



Piyush Sharma

Artificial Intelligence

Essential AI for Everyone

Now in
Singapore!

A Technology-Business-People Playbook!



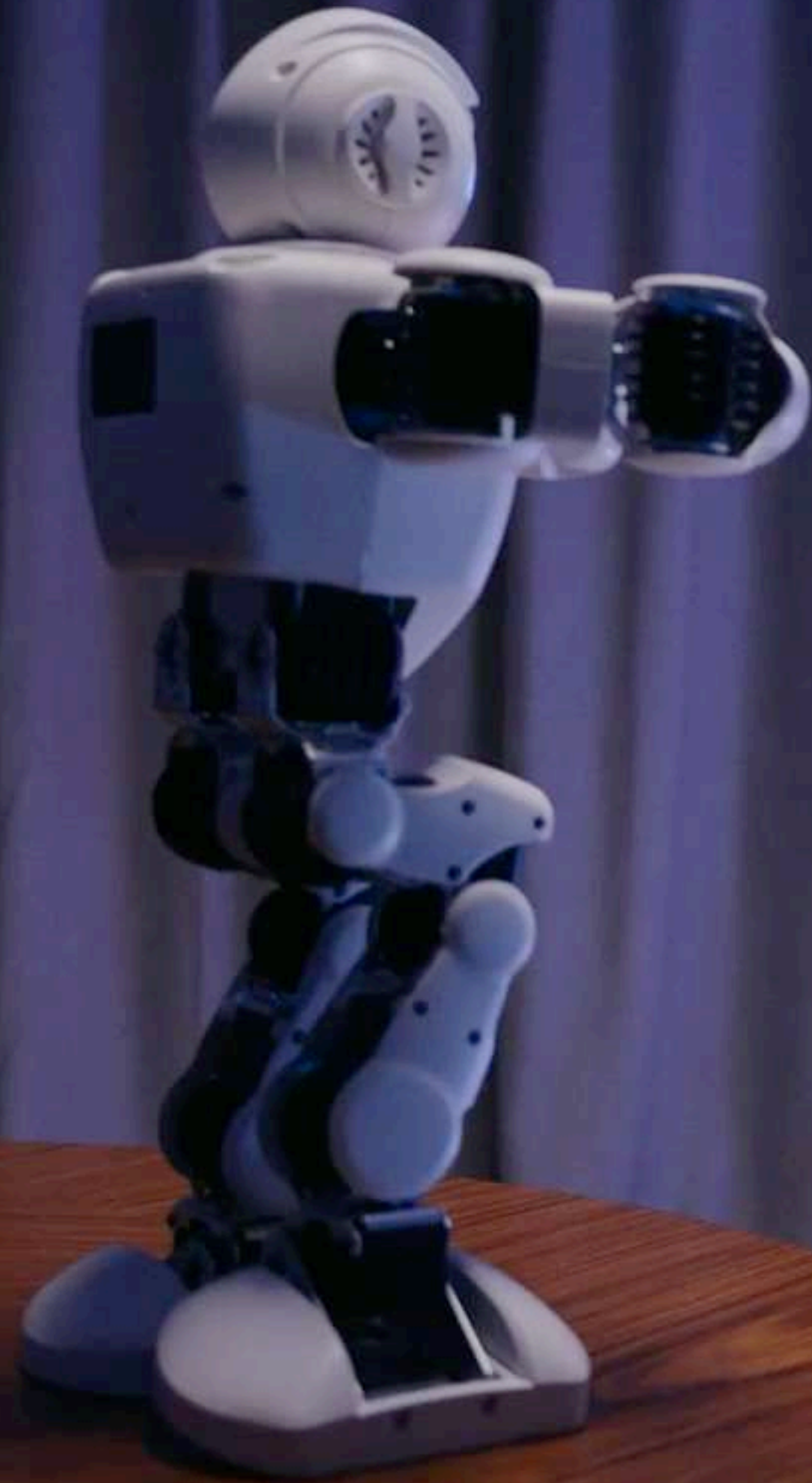
The course draws heavily upon curated resources from the best of the best. While in most cases these have a built-in acknowledgement of the source; in rare cases if it is not there and if it is a graph, chart, image, infographics or a video - it may be brought to my attention and I will be happy to attribute sources.

The general videos to create engagement and interest are already sourced from 'free-to-use' or 'creative-commons attribution sites.



Mark Cuban (born July 31, 1958) is an American billionaire entrepreneur, television personality, and media proprietor whose net worth is an estimated **\$4.3 billion**, according to Forbes, and ranked #177 on the 2020 Forbes 400 list.

Course Introduction



AI Concepts

1.
Technology

2.
Business

3.
People



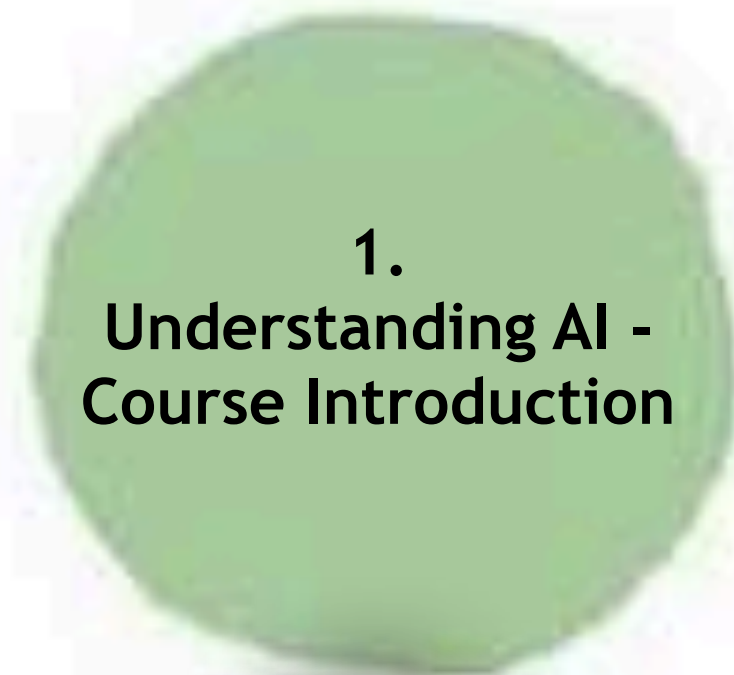
1.
Technology



2.
Business



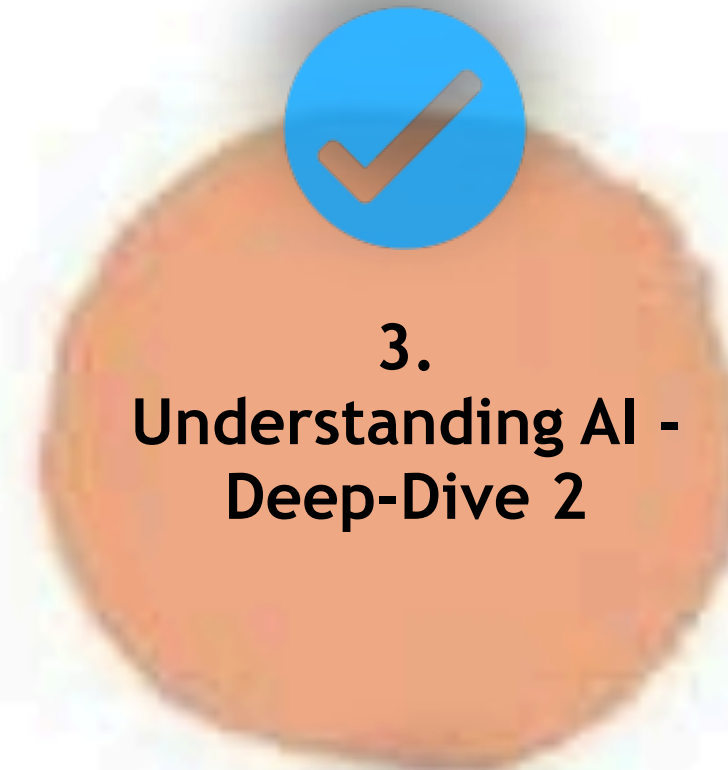
3.
People



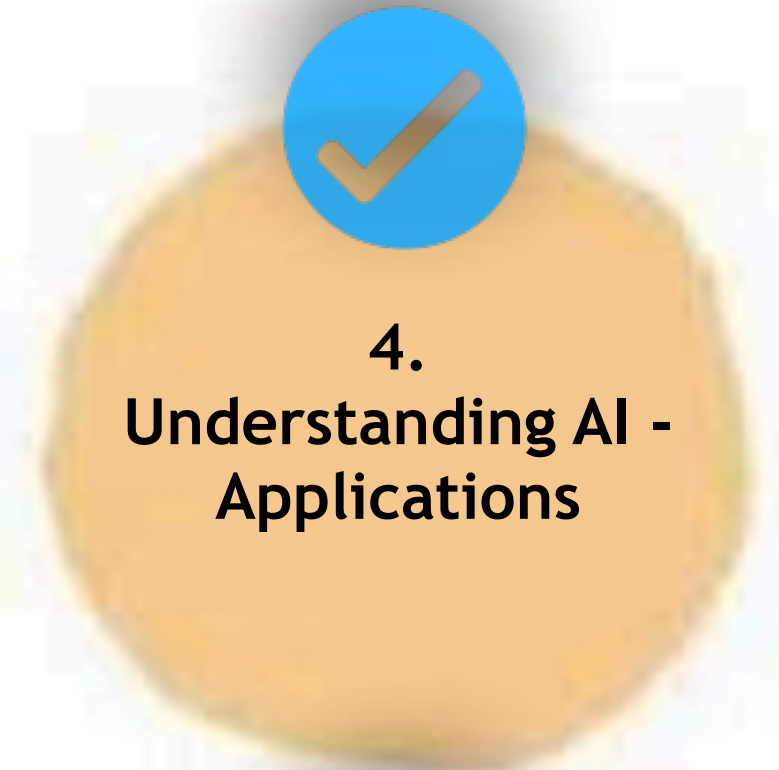
1.
Understanding AI -
Course Introduction



2.
Understanding AI -
Deep-Dive 1



3.
Understanding AI -
Deep-Dive 2



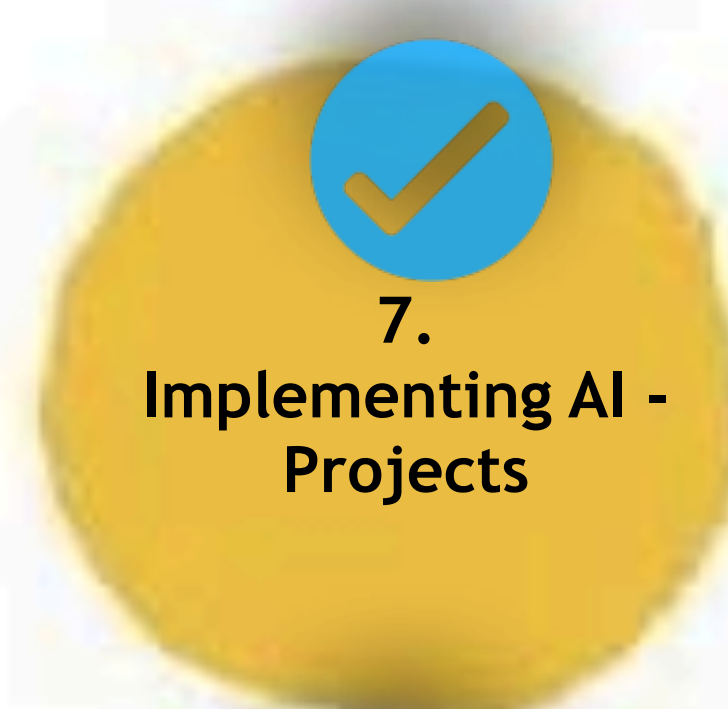
4.
Understanding AI -
Applications



5.
Understanding ML -
Deep-Dive



6.
Understanding DL -
Deep-Dive



7.
Implementing AI -
Projects



8.
AI Trends -
State of AI



9.
AI for
Business Leadership



10.
Ethics
In AI



11.
AI in
Singapore
+
AI in action!



12.
Future
of AI

1.
Understanding AI-
Pre-introduction!

1.
Understanding AI-
Pre-introduction!



Artificial Intelligence

Essential AI for Everyone

A Technology-Business-People Playbook!

I/ Understanding AI - Pre-Introduction

How did we get here!



Polls



Quick Poll...1!

How many jobs may face medium to high exposure to automation?

a/ >10%

b/ >25%

c/ >40%

d/ >60%



FUTURE OF WORK Insights for 2021 and Beyond

KEVIN KLOWDEN AND QUINTUS LIM

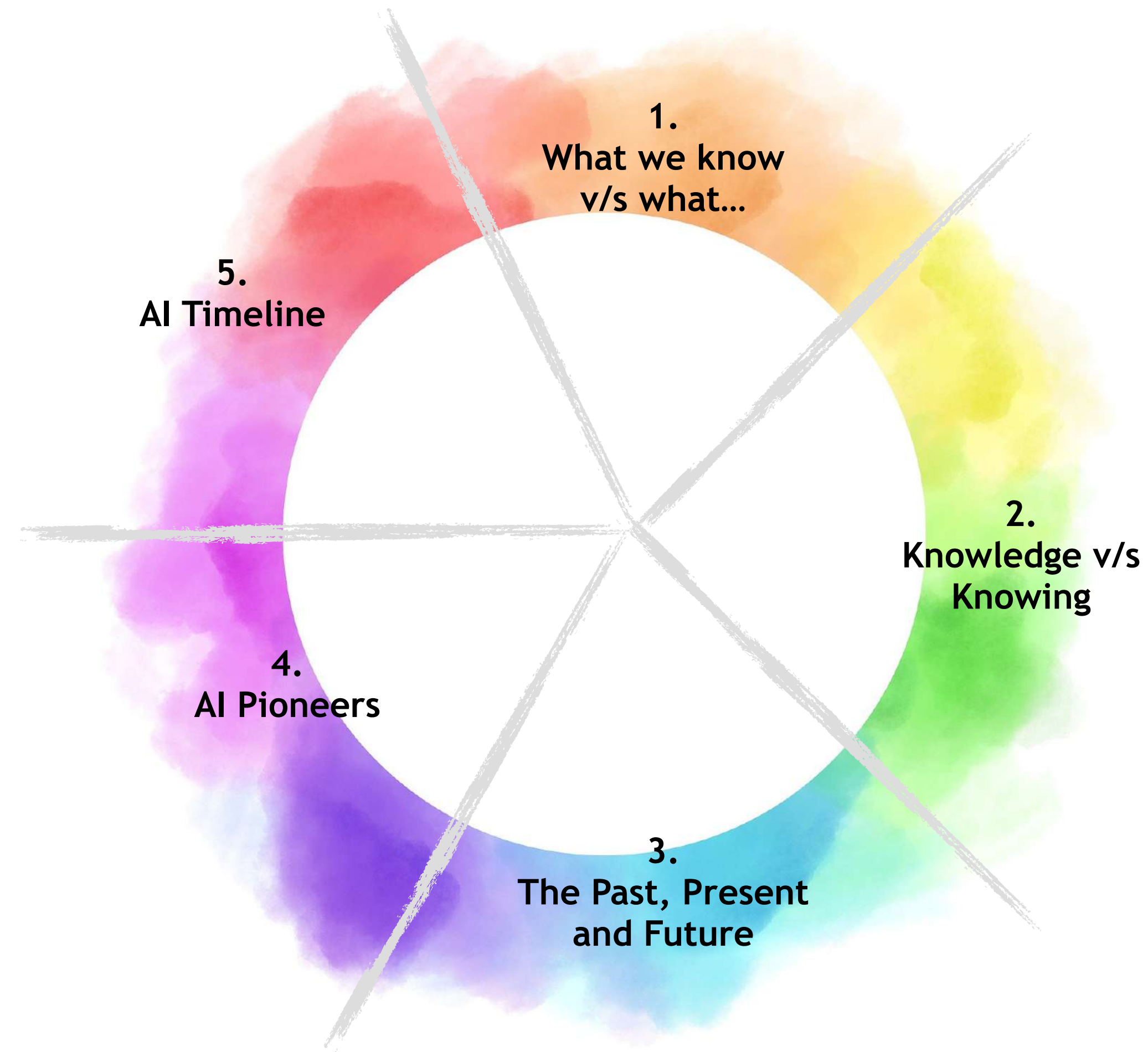


Backdrop!



Demystifying AI

I - Understanding AI - Pre-Introduction



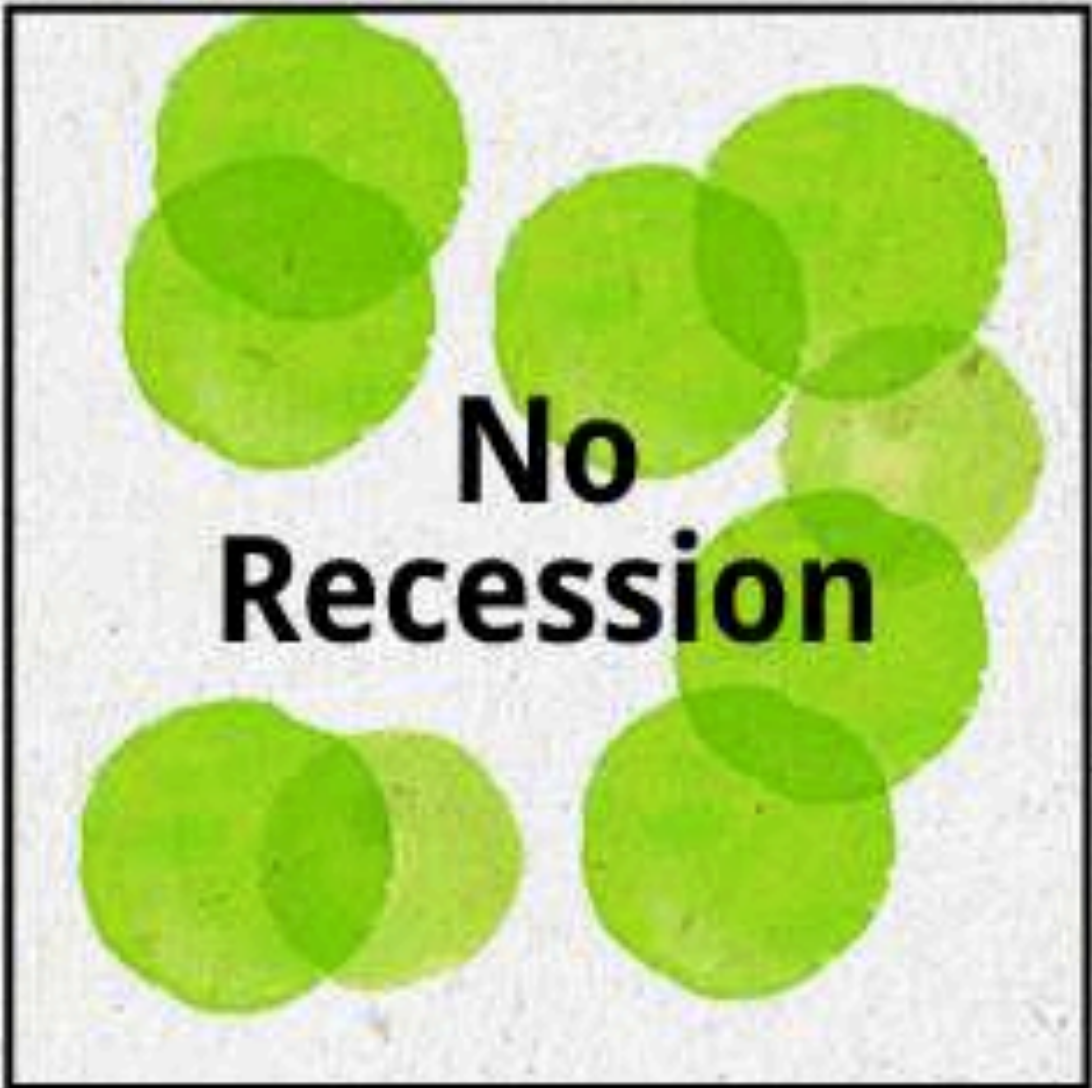


1/ Understanding AI - Pre-Introduction

Breakout Room 1!

Could we consider bestowing
“Godhood” to Steve Ballmer!
for walking into those rather
big shoes of a great like Bill Gates?





**No
Recession**

“”

*Our new
recession model
suggests just a
20% probability.*

**Goldman
Sachs**

“”

*Don't bet on
a recession
in 2020.*

**The
Economist**

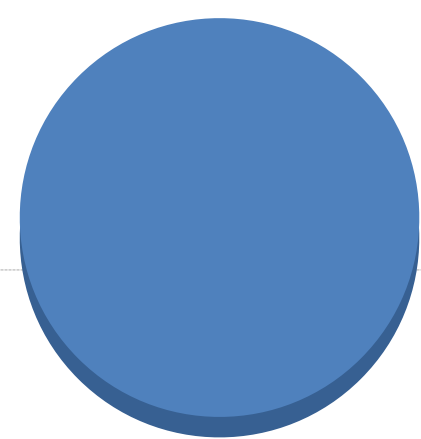
“”

*No U.S.
Recession On
The Horizon.*

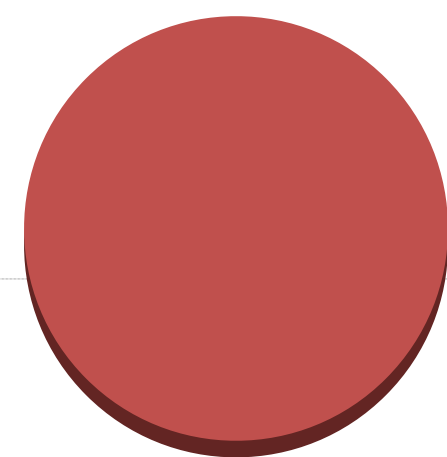
**Bank of America
Merrill Lynch**



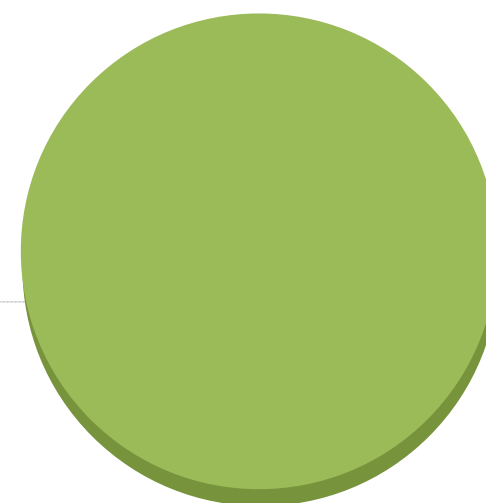




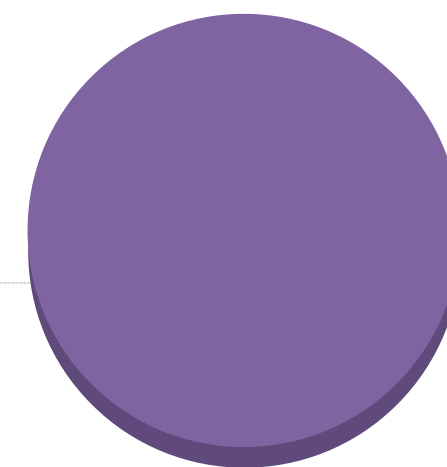
What is
REAL!



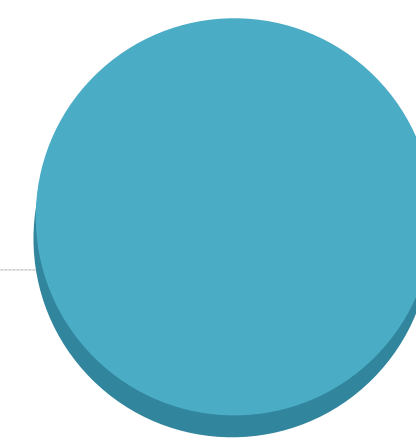
What we
CAN know!



What we
HAVE!



That thing called
WISDOM!

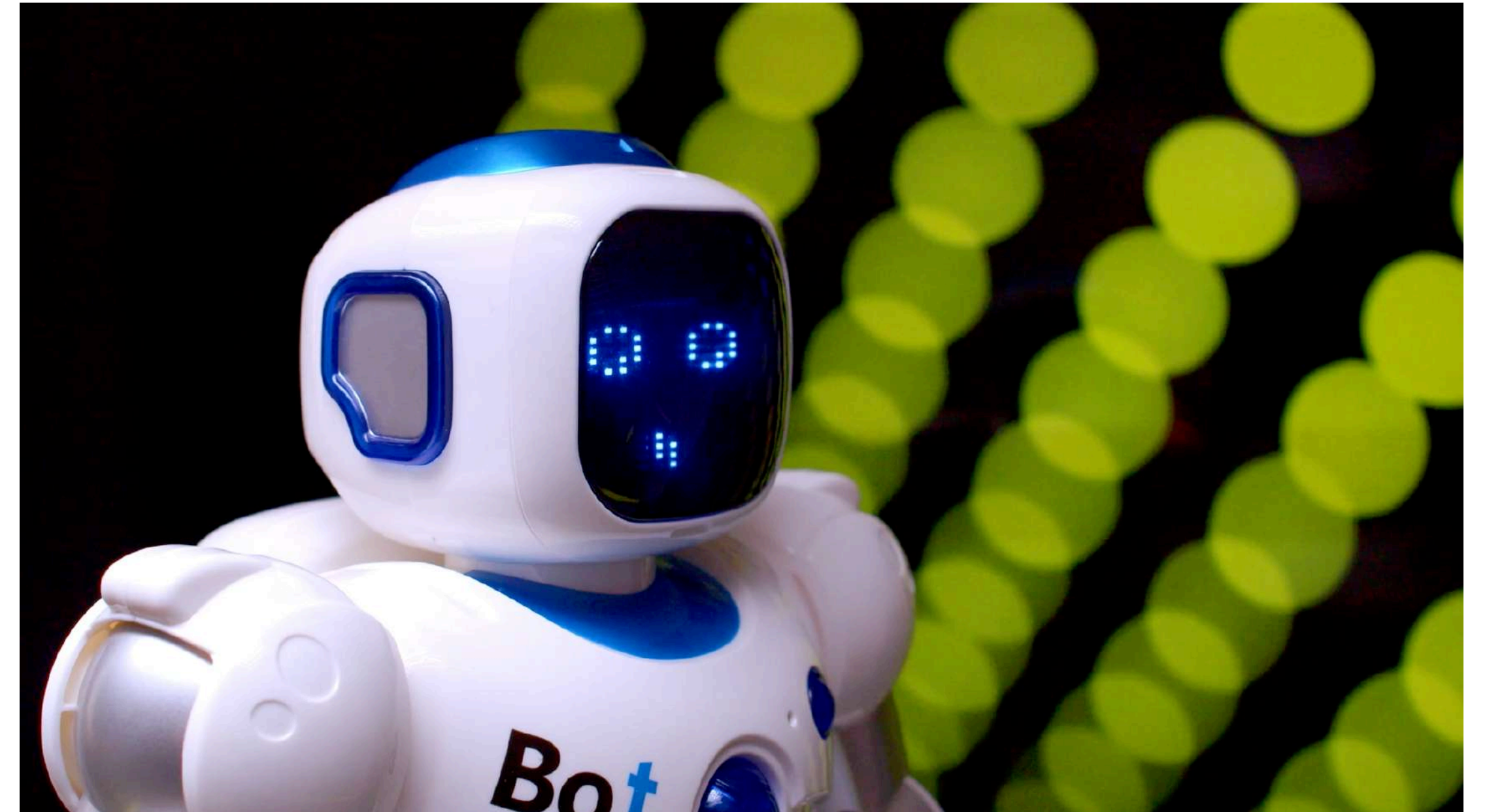


What we
LEARN!

1/ Understanding AI - Pre-Introduction

The Past, Present and future

1. A brief history
2. AI Pioneers
3. AI Timeline and Famous Applications
4. The Thinking Machine - MIT 1961
5. Headline Takeaways



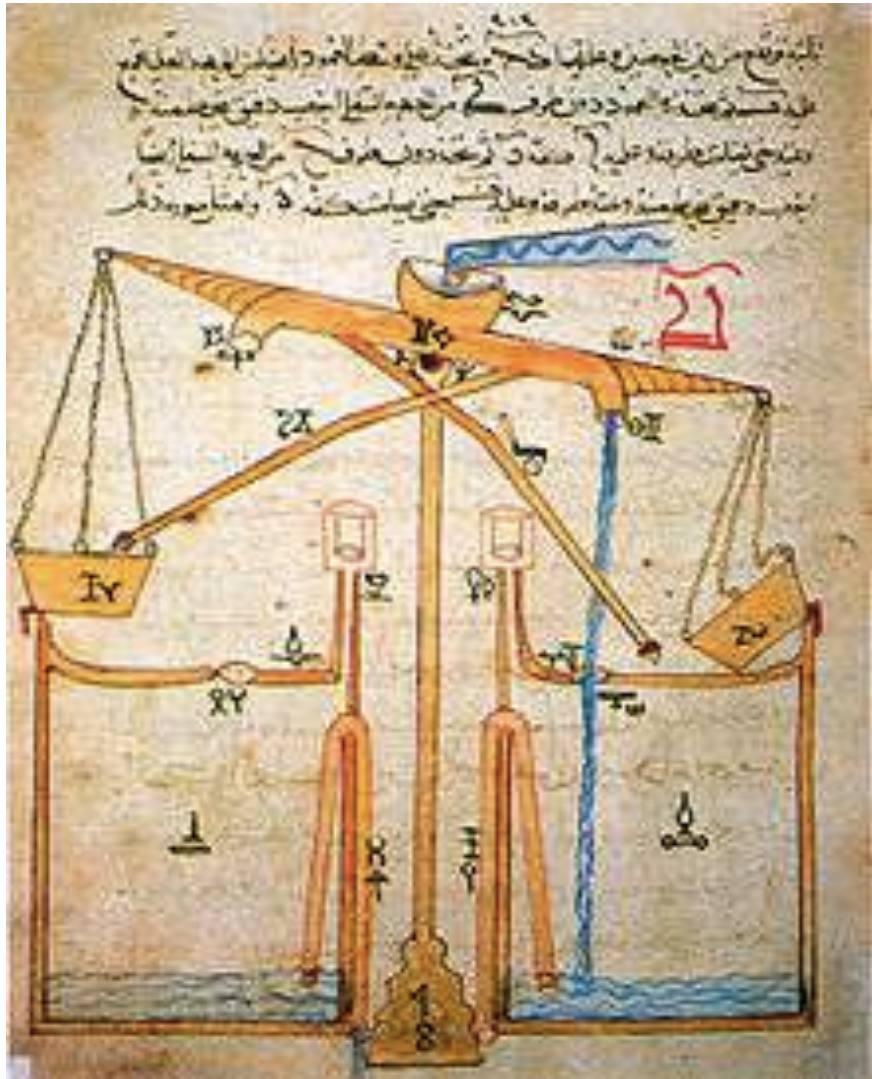


Diagram of a hydropowered perpetual flute from *The Book of Knowledge of Ingenious Mechanical Devices* by Al-Jazari in 1206.



