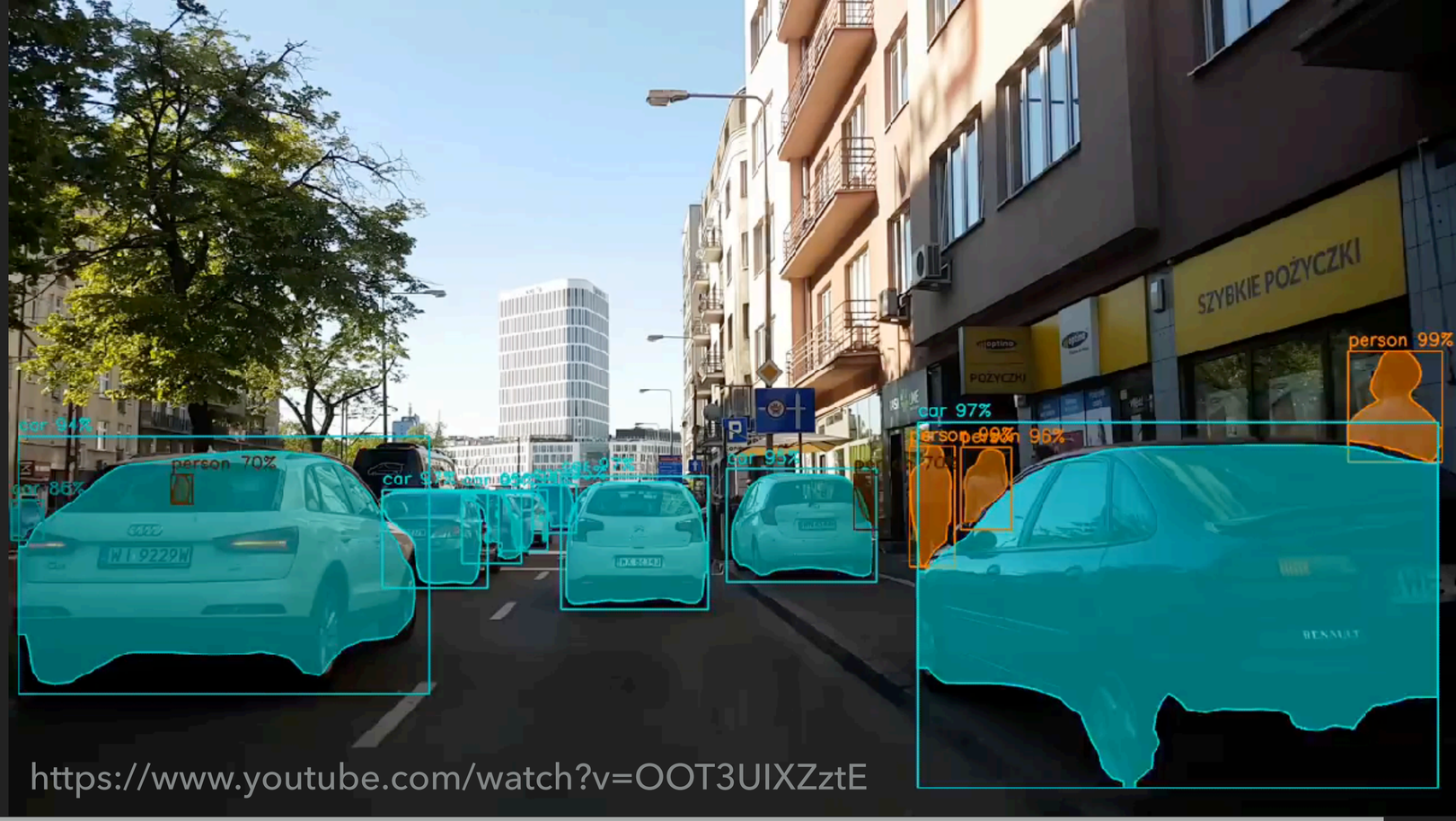
Linaro connect
Vancouver 2018



CHRIS BENSON

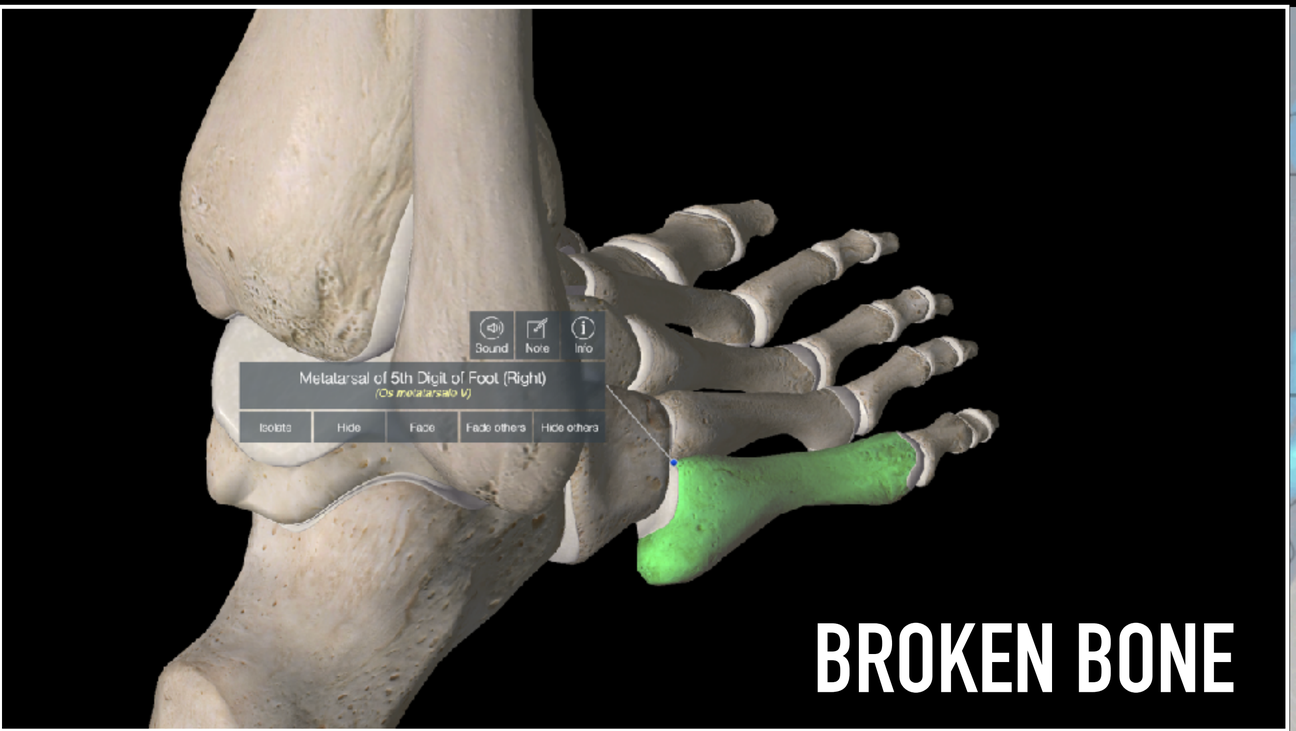
ARTIFICIAL INTELLIGENCE STRATEGY

DIGITAL TRANSFORMATION THROUGH DEEP LEARNING

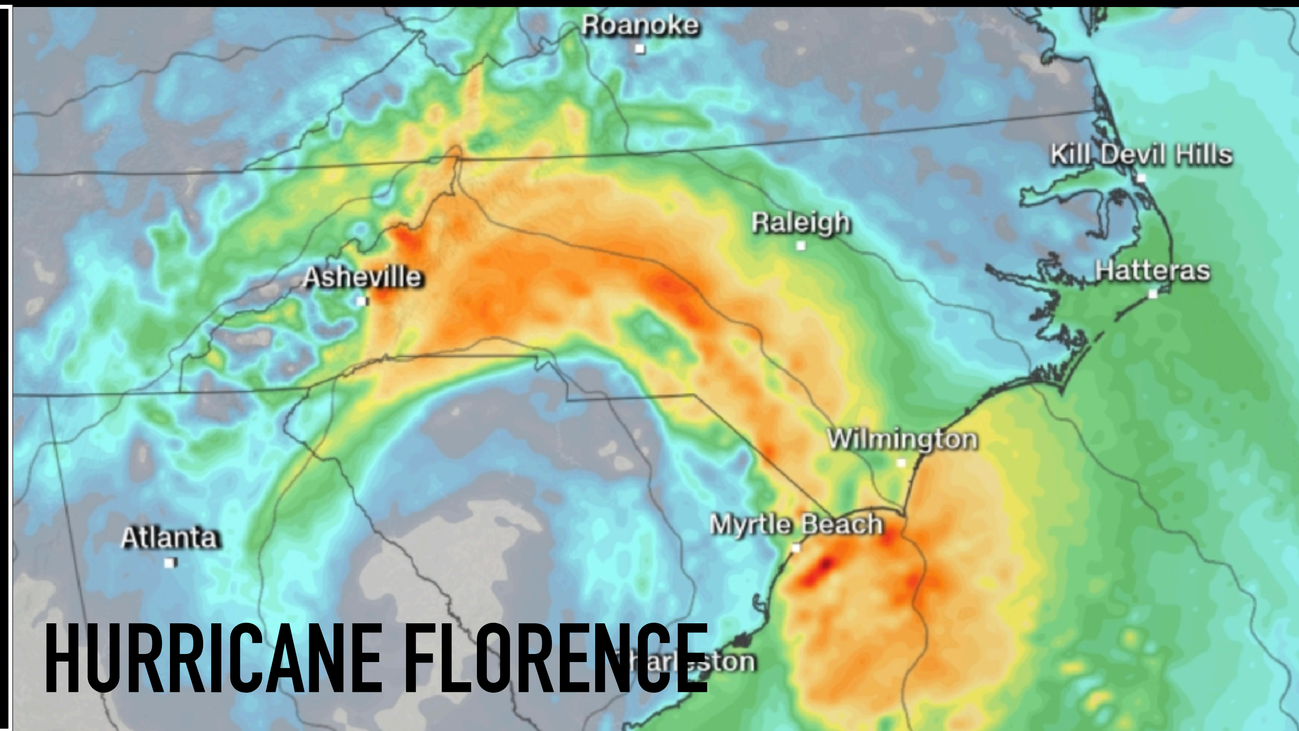
HTTPS://CHRISBENSON.COM

I NEARLY MISSED

Linaro connect
Vancouver 2018



BROKEN BONE



HURRICANE FLORENCE

CHRIS BENSON

- Artificial Intelligence Strategist • Deep Learning Architect
- *Chief Scientist, Artificial Intelligence & Machine Learning (former)*

Honeywell

Safety & Productivity Solutions
Built and operationalized first dedicated AI team from the ground up

- *Artificial Intelligence Delivery Manager (former)*

Accenture Analytics
Part of Accenture Digital

- Keynote Speaker • Storyteller • Educator • AI Evangelist
- Co-Host of the **Practical AI** podcast
- Founder & Organizer, **Atlanta Deep Learning Meetup**
- Introduced to Deep Learning in 1992
- First ‘Hello World’ using IBM BASIC at age 11 on this…

IBM
IBM
IBM
IBM
IBM
IBM
IBM
Guide to Operations
BASIC
Technical Reference

INTRODUCED TO ARTIFICIAL INTELLIGENCE 26 YEARS AGO

WORLD'S MOST ADVANCED AIR-SUPERIORITY STEALTH FIGHTER

LOCKHEED MARTIN

F-22 RAPTOR

DESIGNED, DEVELOPED, AND BUILT AT THE LOCKHEED MARTIN PLANT NEAR ATLANTA

YF-22

CRASH LANDING

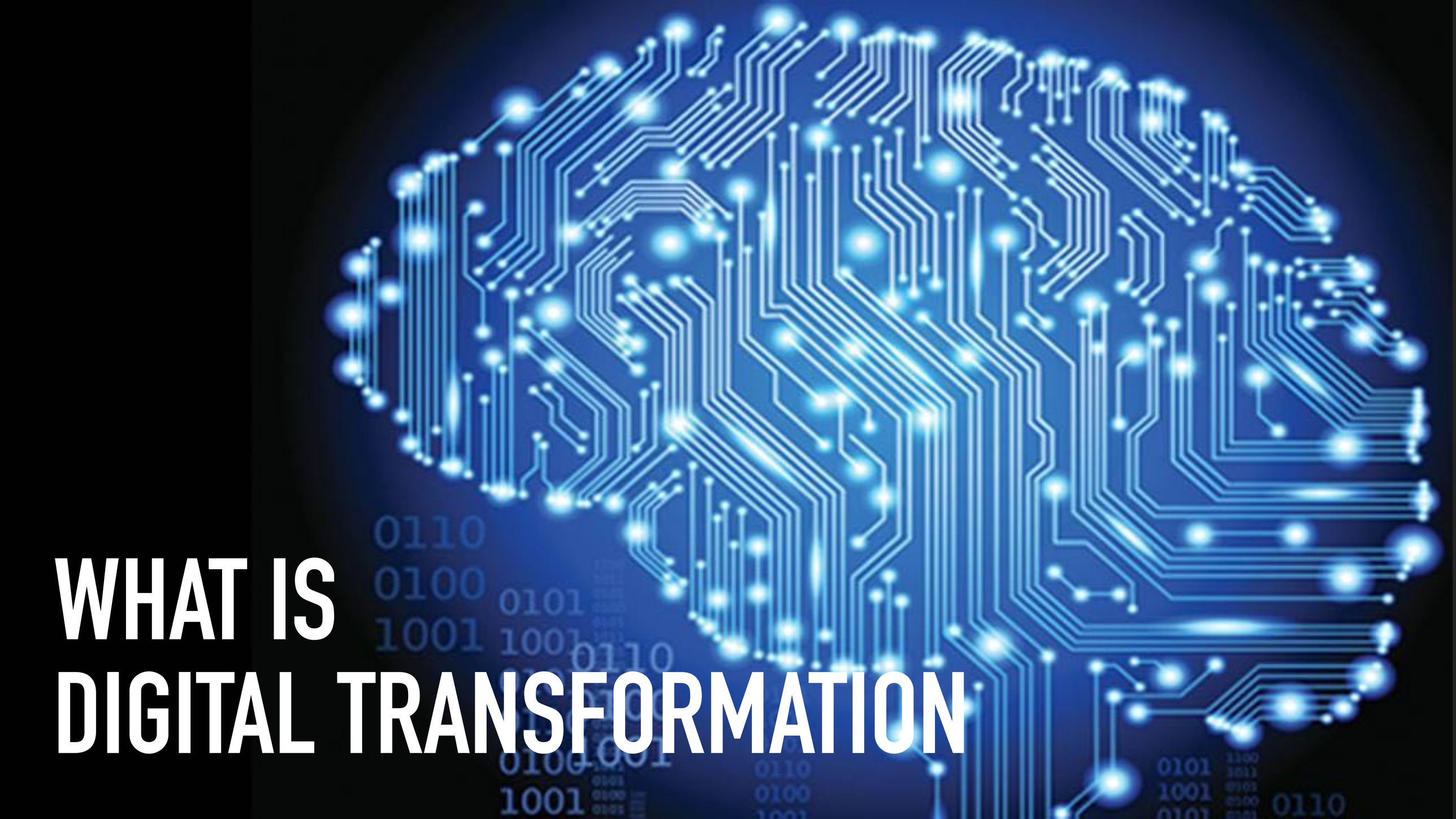
EDWARDS AFB

APRIL 1992

AN AVIONICS ERROR FAILED TO PREVENT A PILOT-INDUCED OSCILLATION.

THIS CRITICAL YF-22 AVIONICS ERROR WAS SOLVED (IN PART) BY A VETERAN LOCKHEED ENGINEER WHO HAD THE INSPIRATION TO RESEARCH AND APPLY A BLEEDING-EDGE DEEP LEARNING APPROACH TO THE AVIONICS PROBLEM.

