3 Watch the results in real time in the AWS Management Console.



You will need to upskill
and expand your perspectives
to make the best of AI.

Python?



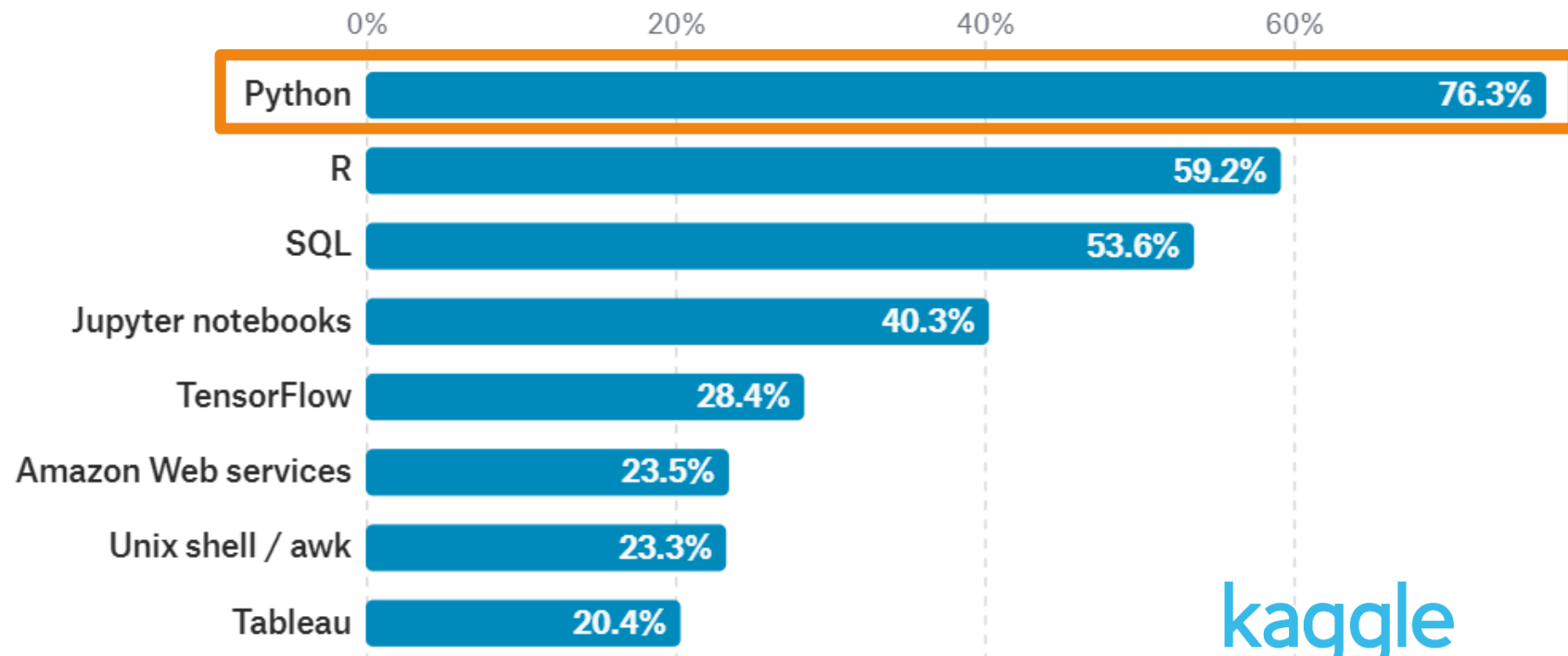