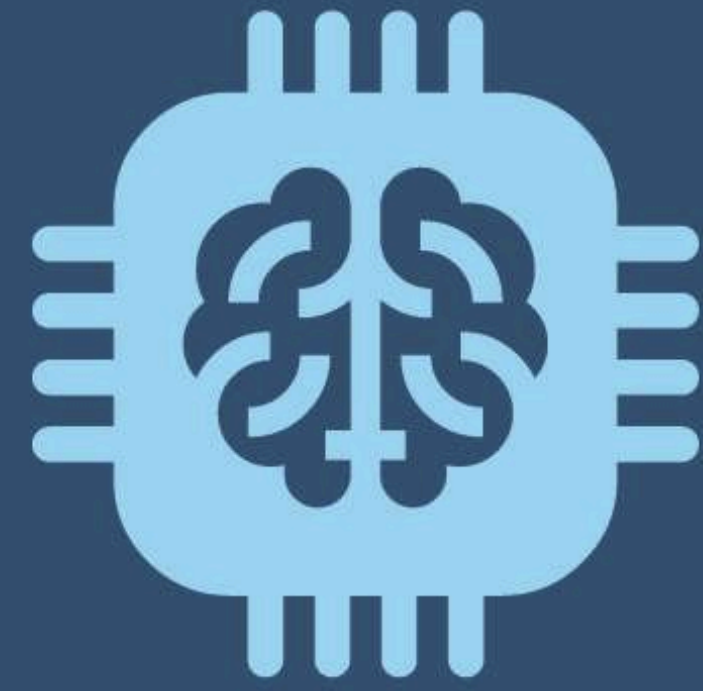
Al-Jazari's Peacock Fountain



Al-Jazari's musical robot band.

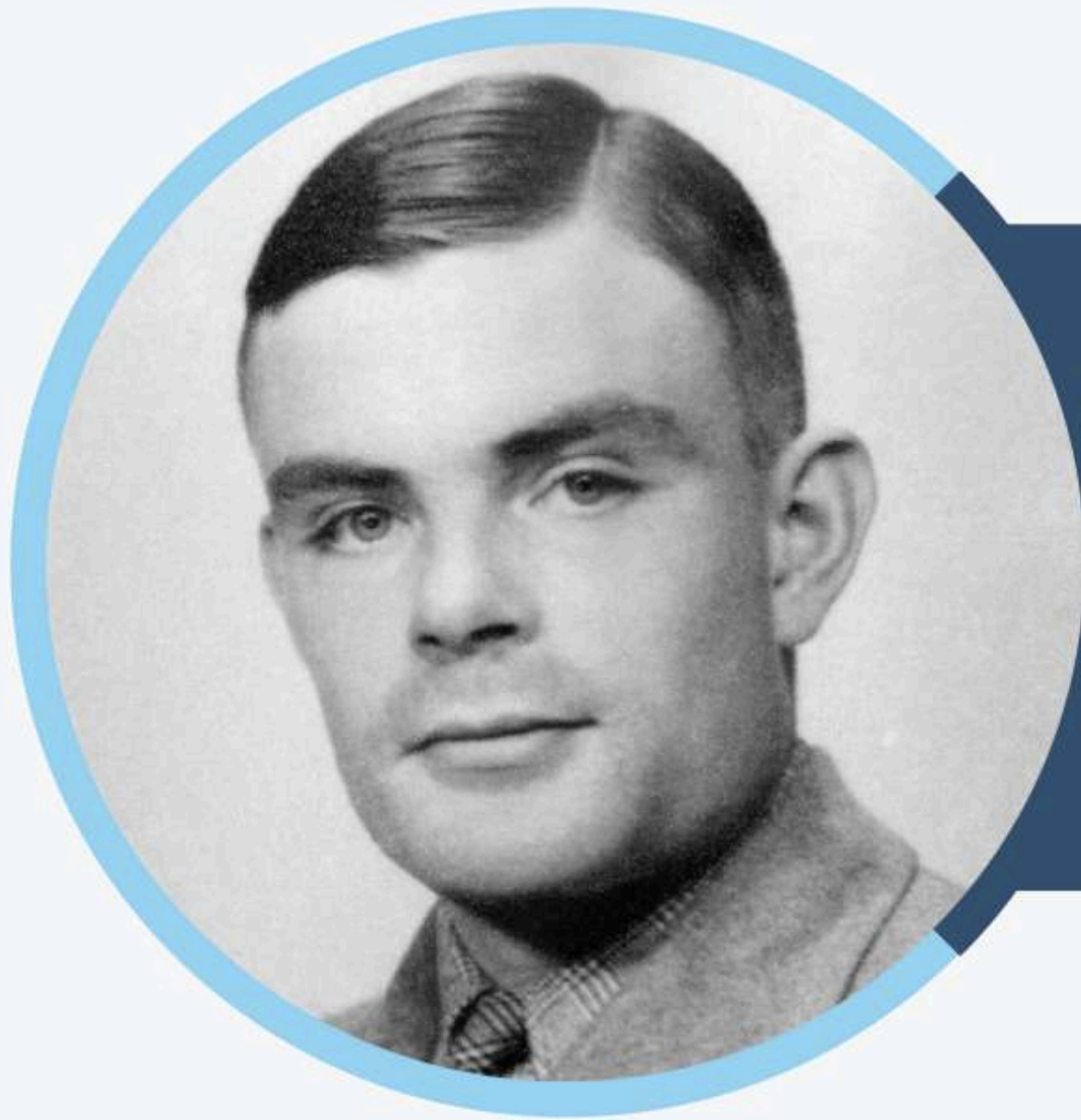


The water-clock of the drummers



AI TIMELINE and PIONEERS OF AI

1912 - 1954

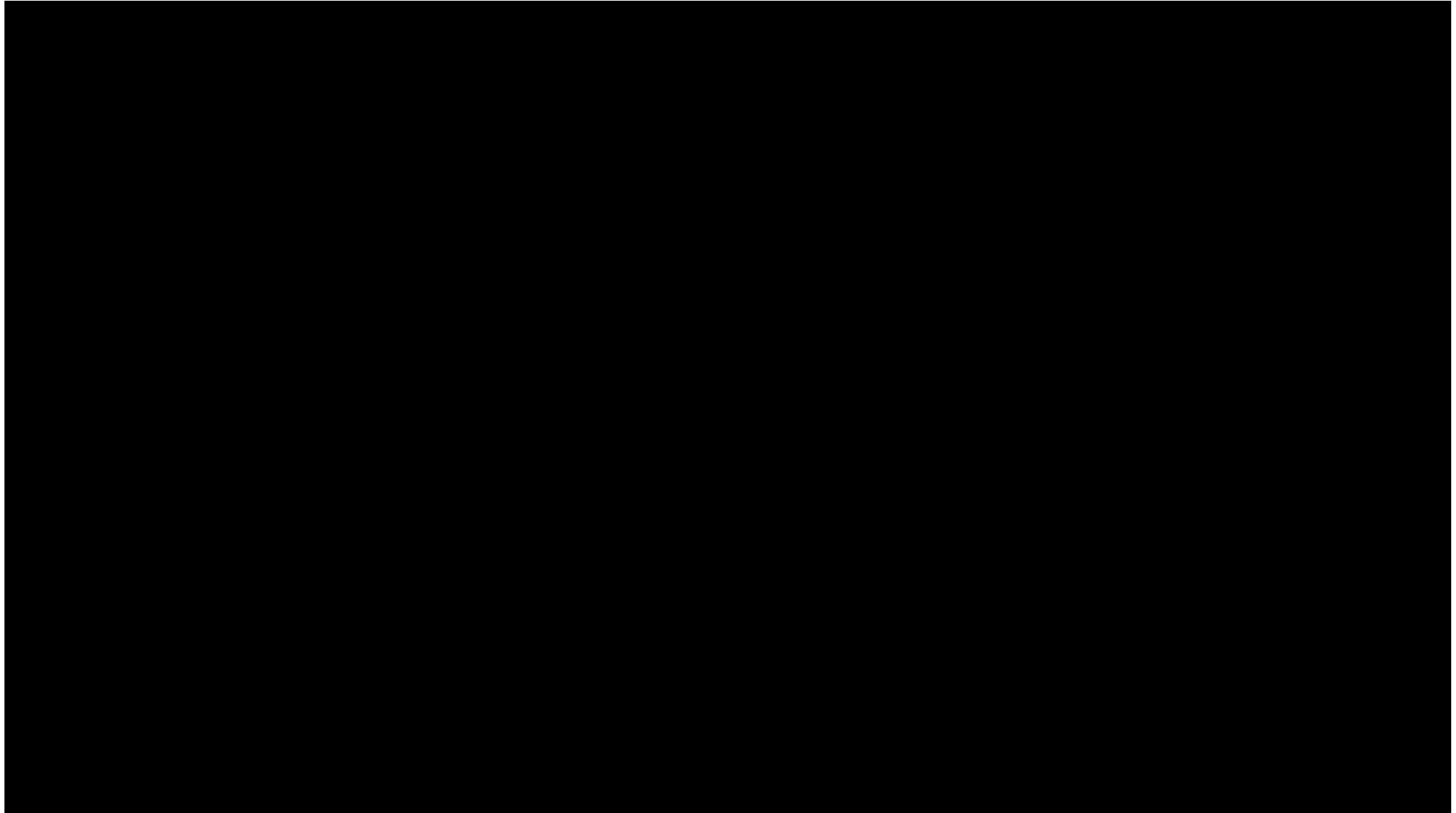


Alan Turing

- Known as the “father of theoretical computer science and artificial intelligence.”
- Developed the Turing Test to test a machine’s ability to appear human.

1/ Understanding AI - Pre-Introduction

The Past, Present and future [Click](#)



Quick Poll...2!

How many career shifts INTO AI are from different fields?

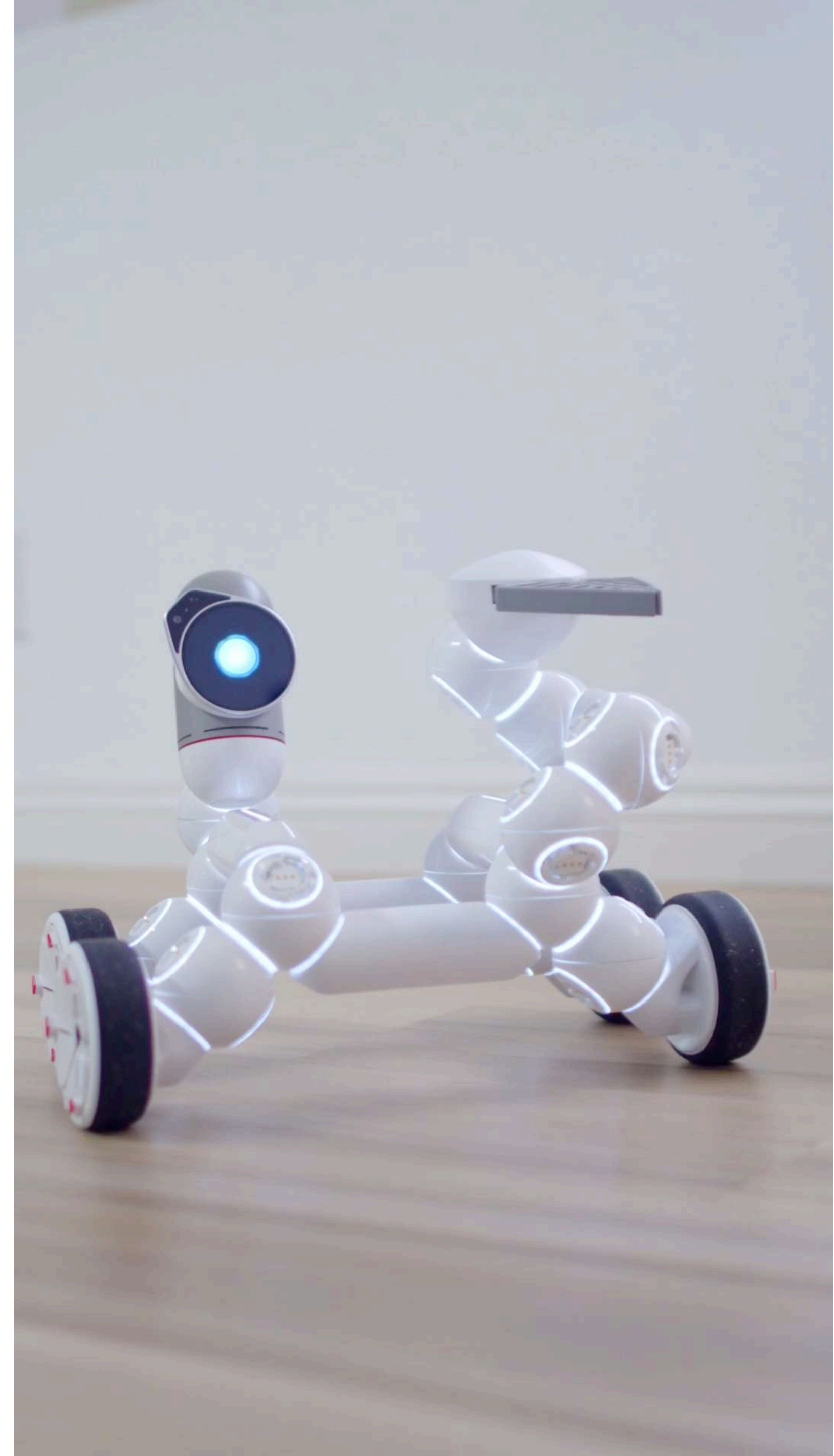
a/ >10%

b/ >25%

c/ >40%

d/ >60%

LinkedIn



Summary

1/ Understanding AI - Pre-Introduction

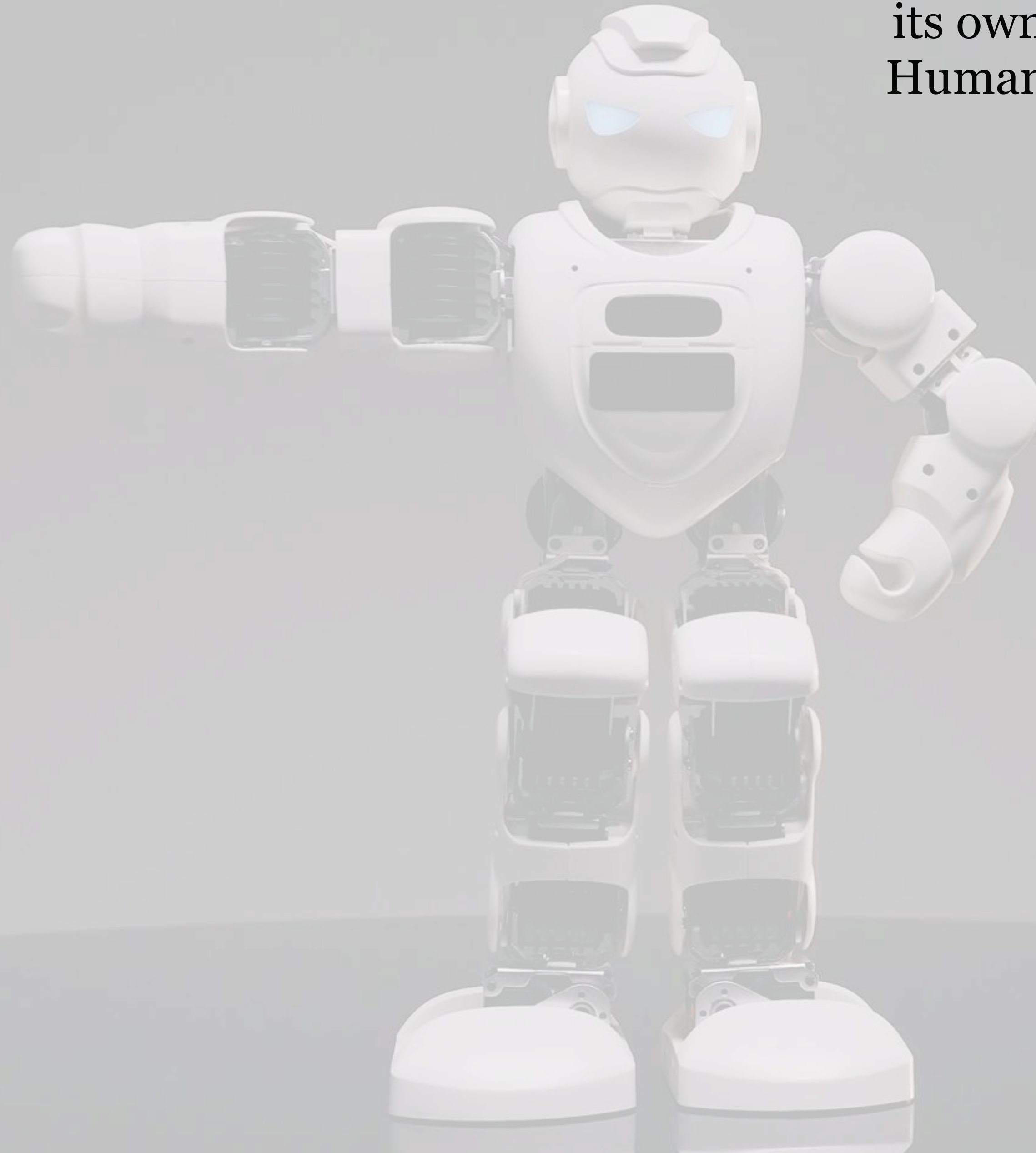
1. Introduction
2. What we know v/s what is real
3. What we know v/s what we can know
4. What we know v/s what we have
5. What we know v/s that thing called wisdom
6. What we know v/s what we learn
7. AI Pioneers
8. AI Timeline and Famous Applications
9. Headline takeaways



“The development of full artificial intelligence could spell the end of the human race....It would take off on its own, and re-design itself at an ever increasing rate. Humans, who are limited by slow biological evolution, couldn't compete, and would be superseded.”



- Stephen Hawking told the BBC



1/ Pre-Introduction
End of Presentation

Artificial Intelligence

Essential AI for Everyone

A Technology-Business-People Playbook!

2/ Understanding AI

Deep-Dive I



Polls



Yeah! Poll time...3!

In 2019, _____ percent of digital transformation initiatives used AI, and significantly more will do so in 2020 and beyond.

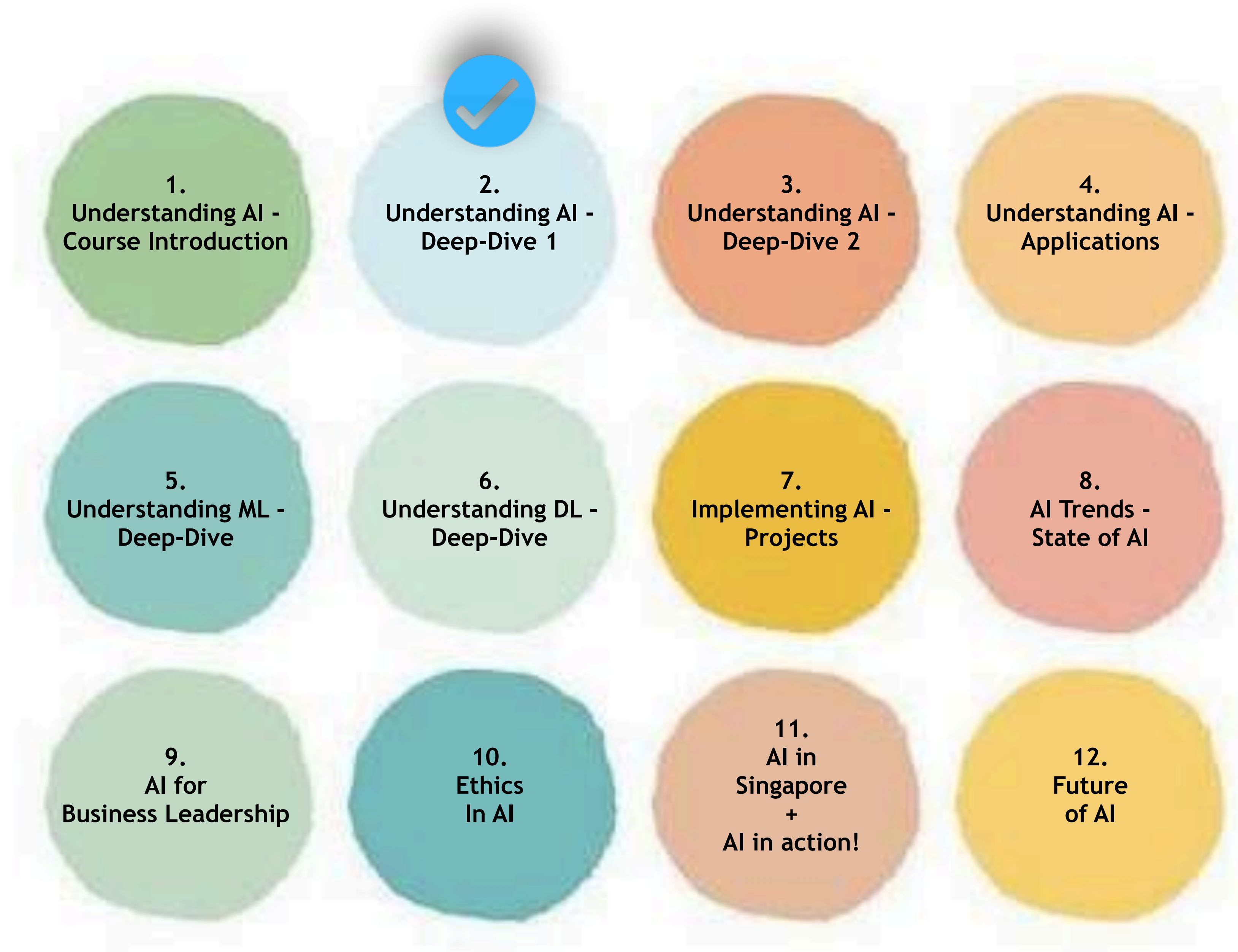
a/ 10%

b/ 20%

c/ 30%

d/ 40%







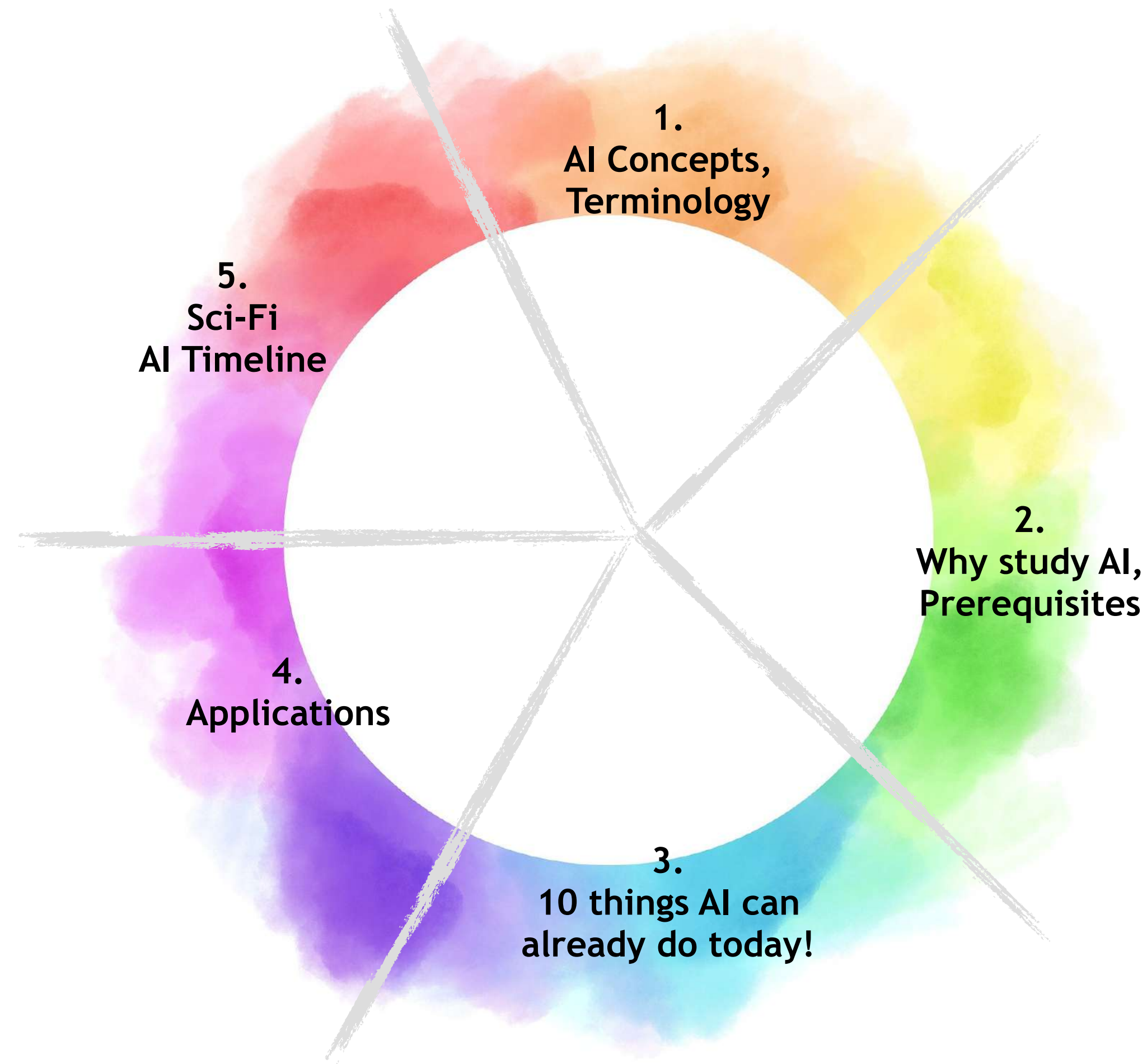
2. Understanding AI- The Basics

2. Understanding AI- The Basics



Demystifying AI

2 - Understanding AI - Deep Dive I



Quick Poll...4!

The pace of technology adoption is expected to remain unabated and may accelerate in some areas. AI figures amongst those on top.

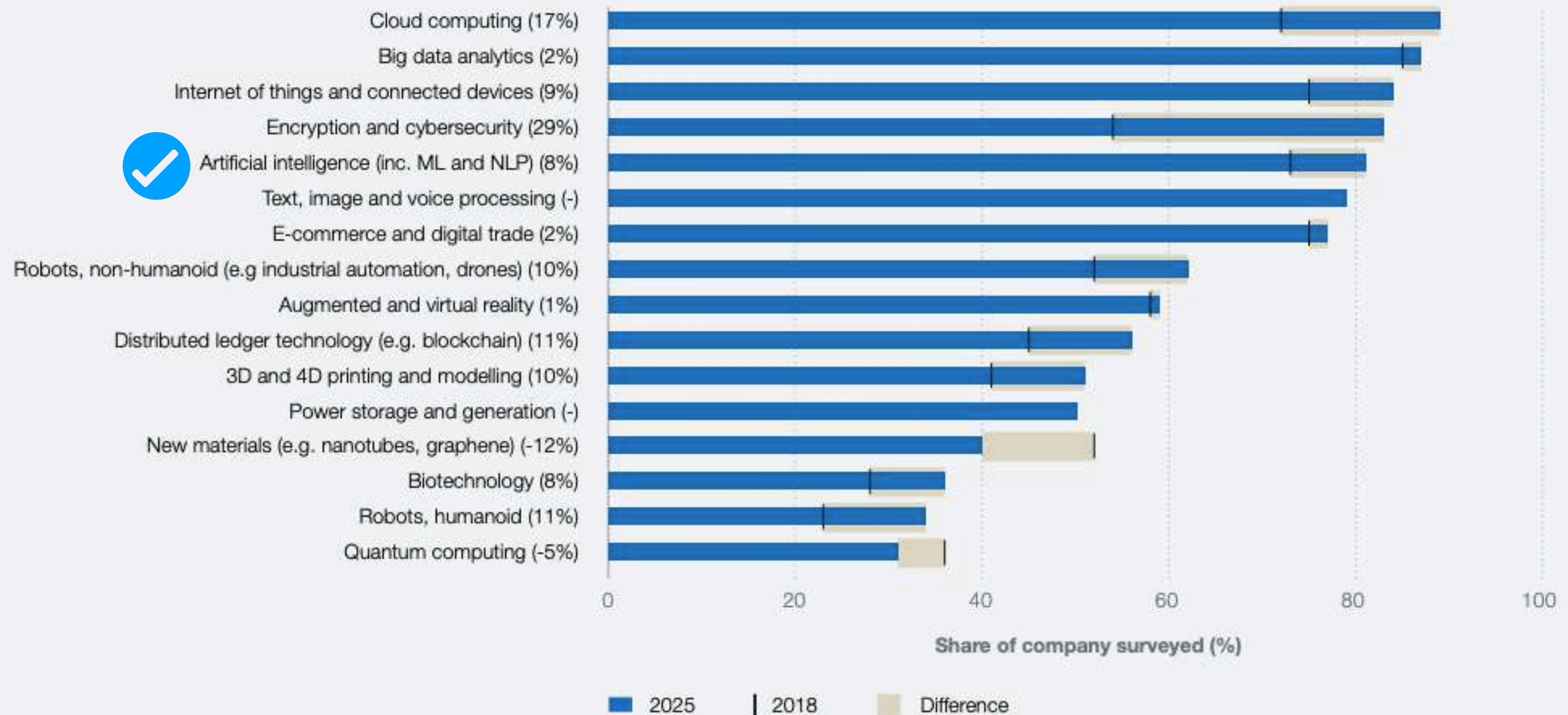
a/ True

b/ False



FIGURE 18

Technologies likely to be adopted by 2025 (by share of companies surveyed)



Source

Future of Jobs Survey 2020, World Economic Forum.