HIS NAME WAS WHIT BENSON,
AND HE WAS MY FATHER.
(1932 - 2011)


WHAT IS
DIGITAL TRANSFORMATION

DIGITAL ISN'T A CHANNEL

HTTPS://GO.FORRESTER.COM/WHAT-IT-MEANS/EP73-TRUE-MEANING-DIGITAL-TRANSFORMATION

TRANSFORMATION ISN'T A PROJECT

HTTPS://GO.FORRESTER.COM/WHAT-IT-MEANS/EP73-TRUE-MEANING-DIGITAL-TRANSFORMATION

THE FUNDAMENTAL PURPOSE
OF DIGITAL TRANSFORMATION
IS NOT TO DIGITIZE
AN EXISTING STATE

HTTPS://GO.FORRESTER.COM/WHAT-IT-MEANS/EP73-TRUE-MEANING-DIGITAL-TRANSFORMATION

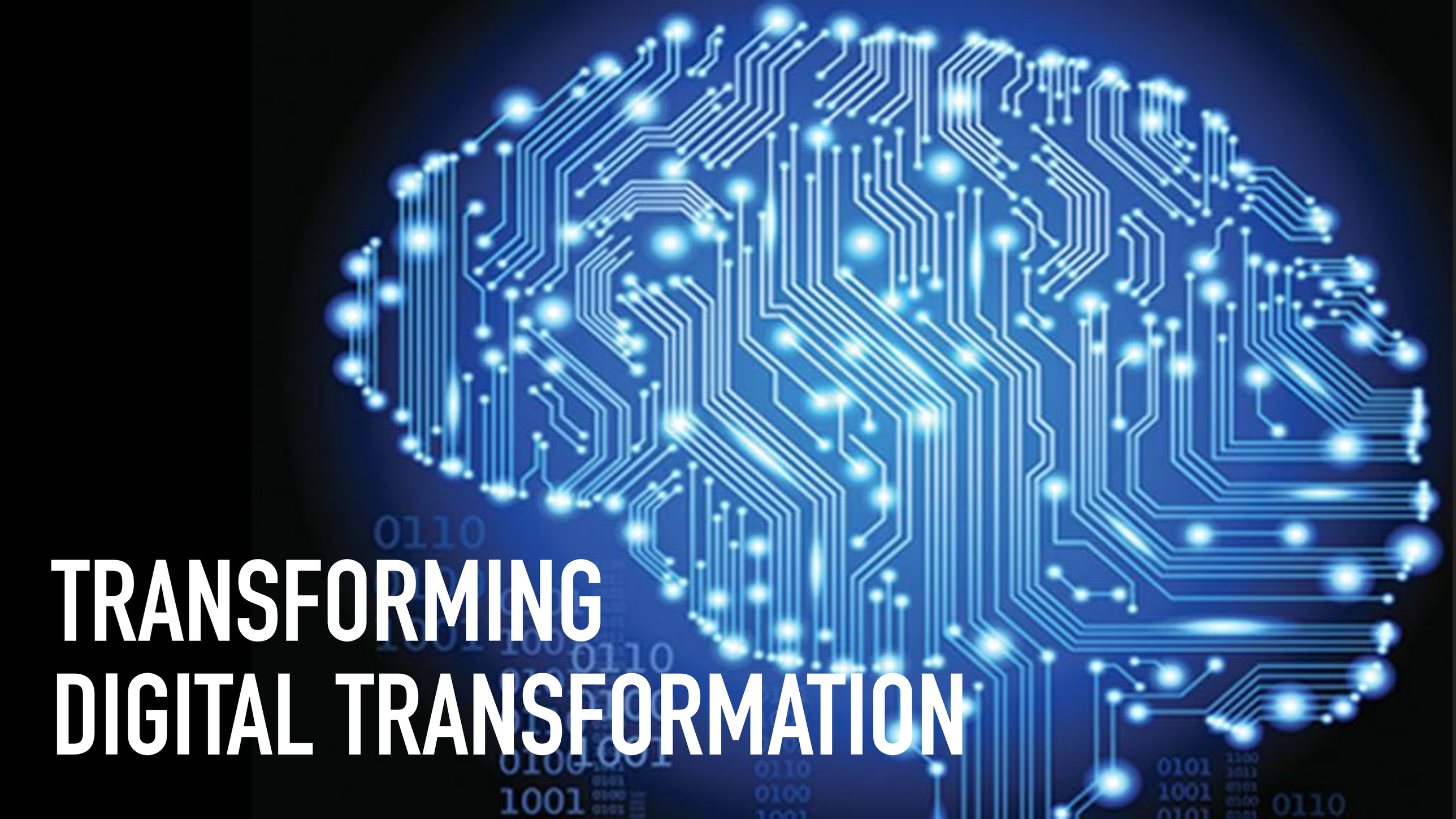
BUT TO REIMAGINE AN ENTIRELY DIFFERENT BUSINESS MODEL THAT PLACES TECHNOLOGY AT ITS CORE

HTTPS://GO.FORRESTER.COM/WHAT-IT-MEANS/EP73-TRUE-MEANING-DIGITAL-TRANSFORMATION

DIGITAL TRANSFORMATION

DRIVES INNOVATION

NOT OPTIMIZATION


TRANSFORMING
DIGITAL TRANSFORMATION

THE COGNITIVE REVOLUTION,
AGRICULTURE REVOLUTION,
INDUSTRIAL REVOLUTION,
DIGITAL REVOLUTION,
AND NOW THE AI REVOLUTION
ALL CHANGE THE FABRIC OF
SOCIETY AS WE KNOW IT.

SOCIAL, CULTURAL, ECONOMIC

DIGITAL TRANSFORMATION WILL BE

AT THE VERY HEART OF THAT

AI-DRIVEN CHANGE

ARTIFICIAL INTELLIGENCE
IS ALREADY CHANGING HOW
BUSINESS MODELS
ARE BEING REIMAGINED

ARTIFICIAL INTELLIGENCE
IS THE TECHNOLOGY

DIGITAL TRANSFORMATION IS THE STRATEGIC PROCESS

THIS TECHNOLOGY IS
CHANGING THE FUNDAMENTALS
OF THIS STRATEGIC PROCESS

UNITED NATIONS

CHIEF INFORMATION TECHNOLOGY OFFICER

ATEFEH RIAZI

"WE NEED TO THINK ABOUT OUR ROLE AS TECHNOLOGISTS."

"AND WE NEED TO THINK ABOUT THE RAMIFICATIONS – POSITIVE & NEGATIVE."

"AND WE NEED TO TRANSFORM OURSELVES AS INNOVATORS."

SOURCE: HTTPS://SWISSCOGNITIVE.CH/2017/03/23/UNITED-NATIONS-CITO-ARTIFICIAL-INTELLIGENCE-WILL-BE-HUMANITYS-FINAL-INNOVATION

UNITED NATIONS

CHIEF INFORMATION TECHNOLOGY OFFICER

ATEFEH RIAZI

"WE LOOK AT ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING, AND THE WORLD WE SEE AS TECHNOLOGISTS 20 YEARS FROM NOW IS VERY DIFFERENT THAN THE WORLD WE HAVE TODAY."

SOURCE: HTTPS://SWISSCOGNITIVE.CH/2017/03/23/UNITED-NATIONS-CITO-ARTIFICIAL-INTELLIGENCE-WILL-BE-HUMANITYS-FINAL-INNOVATION

UNITED NATIONS

CHIEF INFORMATION TECHNOLOGY OFFICER

ATEFEH RIAZI

"ARTIFICIAL INTELLIGENCE MIGHT BE THE LAST INNOVATION HUMANS CREATE."

"THE NEXT INNOVATIONS WILL COME THROUGH ARTIFICIAL INTELLIGENCE."

"FROM THEN ON,
IT WILL BE THE AI INNOVATING."

SOURCE: HTTPS://SWISSCOGNITIVE.CH/2017/03/23/UNITED-NATIONS-CITO-ARTIFICIAL-INTELLIGENCE-WILL-BE-HUMANITYS-FINAL-INNOVATION

UNITED NATIONS

CHIEF INFORMATION TECHNOLOGY OFFICER

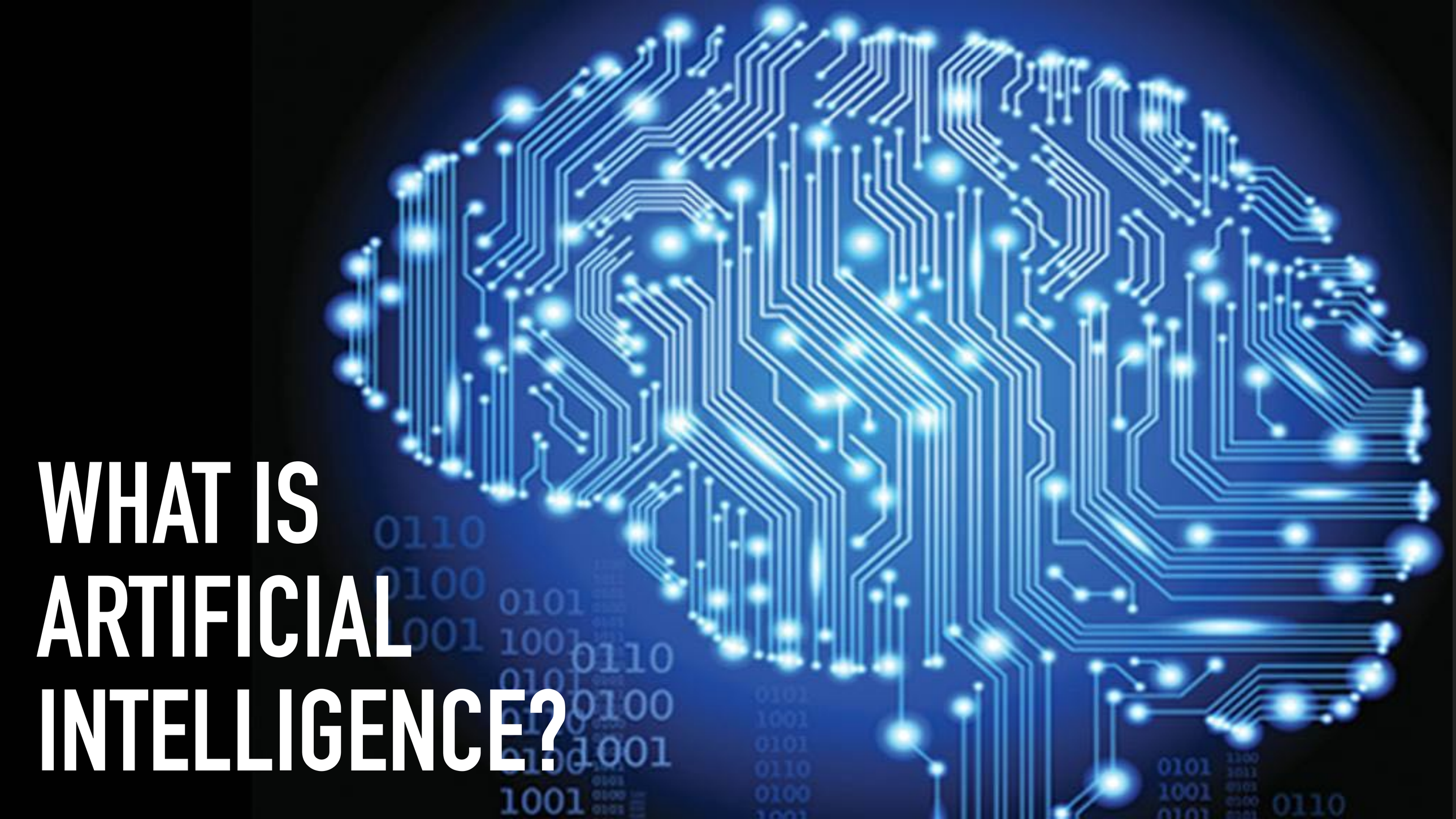
ATEFEH RIAZI

"IF WE CREATE THIS ARTIFICIAL INTELLIGENCE THAT CAN DO 80% OF THE LABOR THAT HUMANS DO, WHAT ARE THE CHANGES?"

"SOCIAL, CULTURAL, ECONOMIC."

SOURCE: HTTPS://SWISSCOGNITIVE.CH/2017/03/23/UNITED-NATIONS-CITO-ARTIFICIAL-INTELLIGENCE-WILL-BE-HUMANITYS-FINAL-INNOVATION

WELCOME TO AI-ENABLED DIGITAL TRANSFORMATION


WHAT IS
ARTIFICIAL
INTELLIGENCE?

CAN WE DEFINE AI?

EASIER SAID

THAN DONE

IF YOU ASK

10 DIFFERENT 'AI EXPERTS'

TO DEFINE AI,

YOU WILL GET

10 DIFFERENT ANSWERS

HOW DO I KNOW?

BECAUSE THAT'S

EXACTLY WHAT ADOBE DID

I WAS ONE OF THOSE

'AI EXPERTS'

Adobe
THINK TANK
BY ADOBE
https://adobethinktank.com
04.30.18
THE FUTURE OF AI
IN THE ENTERPRISE