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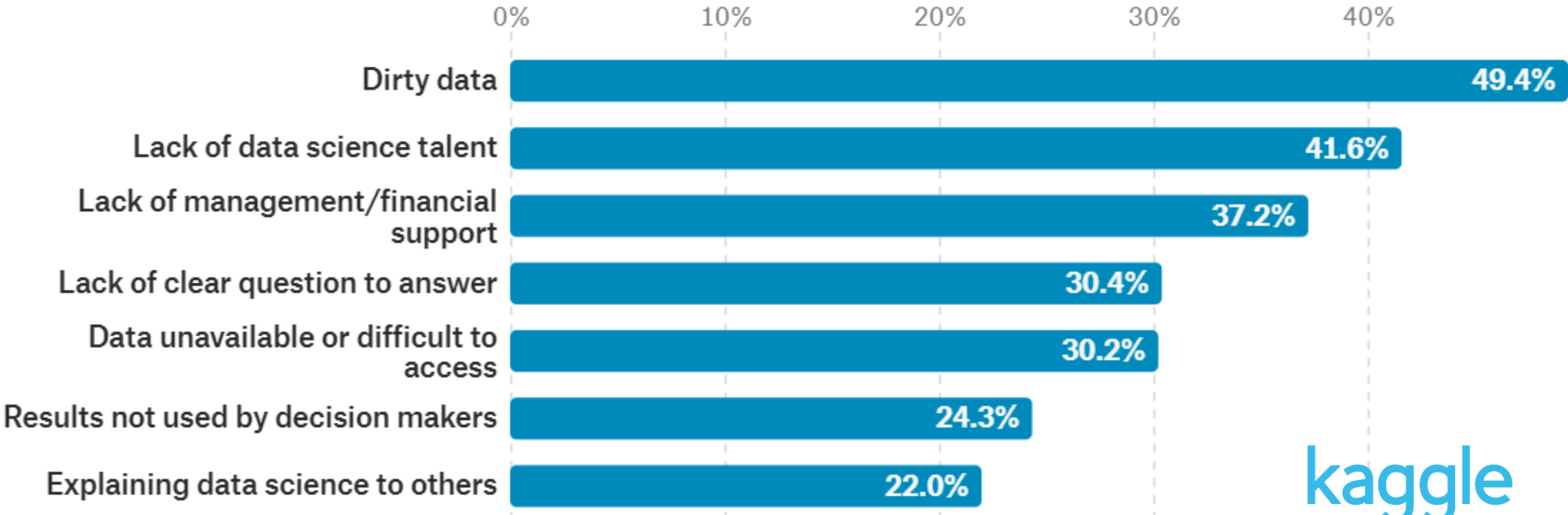
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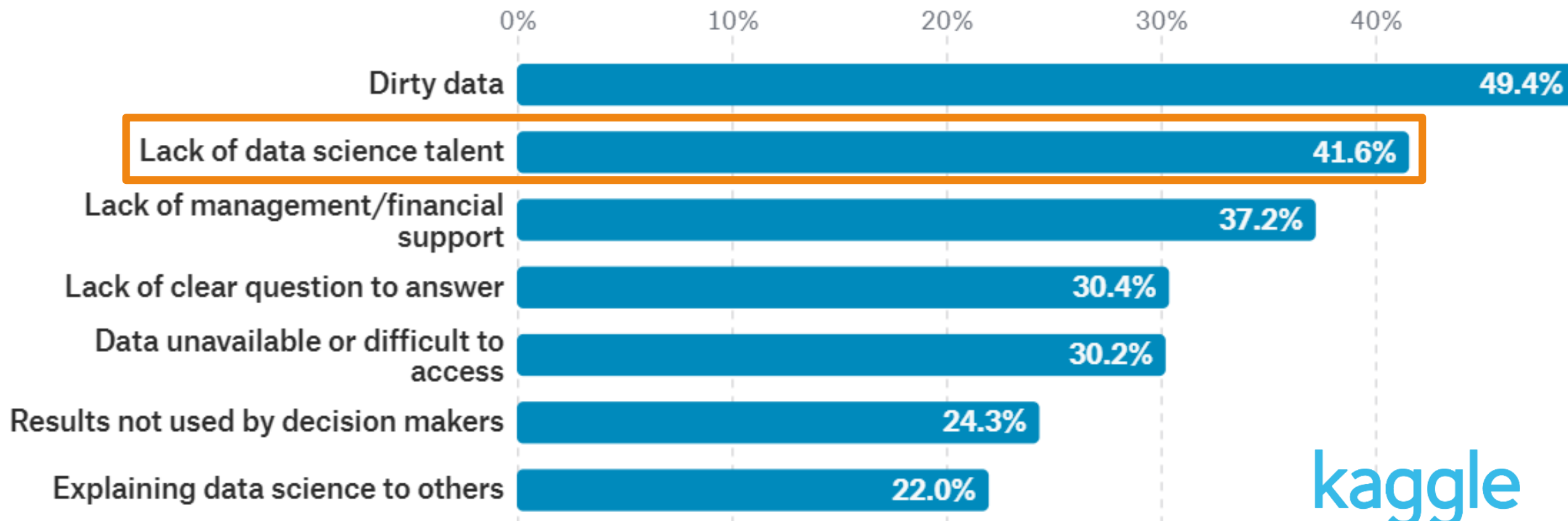
What tools are used at work?