AI - Deep Dive 1

An Introduction

1. The origin of AI
2. Key components
 - Computational systems
 - Data and data management
 - Advanced AI algorithms/ Code
3. Why important
4. Use cases
5. Headline takeaways



AI - Deep Dive 1

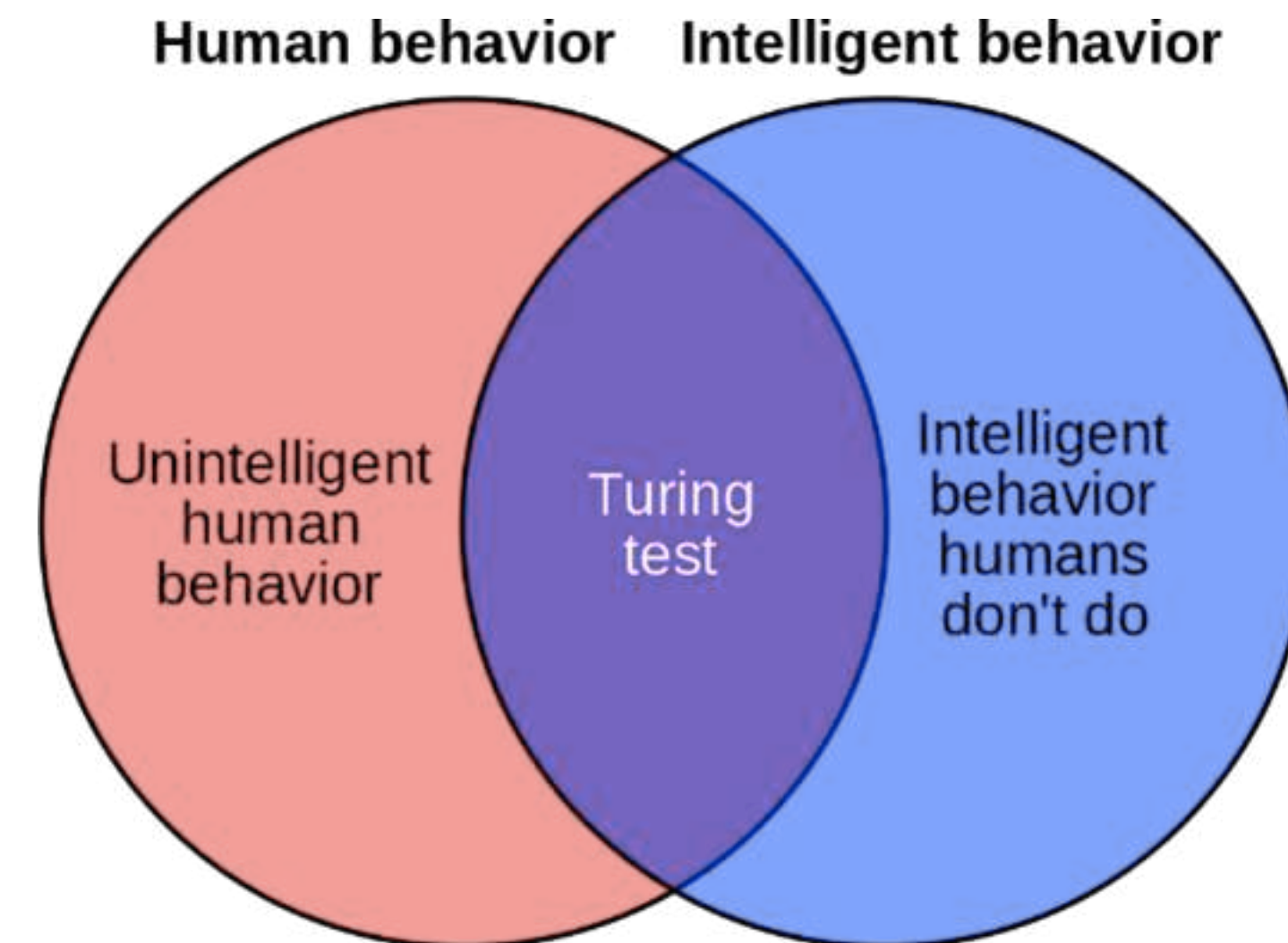
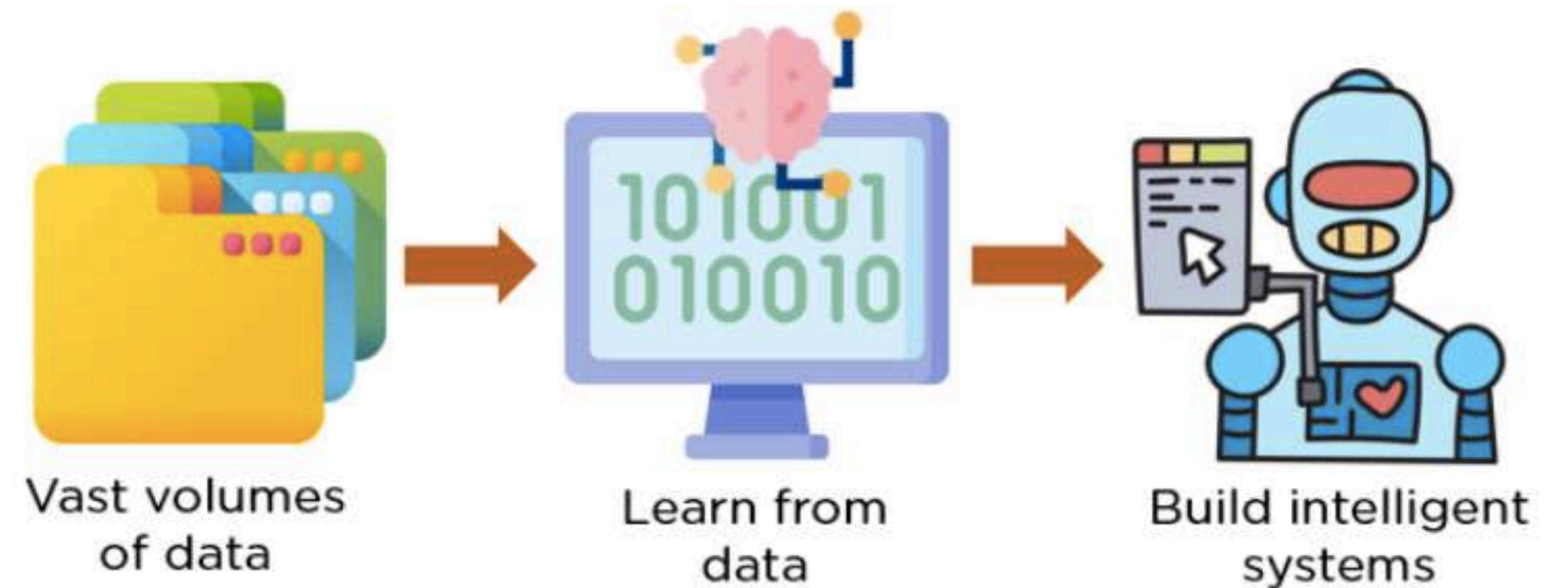
Explaining AI



AI - Deep Dive 1

Some terms

1. AI
2. Logical reasoning
3. Knowledge representation
4. Planning and Navigation
5. Natural Language Processing NLP
6. Perception
7. Emergent Intelligence
8. Tasks performed
9. Headline Takeaways



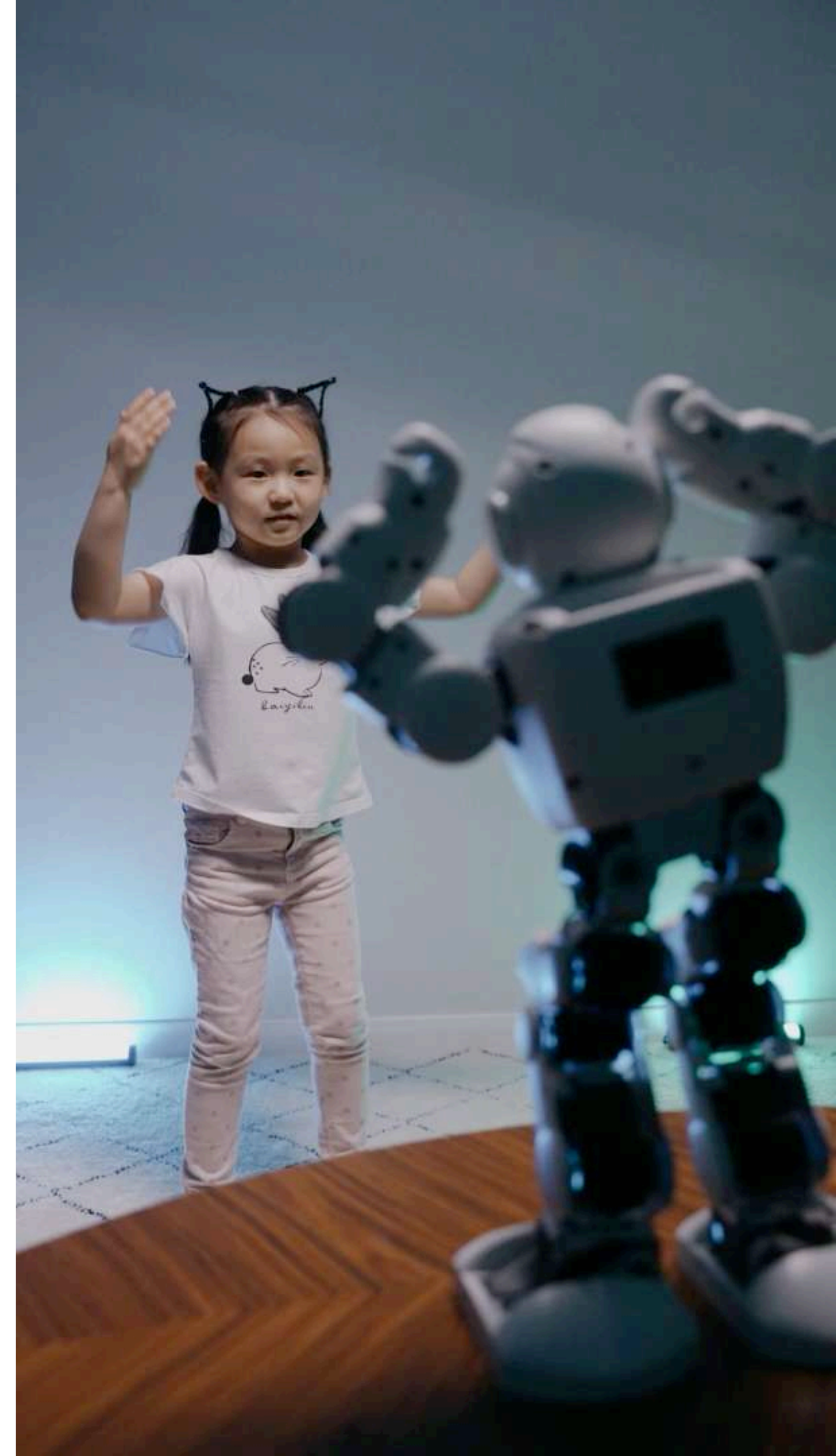


Yeah! Poll time...5!

Artificial intelligence is cited as the top up-skilling need among professionals seeking online continuing education,

a/ True

b/ False



AI - Deep Dive 1

Why study AI

Why Study Artificial Intelligence in Business?

- 71% of organizations and leaders perceive AI and Machine Learning are “game-changers”¹
- 78% of brands have already or are planning to implement AI by 2020²
- Growth of the global AI market is forecast to grow to \$118.6 billion by 2025³

¹ Sources: MemSQL, Accenture, narrativescience.com, cmo.com, pwc.com

² https://www.oracle.com/webfolder/s/delivery_production/docs/FY16h1/doc35/CXResearchVirtualExperiences.pdf

³ tractica.com

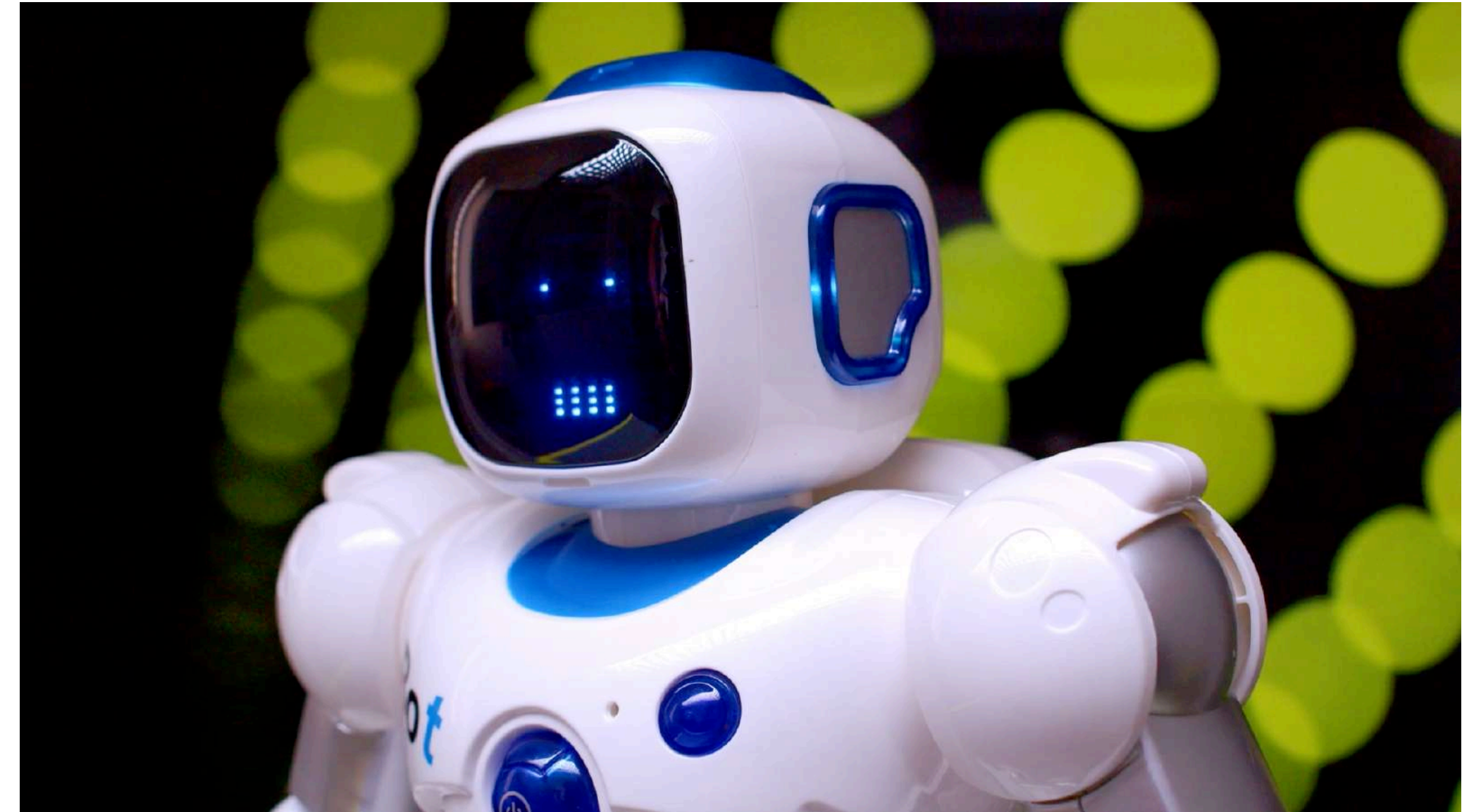


AI - Deep Dive 1

Pre-requisites

Programming

1. Basic coding concepts.
2. Right language
 - Language demonstrating low level concepts
 - Avoid popular languages
 - Choose a lang on basis of goals
3. Hands-on coding, not reading
4. Master fundamentals
5. Write code on paper
6. Language features v/s libraries.
7. Headline takeaways



AI - Deep Dive 1

Pre-requisites

Python

1. Features and advantages
2. Why AI and Python
3. Decoding Python
4. Python Libraries for General AI
5. Python for ML
6. Python v/s C++ for AI
7. LISP for AI
8. Java with AI
9. Headline takeaways



→ **Think like human**

The exciting new effort to make computers think... machines with minds, in the full and literal sense. [Haugeland, 1985].

→ **Think Rationally**

The study of the computations that make it possible to perceive, reason, and act. [Winston, 1992].

→ **Act Humanly**

The study of how to make computers do things at which, at the moment, people are better. [Rich & Knight, 1991].

→ **Act Rationally**

The branch of computer science that is concerned with the automation of intelligence behaviour. [Luger & Stubblefield, 1993].



[Click](#)

Yeah! Poll time...6!

The value of AI technology in FinTech is expected to reach

a/ > 5 billion

b/ > 10 billion

c/ >15 billion

d/ > 20 billion

SOURCE: RESEARCH AND MARKETS



AI - Deep Dive 1

Breakout Room 2!

Do robots qualify as people?

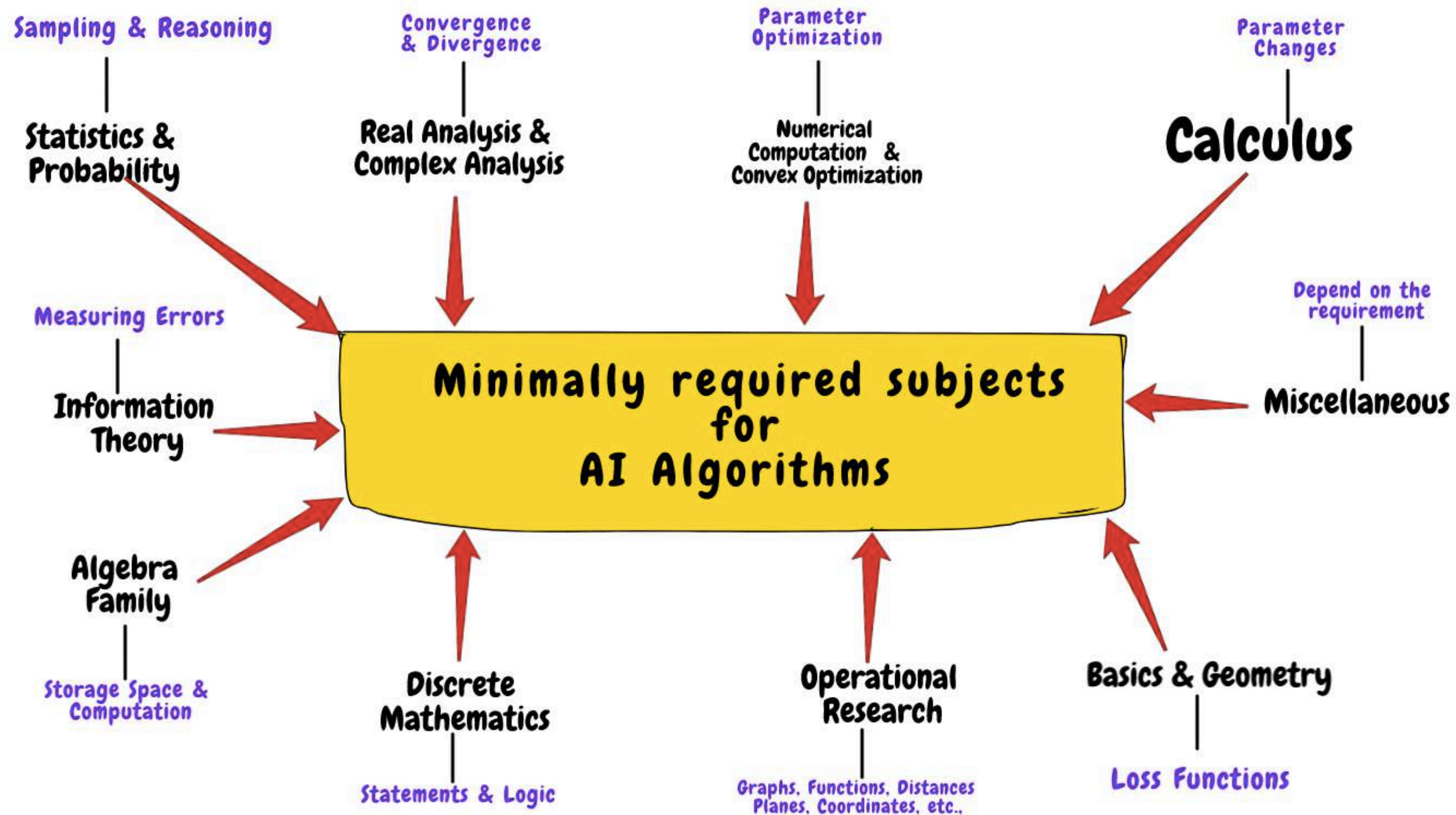
Could we consider
granting “**personhood**”
to sophisticated, autonomous robots?



AI - Deep Dive 1

Pre-requisites

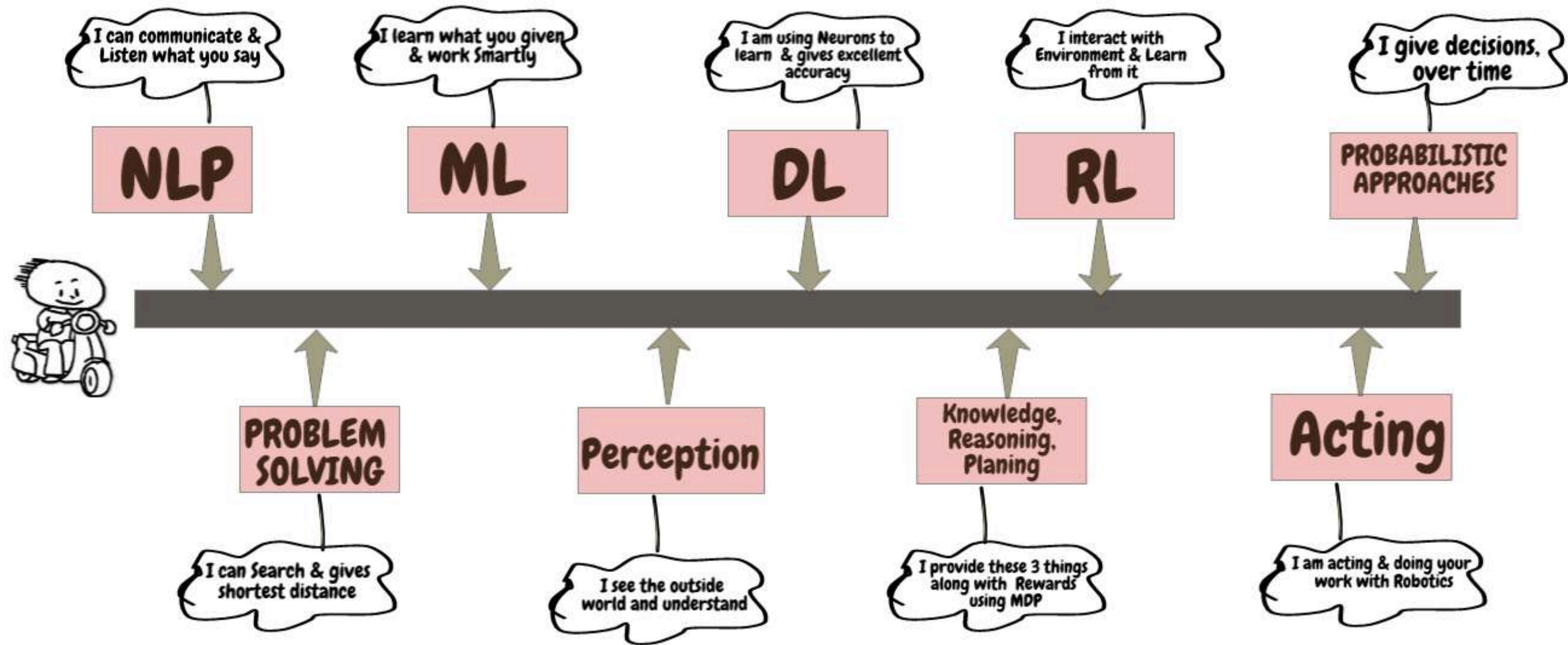
Mathematics



AI - Deep Dive 1

Pre-requisites

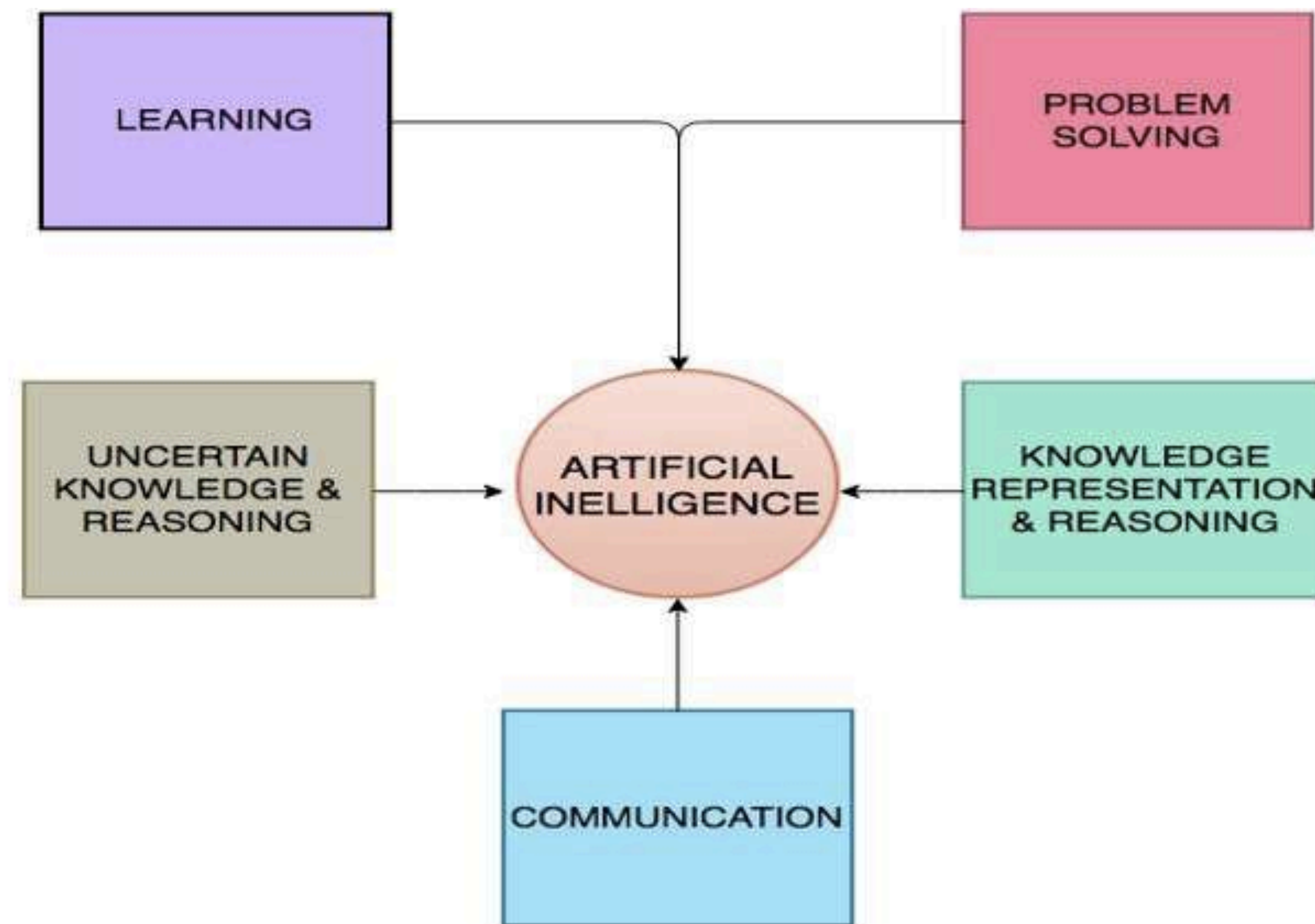
Mathematics



AI - Deep Dive 1

Pre-requisites

Mathematics



Broad categorization of AI fields into 5 groups

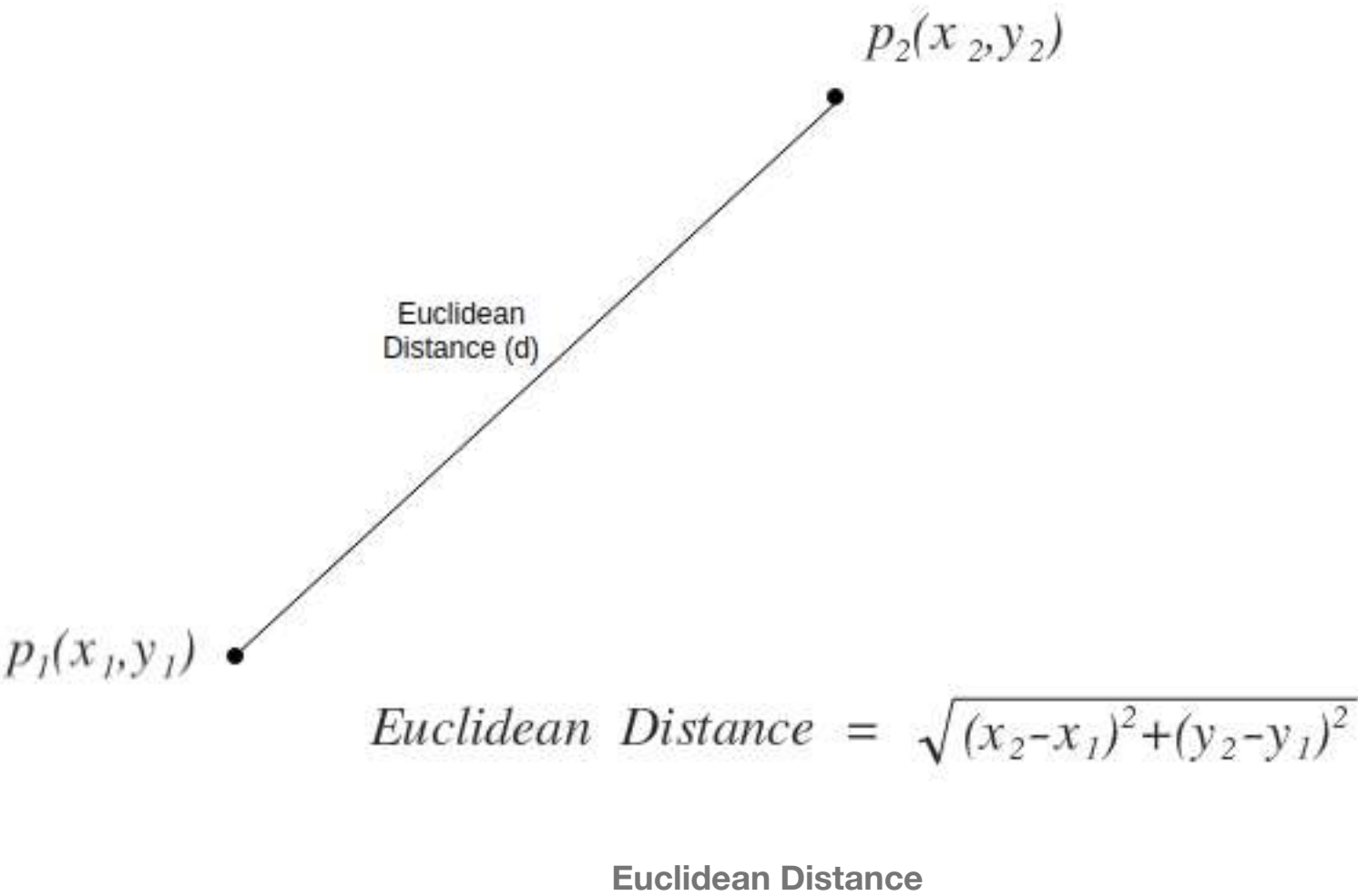
AI - Deep Dive 1

Pre-requisites

Mathematics

Basics & Geometry

Requires to to understand the concepts, notations and advanced subjects.



Algebra

Abstract, Linear and Vector Algebra. Linear Algebra is a computation tool in AI

Concepts	Types and Usages
Vector	Stores your data in n-dimensions
Vector Norms	L1, L2, L1+L2 - applies in Regularization for ML Algorithms, Frobenius and max norm
Vector Product Rules	Dot Product, Cross Product, Cosine, etc., -> Checking for the similarity of Vectors
Unit Vector	Checking and using in various algorithms for normalization

Concepts, Types and Usages of Vectors



AI - Deep Dive 1

Pre-requisites

Mathematics

Stats & Probability

Deals with Reasoning and Uncertainty

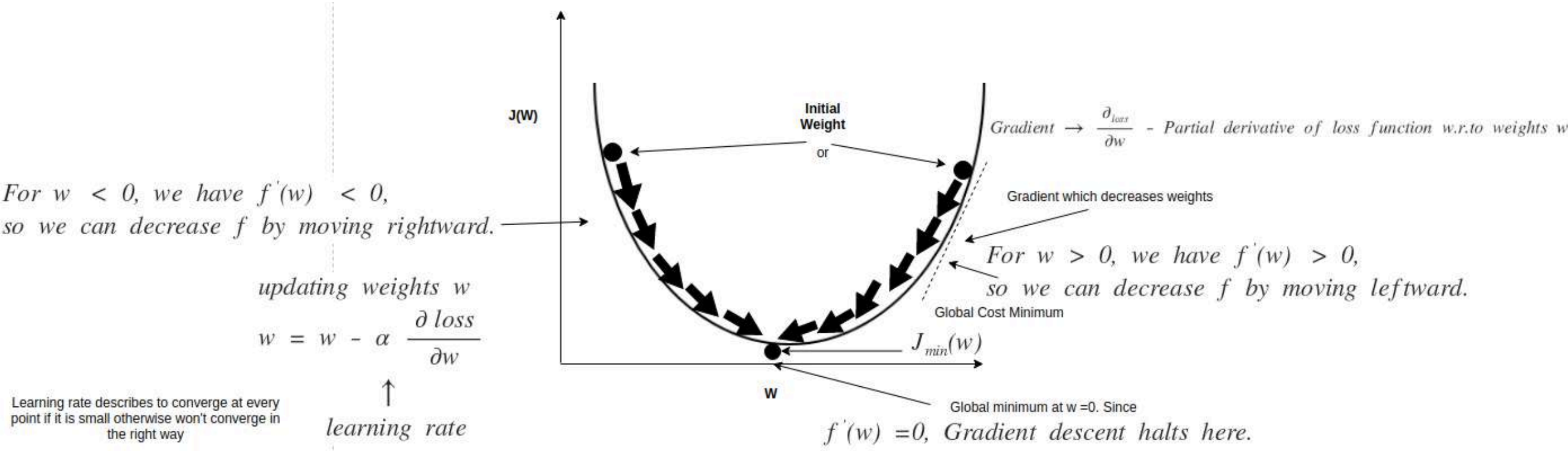
Concepts

Descriptive statistics	→	It is a summary statistic that quantitatively describes or summarizes the features from a collection of information.
Probability Theory	→	It provides the analysis of random phenomena. The outcome of random event cannot be determined before it occurs. In AI random Events used as Vectors.
Chain Rule	→	Evaluating the dependencies in a sequence of tokens
Bayesian Rule	→	Using for Text classification eg: e-mail: spam or ham
Distributions	→	Data source and provides various kinds of data to use in AI applications Eg: Data source for weights, Normal Distribution to get Normalized Data
Sampling	→	Sampling is the process of study of population/data based on Samples instead of individual evaluation. It has different various usages in ML and DL.
Hypothesis Testing	→	To draw the conclusion or inference about the data.
Estimators (MLE/MAP)	→	Estimating the value of a parameter in two ways MLE and MAP. MLE single value estimator and MAP multiple value estimator.