SUSAN ETLINGER

MODERATOR
Industry Analyst
Altimeter

ANAND RAO

Partner, Global AI & Innovation Lead
PwC

JANA EGGERS

CEO
Nara Logics

TOM GOODWIN

EVP, Head of Innovation
Zenith

CATHERINE HAVASI

Chief Strategy Officer & Co-Founder
Luminoso

ROBBIE ALLEN

CEO
Infinia ML

KATHRYN HUME

VP of Product & Strategy
Integrate.ai

THEODORA LAU

Founder
Unconventional Ventures

CHRIS DUFFEY

Head of AI Innovation & Strategy
Adobe

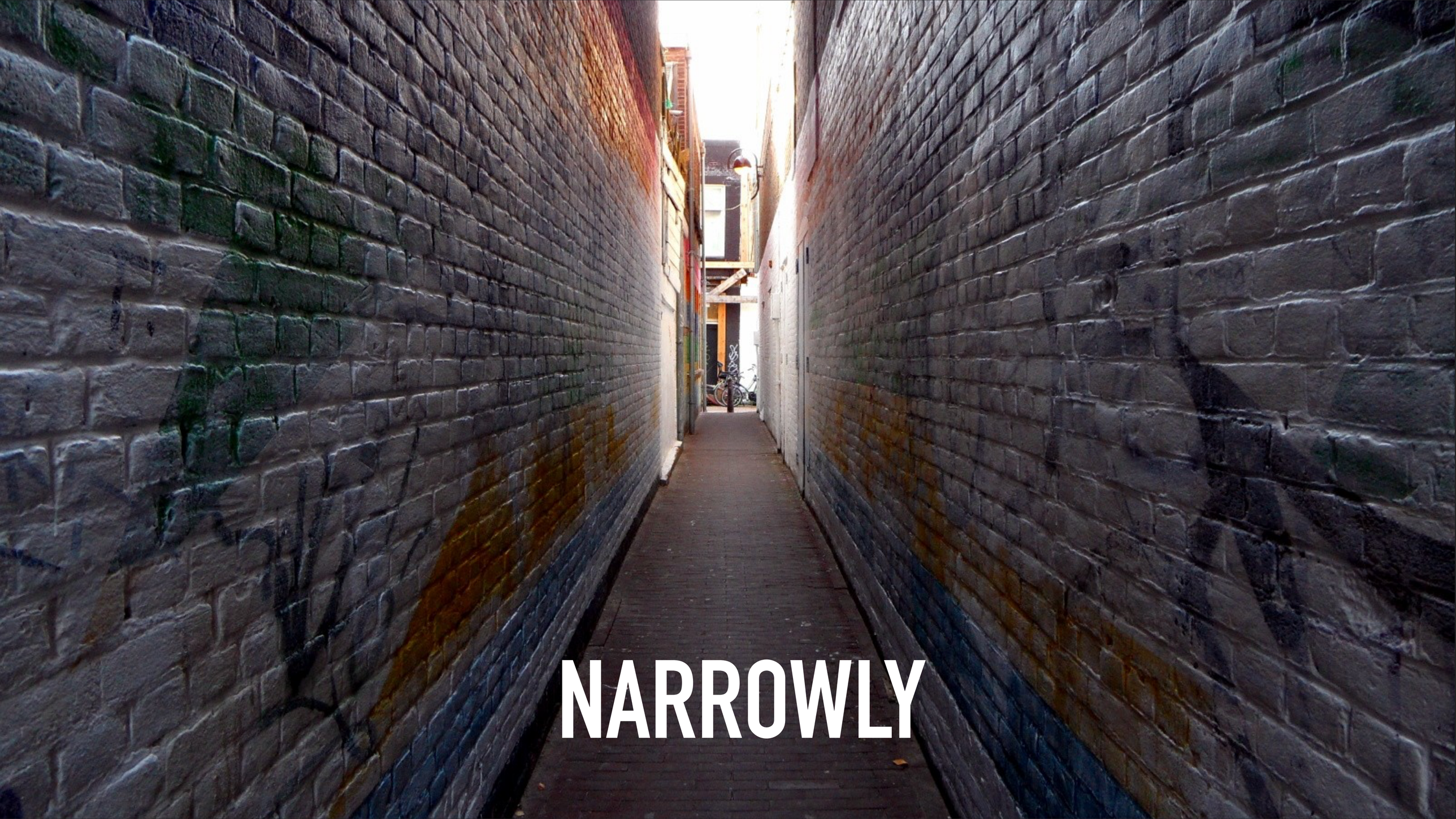
CHRIS BENSON

Chief Scientist, Artificial Intelligence & Machine Learning
Honeywell

SO HOW DO

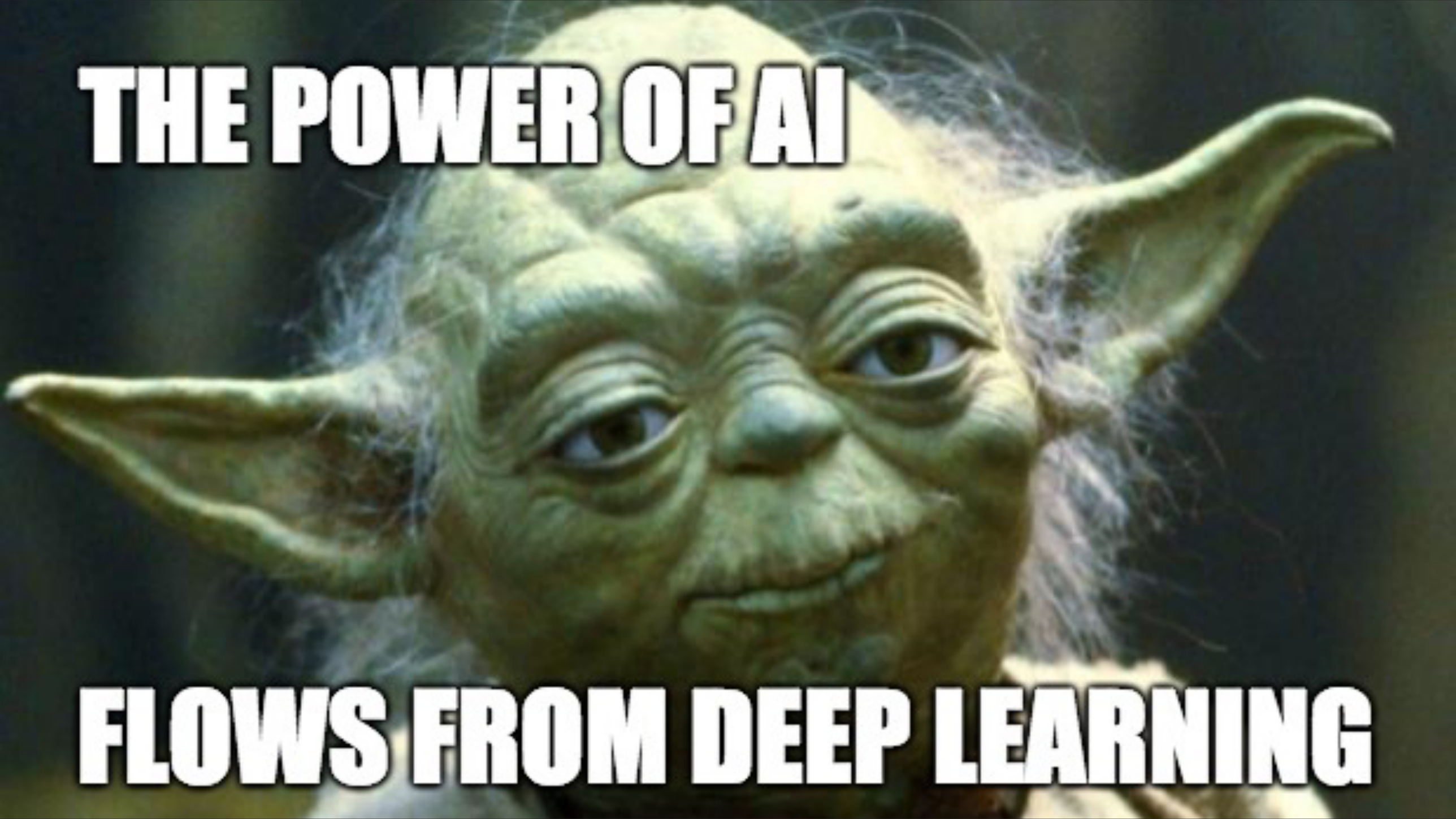
I DEFINE AI

TODAY?


NARROWLY

AI IS A MARKETING BUZZWORD THAT EVOLVES AS TECHNOLOGIES AND HUMAN EXPECTATIONS CHANGE OVER TIME

(SO IS 'DIGITAL TRANSFORMATION')


THE POWER OF AI
FLOWS FROM DEEP LEARNING

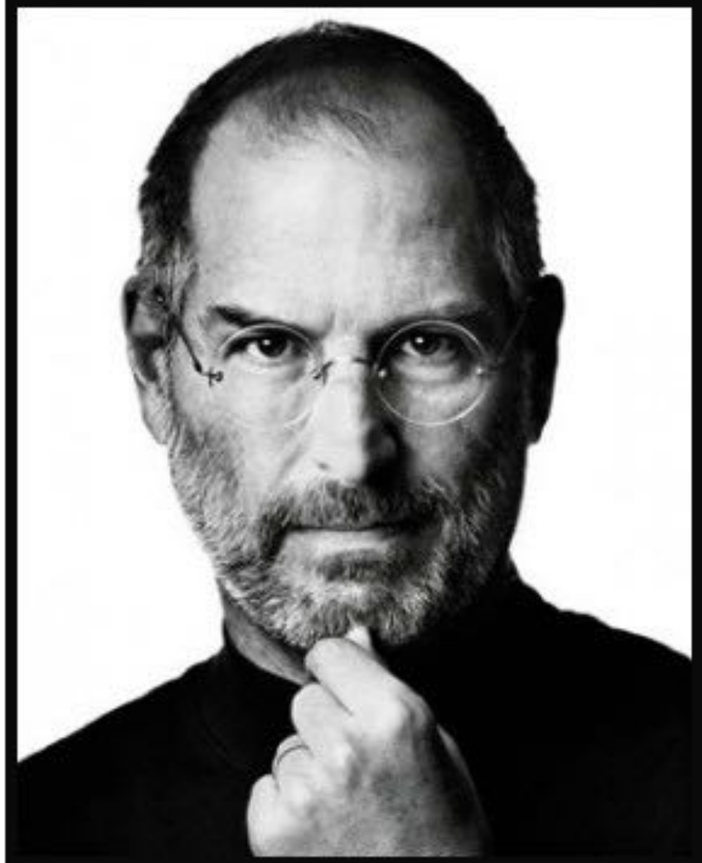
I REALIZE THAT
NOT EVERYONE
WILL AGREE
WITH MY OWN
DEFINITION
OF AI

INCIDENTALLY

10 DIFFERENT 'AI EXPERTS'

TO DID AGREE ON EXACTLY

ONE KEY PRINCIPAL

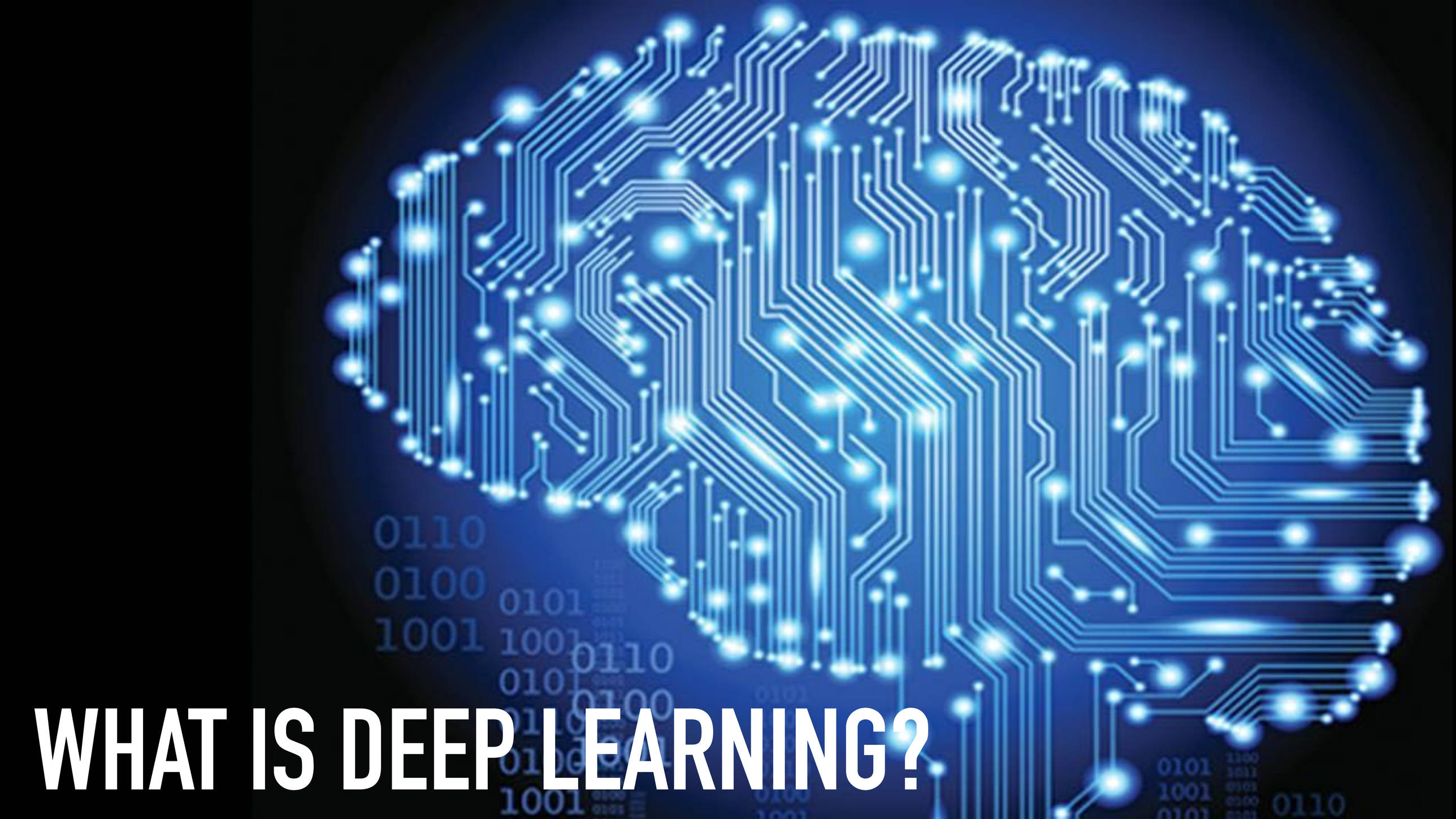


You've got to start with the customer experience and work back toward the technology - not the other way around.

(Steve Jobs)

izquotes.com

(MORE ON THIS LATER. . .)



WHAT IS DEEP LEARNING?

DEEP LEARNING IS
MODERN ARTIFICIAL INTELLIGENCE
THAT WORKS TODAY

DEEP LEARNING IS
THE APPROACH TO MACHINE LEARNING
THAT IS DRIVING THE CURRENT
ARTIFICIAL INTELLIGENCE REVOLUTION

"DEEP LEARNING IS AN APPROACH TO MACHINE LEARNING THAT HAS DRAWN HEAVILY ON OUR KNOWLEDGE OF THE HUMAN BRAIN, STATISTICS, AND APPLIED MATH."

Ian Goodfellow, Yoshua Bengio & Aaron Courville (2016). Deep Learning. MIT Press

"IN RECENT YEARS, IT (DEEP LEARNING) HAS SEEN TREMENDOUS GROWTH IN ITS POPULARITY AND USEFULNESS, DUE IN LARGE PART TO MORE POWERFUL COMPUTERS, LARGER DATASETS AND TECHNIQUES TO TRAIN DEEPER NETWORKS."

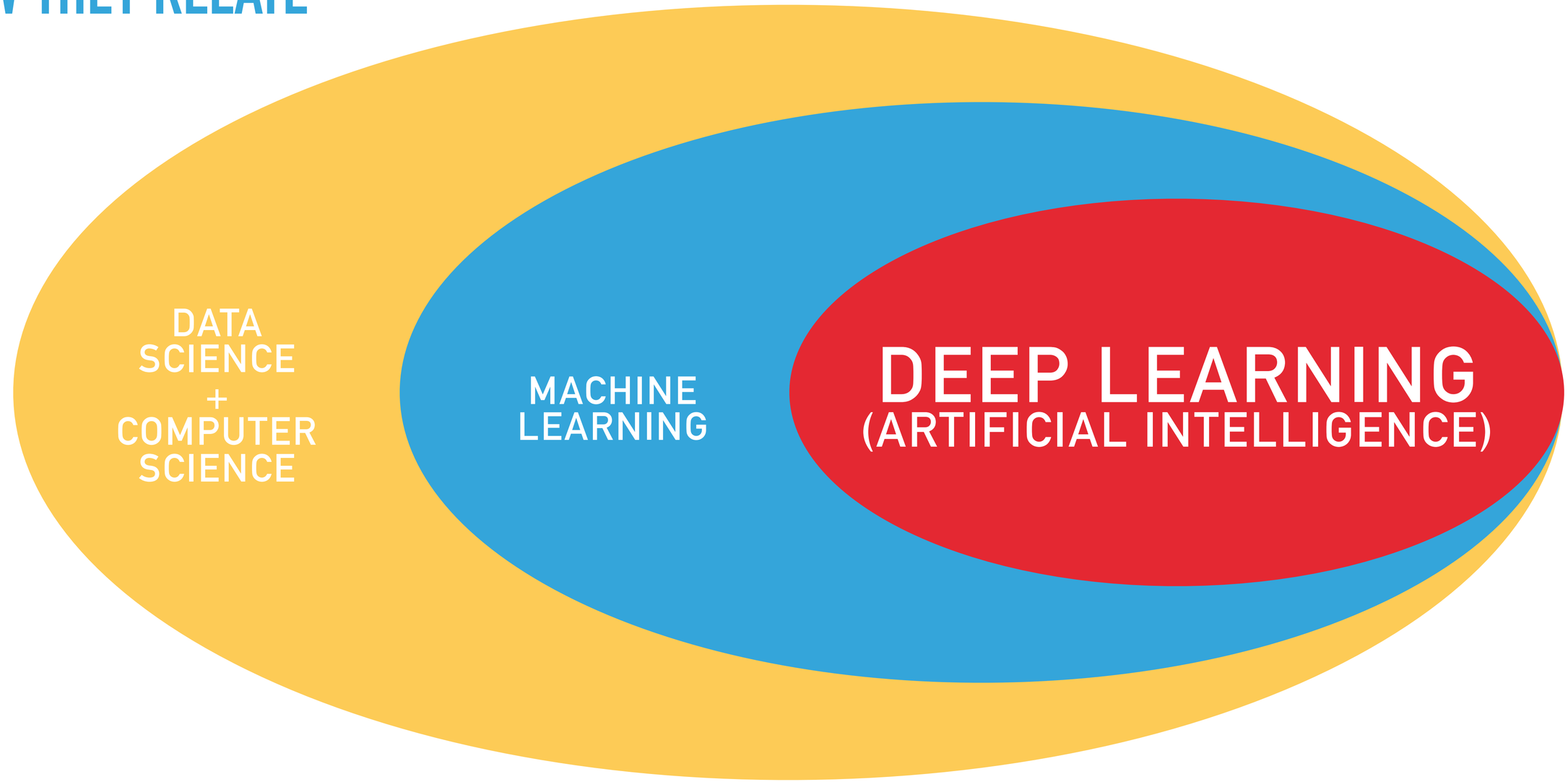
Ian Goodfellow, Yoshua Bengio & Aaron Courville (2016). Deep Learning. MIT Press