You do not personally have to learn to program, but do learn the ecosystem's challenges: What barriers are faced at work?



You do not personally have to learn to program, but do learn the ecosystem's challenges: What barriers are faced at work?



1. CEO buy-in and start small | 2. Upskill and expand your perspectives



Tensorflow usage around the world

Google's TensorFlow is the most-downloaded AI platform, increasingly used by many companies, big and small.



Tensorflow usage around the world

Google's TensorFlow is the most-downloaded AI platform, increasingly used by many companies, big and small. **Its boss, Fei-Fei Li, said this for the opening of Google's new China AI R&D center:**

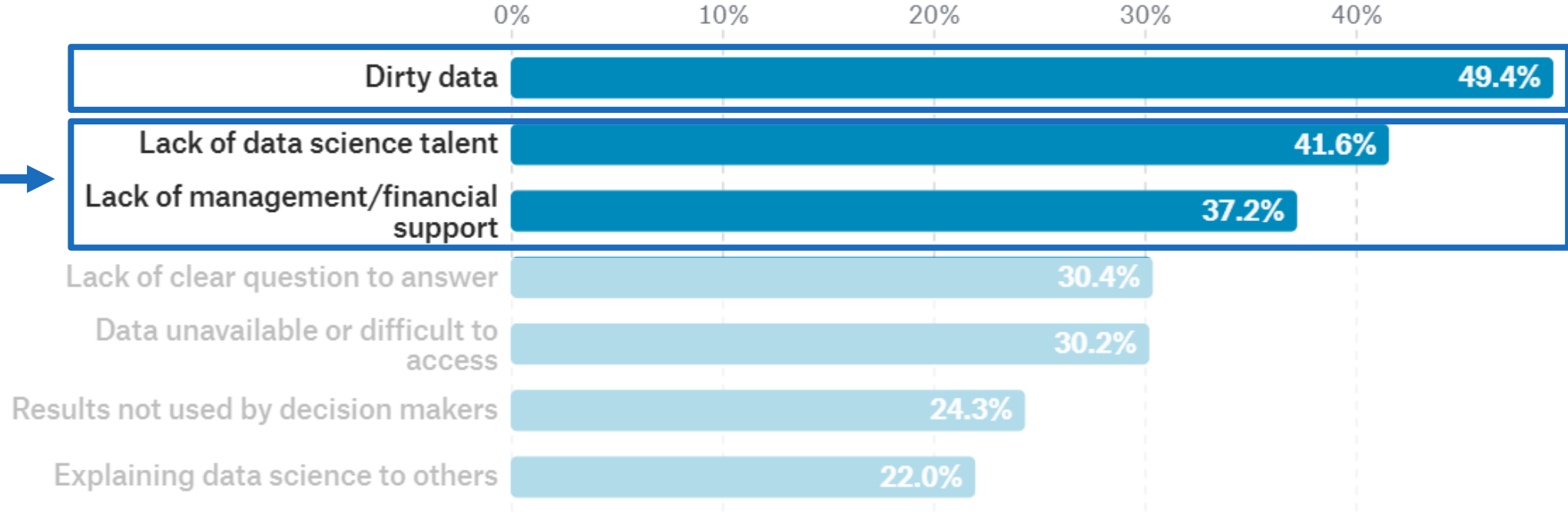
“We want to work with the best AI talent, wherever that talent is.”

A circular inset image showing Fei-Fei Li, a woman with dark hair wearing a red polo shirt, speaking at a podium. Behind her is a screen with the text "Google Dev" and "China". An orange arrow points from the circular inset to the high-usage area of China on the world map above.