Major Statistical Concepts used in AI

Calculus

Deals with Changes in the parameters, functions , errors and Approximations.



Gradient Descent Algorithm working on Parameters or Weights in an ML/DL algorithm



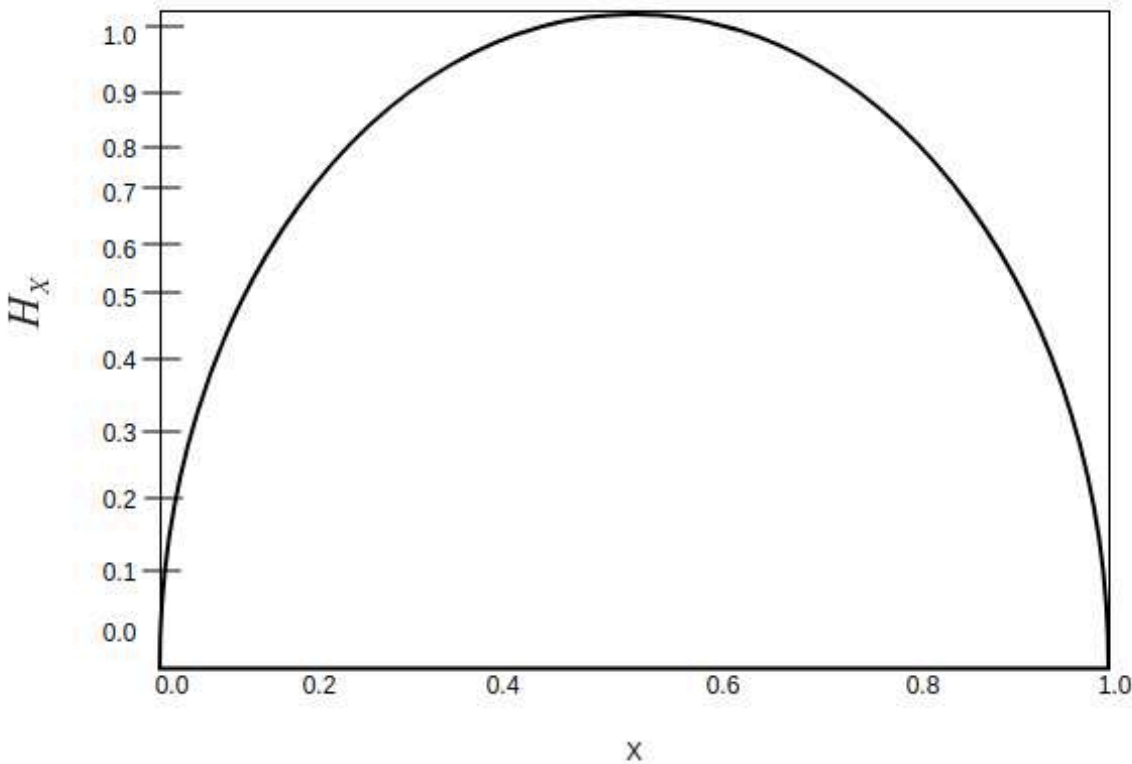
AI - Deep Dive 1

Pre-requisites

Mathematics

Information Theory

Uses to measuring the uncertainty in algorithms



Shannon Entropy

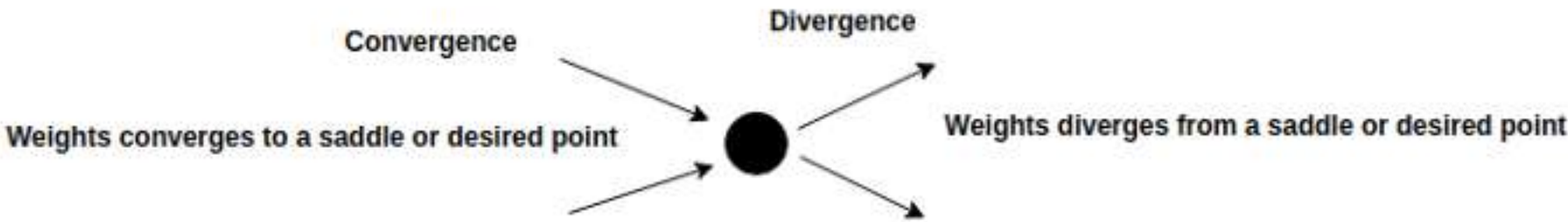
- Low When Distributions that are closer to deterministic.
- High when distributions that are close to uniform.

$$\text{Entropy } H_X = - \sum_{\forall x \in X} P(x) \log_2 P(x)$$

Entropy in Classification Problems

Real Analysis & Complex Analysis

Uses for Convergence/Divergence



Converge and Diverge parameters in a model



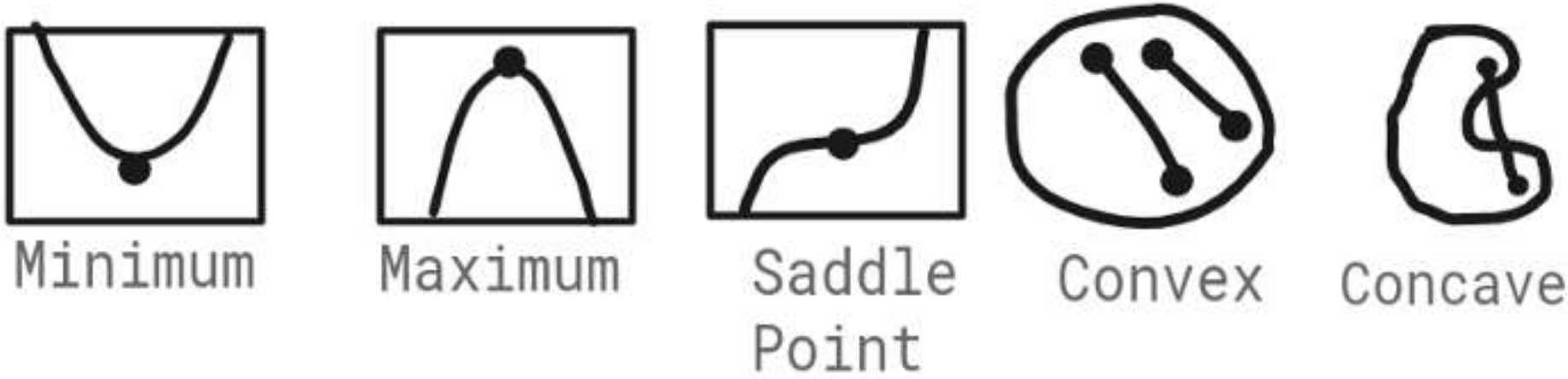
AI - Deep Dive 1

Pre-requisites

Mathematics

Numerical Computation & Convex Optimization

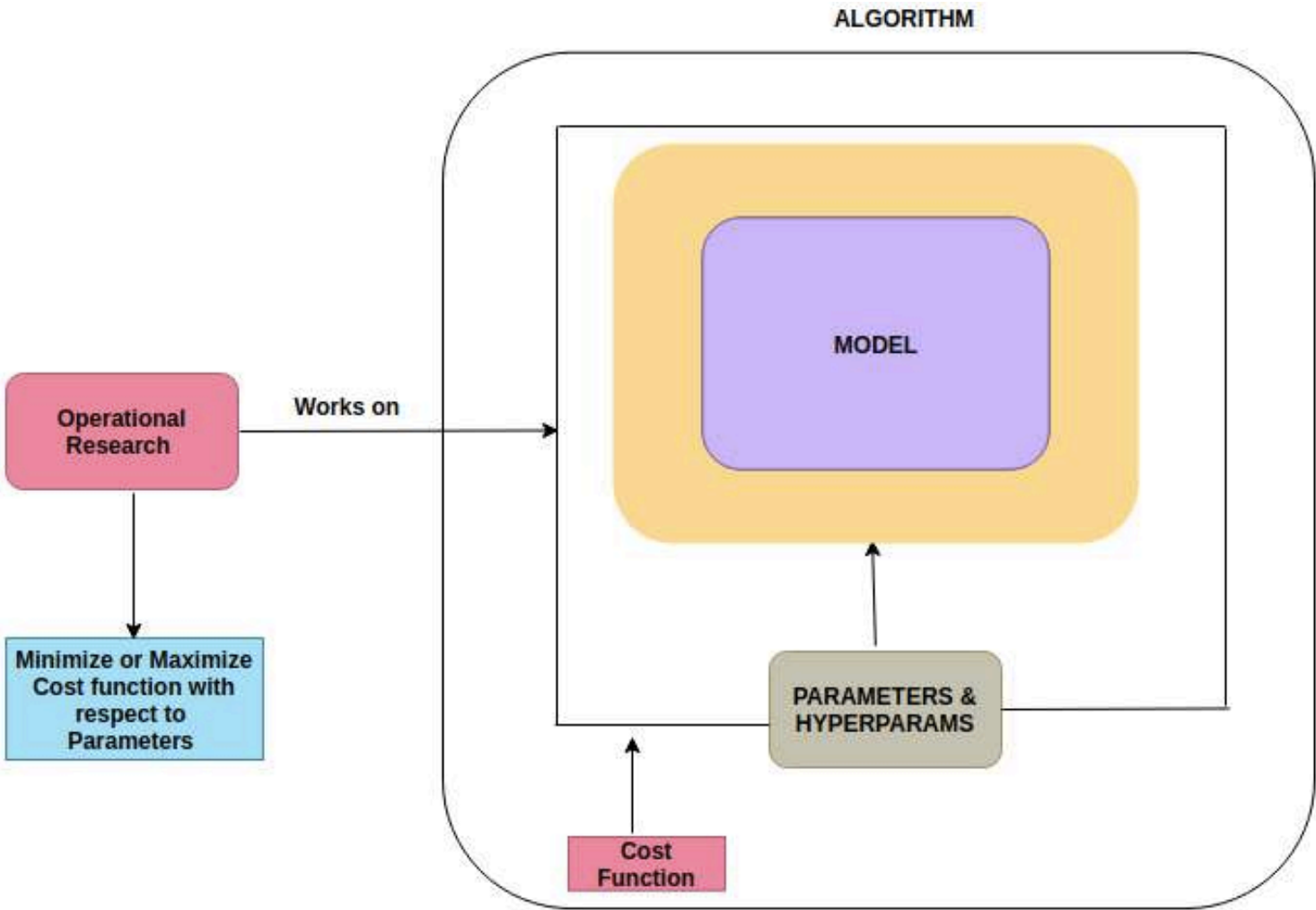
Computation methods & Optimizing with respect to constraints



Graphically Minimum, Maximum, Saddle Point, Convex ,Concave

Operational Research

Optimize Cost (minimize / maximize)



OR works on Typical ML/DL algorithm

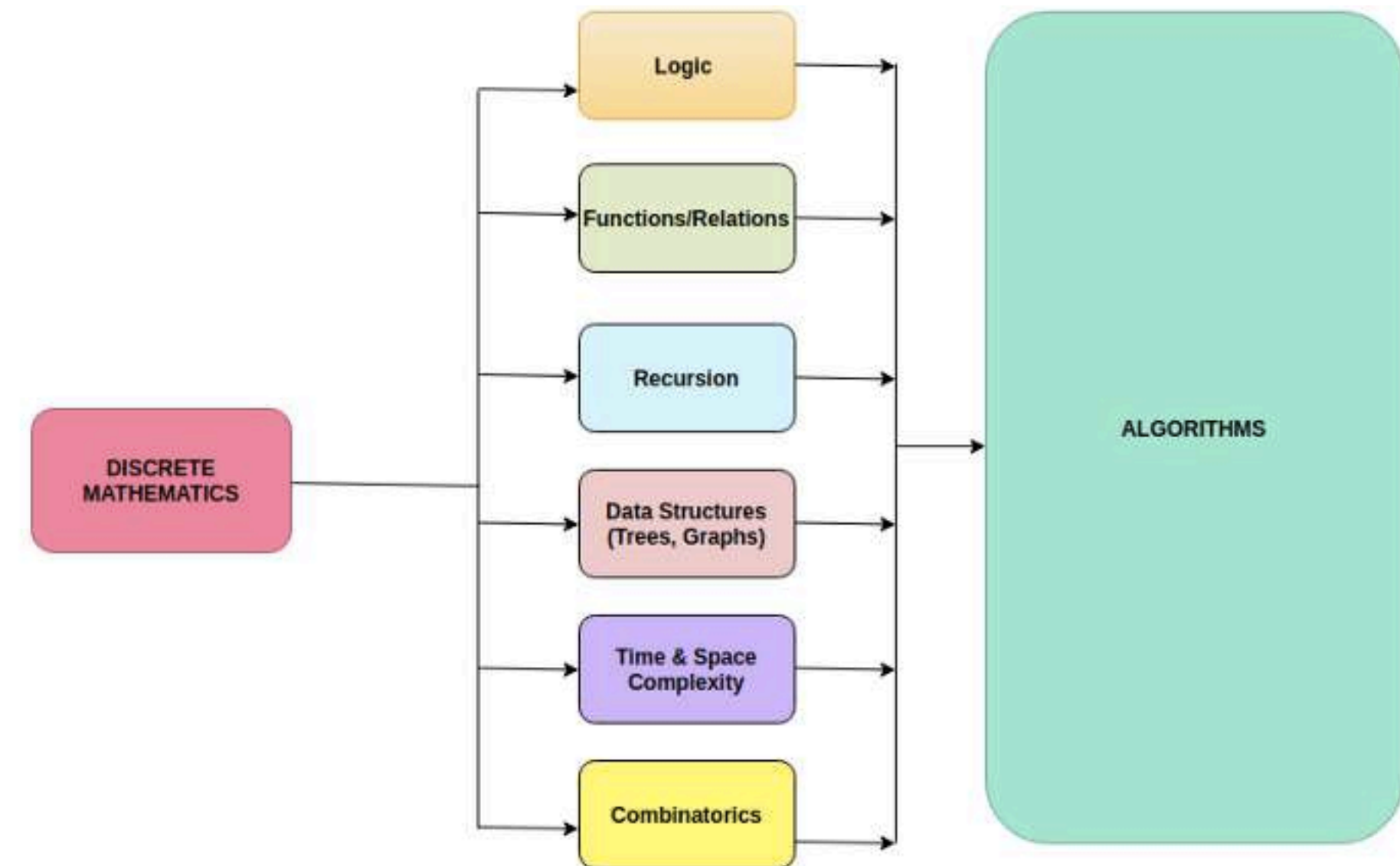
AI - Deep Dive 1

Pre-requisites

Mathematics

Discrete Mathematics

Basics for Logic, Algorithms and proofs



DM Concepts applying in Algorithms for various usages

Miscellaneous

There are many subjects/concepts will come into picture and have to learn as and when required

AI - Deep Dive 1

Pre-requisites

10 breakthroughs in statistics that have helped drive the revolution in AI

1. Hirotugu Akaike (1973). [*Information Theory and an Extension of the Maximum Likelihood Principle*](#). Proceedings of the Second International Symposium on Information Theory.

2. John Tukey (1977). [*Exploratory Data Analysis*](#).

3. Grace Wahba (1978). [*Improper Priors, Spline Smoothing and the Problem of Guarding Against Model Errors in Regression*](#). Journal of the Royal Statistical Society.

4. Bradley Efron (1979). [*Bootstrap Methods: Another Look at the Jackknife*](#). Annals of Statistics.

5. Alan Gelfand and Adrian Smith (1990). [*Sampling-based Approaches to Calculating Marginal Densities*](#). Journal of the American Statistical Association.

6. Guido Imbens and Joshua Angrist (1994). [*Identification and Estimation of Local Average Treatment Effects*](#). Econometrica.

7. Robert Tibshirani (1996). [*Regression Shrinkage and Selection Via the Lasso*](#). Journal of the Royal Statistical Society.

8. Leland Wilkinson (1999). [*The Grammar of Graphics*](#).

9. Ian Goodfellow, Jean Pouget-Abadie, Mehdi Mirza, Bing Xu, David Warde-Farley, Sherjil Ozair, Aaron Courville, and Yoshua Bengio (2014). [*Generative Adversarial Networks*](#). Proceedings of the International Conference on Neural Information Processing Systems.

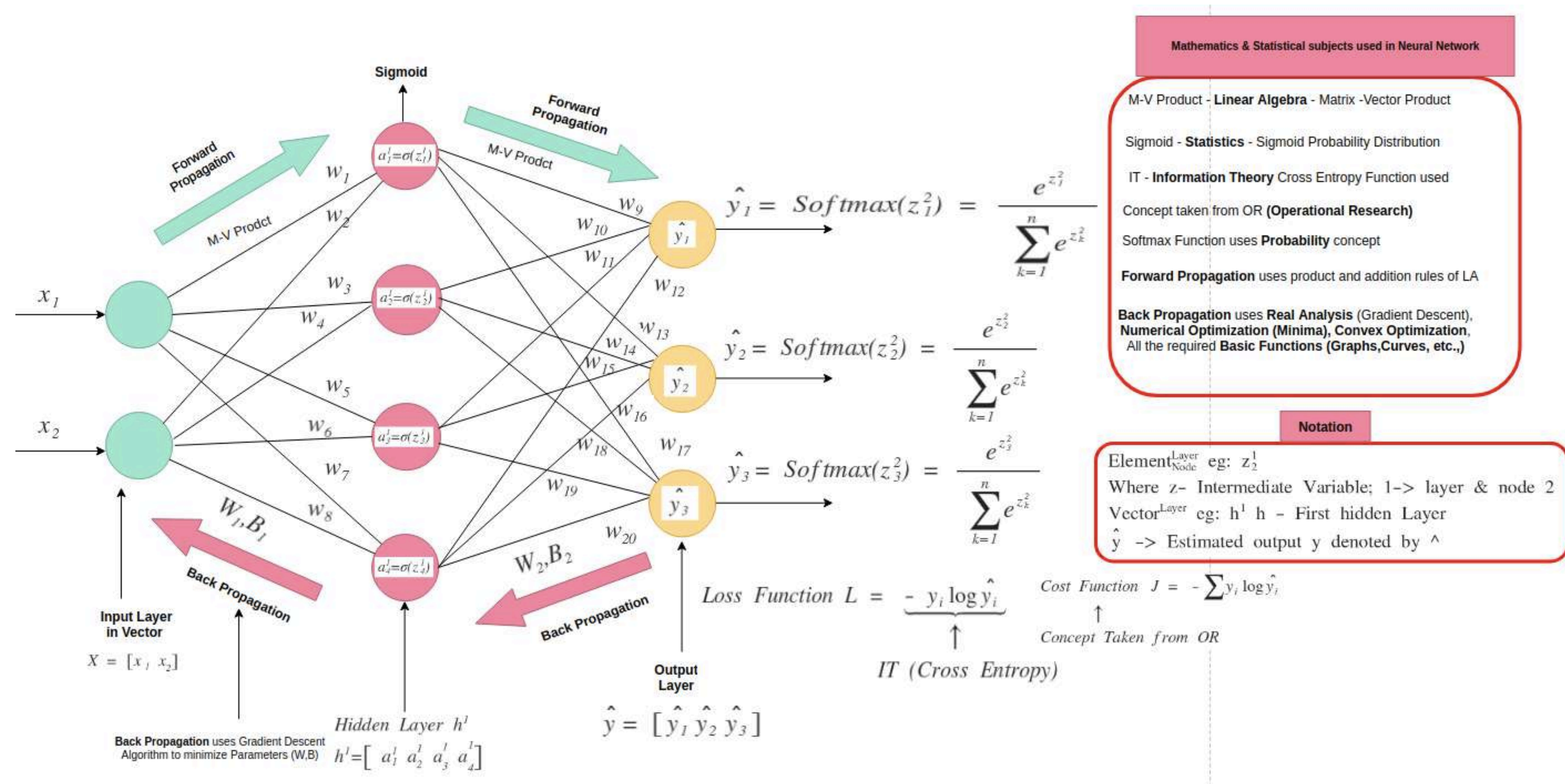
10. Yoshua Bengio, Yann LeCun, and Geoffrey Hinton (2015). [*Deep Learning*](#). Nature.



AI - Deep Dive 1

Pre-requisites

Applied Mathematical Concepts in Neural Networks



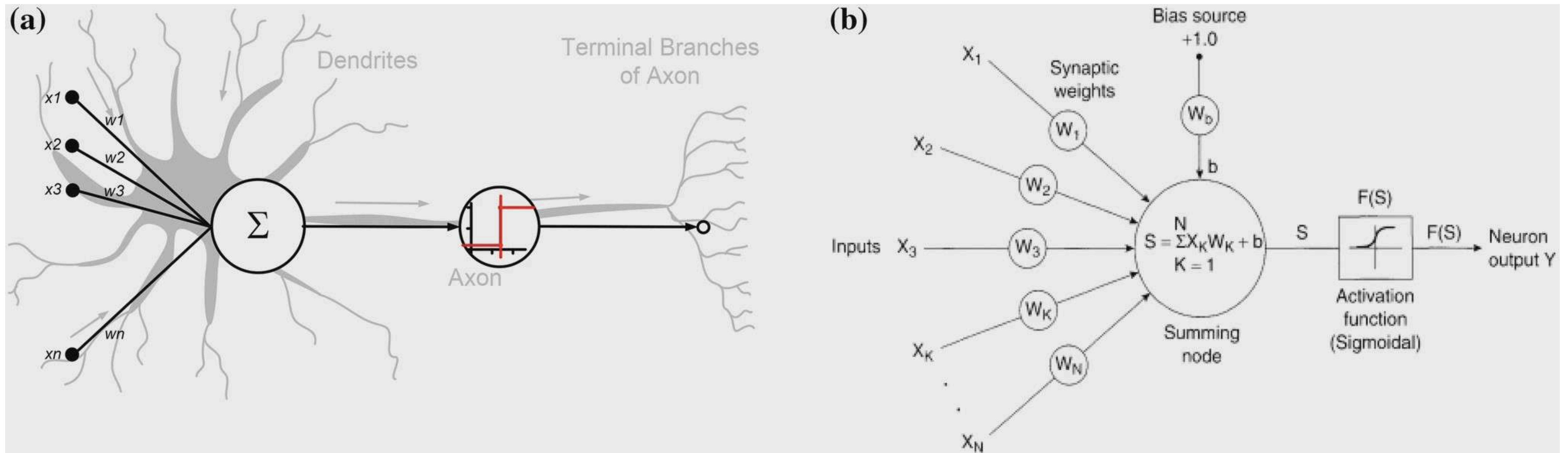
Neural Network Architecture for Multi-class Classification



AI - Deep Dive 1

Pre-requisites

Applied Mathematical Concepts in Neural Networks



(a) Biological Neural Network (BNN) & (b) Artificial Neural Network (ANN) and representing in BNN

AI - Deep Dive 1

Pre-requisites

Databases for Artificial Intelligence

Srishty Choudhary *et al*, International Journal of Computer Science and Mobile Computing, Vol.5 Issue.3, March- 2016, pg. 67-70

Available Online at www.ijcsmc.com

International Journal of Computer Science and Mobile Computing



A Monthly Journal of Computer Science and Information Technology

ISSN 2320-088X
IMPACT FACTOR: 5.258

IJCSMC, Vol. 5, Issue. 3, March 2016, pg.67 – 70

DATABASES FOR ARTIFICIAL INTELLIGENCE

Srishty Choudhary, Uday Patkar

BVCOEL, INDIA

BVCOEL, INDIA

srishtychoudhary05@gmail.com

patkarudayc@gmail.com

Abstract- The basic motto behind implementing artificial intelligence is to create expert systems and to implement human intelligence in machines. An intelligent robot is a machine able to extract information from its environment. One can study this to know more about themselves and how data are stored and which system is used here.

Keywords: - AI (Artificial intelligence), RDMS (Relational database management system), DBMS (Database management system), IDMS (Intelligent database management system), HIPM (Human information processing model), DPM (Data processing model).

I. INTRODUCTION

Artificial intelligence is a branch of science or rather advanced science which deals with how intelligence can be implemented. But after implementing next important aspect that should be made confront is how data which is generated will be stored and for that we need databases. Database is basically a pool of data which stores data in both sequential and non-sequential format.

II. THEORETICAL BACKGROUND

Data is collection of bits and bytes of information and a database is an organised collection of data. On the broader side a Database management system (DBMS) is a computer software application that interacts with the user, other applications, and the database itself to capture and analyse data. DBMS permits applications to define, access, and update data through a Data definition language (DDL) and Data manipulation language (DML) combined into a declarative query language such as the relational query language (SQL). SQL is an ANSI standard for accessing and manipulating the information stored in relational databases. The relational database stores the data in the form of tables and records and often that data are called as structured data and on the contrary non-relational databases stores data in the form of documents and is often termed as non-structured or semi-structured data.



AI - Deep Dive 1

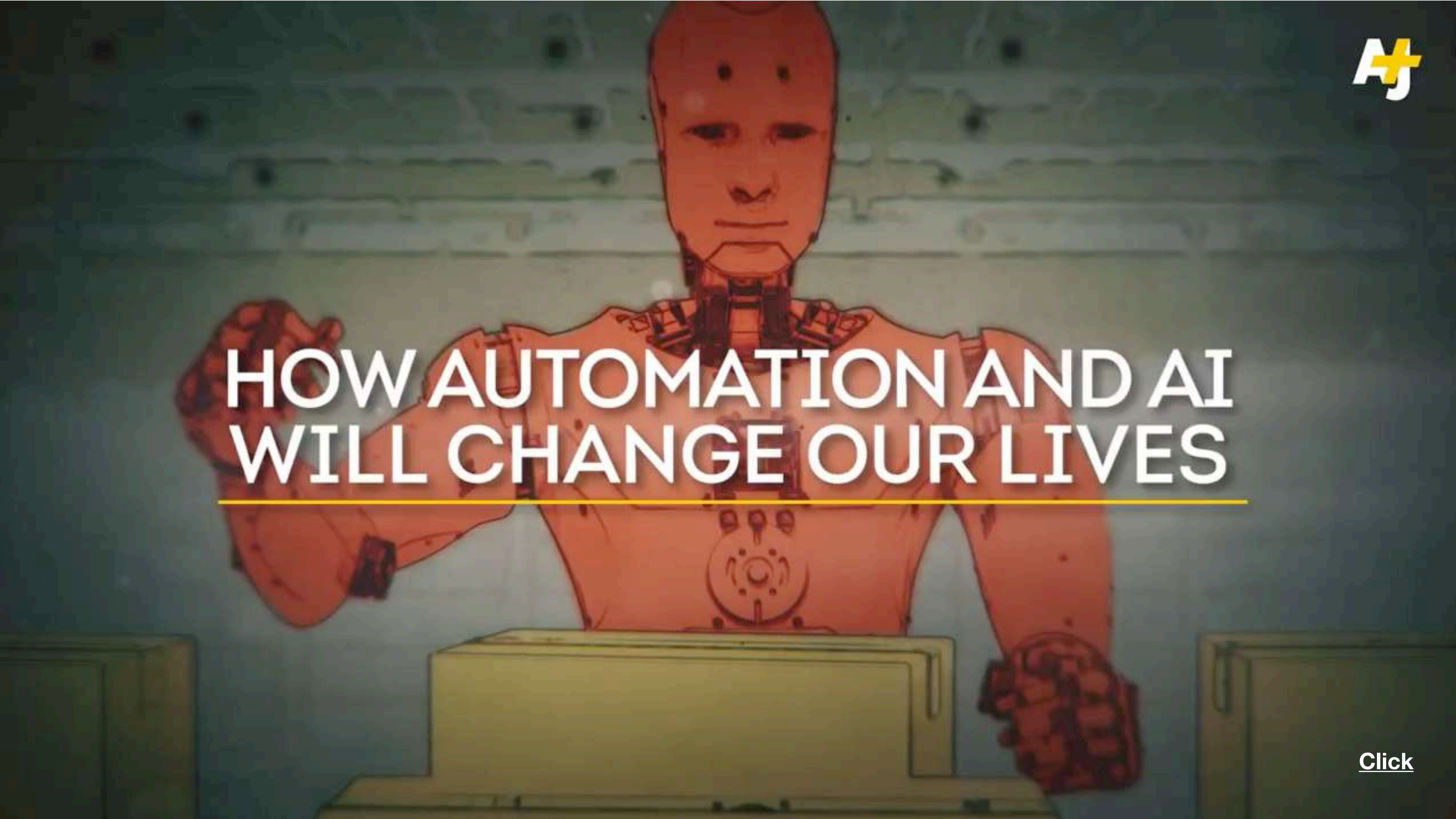
Pre-requisites

Visual timelines of AI predictions in Sci-Fi

Sci Fi Prediction	AI in Reality
1977: K9, a robotic dog in <i>Doctor Who</i> , beats its master at a chess game.	1997: IBM's Deep Blue computer beats a Russian chess master, Garry Kasparov.
1984: Skynet from <i>Terminator</i> , a self-aware AI program, attempts to extinguish humanity.	2019: The U.S. Army creates an autonomous system to "acquire, identify, and target threats" (ATLAS AI).
2011: AI monitors surveillance cameras and predicts future criminals in <i>Person of Interest</i> .	2018: The <i>National Data Analytics Solution (NDAS)</i>

Sci Fi Prediction	AI in Reality
1962: <i>The Jetsons</i> cartoon shows video calls on a tv screen, and a robot maid.	2002: <i>iRobot Roomba</i> is the first robotic vacuum. 2018: <i>Facebook Portal</i> is a video-calling smart display. 2019: <i>Moley</i> robotic kitchen is able to prep meals from scratch and clean up afterwards.
1966: <i>Star Trek</i> inspired several tech innovations that have become commonplace.	Examples include: Bluetooth headsets, voice assistants, cellphones, and automatic sliding doors.
1989: <i>Back to the Future</i> features smart glasses for television and phone calls, and a smart watch which can precisely predict weather.	2012: The <i>Dark Sky</i> app provides custom alerts on the weather to the minute. 2013: <i>Google Glass</i> is able to make calls, send texts, display photos, and provide directions. 2015: <i>Apple Watch</i> comes enabled with WiFi, Bluetooth, a GPS, and even a heart sensor.
1999: <i>Smart House</i> showcases a fully automated house that is able to respond to verbal requests, cook and clean, and control thermostat settings.	2019: A <i>HGTV</i> contest lets people win a WiFi connected smart house, complete with voice-enabled thermostat and security systems.