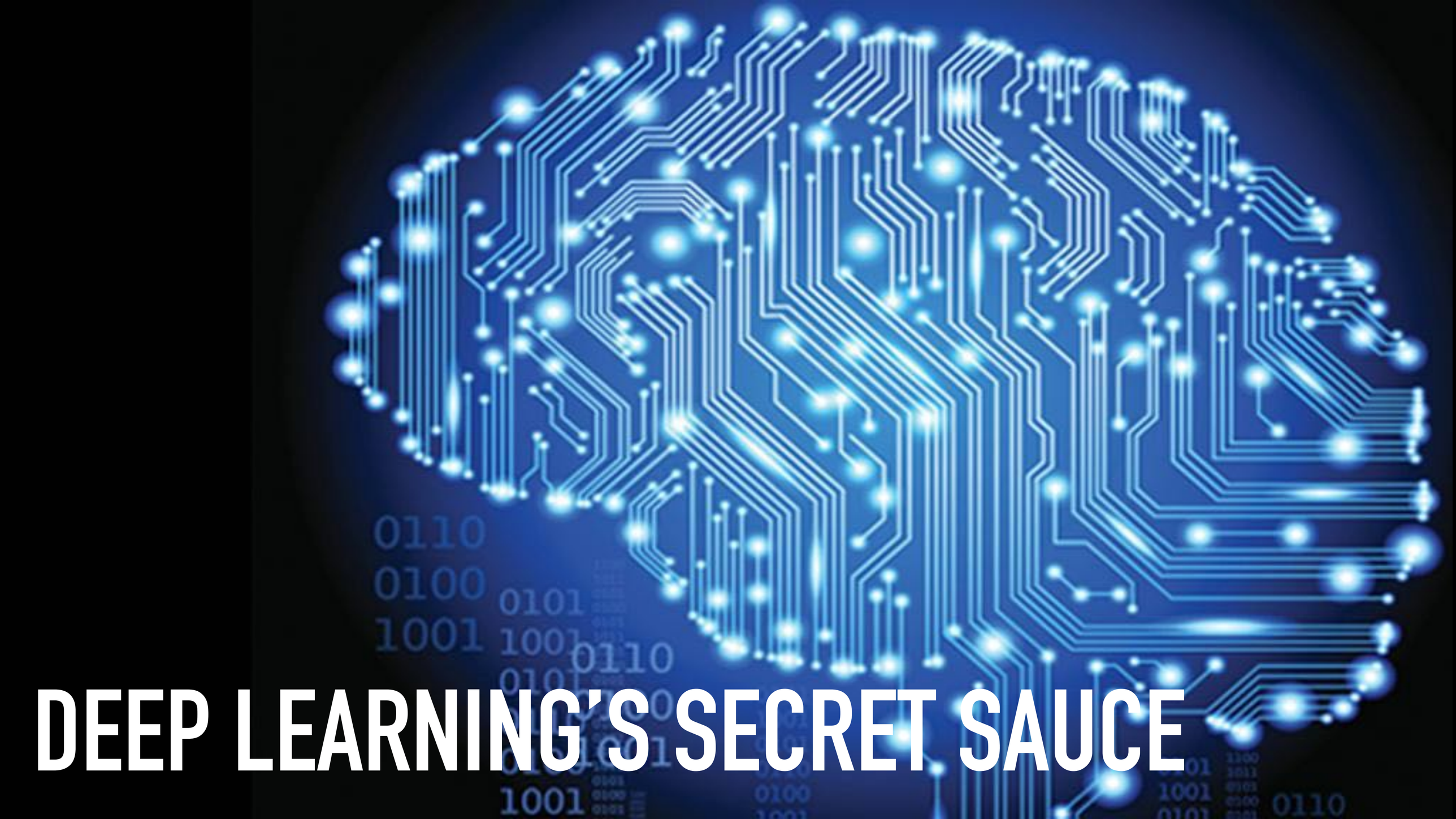
DEEP LEARNING
IS THE MODERN APPLICATION OF
DEEP NEURAL NETWORKS
TO ACHIEVE MACHINE LEARNING

LEARNING FROM DATA
WITHOUT
EXPLICIT PROGRAMMING

NEURAL COMPUTING

HOW THEY RELATE




DEEP LEARNING'S SECRET SAUCE

DEEP NEURAL NETWORKS
CAN PRECISELY APPROXIMATE
ANY CONTINUOUS FUNCTION

AND NEARLY

ANY PROCESS IMAGINABLE

INVOLVES

COMPUTING A FUNCTION

THIS IS HUGE

NEURAL NETWORKS ARE

UNIVERSAL

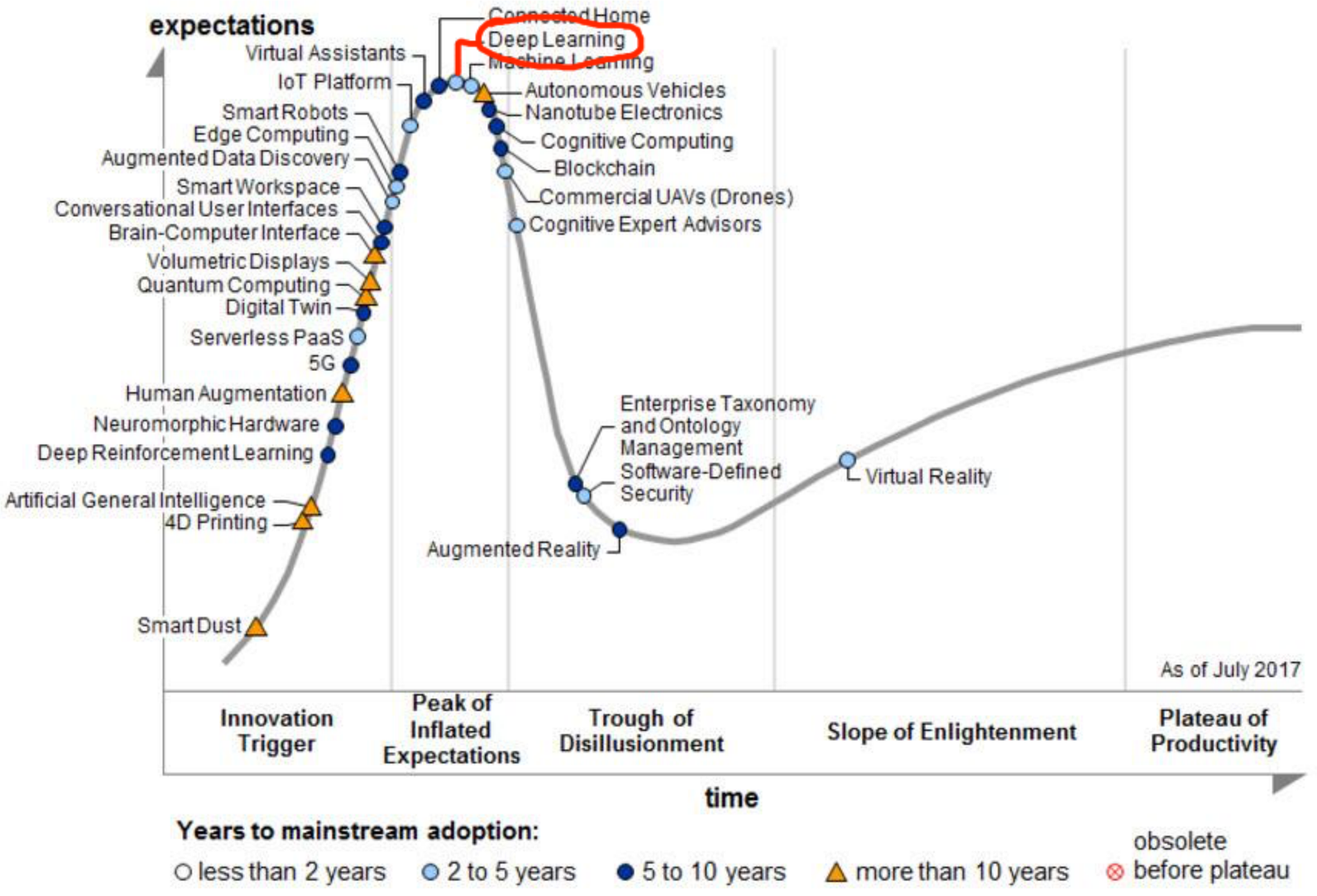
DEEP LEARNING IS A

UNIVERSAL

APPROACH TO

SOLVING COMPLEX PROBLEMS

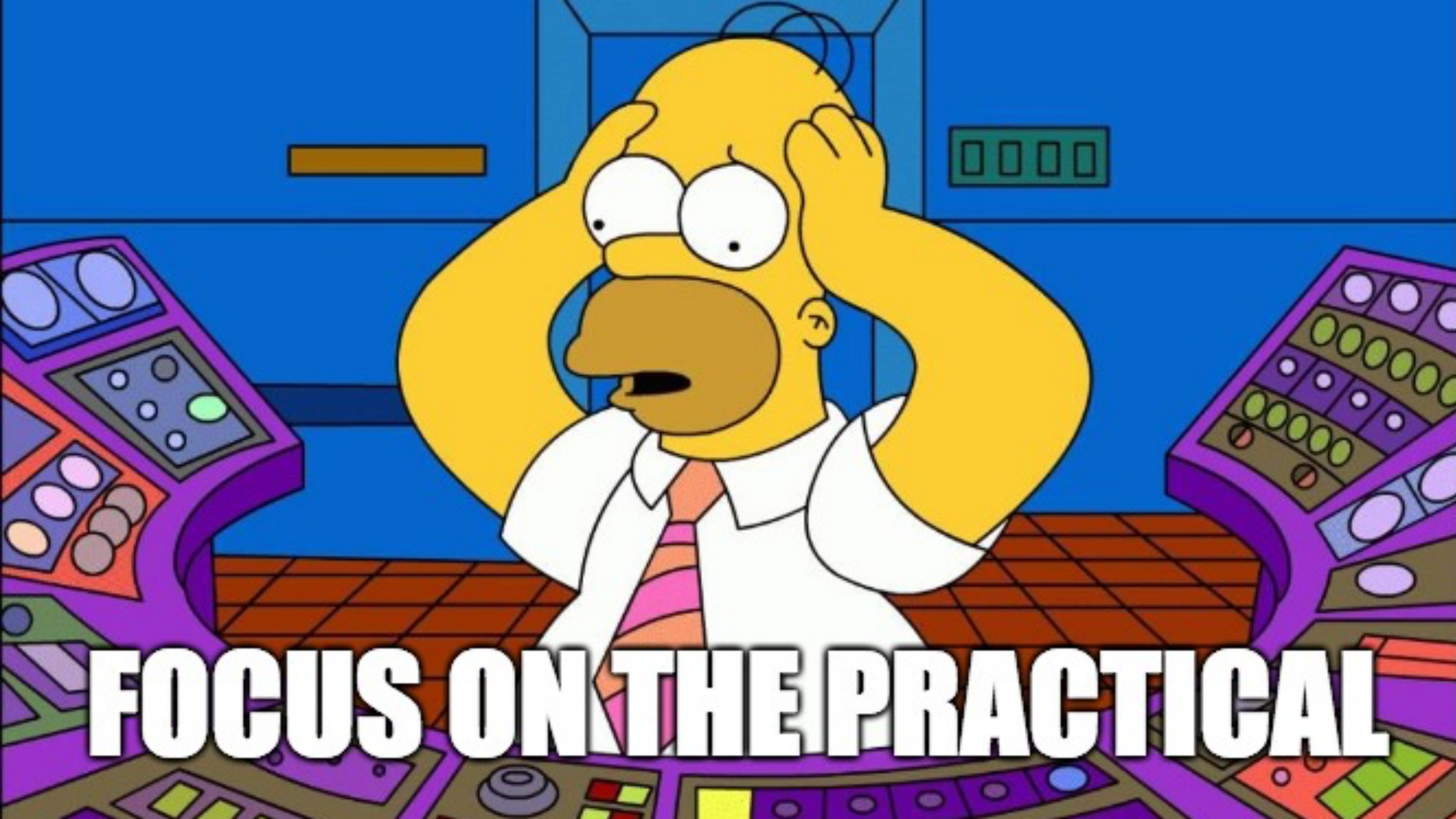
Hype Cycle for Emerging Technologies, 2017

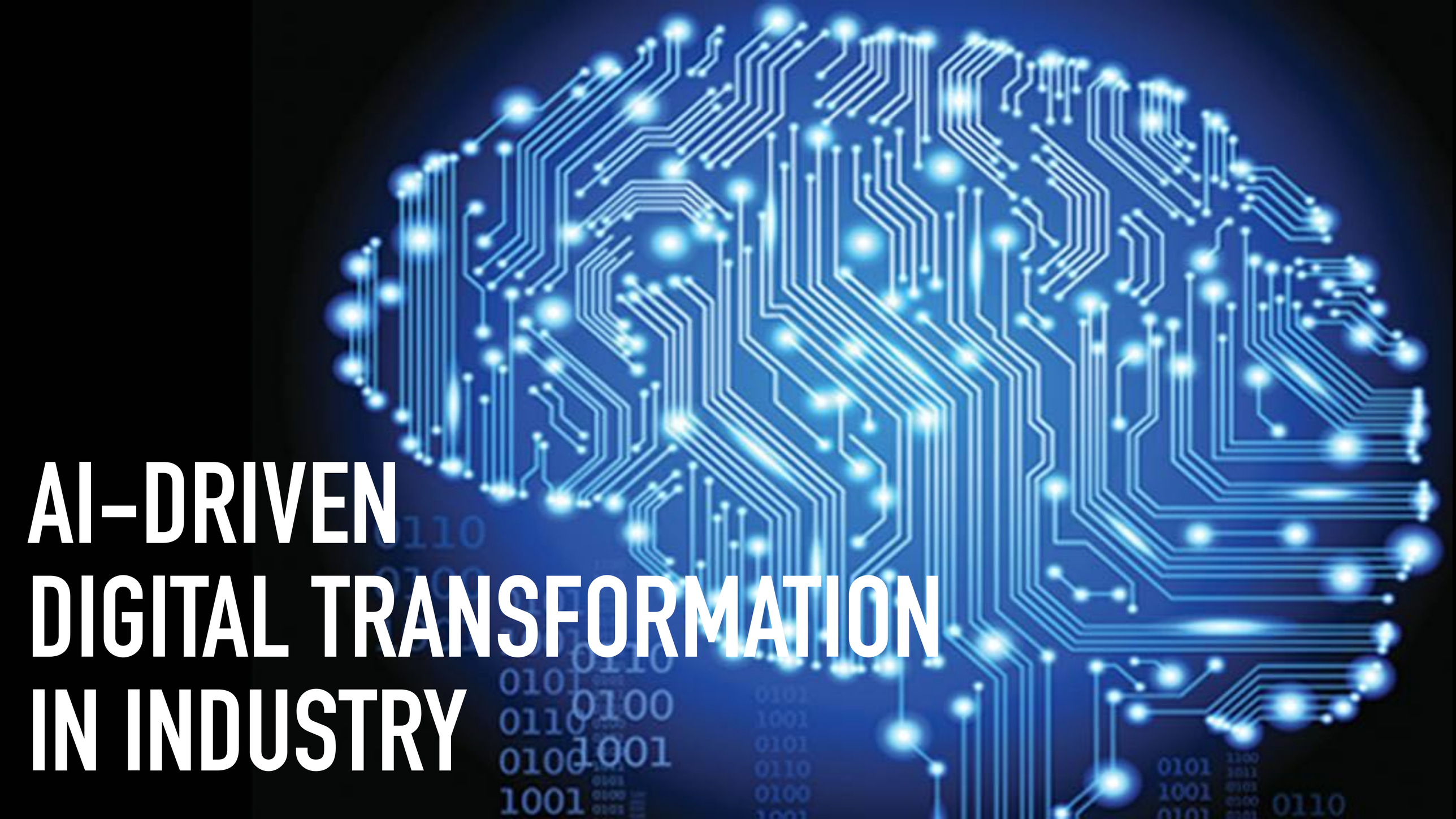


Note: PaaS = platform as a service; UAVs = unmanned aerial vehicles

Source: Gartner (July 2017)

IGNORE THE HYPE


FOCUS ON THE PRACTICAL



AI-DRIVEN DIGITAL TRANSFORMATION IN INDUSTRY

AI-FIRST

GOOGLE CEO SUNDAR PICHAI
A PERSONAL GOOGLE, JUST FOR YOU

"THE LAST 10 YEARS HAVE BEEN ABOUT BUILDING A WORLD THAT IS MOBILE-FIRST...

BUT IN THE NEXT 10 YEARS, WE WILL SHIFT TO A WORLD THAT IS AI-FIRST..."

SOURCE: HTTPS://WWW.BLOG.GOOGLE/PRODUCTS/ASSISTANT/PERSONAL-GOOGLE-JUST-YOU

AI-FIRST

GOOGLE CEO SUNDAR PICHAI'S KEYNOTE AT 2017 I/O CONFERENCE

"IN AN AI-FIRST WORLD, WE ARE RETHINKING ALL OUR PRODUCTS AND APPLYING MACHINE LEARNING AND AI TO SOLVE USER PROBLEMS. AND WE ARE DOING THIS ACROSS EVERY ONE OF OUR PRODUCTS."

SOURCE: HTTPS://SINGJUPOST.COM/GOOGLE-CEO-SUNDAR-PICHAIS-KEYNOTE-AT-2017-IO-CONFERENCE-FULL-TRANSCRIPT

DAN OLLEY, ELSEVIER CTO
CIO MAGAZINE – APRIL 26, 2016

CIO

WHY IT'S TIME FOR CIOS TO INVEST IN MACHINE LEARNING

"IF CIOS INVESTED IN MACHINE LEARNING THREE YEARS AGO, THEY WOULD HAVE WASTED THEIR MONEY.

BUT IF THEY WAIT ANOTHER THREE YEARS, THEY WILL NEVER CATCH UP."