Be paranoid about
embedding your AI teams
within real business challenges.

Hiring data scientists is hard.

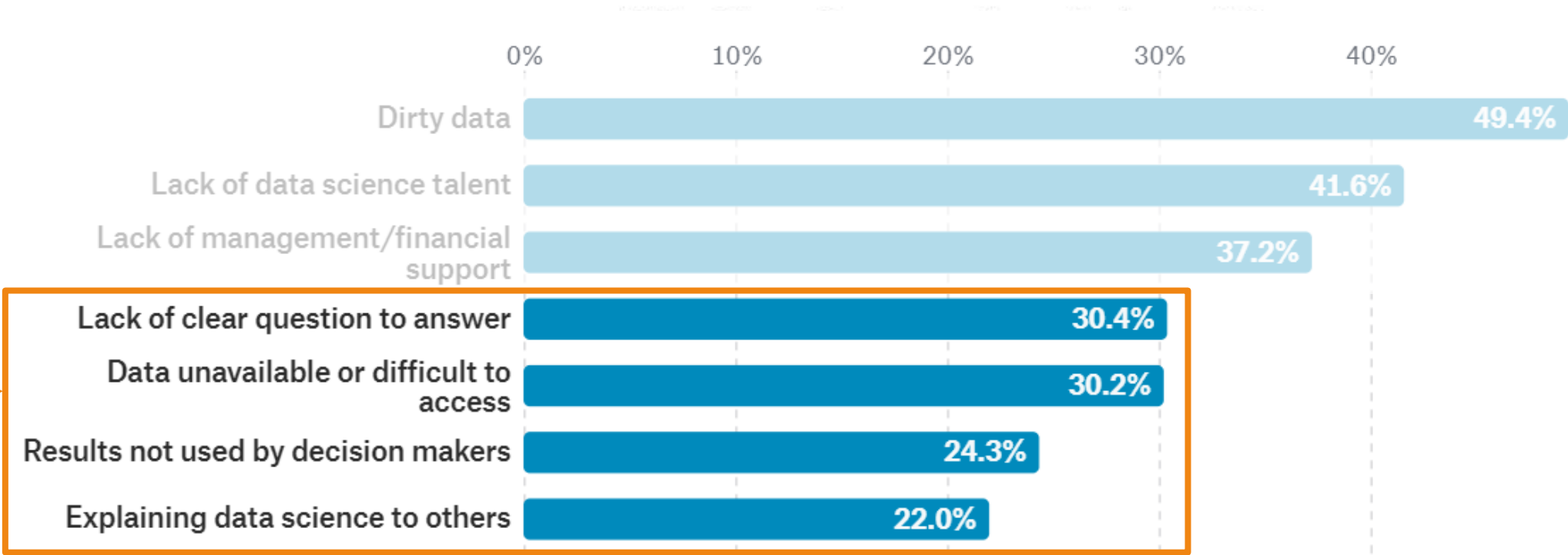
Hard, but obvious.



Hiring data scientists is hard. Building effective, useful AI teams is even harder.

Hard, but obvious.

The kiss of death for AI efforts.





The classic trap is to hire a team of very smart and capable data scientists, seclude them, and hope that after 1-3 years they come back with an amazing innovation.

- This almost always fails.
- Don't just work on AI for AI's sake.

Avoiding silos is cliché, but a key for AI efforts. **Try to embed your data scientists.**

- Day in and day out, they need to talk to customers, so that “*what question am I answering*” is crystal clear.

Building *your* AI roadmap.

“AI is probably the most important thing humanity has ever worked on.”

- Sundar Pichai



Overhyped? Probably not.

Our generation – including **you** – will need to navigate the biggest disruption the world has ever seen.

But how do we start?



Putting it all together: A roadmap for your AI journey

Start with data science fundamentals.



2018

Sync your AI efforts with your CEO's vision.



Upskill yourself, and look broadly.



Keep your AI team embedded, day in and day out.



"AI is probably the most important thing humanity has ever worked on."



Post-2030

Fight against bias.



Supervise your AI closely.



Help your entire firm reskill and adapt.





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