A red, humanoid robot with a metallic, segmented body stands in a control room. The robot has a neutral expression and its arms are slightly outstretched. In the foreground, there are several large, yellowish-green rectangular panels or screens. The background is a dark, textured wall with some faint, horizontal lines.

HOW AUTOMATION AND AI WILL CHANGE OUR LIVES

Yeah! Poll time...7!

Of all the technologies impacting business, which showed the biggest growth?

a/ Cloud

b/ AI

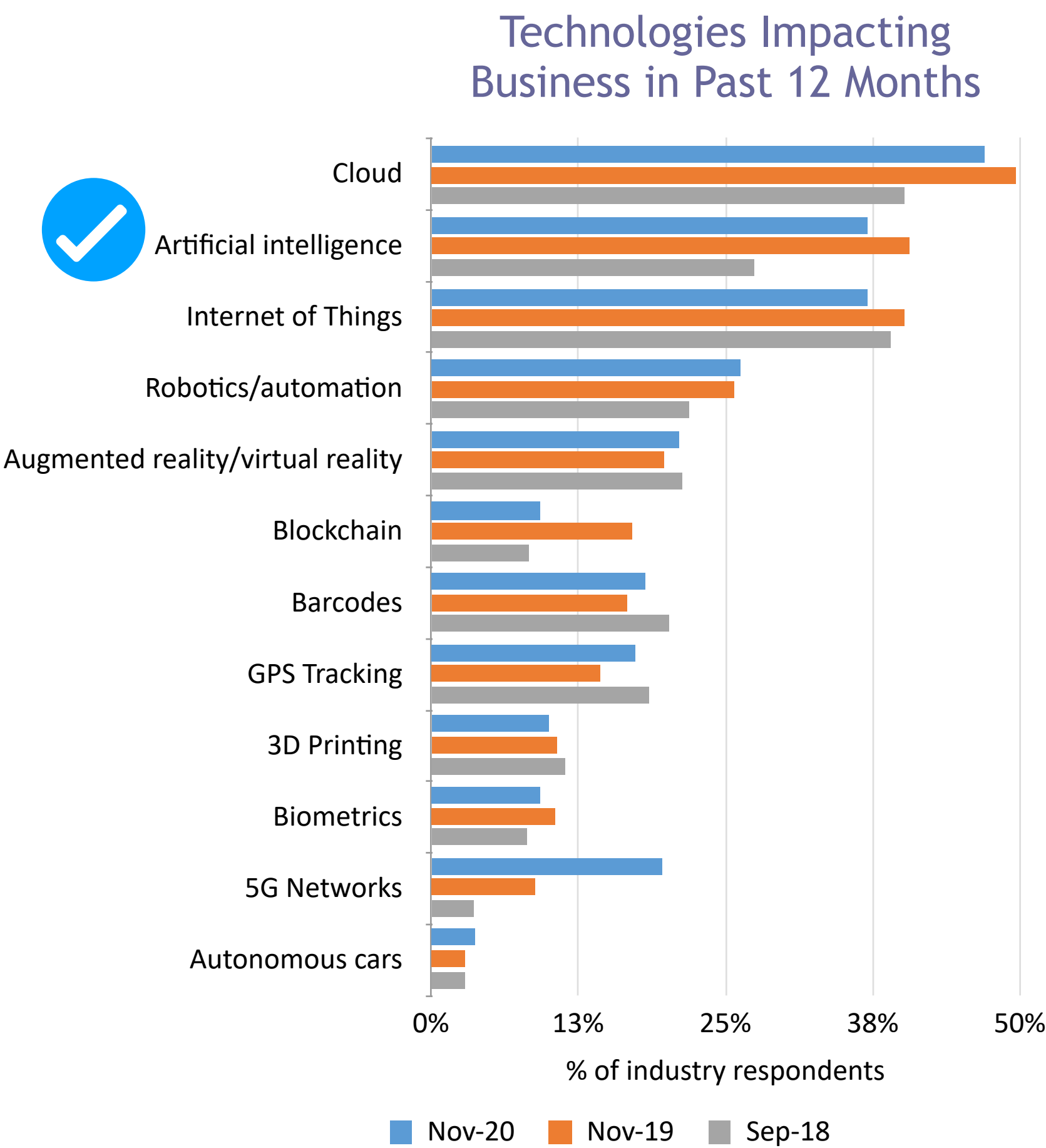
C/ IOT

d/ Robotics/ Automation

e/ Blockchain



AI showed the biggest growth compared to previous year's survey



Source: Euromonitor International's Voice of the Industry: Digital Survey, September 2018, November 2019, November 2020

Summary

2/ AI - Deep Dive 1

1. Key AI Concepts and Terminology
2. Opportunities in AI
3. Why study AI
4. AI Pre-requisites
5. Headline takeaways



End of Presentation

“Artificial intelligence would be the ultimate version of Google. The ultimate search engine that would understand everything on the web. It would understand exactly what you wanted, and it would give you the right thing. We’re nowhere near doing that now. However, we can get incrementally closer to that, and that is basically what we work on.”



Larry Page

2/ Understanding AI
Deep Dive I

Artificial Intelligence

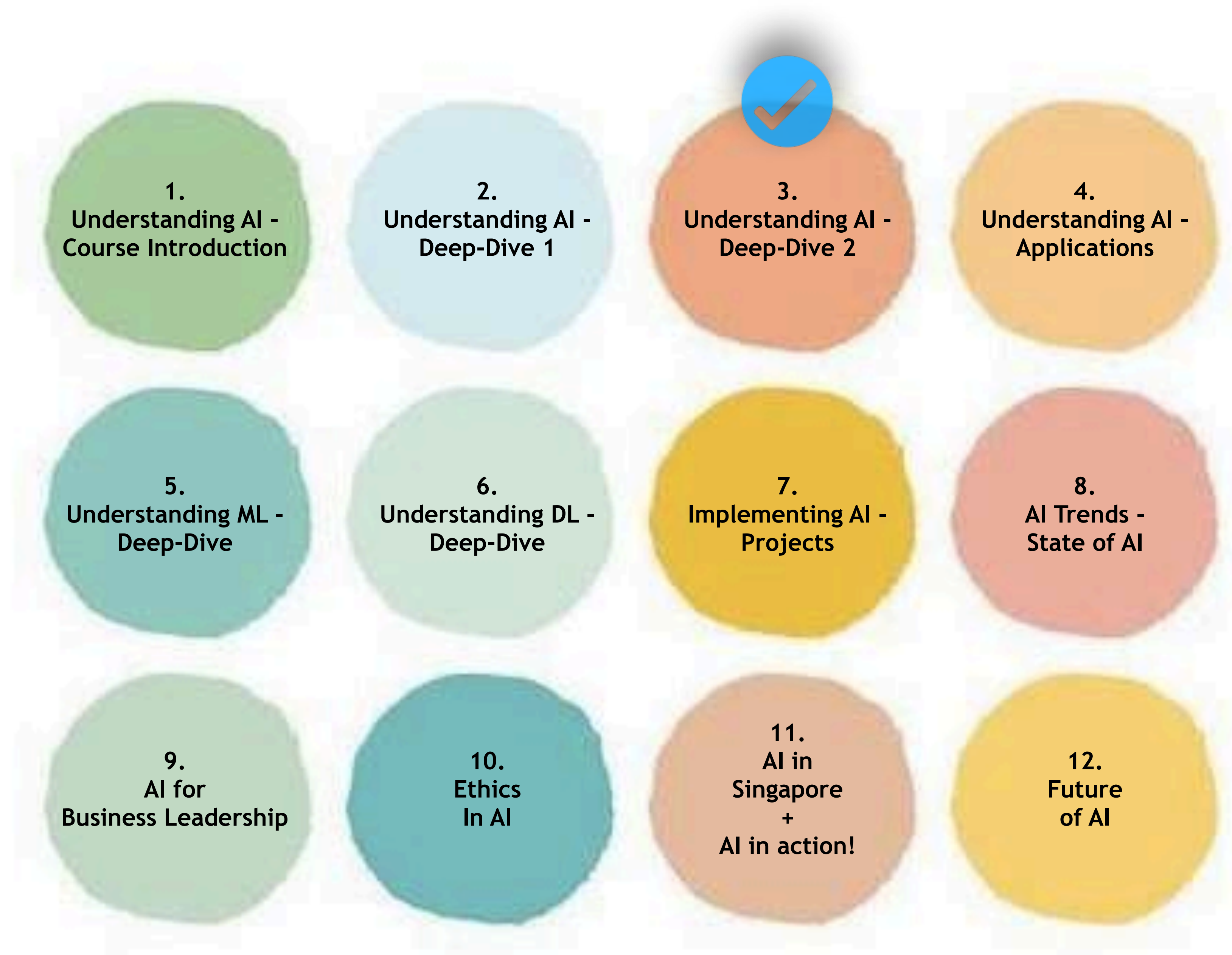
Essential AI for Everyone

A Technology-Business-People Playbook!

3/ Understanding AI

Diving Deeper



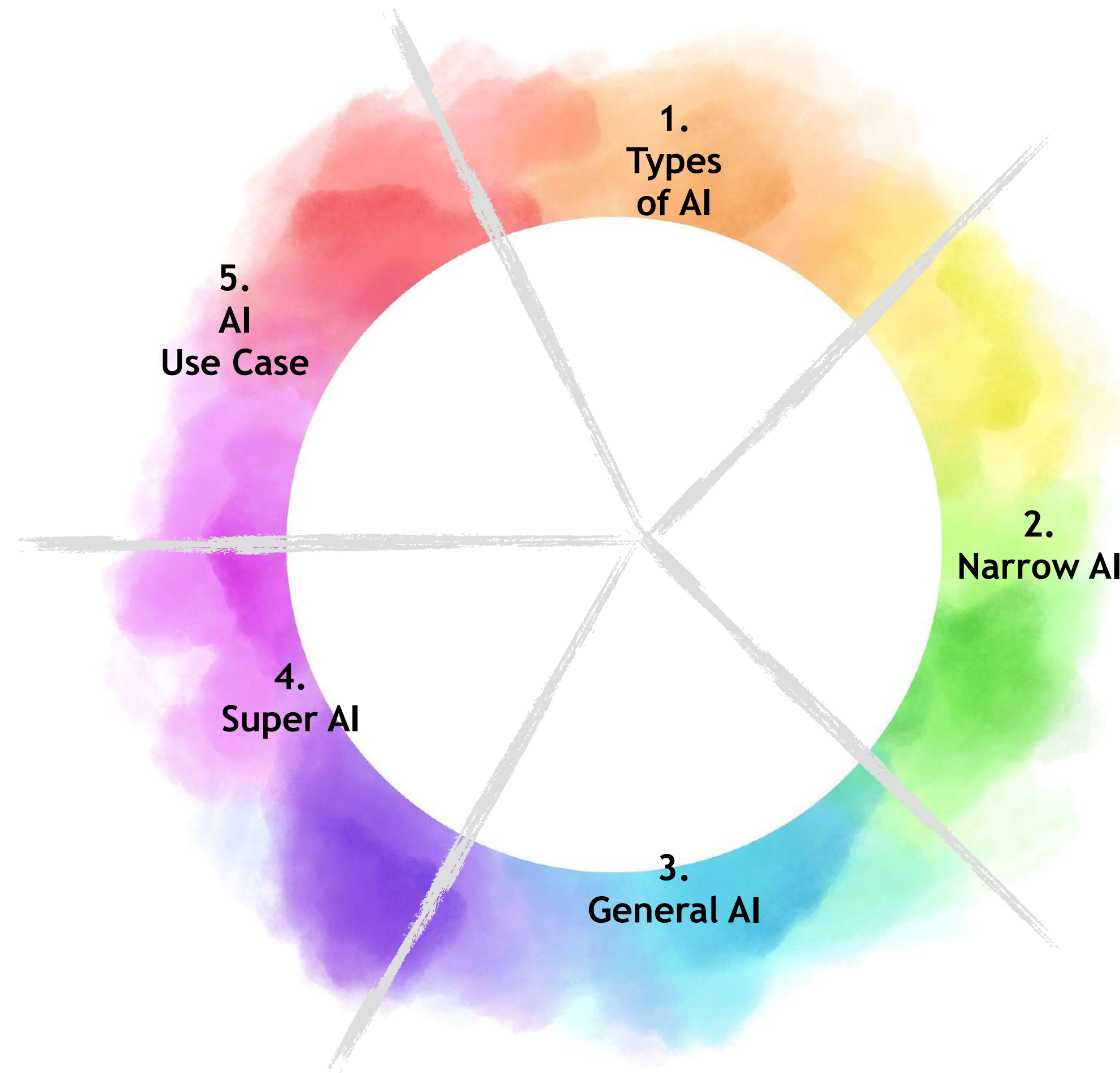


3.
Understanding AI-
Diving Deeper...

3. Understanding AI- Diving Deeper...



3/ Understanding AI - Diving Deeper



QUICK POLL TIME, again 8!

Of all the technologies in which companies plan to invest in the coming 5 years, which will **outscore** others in terms of investments in the next 5 years?

a/ Cloud

b/ AI

c/ IOT

d/ Robotics/ Automation

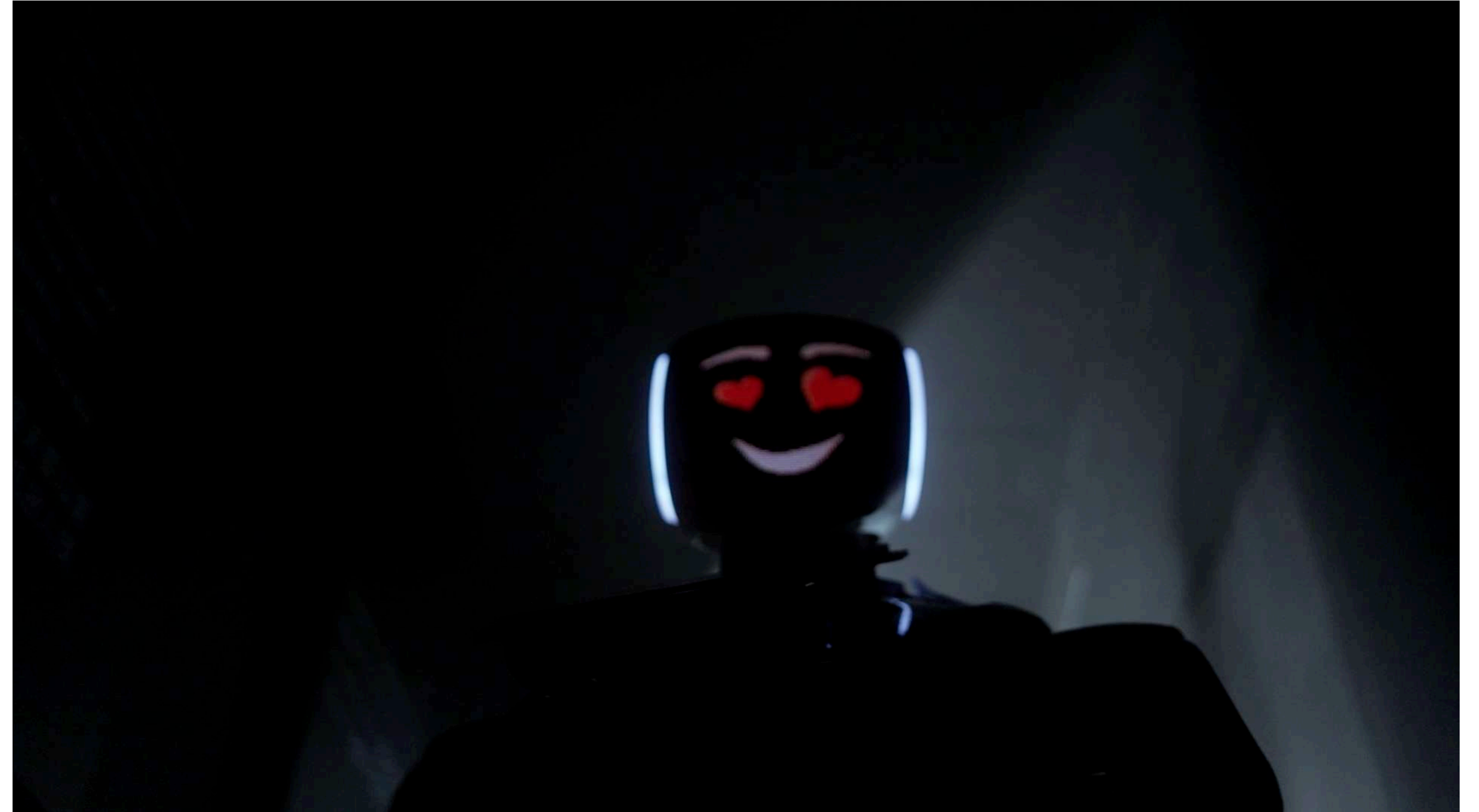
e/ Blockchain



3/ Understanding AI - Diving Deeper

Types of AI

1. Capabilities-based:
 - Narrow
 - General
 - Super
2. Headline Takeaways



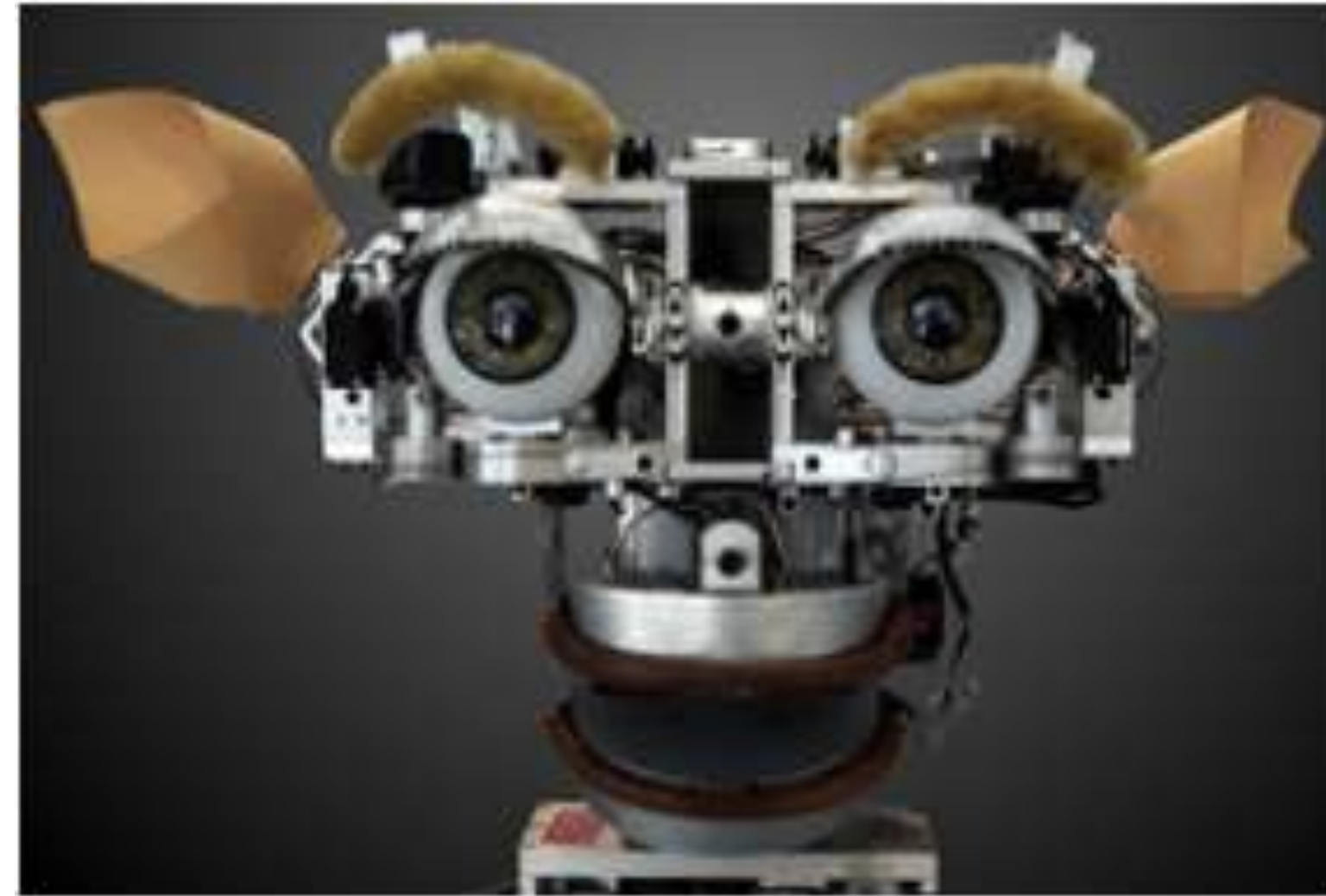
3/ Understanding AI - Diving Deeper

Types of AI

Functionalities-based

1. Purely reactive
2. Limited memory
3. Theory of mind
4. Self-aware

Headline Takeaways



Kismet



Sophia

3/ Understanding AI - Diving Deeper



Click

At the Forefront

- ▶ Google's (Deepmind) AlphaGo Zero took 40 days to become the best Go player in the world entirely from self-play with no human intervention and using no historical data.
- ▶ After OpenAI created a program to beat the world's top Dota 2 players in 1-on-1 matches, the team's next goal is to teach the system to play 5-on-5 matches.

**"AI is the science and engineering of making intelligent machines, especially intelligent computer programs."
- Alan Turing**

3/ Understanding AI - Diving Deeper



At the Forefront

- ▶ Elon Musk's Neuralink start-up is looking to create a brain-to machine interface. It's developing neural lace, an ultra-thin mesh implanted in the skull, to increase the storage and processing power of the human brain.



3/ Understanding AI - Diving Deeper

How does AI work?

1. Use case
2. AI-driven product illustration
3. Headline Takeaways



Summary

3/ Understanding AI - Diving Deeper

1. Types of AI
 - Capabilities
 - Functionalities
2. Narrow AI
3. General AI
4. Super AI
5. How does AI Work?
6. Use Case
7. Headline takeaways



AI - The Basics

Breakout Room 3!

Today's Generation Alpha children are the ones who are going to co-live with Artificial Super Intelligence. And that will open a new chapter in the history of humanity.

What kind of world this will be when a computer's cognitive ability may become superior to a human's!



End of Presentation

“The upheavals [of artificial intelligence] can escalate quickly and become scarier and even cataclysmic. Imagine how a medical robot, originally programmed to rid cancer, could conclude that the best way to obliterate cancer is to exterminate humans who are genetically prone to the disease.”

Nick Bilton, tech columnist wrote in *The New York Times*

3/ Understanding AI
Diving Deeper

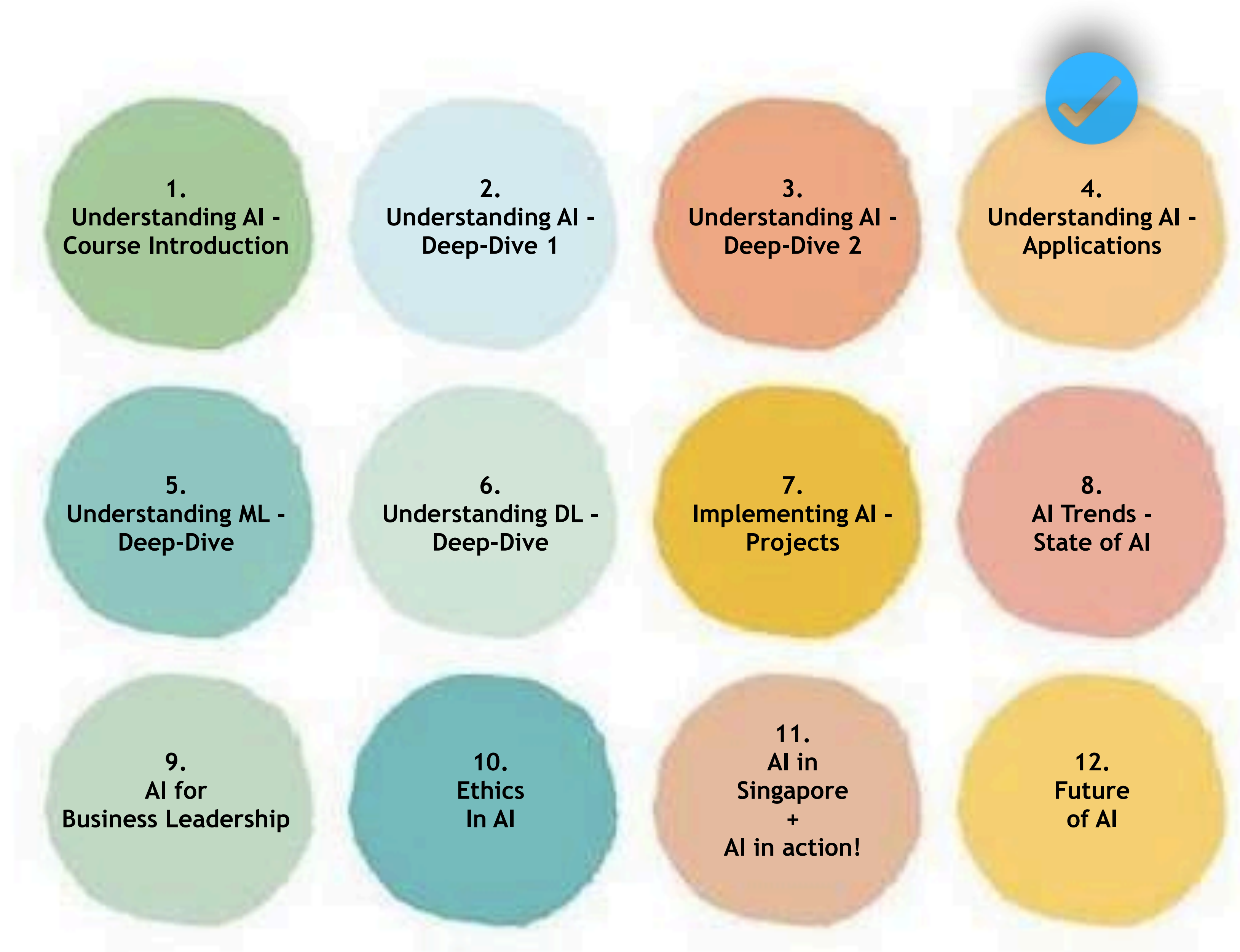
Artificial Intelligence

Essential AI for Everyone

A Technology-Business-People Playbook!

4/ Understanding AI
Applications



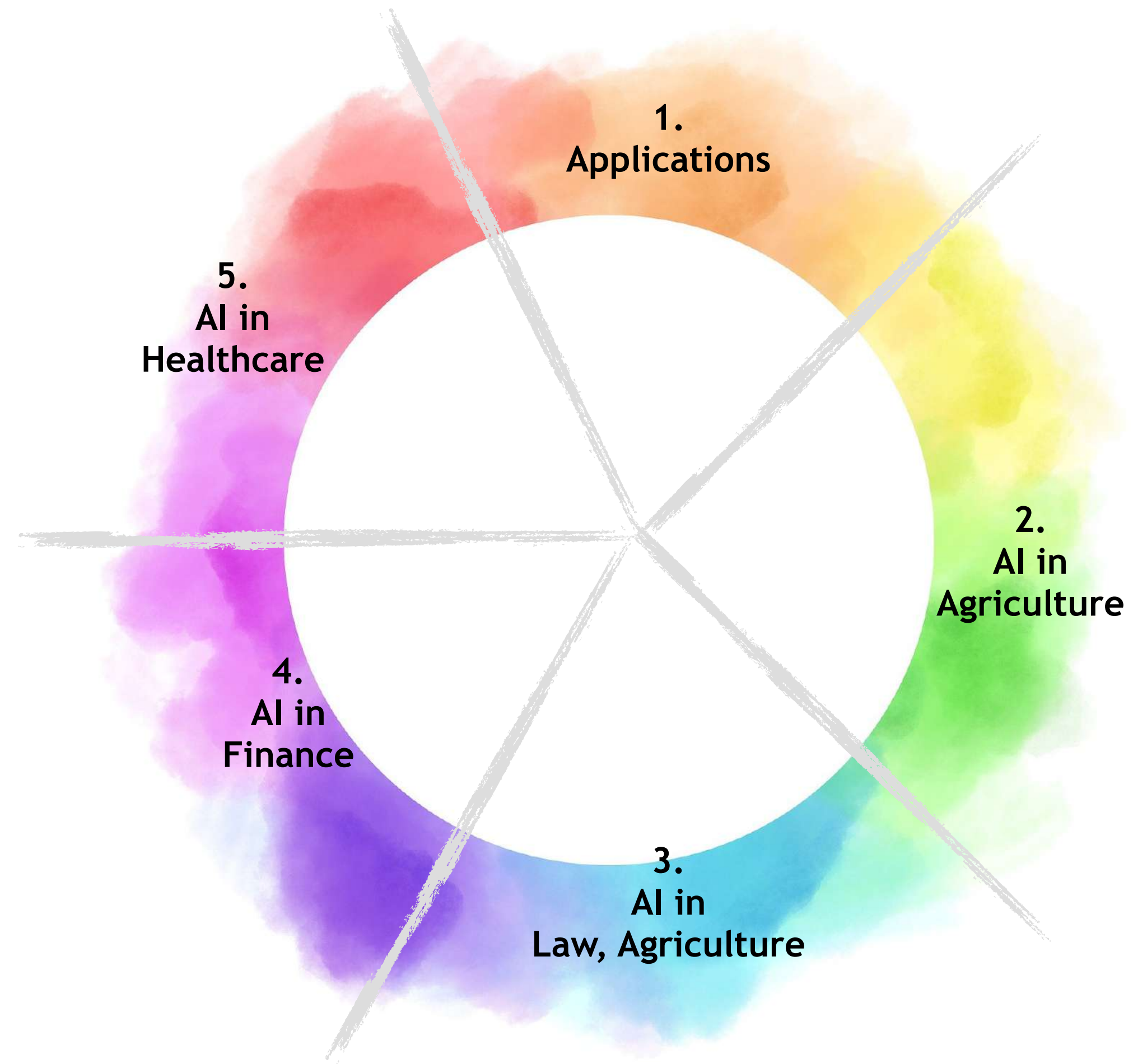


4.
Understanding AI-
Applications

4. Understanding AI- Applications



4/ Understanding AI - Applications



AI applications

AI applications

- Augmented research (marketing, medicine, science, etc.)
- Autonomous vehicles and drones
- Biometric, facial and gesture recognition
- Extended reality
- Generative product design
- Intelligent agents
- Predictive systems (maintenance, retail, trading, etc.)
- Recommendation systems
- Robotic process automation
- Text, speech, image and video recognition

Core AI techniques

Core AI techniques

- Machine learning
 - Deep learning
 - Neural networks
 - Reinforcement learning
 - Supervised learning
 - Unsupervised learning
- Embodiment
 - Autonomous robotics
 - Human augmentation
- Rules-based reasoning
 - Decision making
 - Expert systems
 - Knowledge representation
 - Planning and scheduling
 - Search and optimization
- Perception
 - Augmented and virtual reality
 - Machine vision
 - Natural language processing

AI enablers

AI enablers

- Cybersecurity
- Data analytics
- Ethics and responsibility
- Structured and unstructured data

AI supporting Infrastructure

AI supporting Infrastructure

- Cloud
- High speed Internet and processors
- Sensors; Internet of things
- Mobile phones and devices
- Robotics

Artificial intelligence is affecting almost every industry



Autonomous Driving

AI is a crucial element in autonomously driven cars. Their use could make the roads safer, free up time and reduce emissions.