SOURCE: HTTP://WWW.CIO.COM/ARTICLE/3061713/LEADERSHIP-MANAGEMENT/WHY-ITS-TIME-FOR-CIOS-TO-INVEST-IN-MACHINE-LEARNING.HTML

IN THE YEARS TO COME,
YOU WILL CERTAINLY CONSUME,
AND PROBABLY CREATE,
ARTIFICIAL INTELLIGENCE
AND MACHINE LEARNING
MICROSERVICES

MANY OF THOSE WILL BE BASED ON

DEEP LEARNING

COMMON DEEP LEARNING USE CASES

- Anomaly Detection / Cyber-Security / Fraud Detection
- Recommender Systems / Marketing Personalization / Search
- Machine Perception / Computer Vision / Object Recognition
- Speech Recognition / Natural Language Processing
- Transportation (e.g. self-driving cars) / Drone Navigation
- Healthcare Diagnosis / Medical Imaging Interpretation
- Securities Trading / Financial Analysis / Economic Forecasting

What Machine Learning Can Do

A simple way to think about supervised learning.

INPUT A	RESPONSE B	APPLICATION
Picture	Are there human faces? (0 or 1)	Photo tagging
Loan application	Will they repay the loan? (0 or 1)	Loan approvals
Ad plus user information	Will user click on ad? (0 or 1)	Targeted online ads
Audio clip	Transcript of audio clip	Speech recognition
English sentence	French sentence	Language translation
Sensors from hard disk, plane engine, etc.	Is it about to fail?	Preventive maintenance
Car camera and other sensors	Position of other cars	Self-driving cars

SOURCE ANDREW NG

© HBR.ORG

WHAT IS TODAY'S AI GOOD AT?

SOLVING VERY COMPLEX – BUT VERY SPECIFIC – PROBLEMS

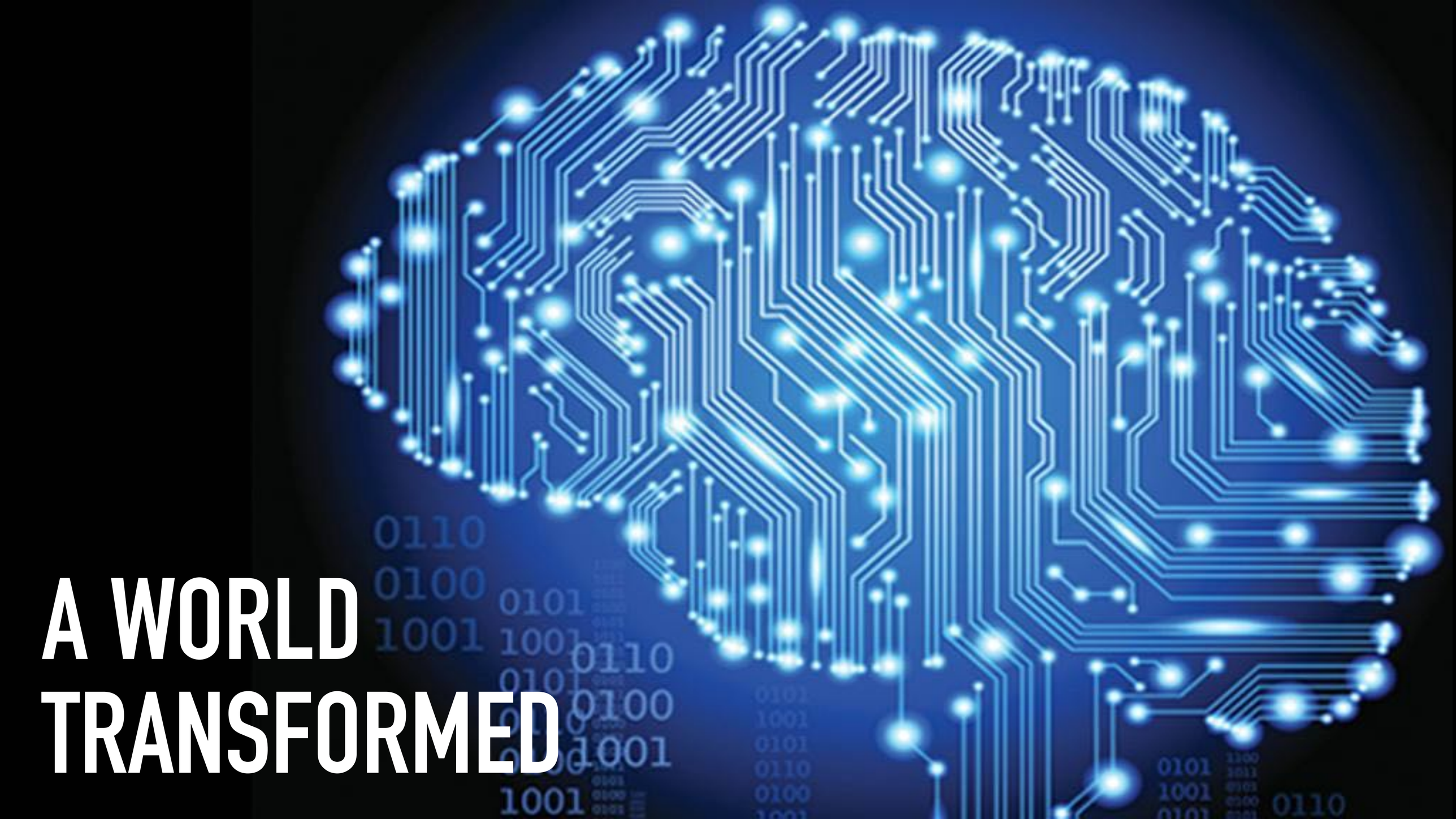
WHAT IS TODAY'S AI BAD AT?

SOLVING COMPLEX PROBLEMS THAT REQUIRE CREATIVITY
OR THAT CHANGE OR EVOLVE CONTINUALLY

HUMANS + AI

- Autonomous Vehicles (delegation)
- Autonomous Industrial Robotics (collaboration, delegation)
- Human Interactions through Augmented Reality (collaboration)
- Human Interactions through Mobile Devices (consultation)
- Human Interactions through Conversational Interfaces (consultation)
- Cloud • Edge • Mobile • IoT • Robots • Wearables • Environmentals

HUMAN / AI COLLABORATIONS WILL GIVE HUMANS SUPERPOWERS


A WORLD
TRANSFORMED

Computer
History
Museum
Google
Google
Google

WILL WE SEGREGATE OURSELVES AWAY FROM THE NEED FOR PERSONAL PRODUCTIVITY AND LIVE LIVES OF CARE-FREE LEASURE?

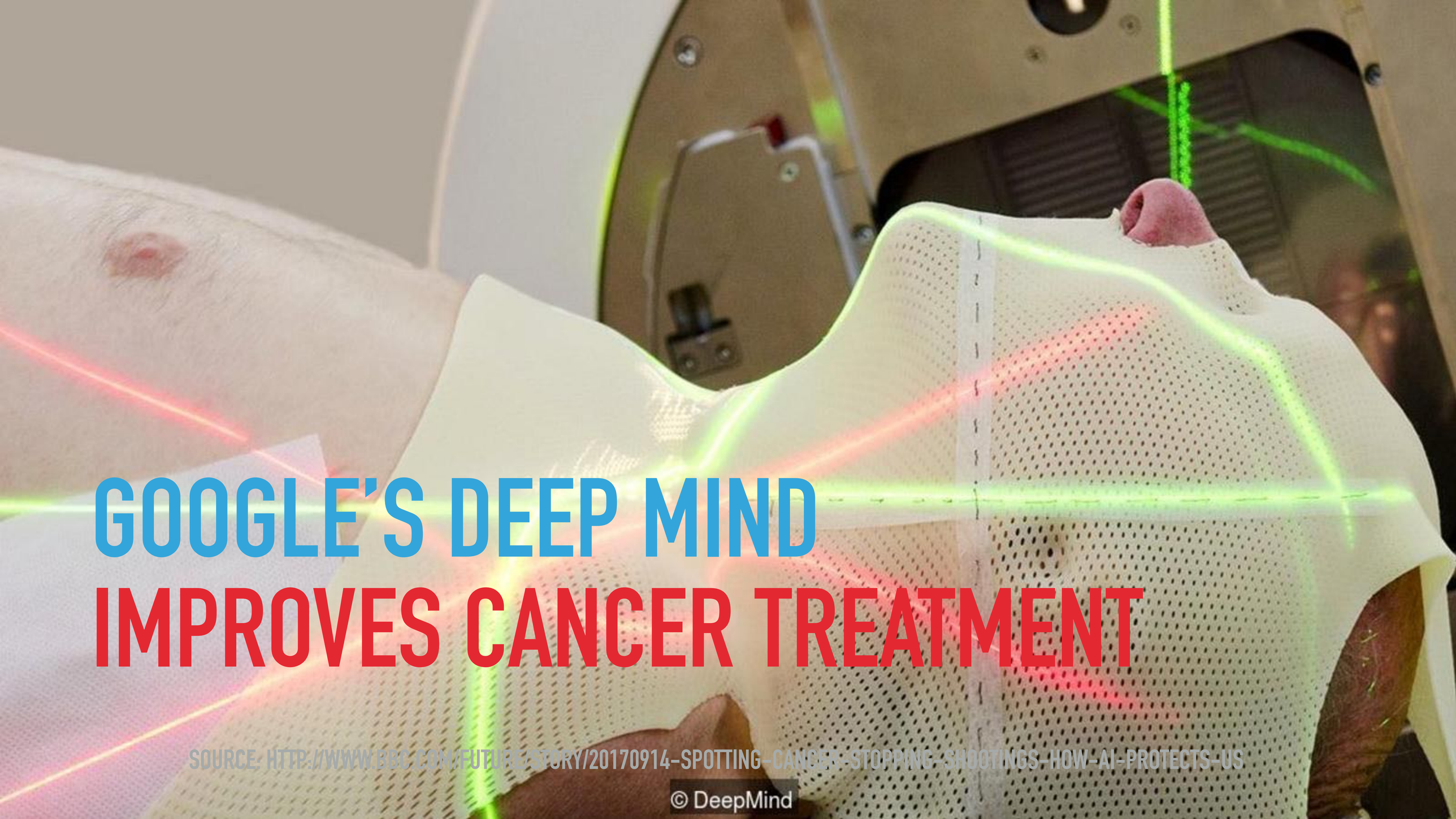
"ME DO WHAT? OH NO, I HAVE BOTS FOR THAT."

Gartner® PREDICTS THAT BY 2025,

50% OF THE POPULATION WILL RELY ON VIRTUAL PERSONAL HEALTH ASSISTANTS FOR PRIMARY CARE, FINDING THEM MORE RESPONSIVE AND ACCURATE THAN THEIR HUMAN COUNTERPARTS

SOURCE: HTTPS://WWW.GARTNER.COM/NEWSROOM/ID/3483817

https://medium.com/chat-bots-weekly/chatbot-conversational-ui-start-here-2f9250e8cde0



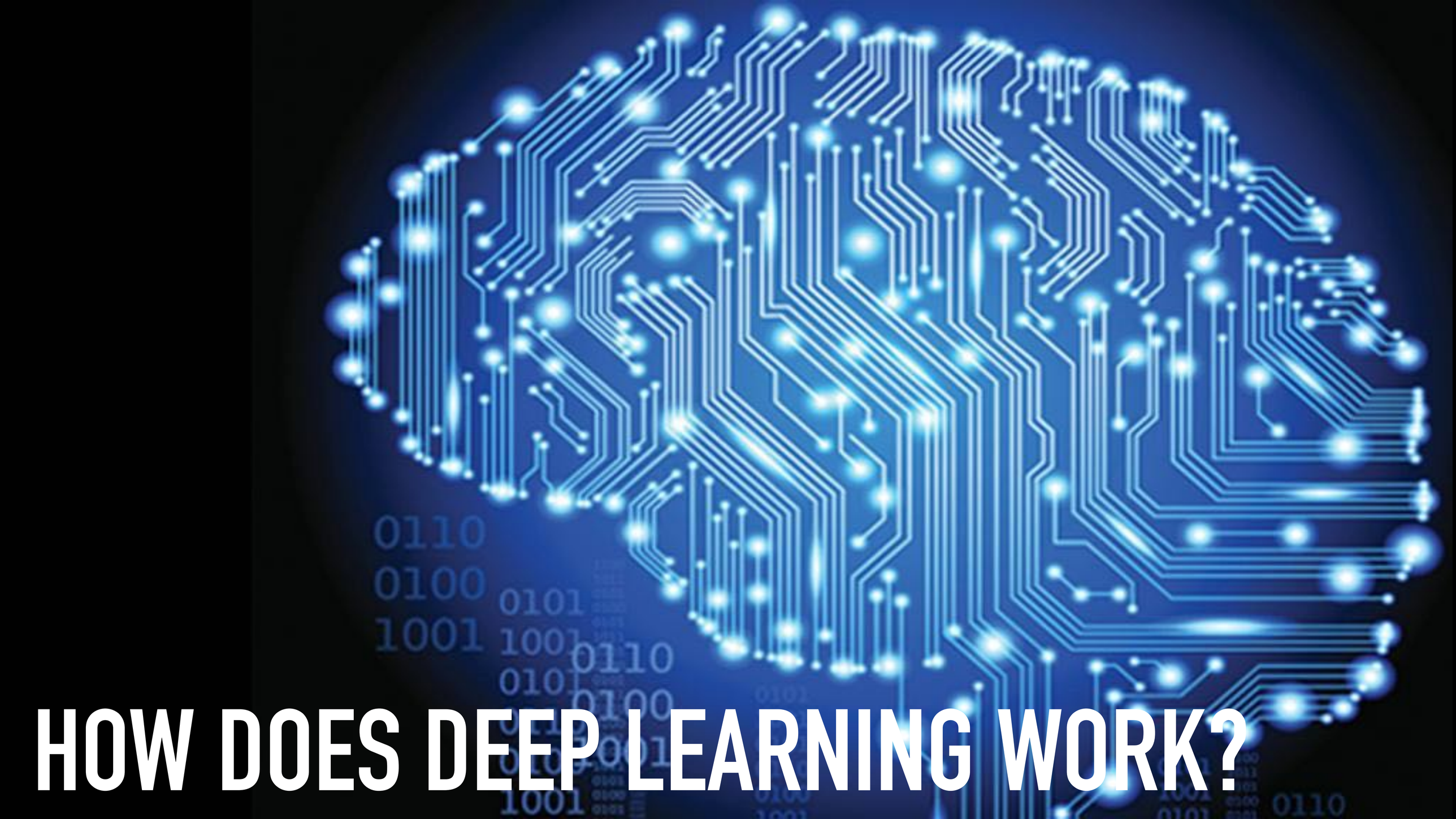
GOOGLE'S DEEP MIND IMPROVES CANCER TREATMENT

SOURCE: HTTP://WWW.BBC.COM/FUTURE/STORY/20170914-SPOTTING-CANCER-STOPPING-SHOOTINGS-HOW-AI-PROTECTS-US

DETECTING & STOPPING GUN VIOLENCE

SOURCE: HTTP://WWW.BBC.COM/FUTURE/STORY/20170914-SPOTTING-CANCER-STOPPING-SHOOTINGS-HOW-AI-PROTECTS-US

© ShotSpotter



HOW DOES DEEP LEARNING WORK?