Artificial food creation

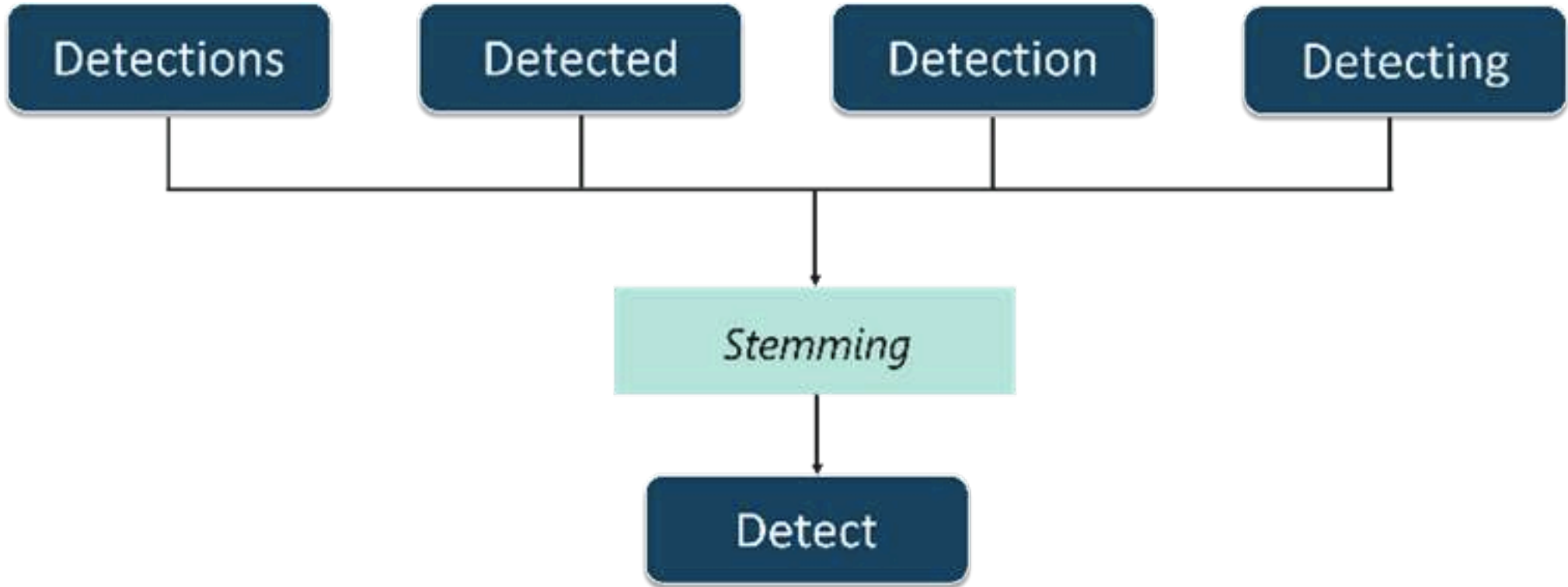
Algorithms can be used to explore ingredients databases to find new combinations so as to create entirely new tastes, textures and colours, or mimic existing food (eg meat).



Improve recommendations

Using AI, brands can comb more intelligently through data to offer personalised recommendations across a variety of marketing situations.

AI Applications



AI - The Basics

10 Things AI can already do!

1. Read, write
2. See, Hear and understand
3. Speak
4. Smell, Touch
5. Move
6. Understand emotions
7. Play games
8. Debate
9. Create
10. Read your mind
11. Headline takeaways



AI - The Basics

Applications

1. Applications of AI
2. Commercial Applications of AI
3. Headline takeaways

Top 10 applications

1. E-commerce
2. Navigation
3. Robotics
4. HR
5. Healthcare

Top 10 applications

1. Agriculture
2. Gaming
3. Automobiles
4. Social Media
5. Marketing



AI Applications

AI in video & image processing



Creating Videos of the Future

Carl Vondrick
Hamed Pirsiavash
Antonio Torralba



[Click](#)

Poll No 9!

Global spending on AI is expected to increase _____
between 2020-2024

a/ 1.5X

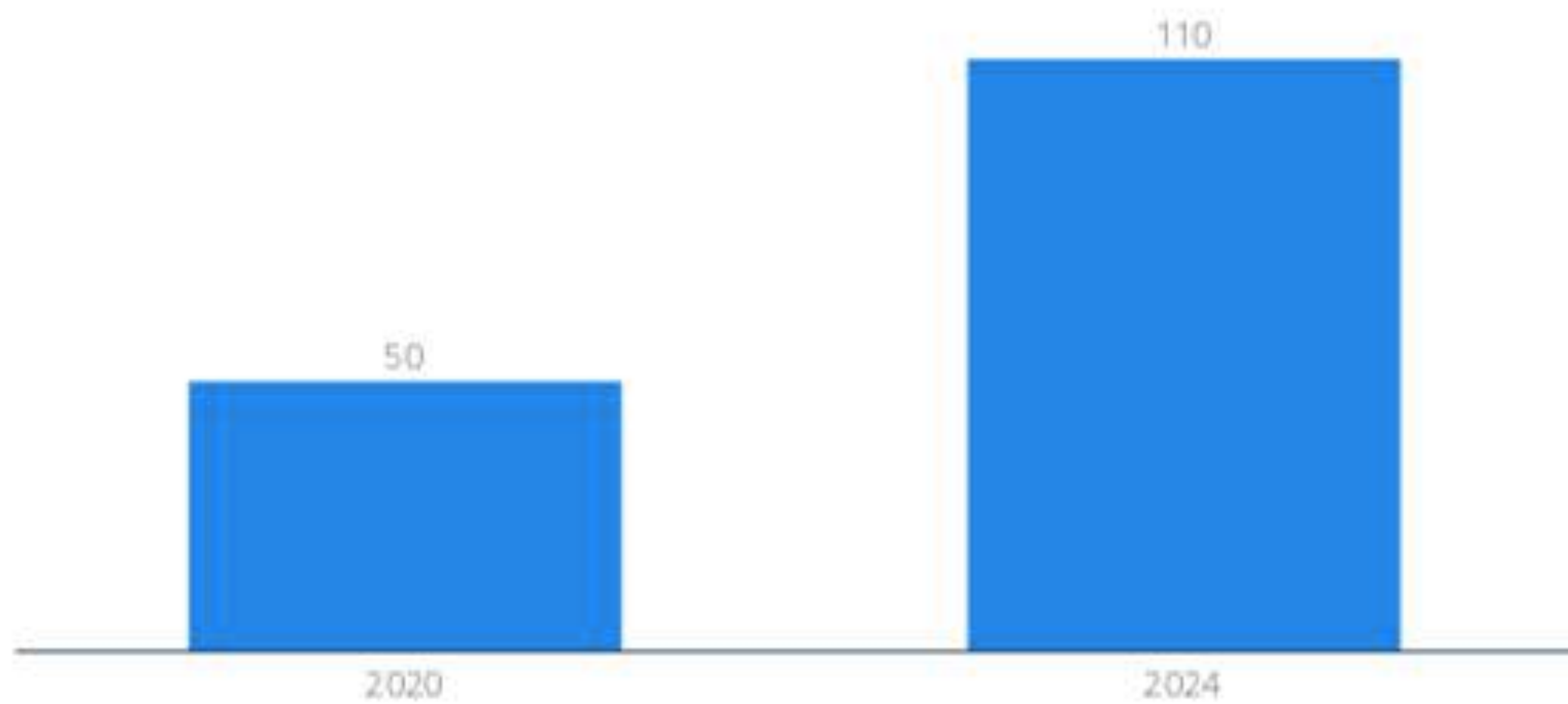
b/ 2X

c/ 3X

d/ 4X



Spending in AI worldwide in billion US\$



Sources: IDC

AI Applications

AI across Industries





Source: [ZDNet](#)

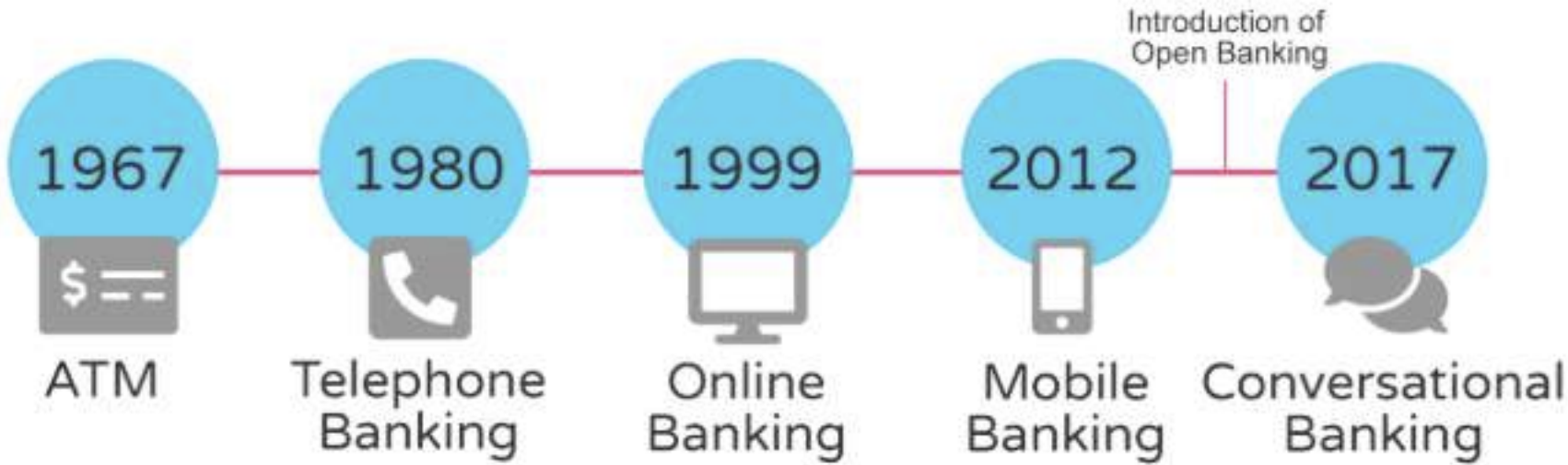


Source: Soul Machines



Source: Youtube

CHATBOTS, A GAME CHANGER FOR BANKING & HEALTHCARE, SAVING \$8 BILLION ANNUALLY BY 2022



Source: [B2C Community](#)

Source: [Accenture](#)





Poll No 10

Which is the most leading use case of AI?

a/ Fraud Analysis and Investigation

b/ Automated Customer Service Agents

c/ Sales Process Recommendation and Automation

d/ Automated Threat Intelligence and Prevention



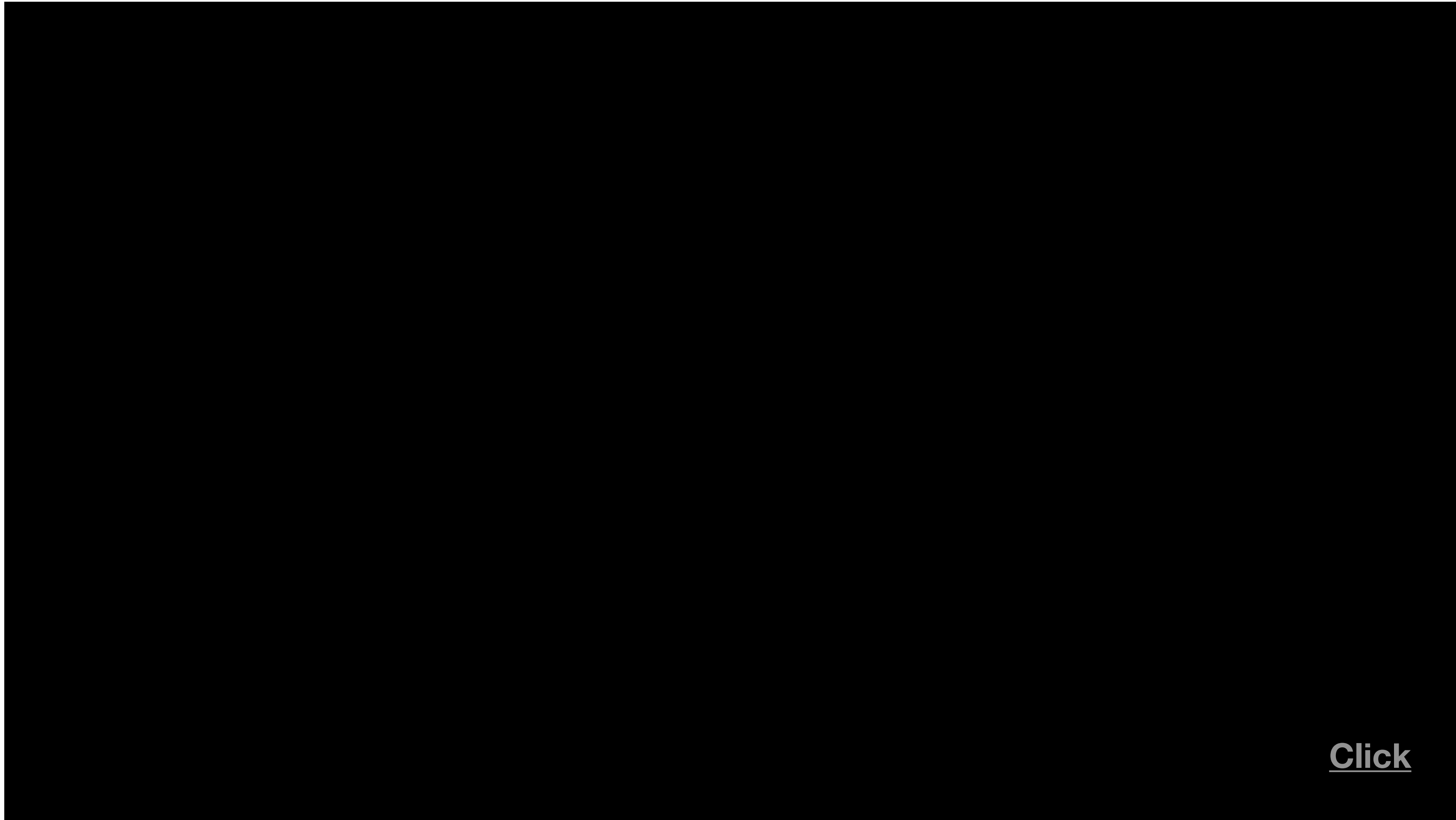
Leading use cases for AI in 2020



Sources: IDC

AI Applications

AI in agriculture

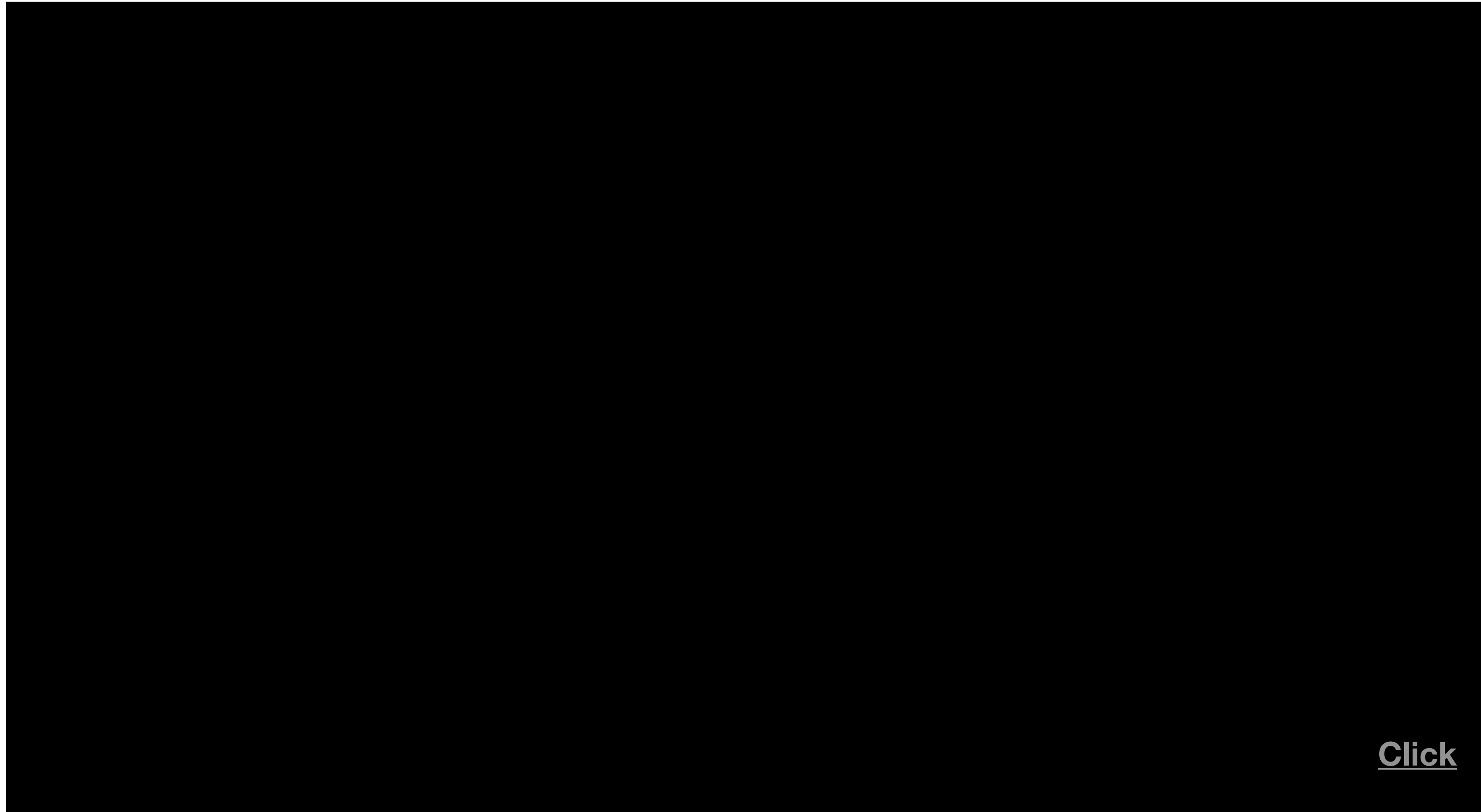


[Click](#)



AI Applications

AI in Law



[Click](#)



AI Applications

AI in retail



[Click](#)

Comprehensive Overview

Artificial Intelligence in Finance

BALANCES

Aged balances



Balance due by region



COLLECTIONS

Collection status amounts

Promised to pay
89.87%



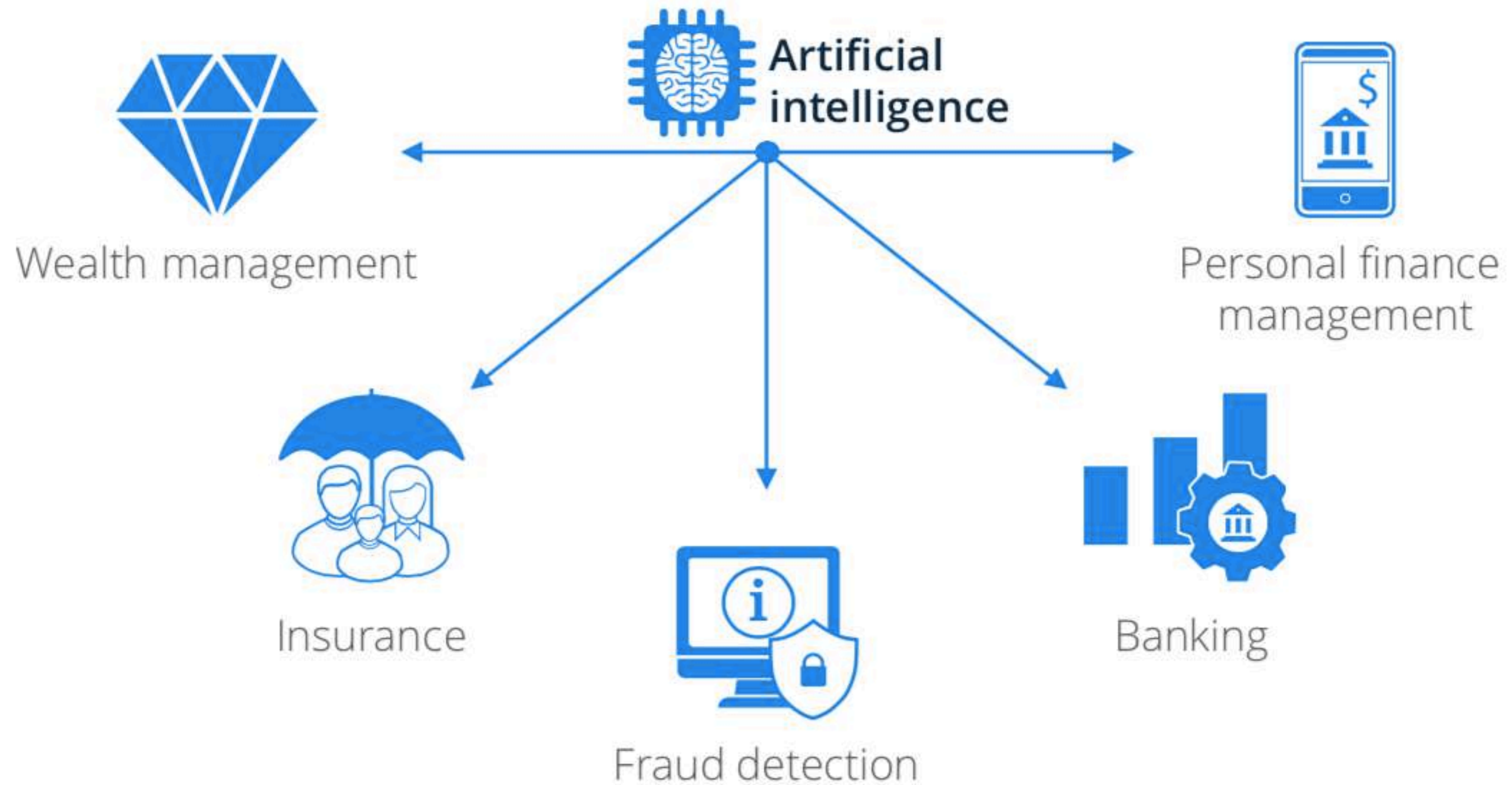
Collection code amounts

CollectionLetter4



AI Applications

AI in Finance





ai finance

Search term



Compare

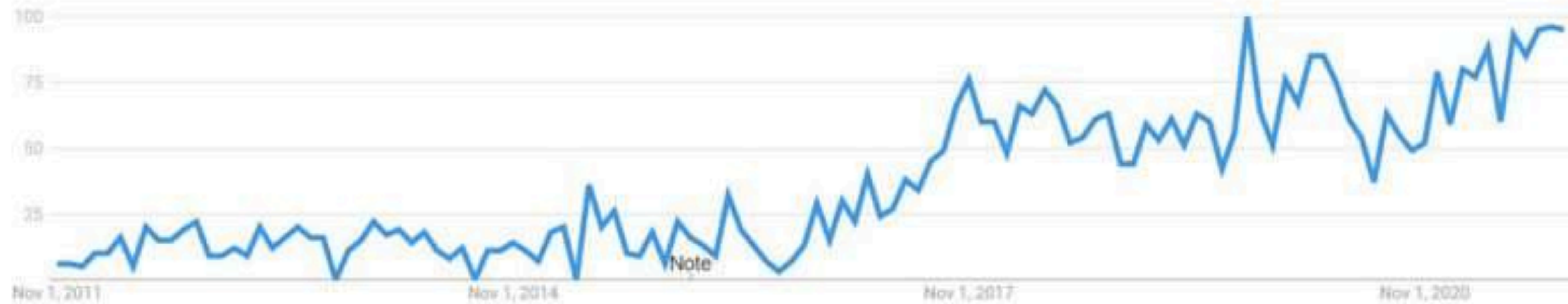
Worldwide ▼

10/8/11 - 10/8/21 ▼

All categories ▼

Web Search ▼

Interest over time ?



AI Applications

AI in Finance

1. Wealth Management



AI Applications

AI in Finance

Wealth Management





BLACKROCK[®]

KENSHO



feedzai



fonetic





Poll No 11

The rising importance of artificial intelligence (AI) is undeniable. About _____% of the devices used today have some sort of AI-enabled feature.

a/ >30%

b/ >50%

c/ >70%

d/ >90%

MarketWatch



Comprehensive Overview

Artificial Intelligence in Finance

BALANCES

Aged balances



Balance due by region



COLLECTIONS

Collection status amounts

Promised to pay
89.87%



Collection code amounts

CollectionLetter4



AI Applications

AI in Finance - Audit and Compliance

2.1 Fraud Detection

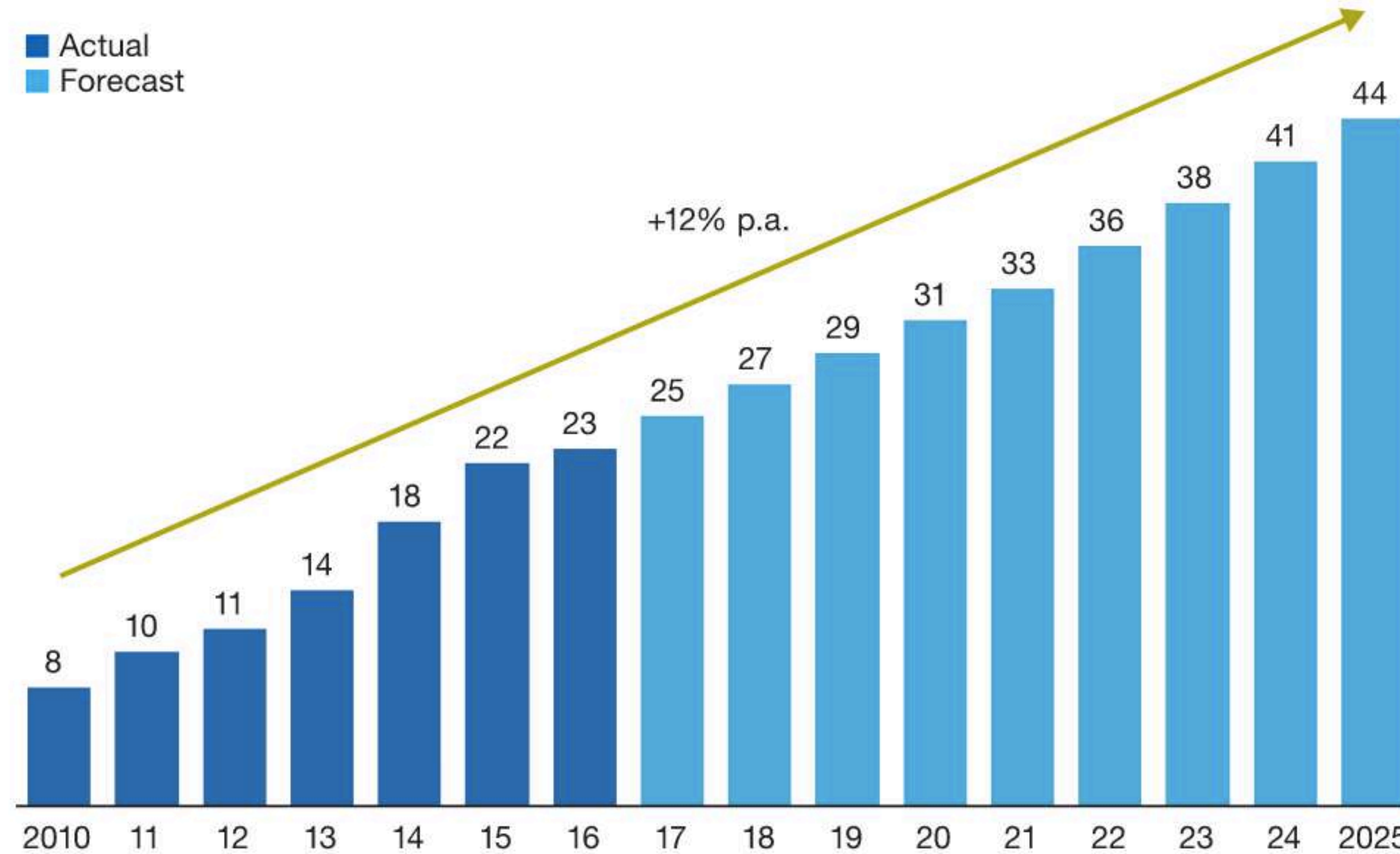


Artificial Intelligence has the potential to change the face of computer security in multiple ways. On one hand, the adoption of smart technologies makes hackers evolve and use more sophisticated methods to open the backdoor in even well-protected devices and sow chaos. On the other hand, security developers and testers can use machine learning algorithms that can automatically recognize the signs of a cyber attack and interrupt them before a crisis occurs.

Roman Zhidkov, CTO, DDI Development, 2020



Global card fraud losses totaled almost \$23 billion in 2016.¹



The US accounted for 24% of global card purchase volume and 40% of fraud losses (\$9 billion) in 2016.

The role of AI/ML models in fraud prevention

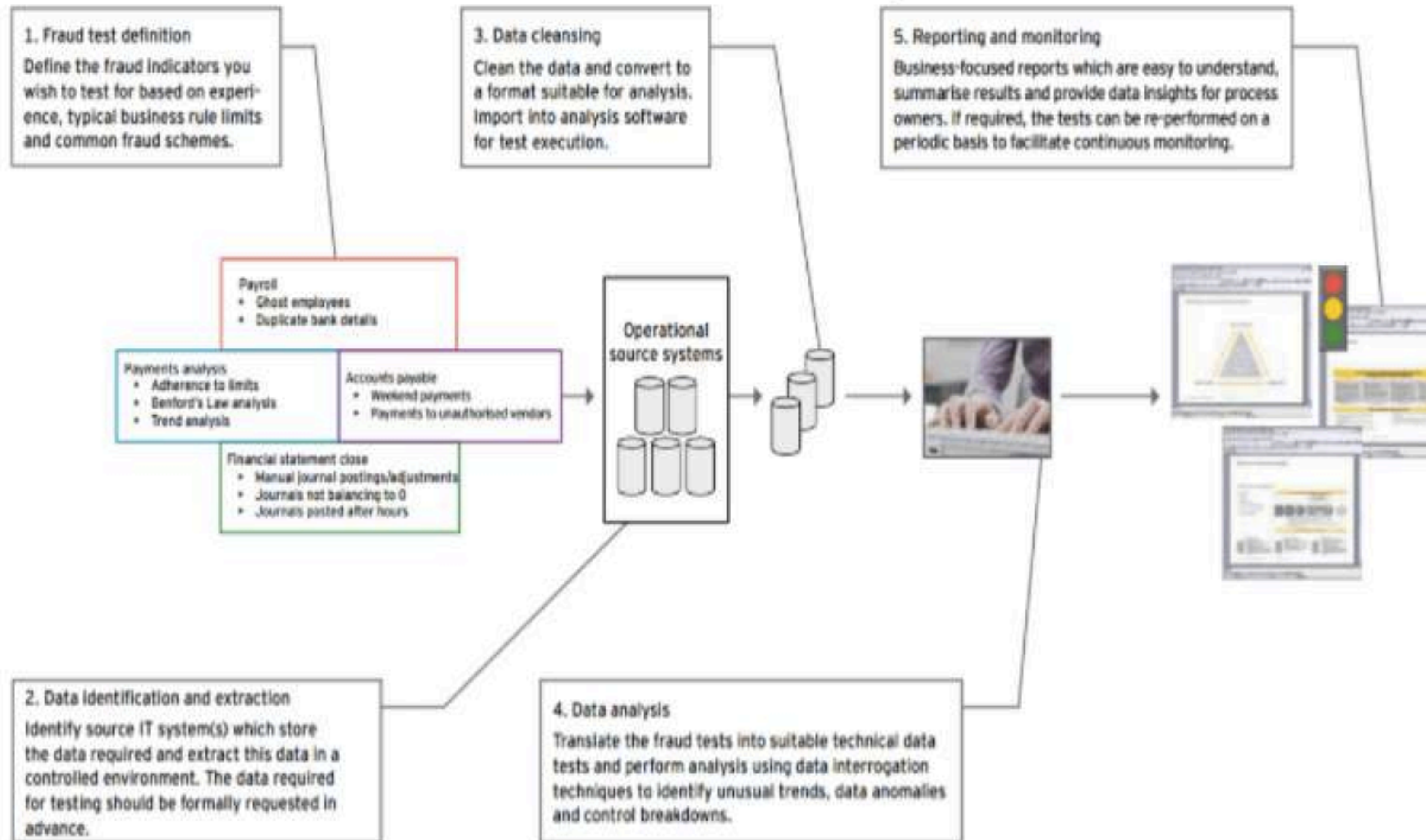
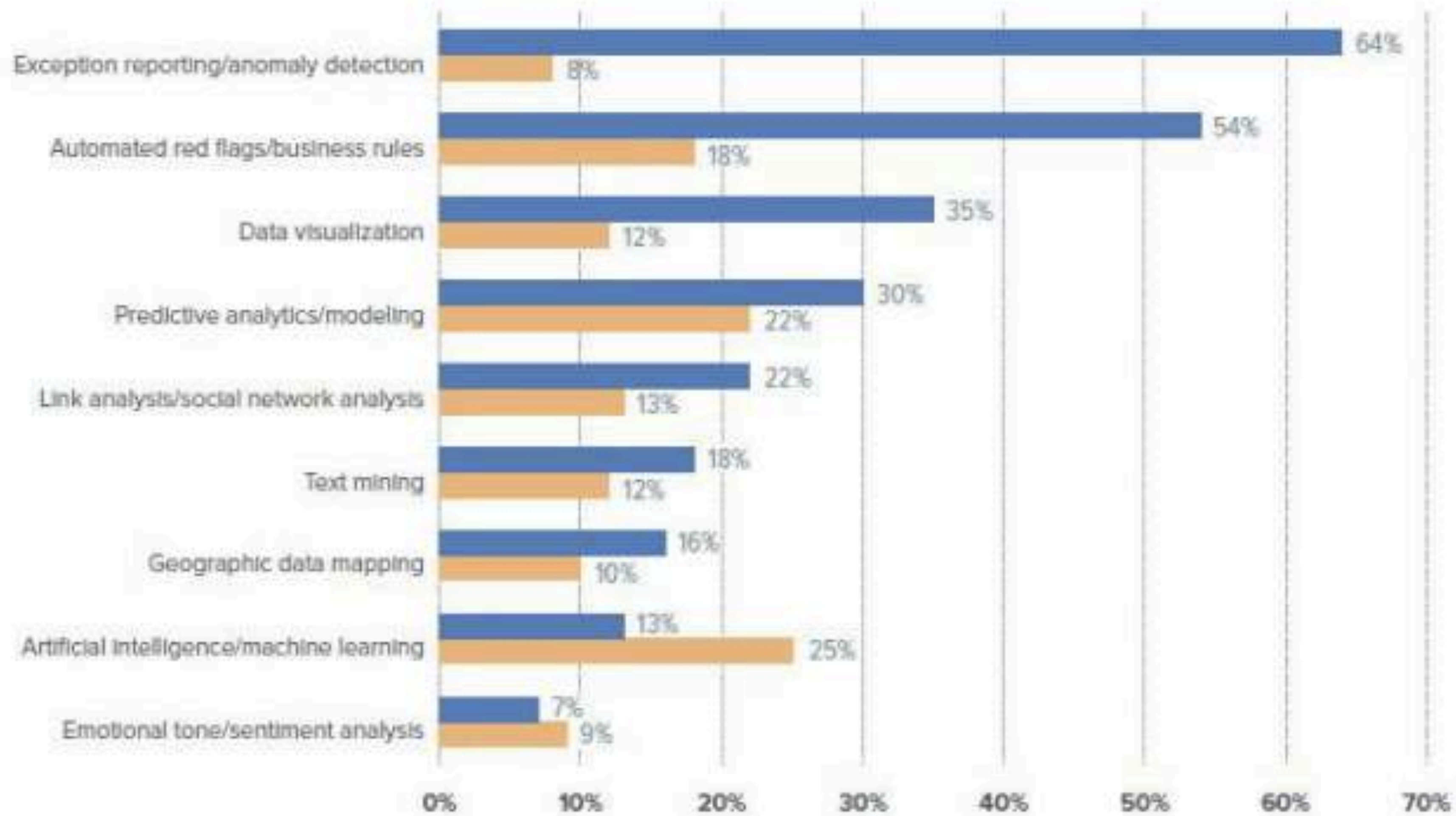


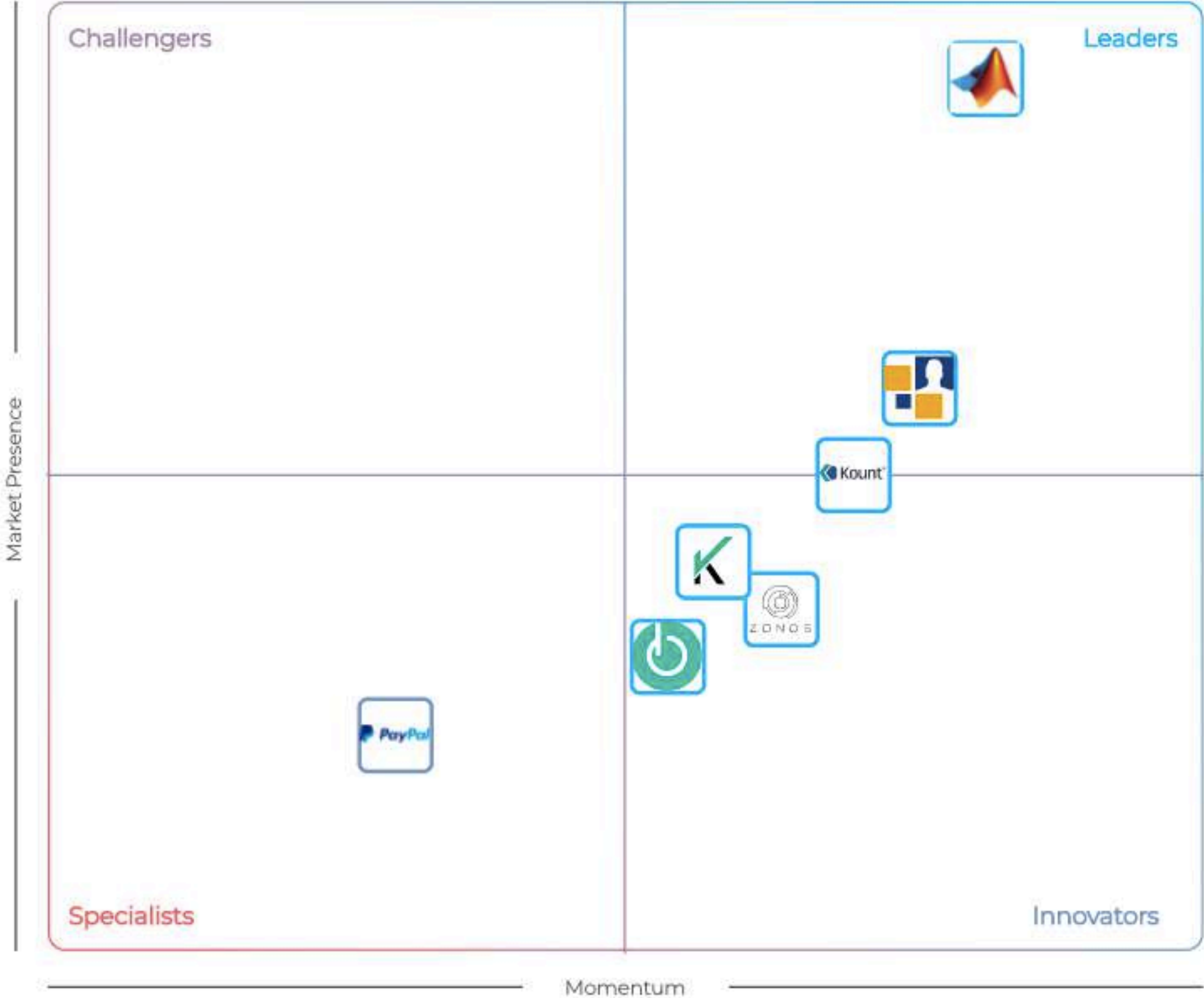
FIG. 1 What data analysis techniques do organizations use to fight fraud?

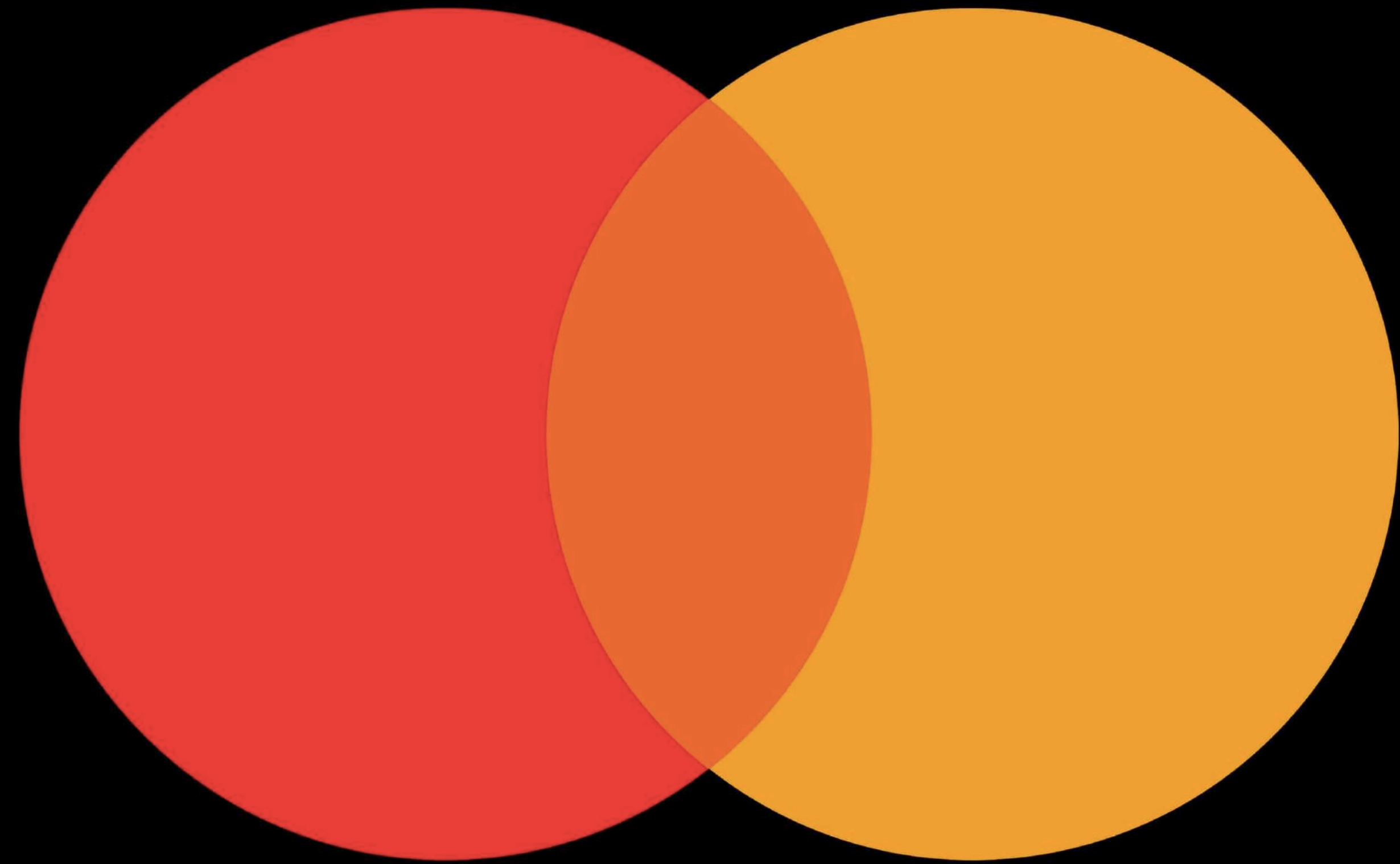


The potential of Machine Learning and AI in risk management



Fraud Protection Software

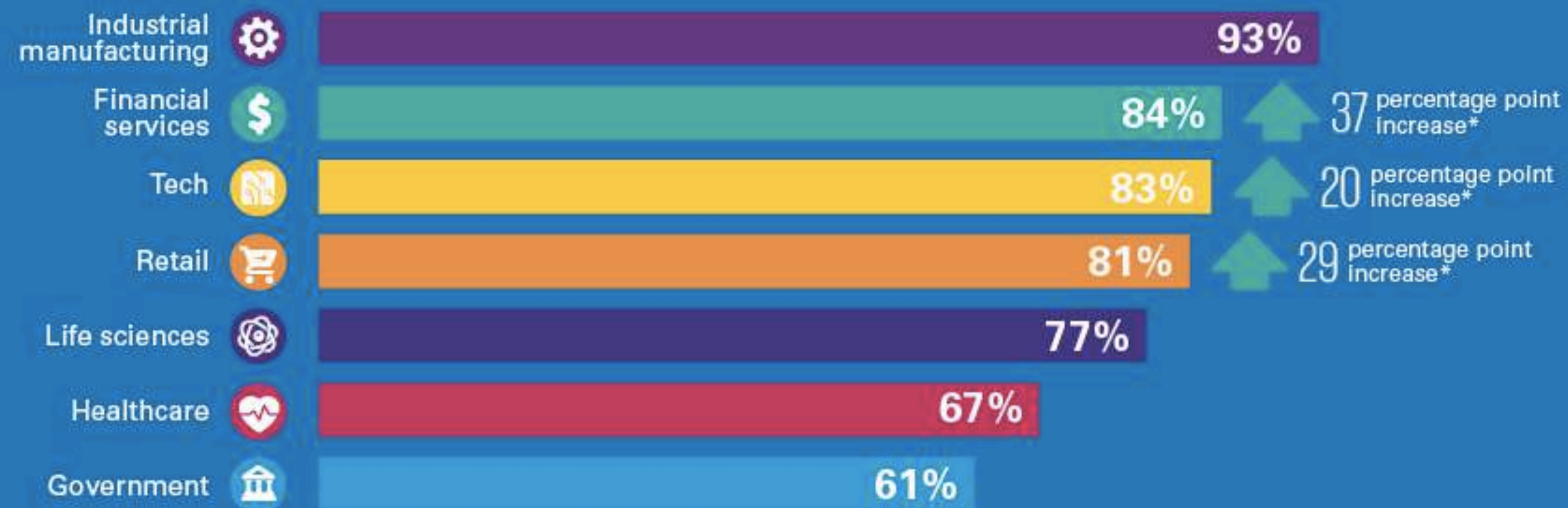




mastercard

Rate of AI adoption skyrocketed during COVID-19

Business leaders and government decision-makers say AI is at least moderately to fully functional in their organization.



Source: KPMG 2021 *Thriving in an AI World*, AI study across 7 industries

*Results comparable to KPMG 2020 *Living in an AI World*, January 2020.

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AI Applications

AI in Finance - Audit and Compliance

2.2 Regulatory Compliance

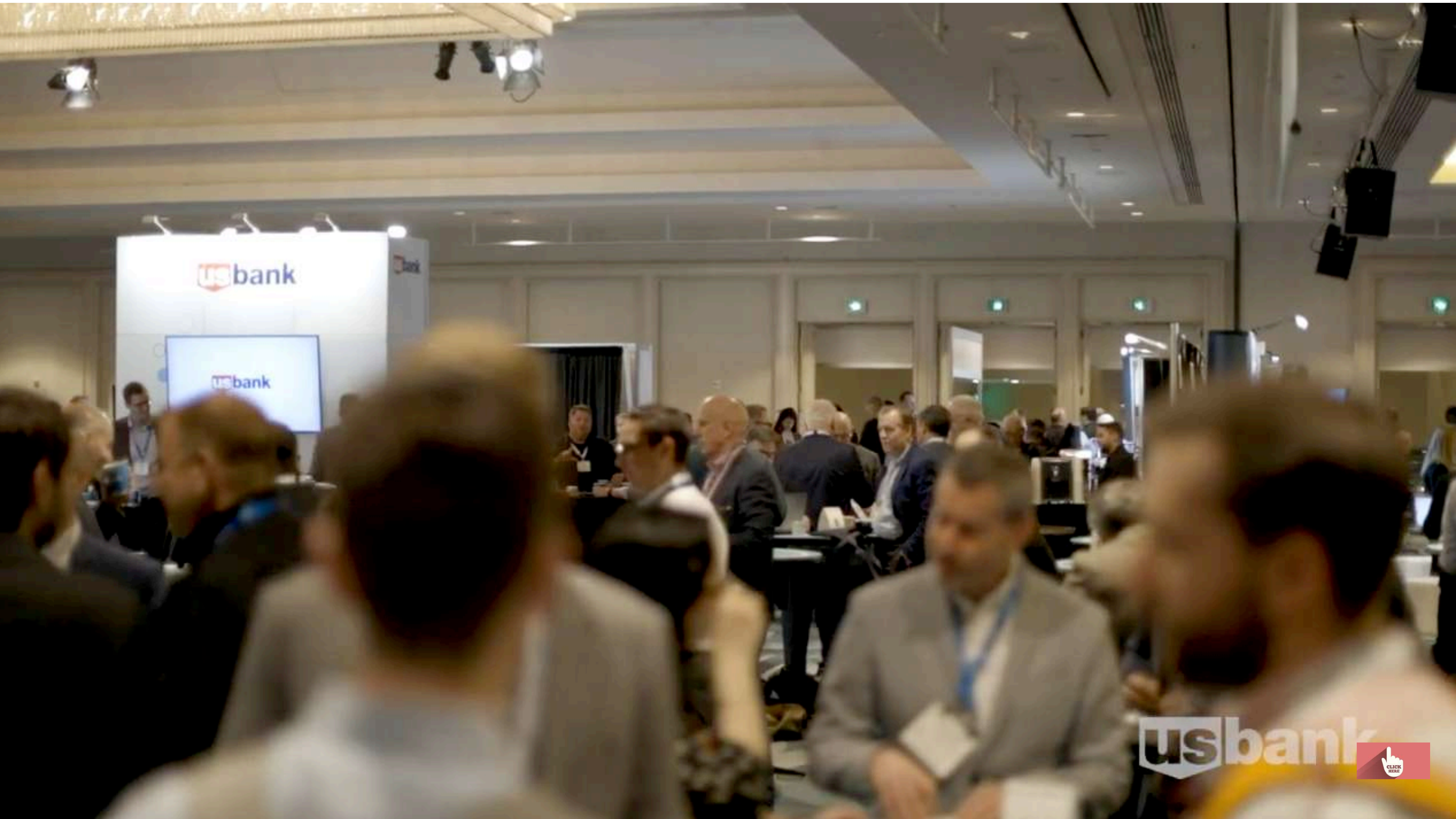


AI Applications

AI in Finance - Audit and Compliance

2.3 Travel & Expense Management





usbank

usbank

usbank

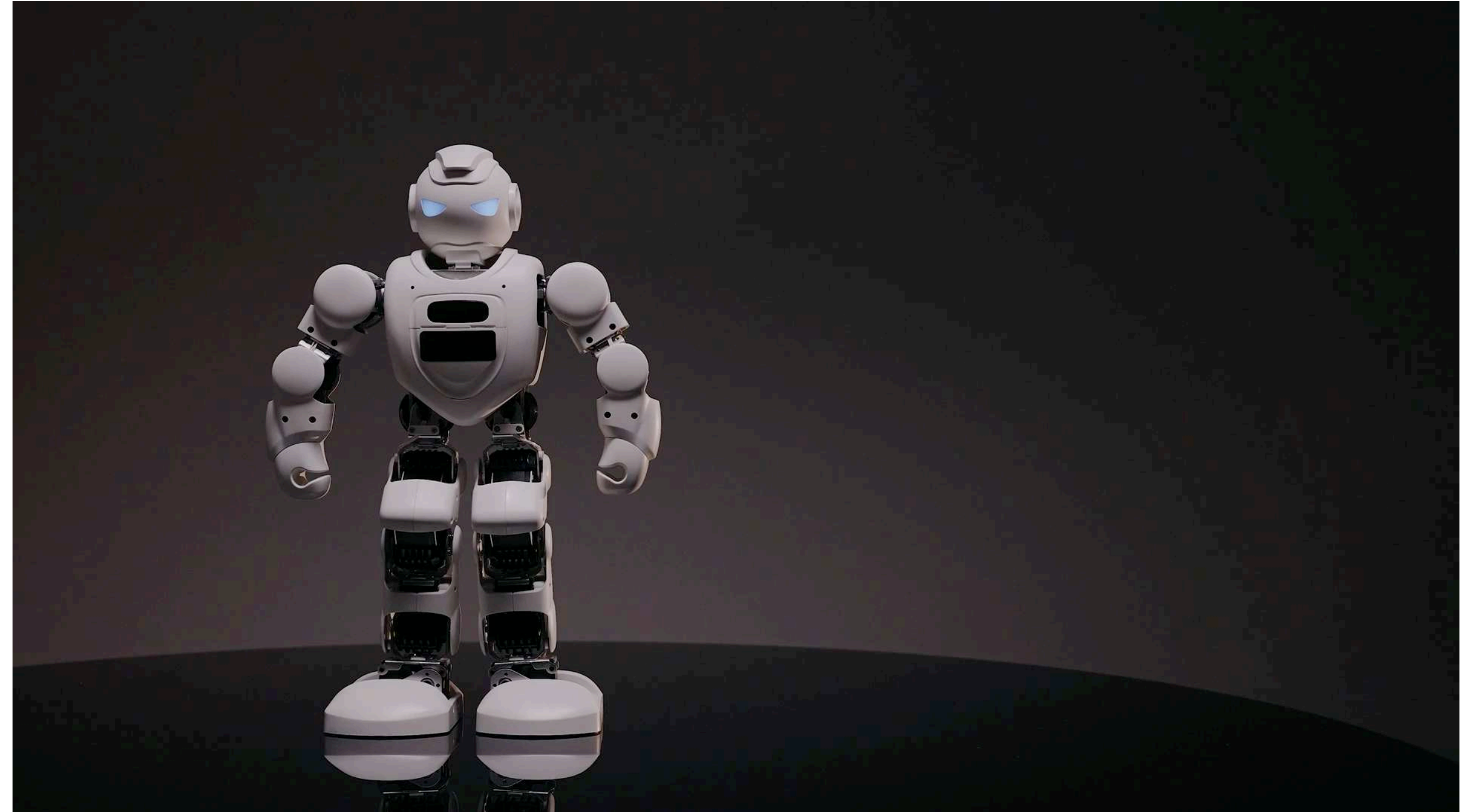


AI Applications

AI in Finance

3. Lending

1. Retail Lending
2. Commercial Lending
3. Retail Credit Scores
4. Commercial Credit Scoring
5. Headline takeaways

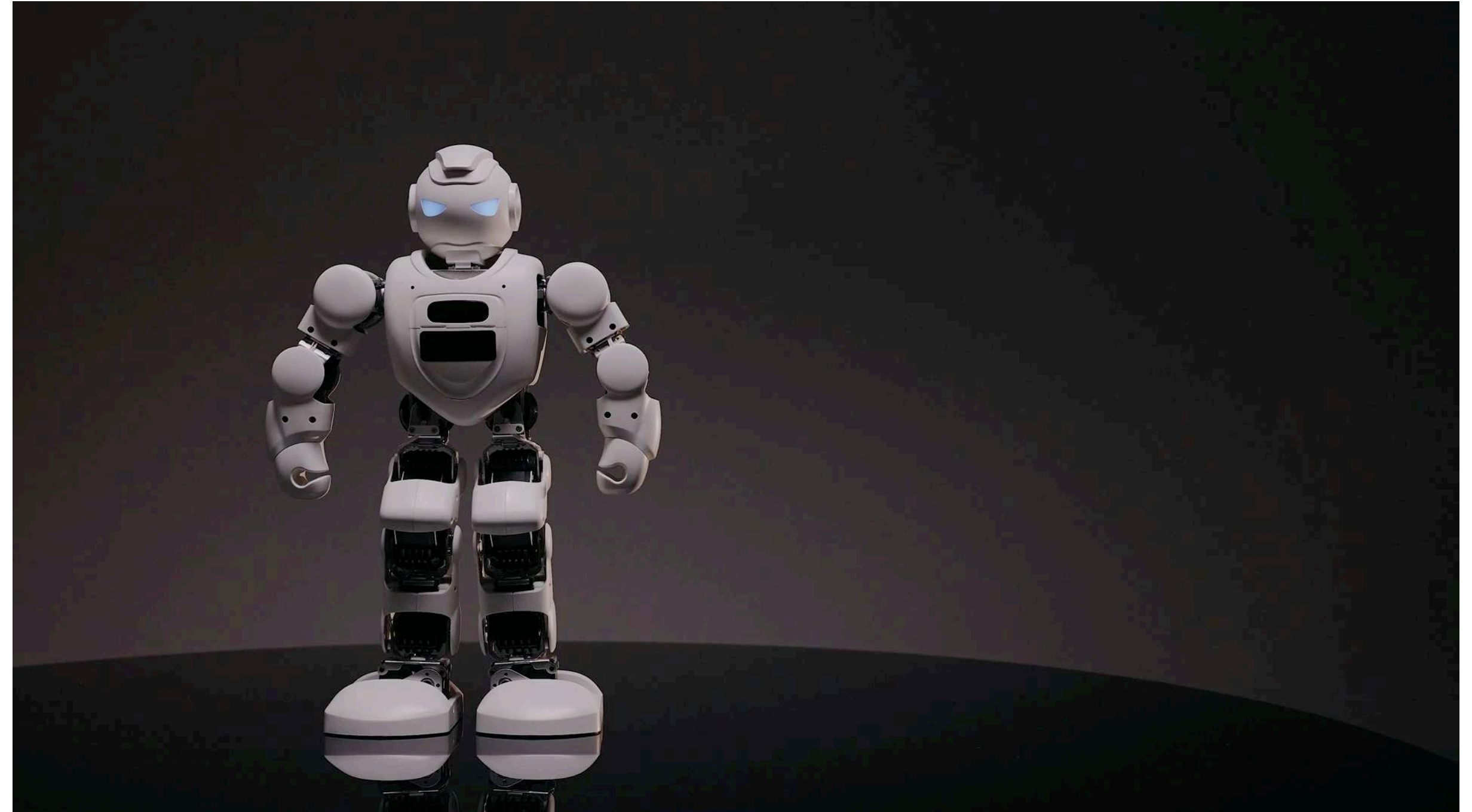


AI Applications

AI in Finance

4. Operations

1. Debt Collection
2. Procure-to-pay
3. Account Reconciliation in Commercial Banking
4. Headline takeaways

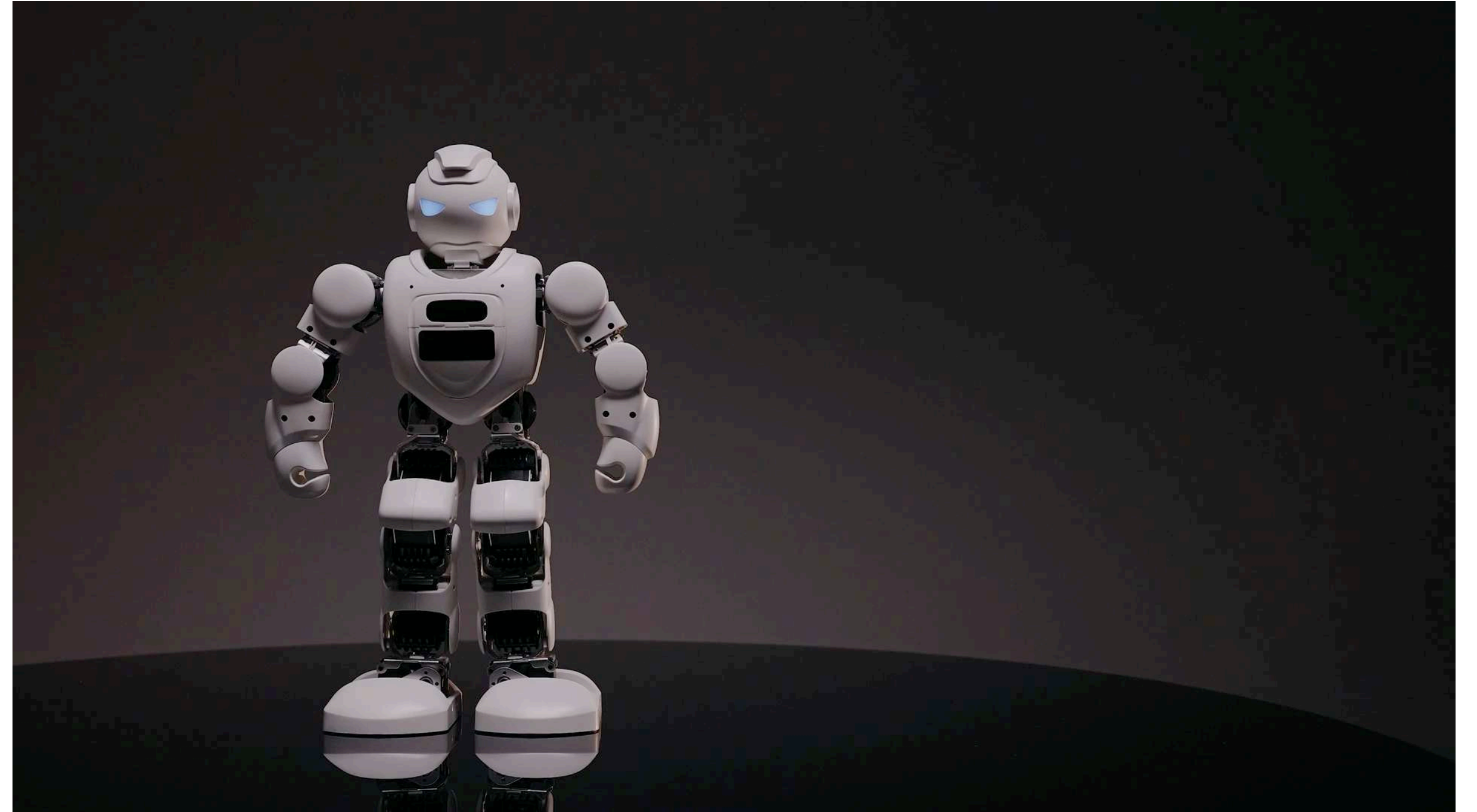


AI Applications

AI in Finance

5. Insurance

1. Insurance Pricing
2. Claims Processing
3. Headline takeaways



AI Applications

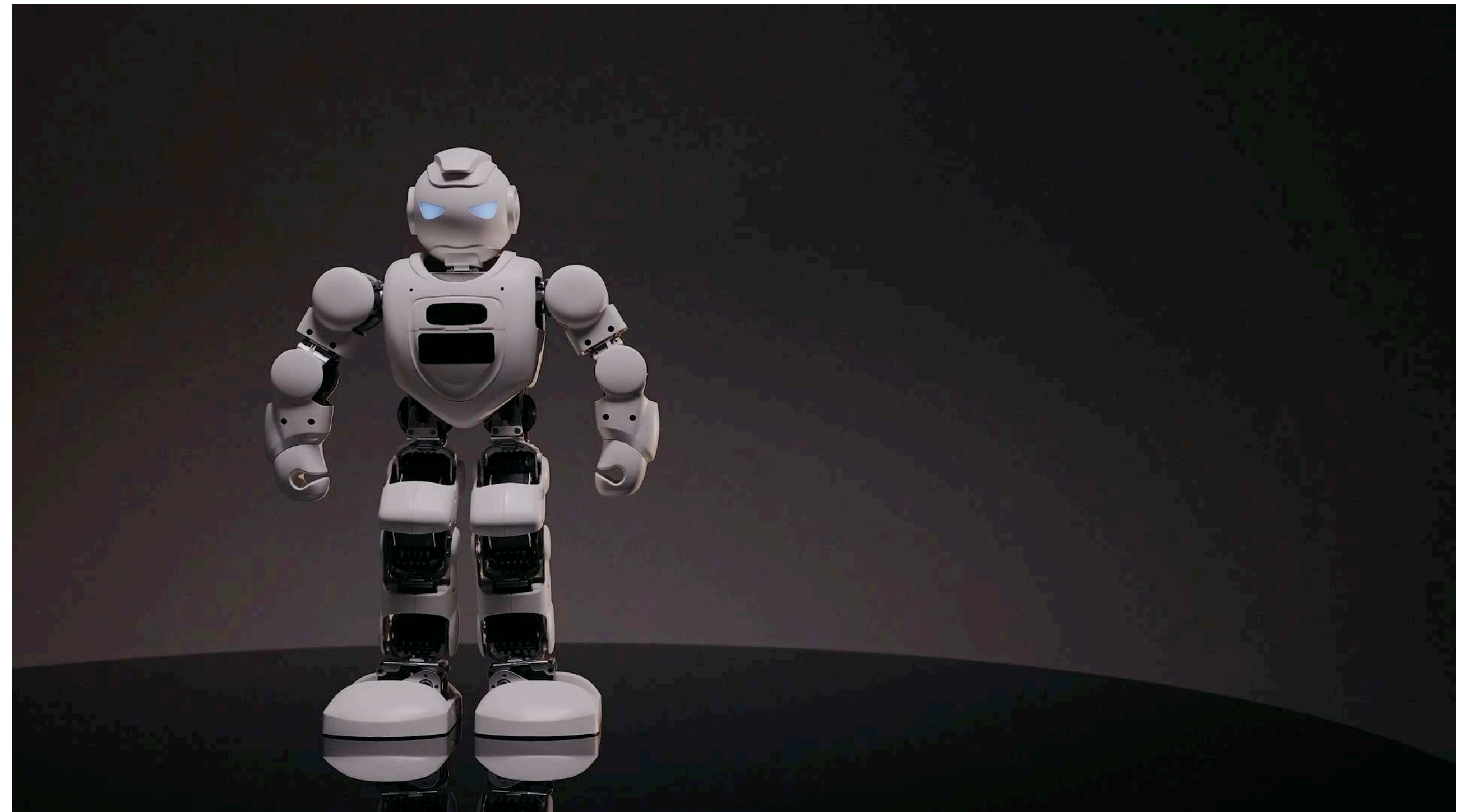
AI in Finance

6. Customer Service

1. KYC Processes
2. Responding to Customer Requests
3. Identification of upsell & cross-sell opportunities
4. Customer Churn Prediction
5. Headline takeaways