TRAINING ENABLES
GENERALIZED PREDICTIONS
USING KNOWN CORRECT RESULTS

LOTS OF KNOWN CORRECT RESULTS

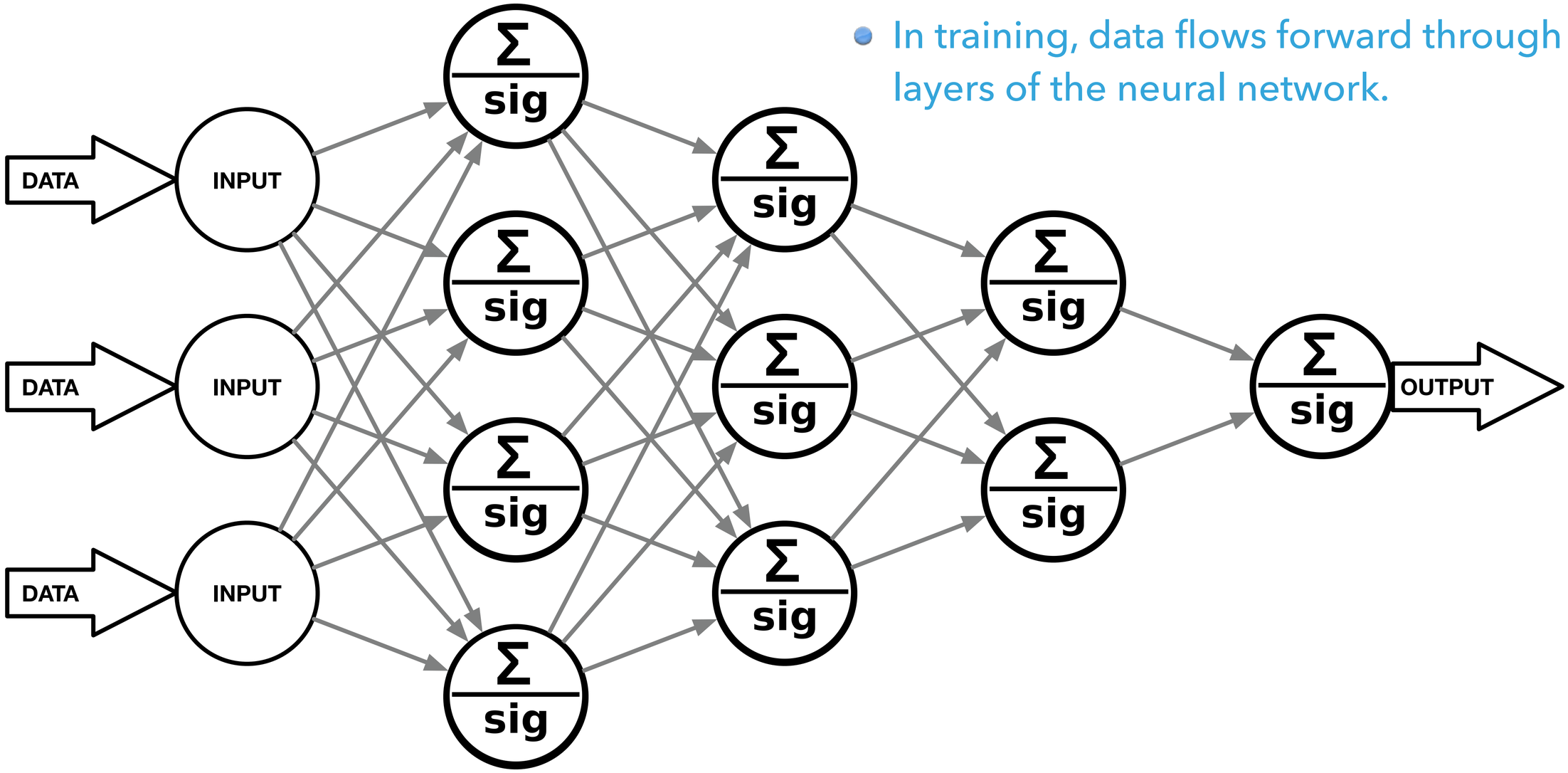
ONCE TRAINED,
GENERALIZED PREDICTIONS
FROM NEW INPUTS

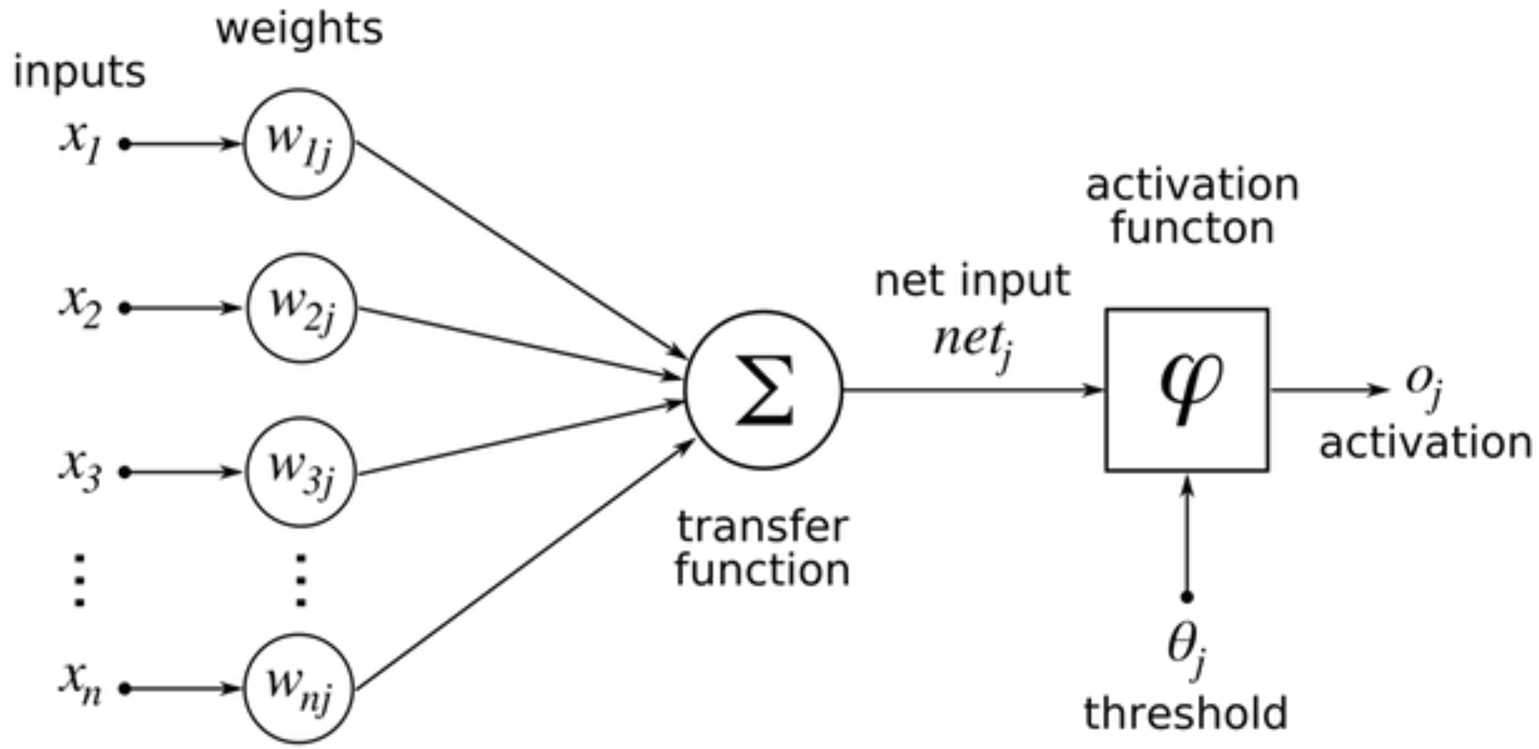
"ALLOW COMPUTERS TO LEARN FROM EXPERIENCE AND UNDERSTAND THE WORLD IN TERMS OF A HIERARCHY OF CONCEPTS, WITH EACH CONCEPT DEFINED THROUGH ITS RELATION TO SIMPLER CONCEPTS."

Ian Goodfellow, Yoshua Bengio & Aaron Courville (2016). Deep Learning. MIT Press

HOW DEEP LEARNING WORKS - FEED FORWARD NEURAL NETWORK

- In training, data flows forward through the layers of the neural network.





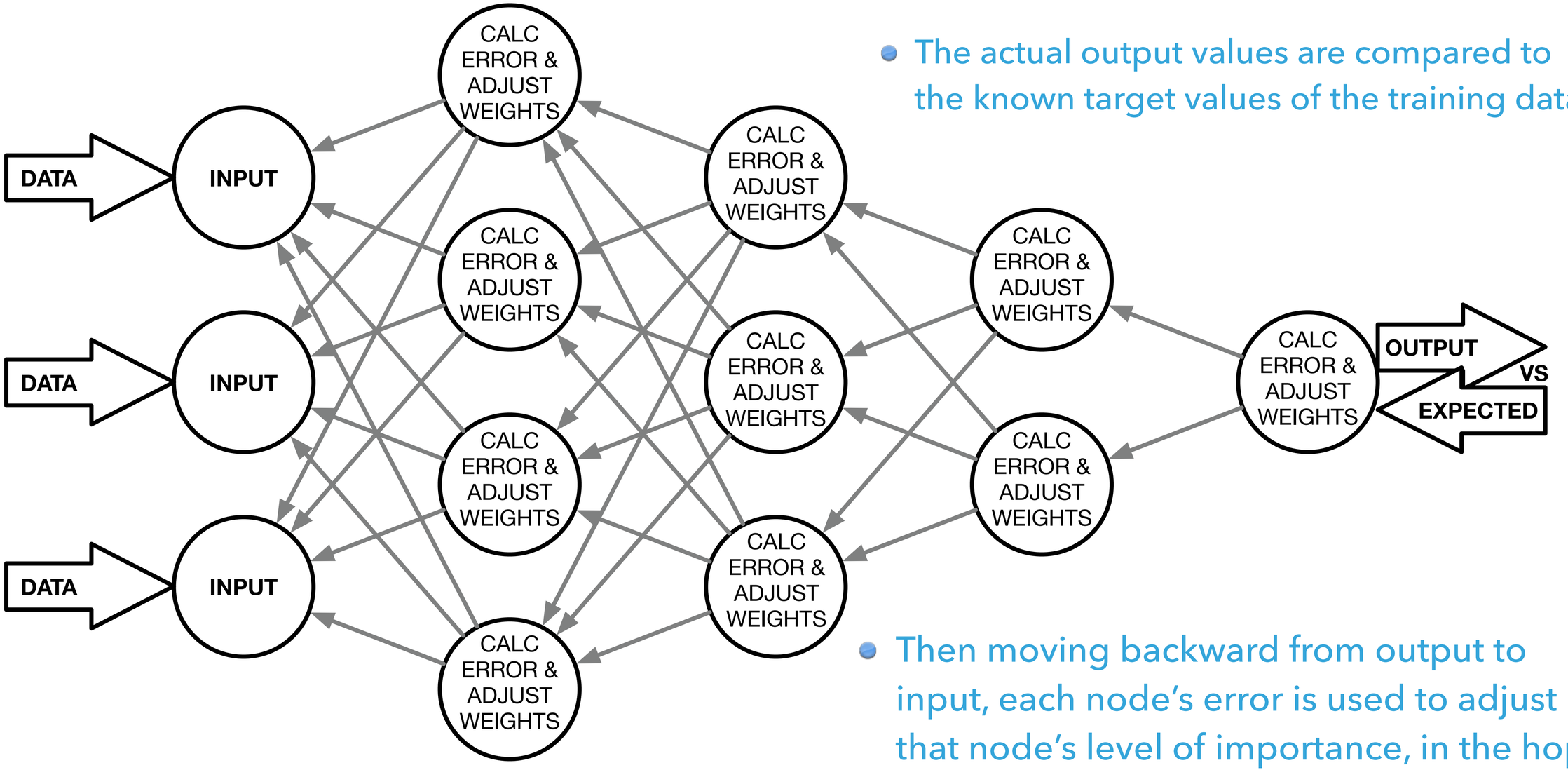
EACH NEURON

SOURCE: HTTPS://THECLEVERMACHINE.WORDPRESS.COM/TAG/BACKPROPAGATION

"UPDATE EACH OF THE WEIGHTS IN THE NETWORK SO THAT THEY CAUSE THE ACTUAL OUTPUT TO BE CLOSER THE TARGET OUTPUT, THEREBY MINIMIZING THE ERROR FOR EACH OUTPUT NEURON AND THE NETWORK AS A WHOLE."

SOURCE: HTTPS://MATTMAZUR.COM/2015/03/17/A-STEP-BY-STEP-BACKPROPAGATION-EXAMPLE

HOW DEEP LEARNING WORKS - ERROR BACKPROPAGATION



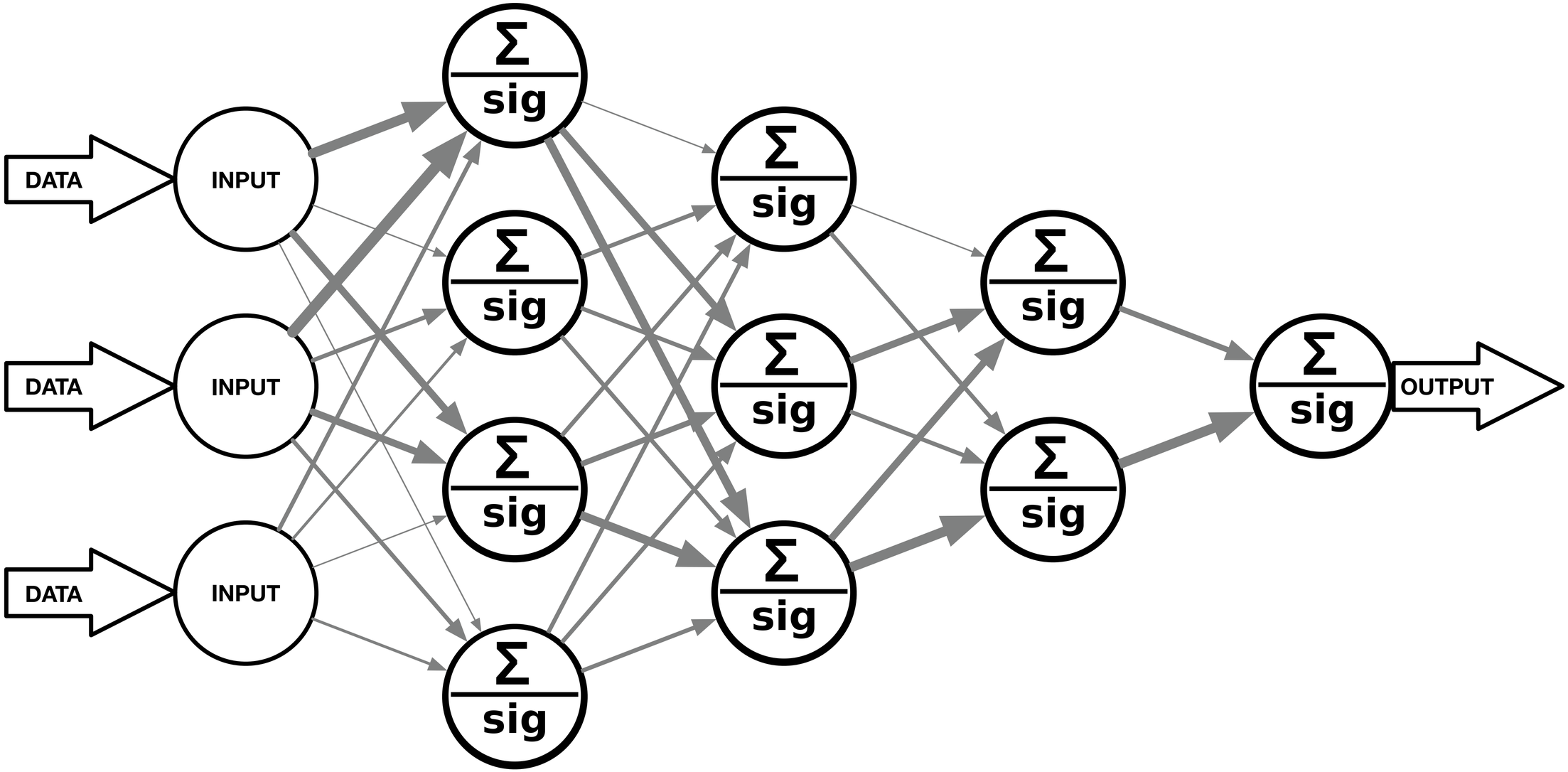
- The actual output values are compared to the known target values of the training data.

- Then moving backward from output to input, each node's error is used to adjust that node's level of importance, in the hope that the next iteration will be more accurate.

"BASICALLY, TRAINING IS A SEARCH. YOU ARE SEARCHING FOR THE SET OF WEIGHTS THAT WILL CAUSE THE NEURAL NETWORK TO HAVE THE LOWEST GLOBAL ERROR FOR A TRAINING SET."

Jeff Heaton (2012). Introduction to the Math of Neural Networks. Heaton Research, Inc.

HOW DEEP LEARNING WORKS - A TOY FEED-FORWARD NETWORK



"DEEP LEARNING IS A PARTICULAR KIND OF MACHINE LEARNING THAT ACHIEVES GREAT POWER AND FLEXIBILITY BY LEARNING TO REPRESENT THE WORLD AS A NESTED HIERARCHY OF CONCEPTS." . . .

Ian Goodfellow, Yoshua Bengio & Aaron Courville (2016). Deep Learning. MIT Press

. . . "WITH EACH CONCEPT DEFINED IN RELATION TO SIMPLER CONCEPTS, AND MORE ABSTRACT REPRESENTATIONS COMPUTED IN TERMS OF LESS ABSTRACT ONES."

Ian Goodfellow, Yoshua Bengio & Aaron Courville (2016). Deep Learning. MIT Press

DEEP LEARNING ARCHITECTURES

FEED-FORWARD NETWORKS

THIS IS THE ORIGINAL AND MOST COMMON FORM OF DEEP NEURAL NETWORK.
IT CAN BE USED TO SOLVE A WIDE RANGE OF PROBLEMS.

CONVOLUTIONAL NETWORKS

FEED-FORWARD CONNECTIVITY INSPIRED BY THE ANIMAL VISUAL CORTEX. VISUAL 'TILING' ENABLES IMAGE AND VIDEO RECOGNITION, RECOMMENDER SYSTEMS, AND NATURAL LANGUAGE PROCESSING.

RECURRENT NETWORKS

CONNECTIONS CREATE AN INTERNAL MEMORY FOR DYNAMIC TEMPORAL BEHAVIOR LIKE SPEECH RECOGNITION OR HANDWRITING RECOGNITION.

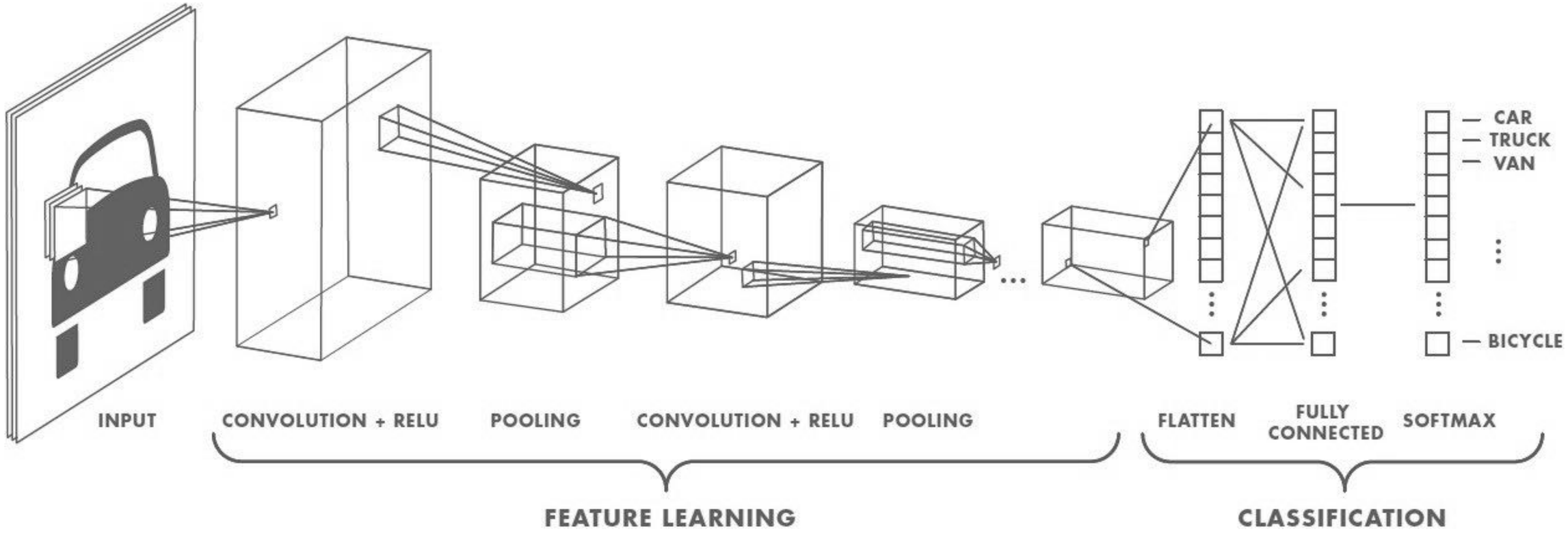
GENERATIVE ADVERSARIAL NETWORKS

TWO NEURAL NETWORKS COMPETING AGAINST EACH OTHER - ONE GENERATIVE AND ONE DISCRIMINATIVE. BLEEDING-EDGE APPROACH USING UNSUPERVISED TRAINING.

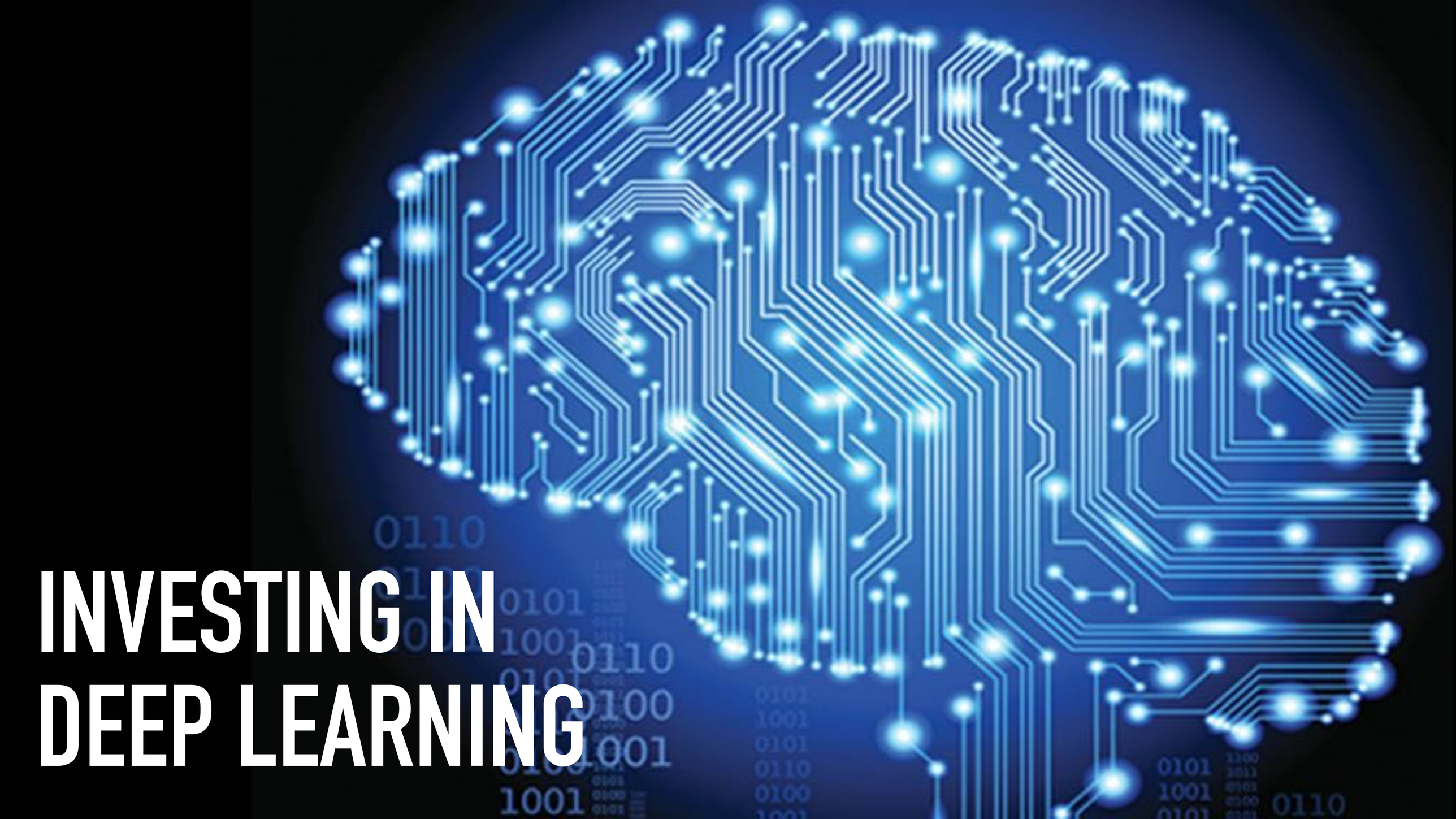
CONVOLUTIONAL NEURAL NETWORKS

CONVOLUTION SIMPLIFIES THE COMPUTATION WITHOUT LOSING THE ESSENCE OF THE DATA.

CONVOLUTION IS BASICALLY A LOT OF MATRIX MULTIPLICATION AND SUMMATION OF THOSE RESULTS.



SOURCE: HTTPS://HACKERNOON.COM/WHAT-IS-A-CAPSNET-OR-CAPSULE-NETWORK-2BFBE48769CC

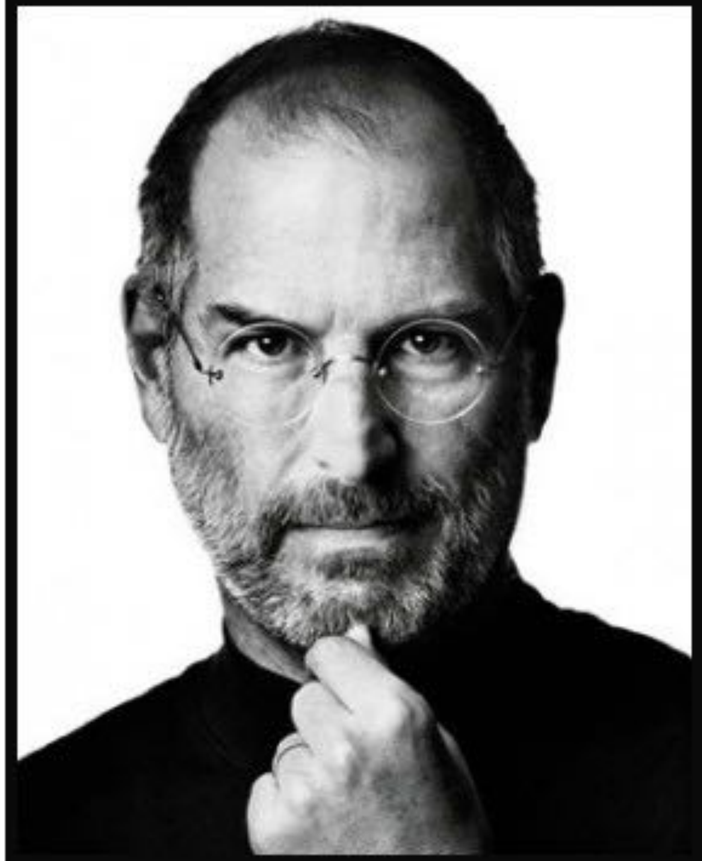

INVESTING IN
DEEP LEARNING

DIGITAL TRANSFORMATION REQUIRES A STARTUP MENTALITY

- Invent DT solutions to improve and enhance product capabilities.
- Deploy data models as software components into products & services.
  Requirements > Data > Models > Software > Intelligent Products & Services
- Maximize data value extraction through digital transformation innovations.
- Inform product design to improve capture and operationalization of data.
- Startup Culture => Fail fast. Learn fast. Pivot fast. Invent fast. Win fast.
- Strategic. Disruptive. Intensely competitive. Fiercely innovative. GO BIG.

QUESTIONS TO START WITH

- Are we prepared to experiment, fail fast, and learn our way into success?
- What problem are we trying to solve?
- What data do we need to solve the problem?
- What data do we have? Where is it coming from? How will it get to us?
- Do we have enough of the right data to train models?
- Where will that data be aggregated and maintained?
- What pre-processing / post-processing will be necessary?
- What enterprise and data architectures will be used?



You've got to start with the customer experience and work back toward the technology - not the other way around.

(Steve Jobs)

izquotes.com

ANALYZE THE PROBLEM STATEMENT

CAN YOU

SOLVE THE PROBLEM

WITH SIMPLER, LESS EXPENSIVE TOOLS?

DEEP LEARNING

IS SOMETIMES THE

WRONG SOLUTION

TO YOUR PROBLEM

MORE ON THIS LATER

DEEP LEARNING AUTOMATION IS

EXPENSIVE

TO IMPLEMENT AT SCALE

AI-ENHANCED DIGITAL TRANSFORMATION REQUIRES A STRATEGIC INVESTMENT FROM LEADERSHIP

RECRUIT THE

BEST PEOPLE

YOU CAN FIND

AND TRAIN THE

BEST PEOPLE

YOU ALREADY HAVE

LEARNING CULTURE

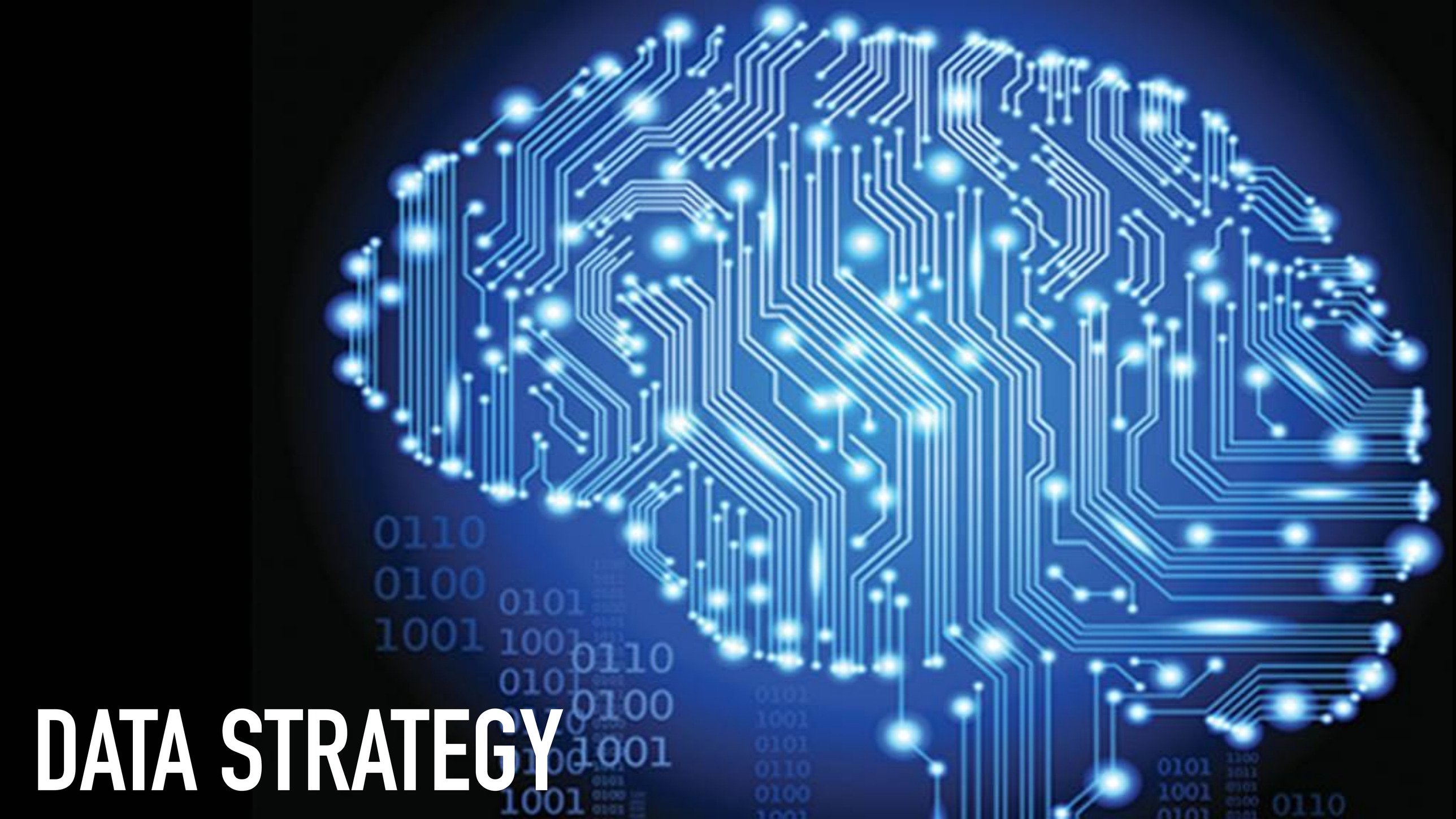
DEEP LEARNING

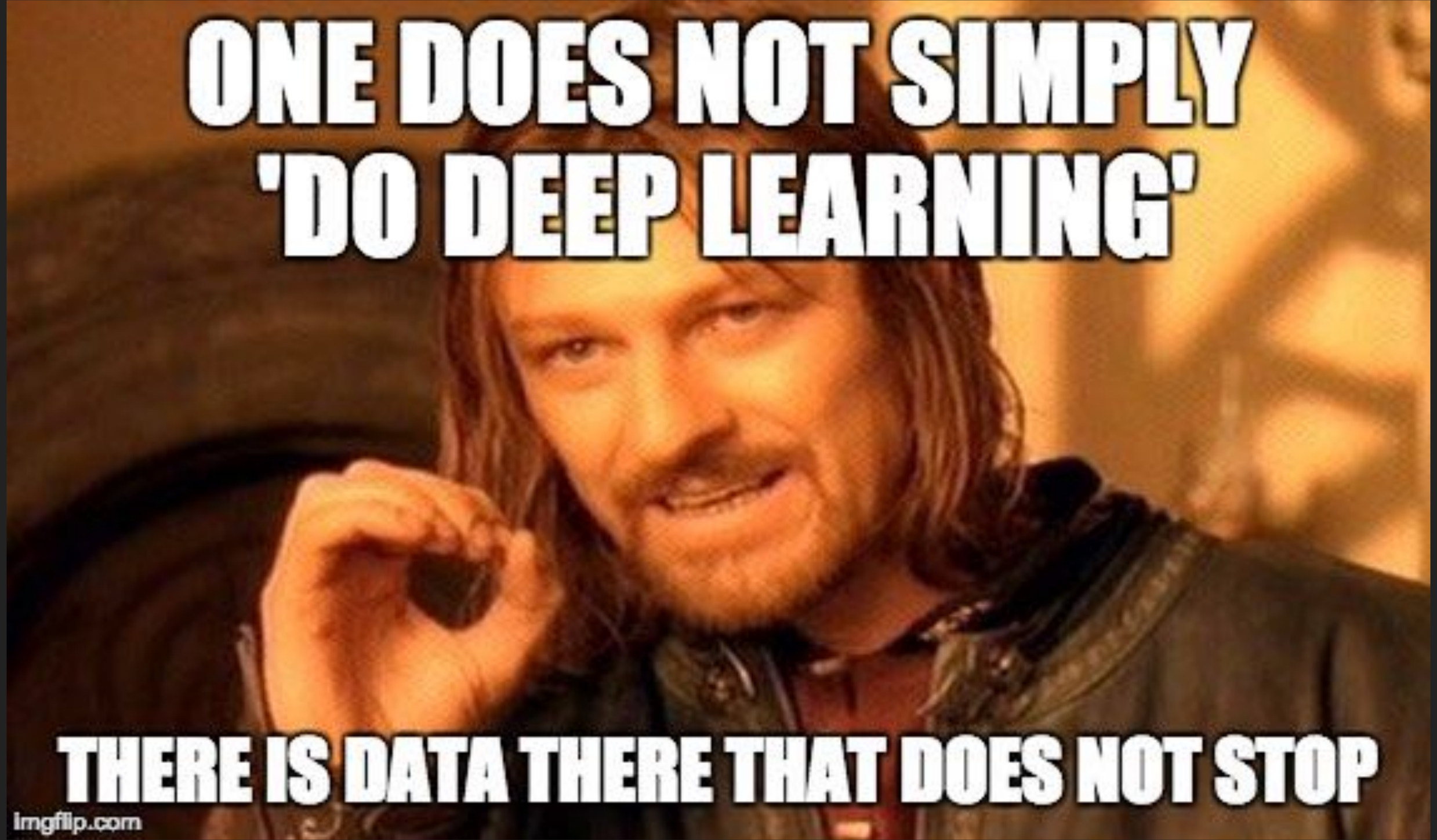
REQUIRES

- DATA SCIENTISTS
- DATA ENGINEERS
- SOFTWARE ENGINEERS
- DOMAIN EXPERTS

DATA SCIENTISTS

DEEP LEARNING EXPERTS


DATA STRATEGY


ONE DOES NOT SIMPLY
'DO DEEP LEARNING'
THERE IS DATA THERE THAT DOES NOT STOP
imgflip.com

LOTS OF DATA

LOTS OF COMPUTATION

AN EXECUTABLE

AI STRATEGY

REQUIRES A PREREQUISITE

AND AN EXECUTED BUT EVOLVING

DATA STRATEGY

IN PLACE AHEAD OF TIME

THIS IS WHERE

MOST ORGANIZATIONS...

FAIL!

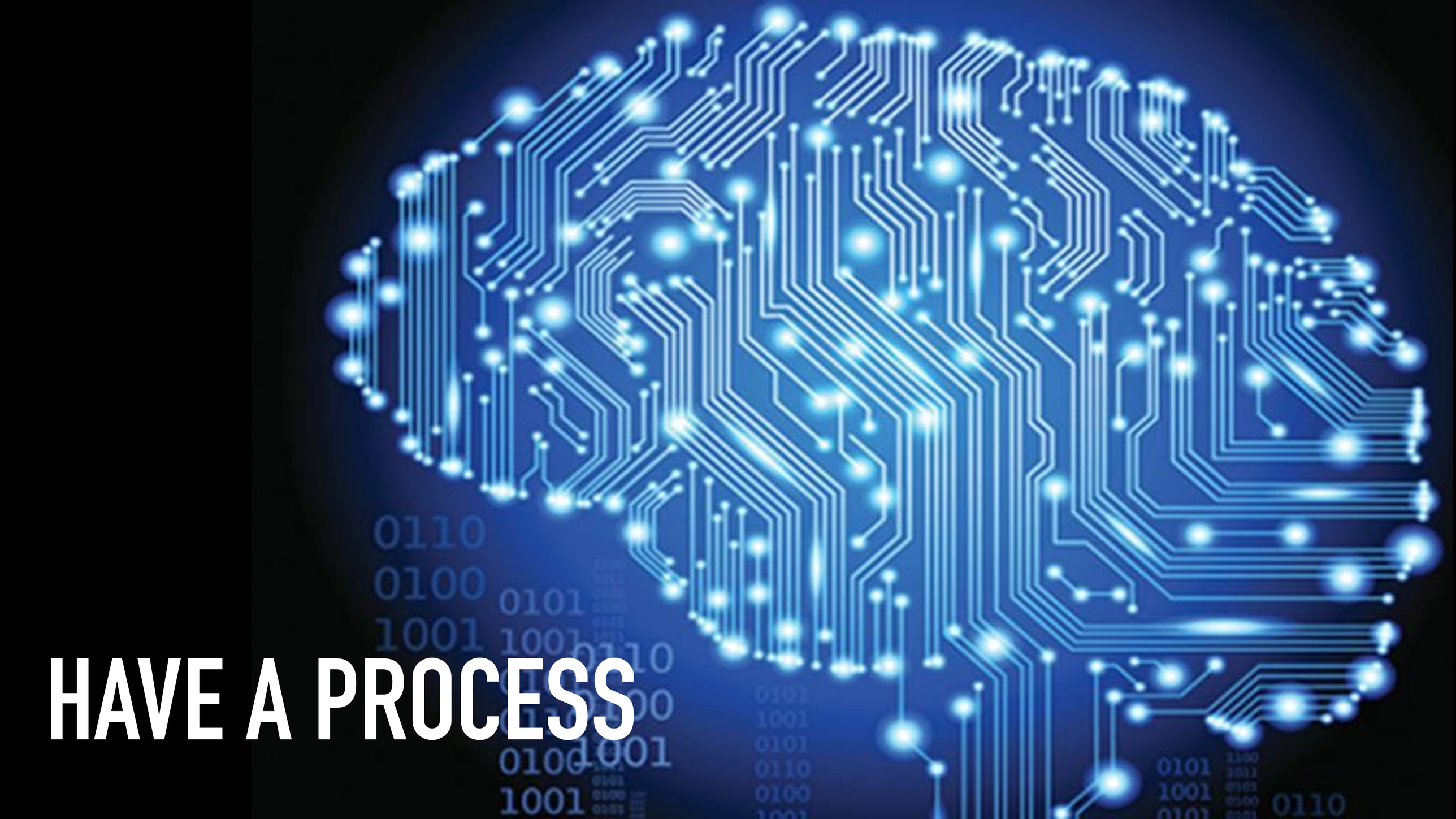
FAIL!

FAIL!

GET YOUR

DATA STRATEGY

IN ORDER FIRST



HAVE A PROCESS

EVALUATE THE BUSINESS PROBLEM

- BUSINESS PROBLEM
- MEASURABLE
- VALIDATED CUSTOMER VALUE

DATA DISCOVERY

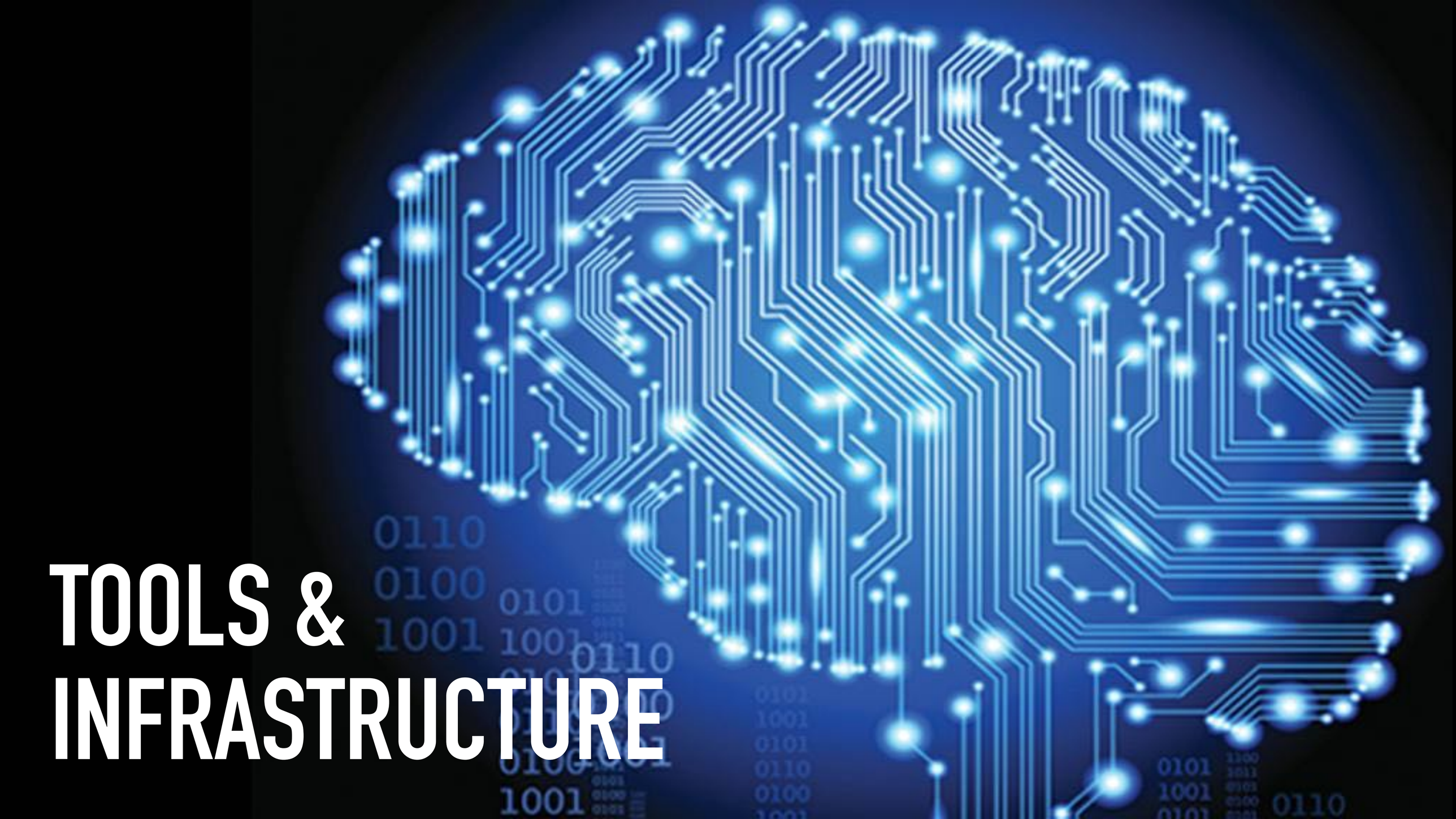
- DATA FORMAT
- DATA UNDERSTANDING
- DATA VERIFICATION
- FEASIBILITY
- TARGET HARDWARE

MODELING

- FEATURE ENGINEERING
- MODEL SELECTION
- MODEL TRAINING
- MODEL EVALUATION

DEPLOYMENT

- SOFTWARE
- SYSTEMS
- DATA FEEDS
- CONTINUOUS INTEGRATION
- CONTINUOUS DEPLOYMENT



TOOLS & INFRASTRUCTURE

Google Cloud Platform

amazon
web services

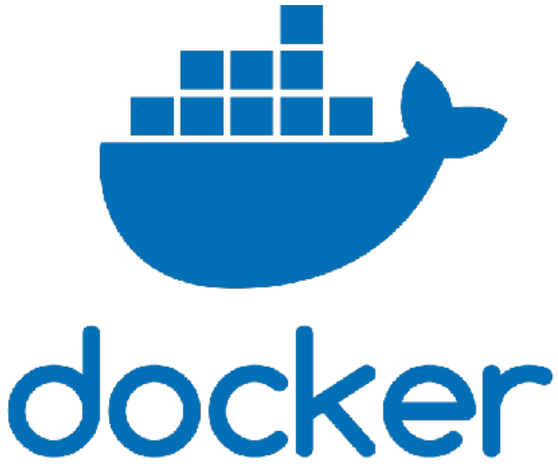
Microsoft Azure

DATA CENTER INFRASTRUCTURE

NVIDIA® DGX-1™
THE WORLD'S FIRST DEEP LEARNING SUPERCOMPUTER IN A BOX

DEEP LEARNING FRAMEWORKS

CONTAINERIZED INFRASTRUCTURE



OPEN-SOURCE TOOLS ARE

DEMOCRATIZING

DEEP LEARNING AS AN

ACCESSIBLE DISCIPLINE

DEPLOYMENT TO THE EDGE
IS WHERE THE
PAIN IS NOW

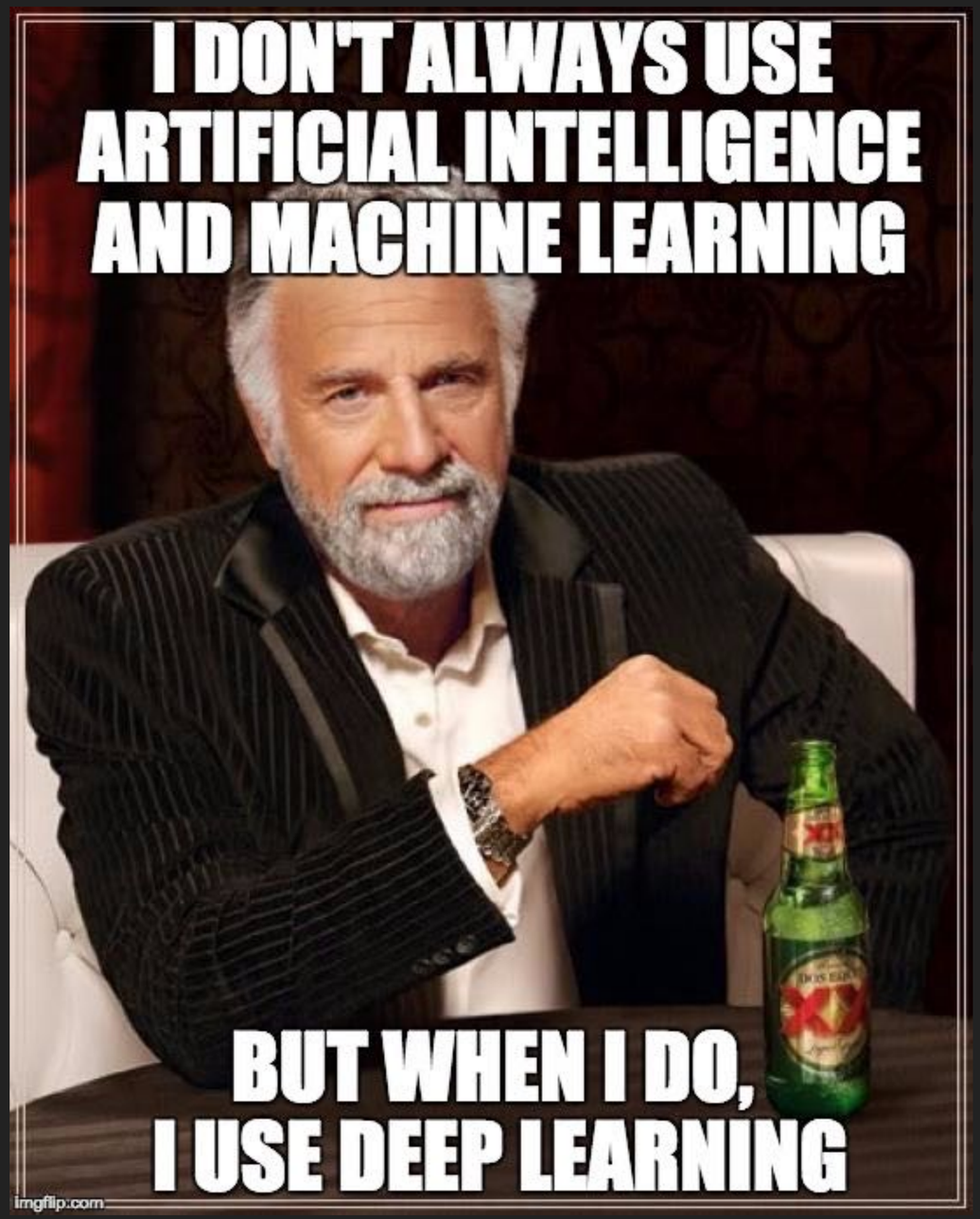
Making artificial intelligence practical, productive, and accessible to everyone.

Apple Overcast Android RSS

Chris Benson

Daniel Whitenack

https://changelog.com/practicalai



THANK YOU VERY MUCH!

https://chrisbenson.com

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