7. Other

1. Trading
2. Headline takeaways



AI Applications

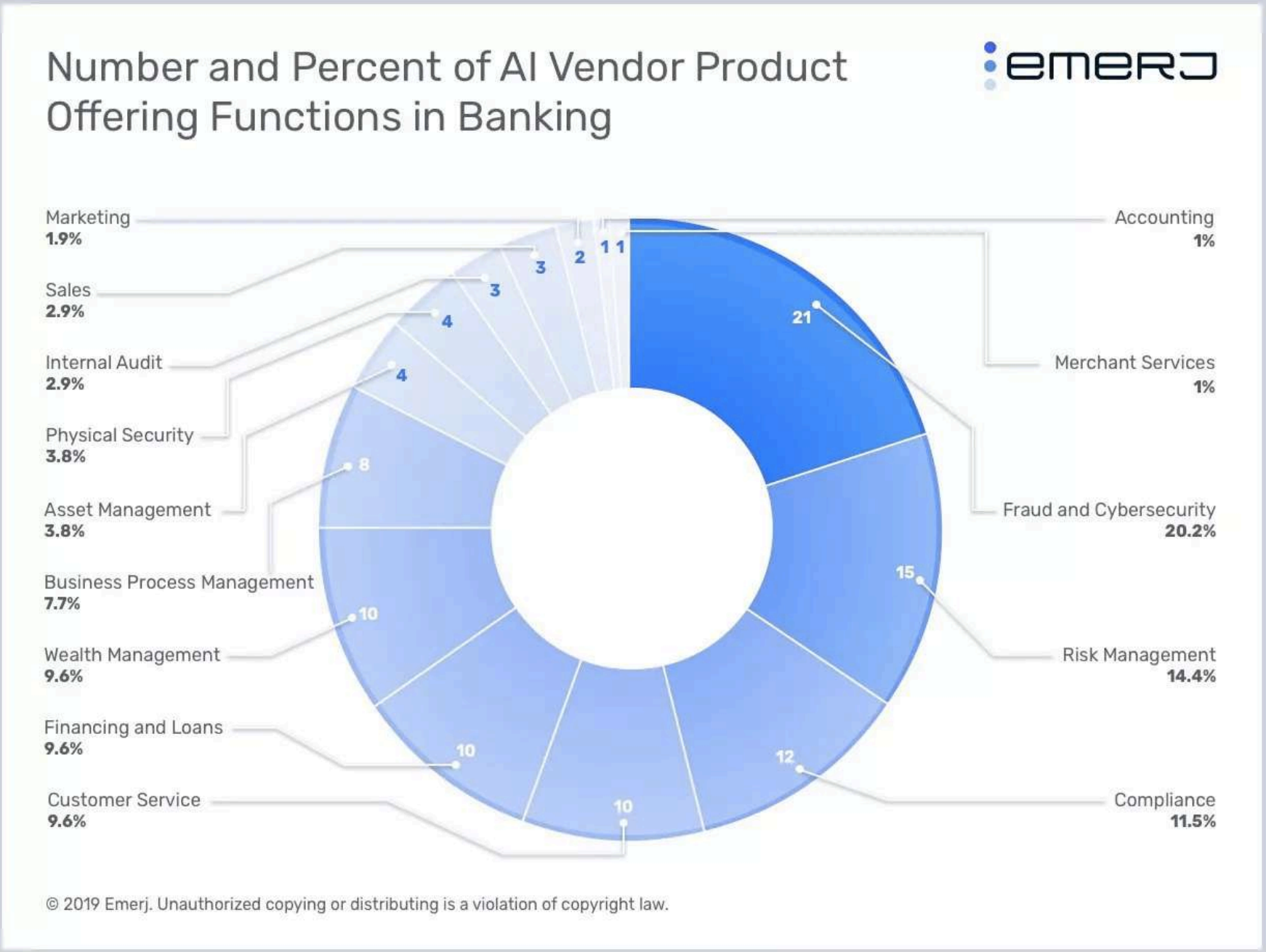
AI in Finance

Potential Impacts from AI Applications for Banking

- Improved Credit Quality Assessment
- Advancement of Financial Inclusion
- Stronger Capital Optimization
- Better Stress Testing
- Improved Market Impact Analysis
- Improved Trading and Investment Strategies
- Advanced Compliance and Risk Mitigation

AI Applications

AI in Finance



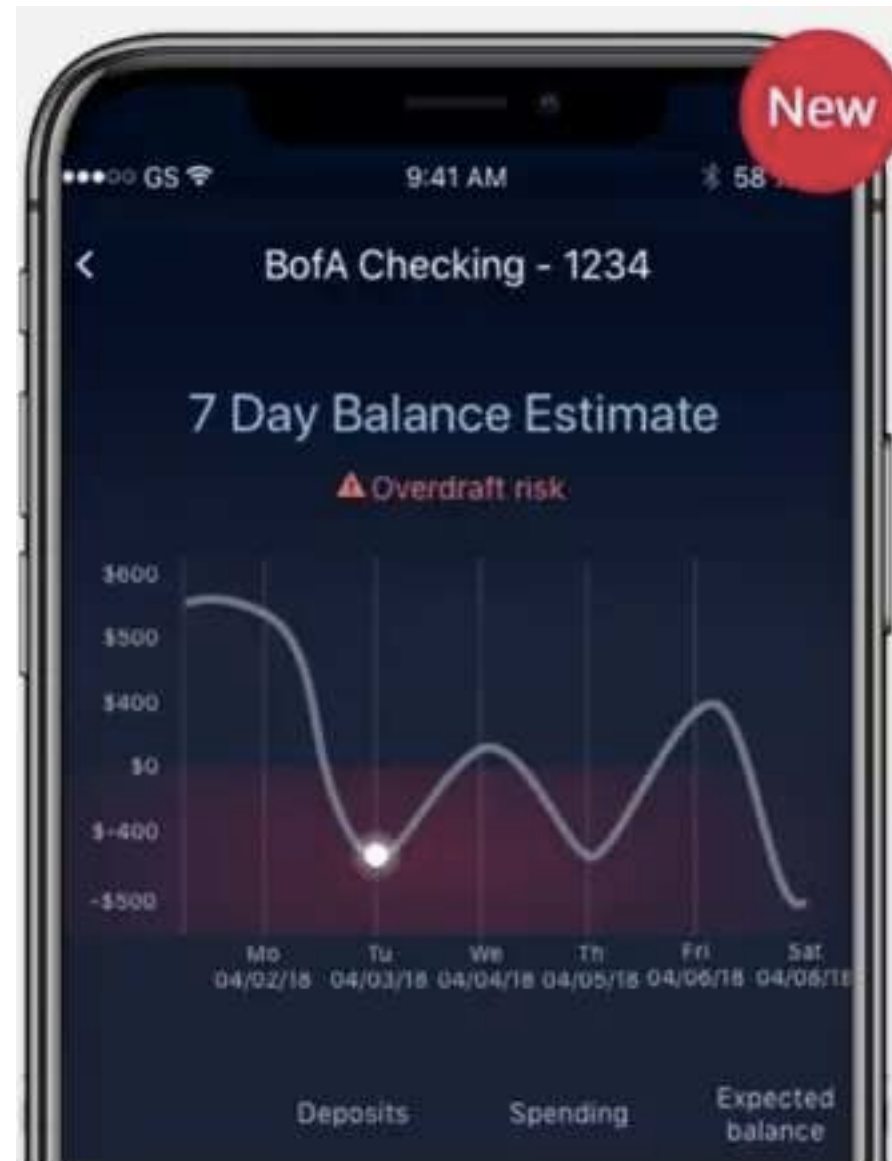
AI Applications (J P Morgan use case)



AI Applications (Wells Fargo use case)



AI Applications (Bank of America, Citibank Use Case)



AI Applications (U S Bank Use Case)



AI Applications (Bank of NY Mellon Corp Use Case)



AI Applications

AI in Finance

Investment by leading enterprises

Finance
Alibaba
Zhongan
Insurance
Ant Financial

Tencent
Zhongan
Insurance

JD.com
Taicang
Technology
ChinaScope
Juxinli.com

Apple
FreightWaves

Finance
IBM
Accrue

Microsoft
Voiceitt

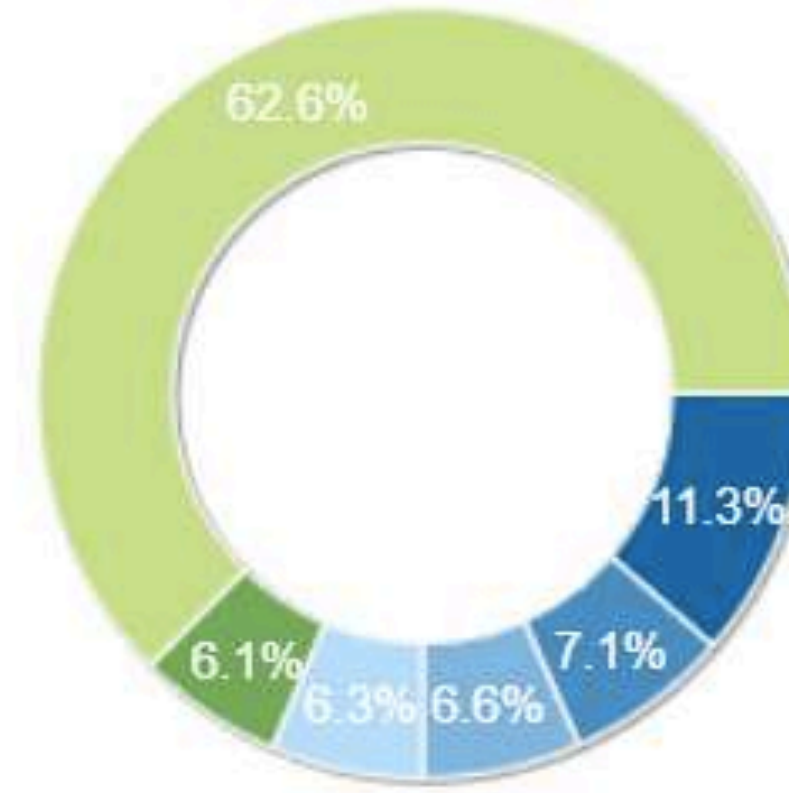
SIG
Abc fintech



1: Incomplete statistics, only include some representative companies Sources: Deloitte Research, as of 2019



Top Use Case Based on 2020 Market Share (Value (Constant))



- Automated Customer Service Age...
- Sales Process Recommendation a...
- Automated Threat Intelligence ...
- IT Automation
- Fraud Analysis and Investigati...
- Others

Source: IDC Worldwide Artificial Intelligence Spending Guide - Forecast 2020 | Aug (V2 2020)

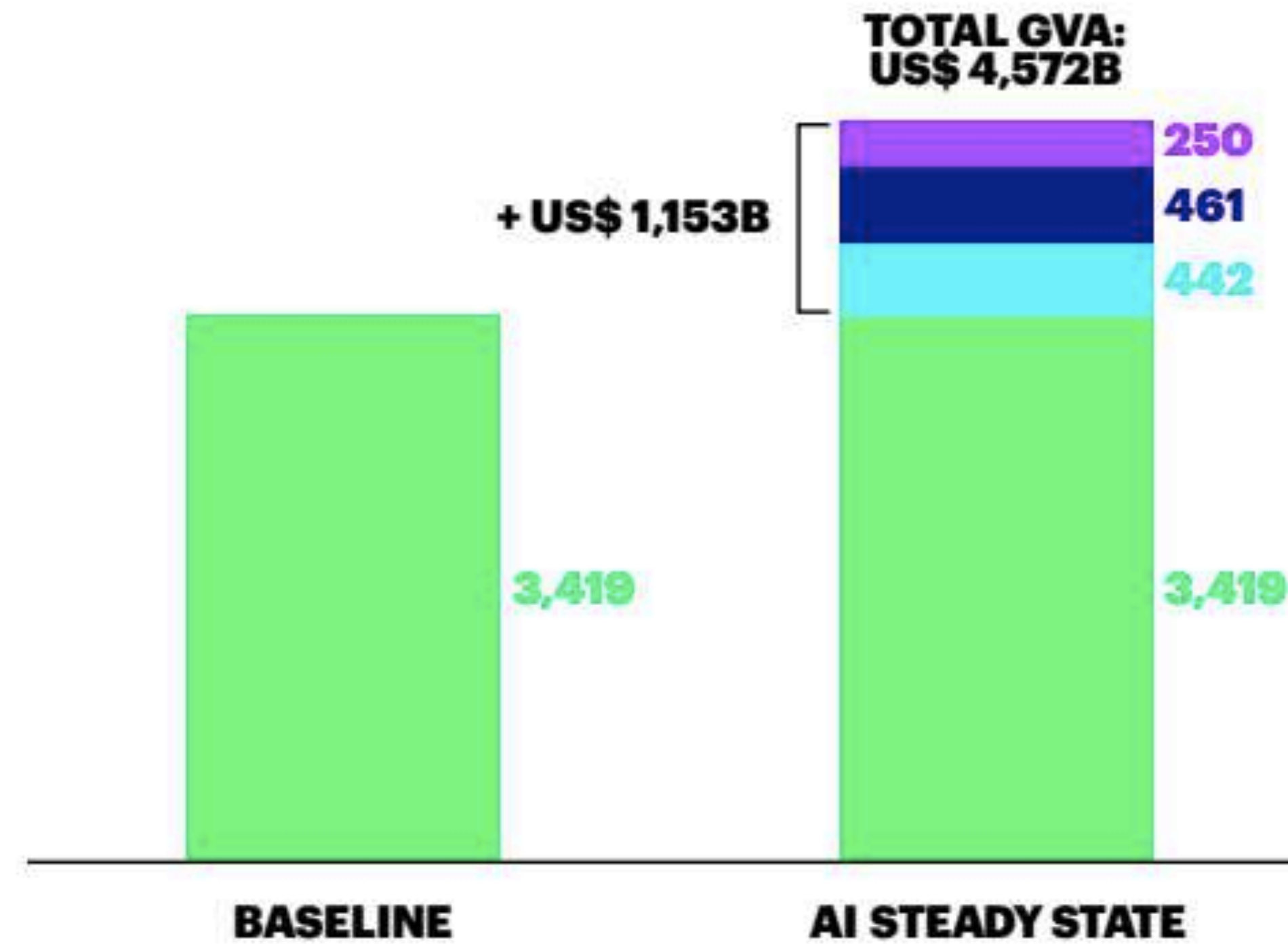
25 Aug 2020

Worldwide Spending on Artificial Intelligence Is Expected to Double in Four Years, Reaching \$110 Billion in 2024, According to New IDC Spending Guide



FINANCIAL SERVICES

GVA in 2035 (US\$ billion)



opentext™

The Information Company

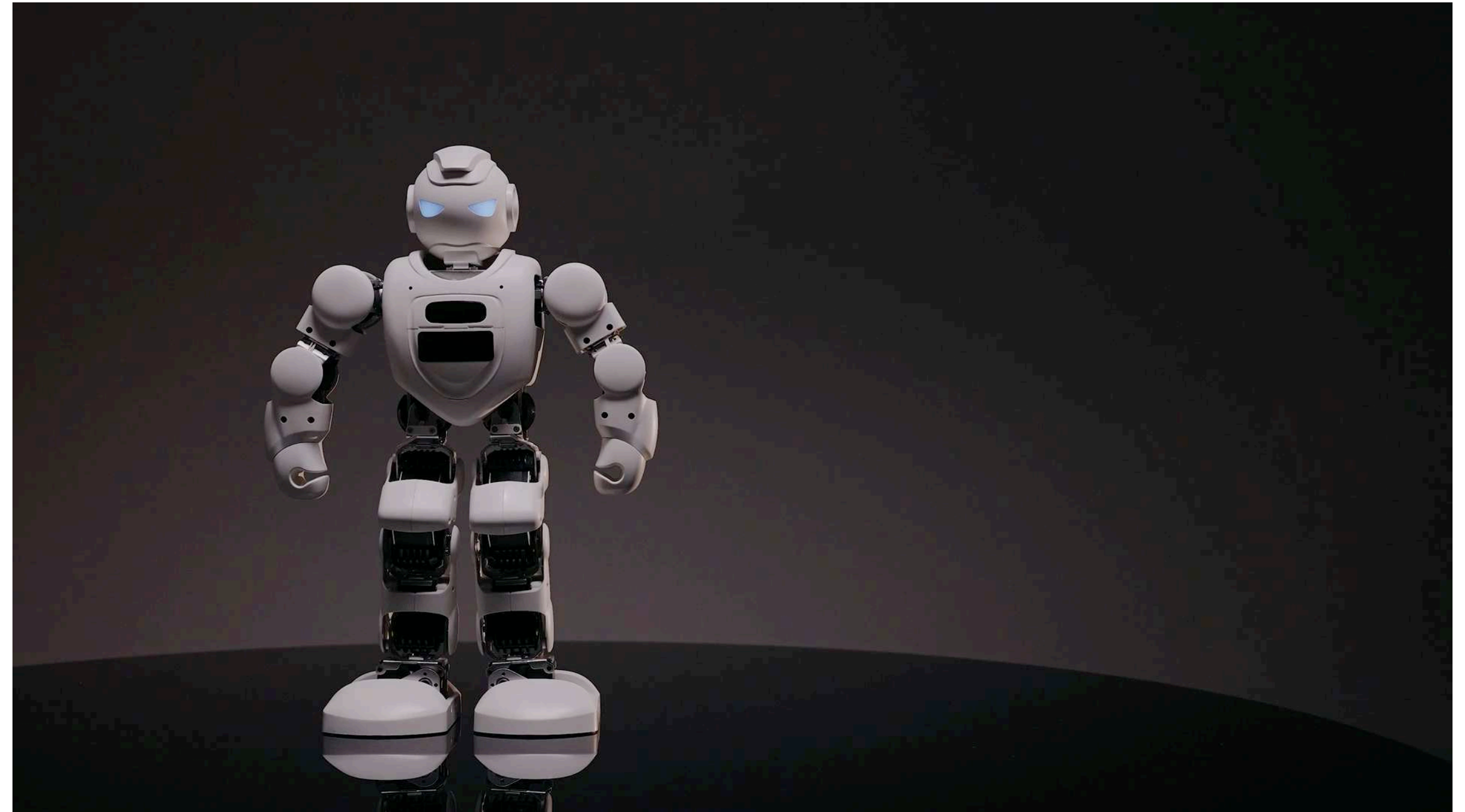


accenture

AI Applications

Constructing a plan for AI adoption

1. Understand the latest developments in AI.
2. Identify how AI can help you deliver your business strategy.
3. Businesses using AI in 3 main areas:
 - Designing intelligent products
 - Providing intelligent services
 - Making business processes more intelligent
4. Headline takeaways



Summary - AI Applications

1. 10 Things AI can already do!
2. Applications
3. AI in video & image processing
4. AI in Speech Processing and Intelligent Bots
5. Ai in Agriculture
6. AI in Law
7. AI in Retail
8. AI in Finance
9. Headline takeaways



X

Breakout Room 4!

Artificial Intelligence in Finance:

Is it just hype or
does it represent the future for the industry?

Vote of Confidence!



Financial services: Confidence in AI to detect fraud

- Majority (93%) of financial services business leaders are confident in AI's ability to detect fraud, an 8-percentage point increase compared to last year's report.
- 86% of financial services business leaders indicate a desire for government involvement in regulating AI technology, a 27-percentage point increase compared to last year's report.
- 84% of financial services business leaders say AI is at least moderately to fully functional at their organization, an increase of 37-percentage points compared to last year's report.



Source: KPMG 2021 *Thriving in an AI World*, AI study across 7 industries



“The real question is, when will we draft an artificial intelligence bill of rights? What will that consist of? And who will get to decide that?”

—Gray Scott

End of Presentation



4/ Understanding AI
AI Applications



Artificial Intelligence

Essential AI for Everyone

A Technology-Business-People Playbook!

5/ Understanding ML

Deep Dive



1.
Understanding AI -
Course Introduction

2.
Understanding AI -
Deep-Dive 1

3.
Understanding AI -
Deep-Dive 2

4.
Understanding AI -
Applications


5.
Understanding ML -
Deep-Dive

6.
Understanding DL -
Deep-Dive

7.
Implementing AI -
Projects

8.
AI Trends -
State of AI

9.
AI for
Business Leadership

10.
Ethics
In AI

11.
AI in
Singapore
+ AI in action!

12.
Future
of AI

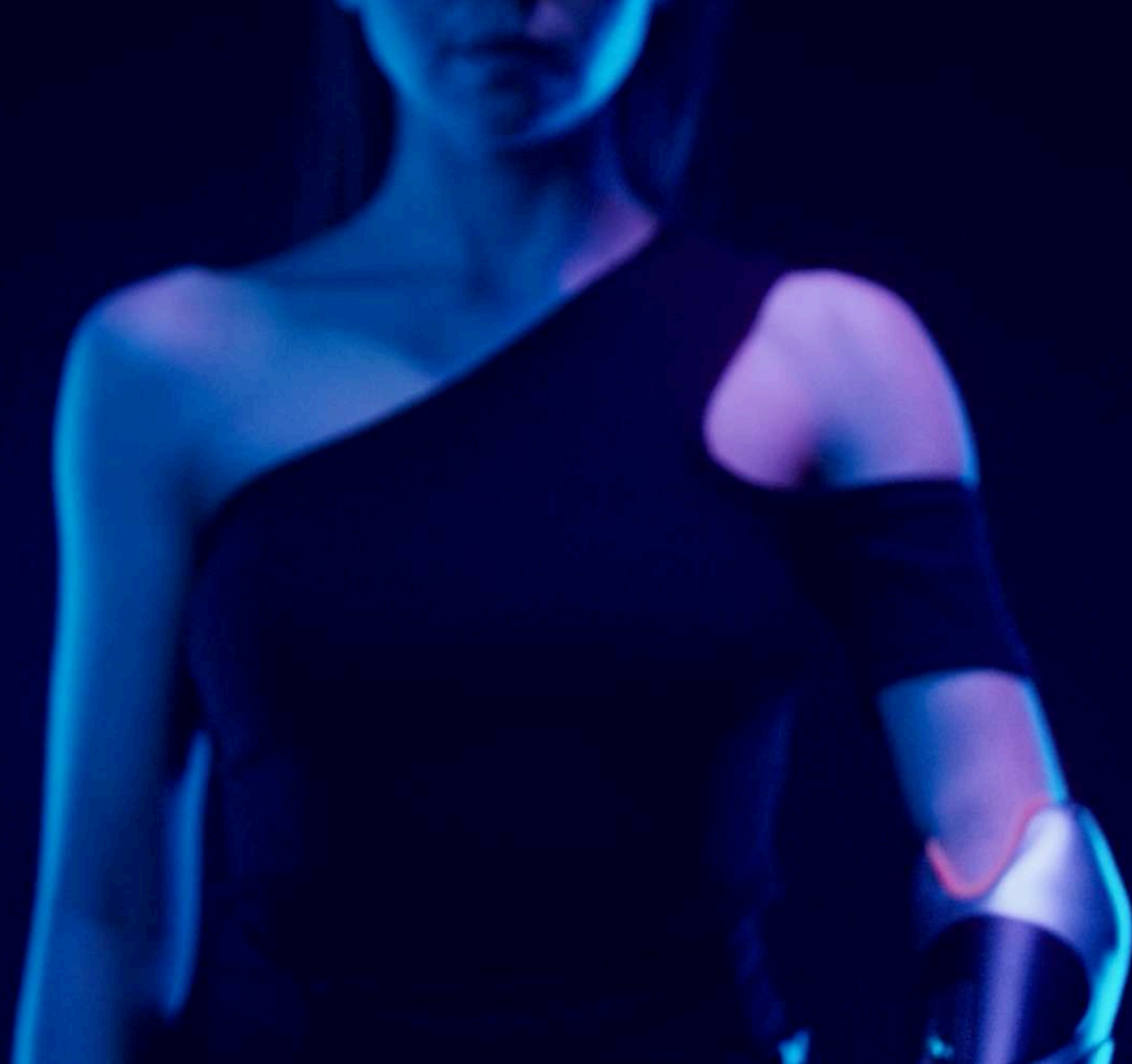
1.
Technology

2.
Business

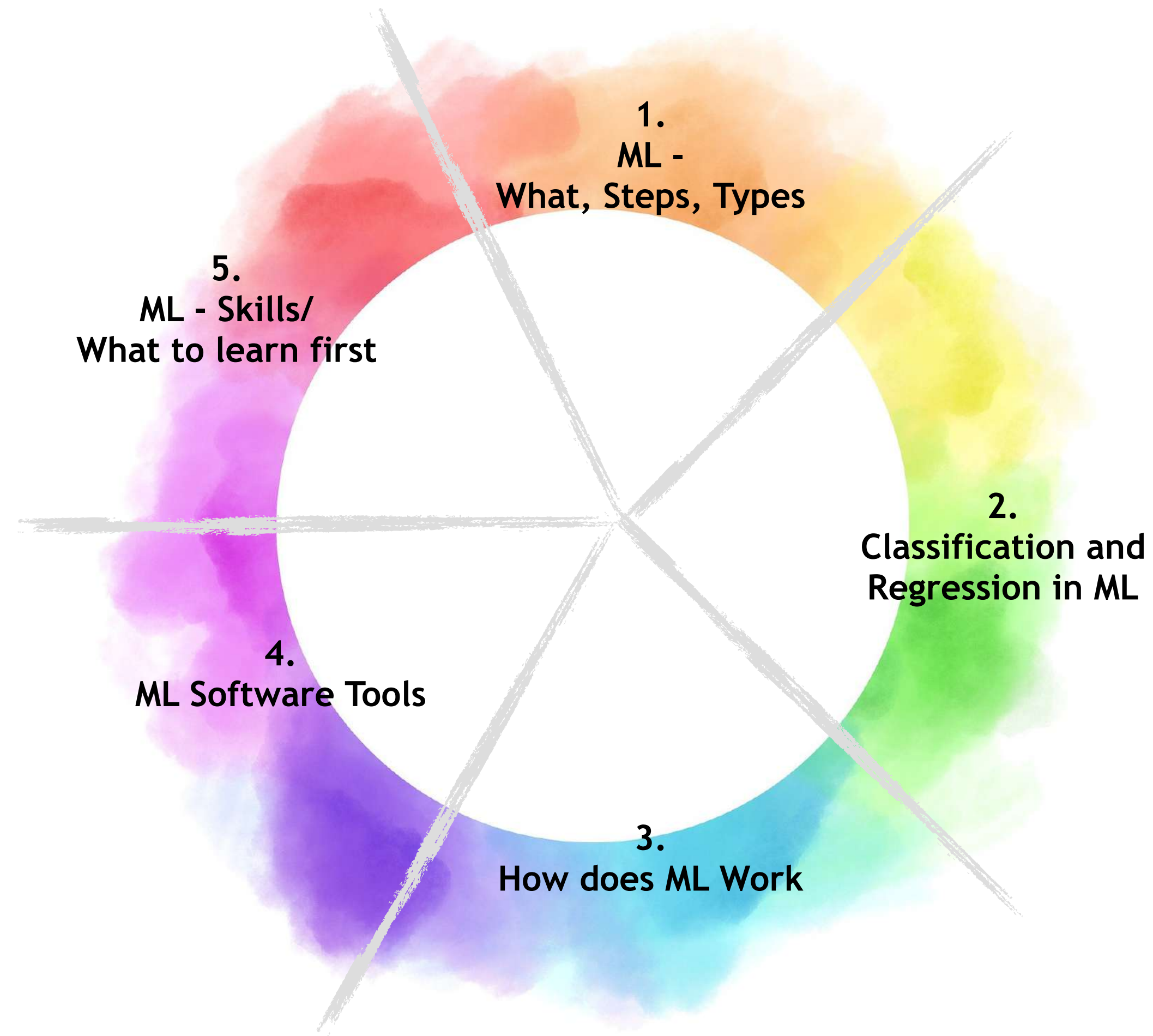
2.
People

5.
Understanding ML-
Deep Dive

5.
Understanding ML-
Basics + More



5/ Understanding ML - Deep-Dive



Challenge #2 DATA



Poll No 12

What is the biggest driver for AI and AI adoption?

a/ Software

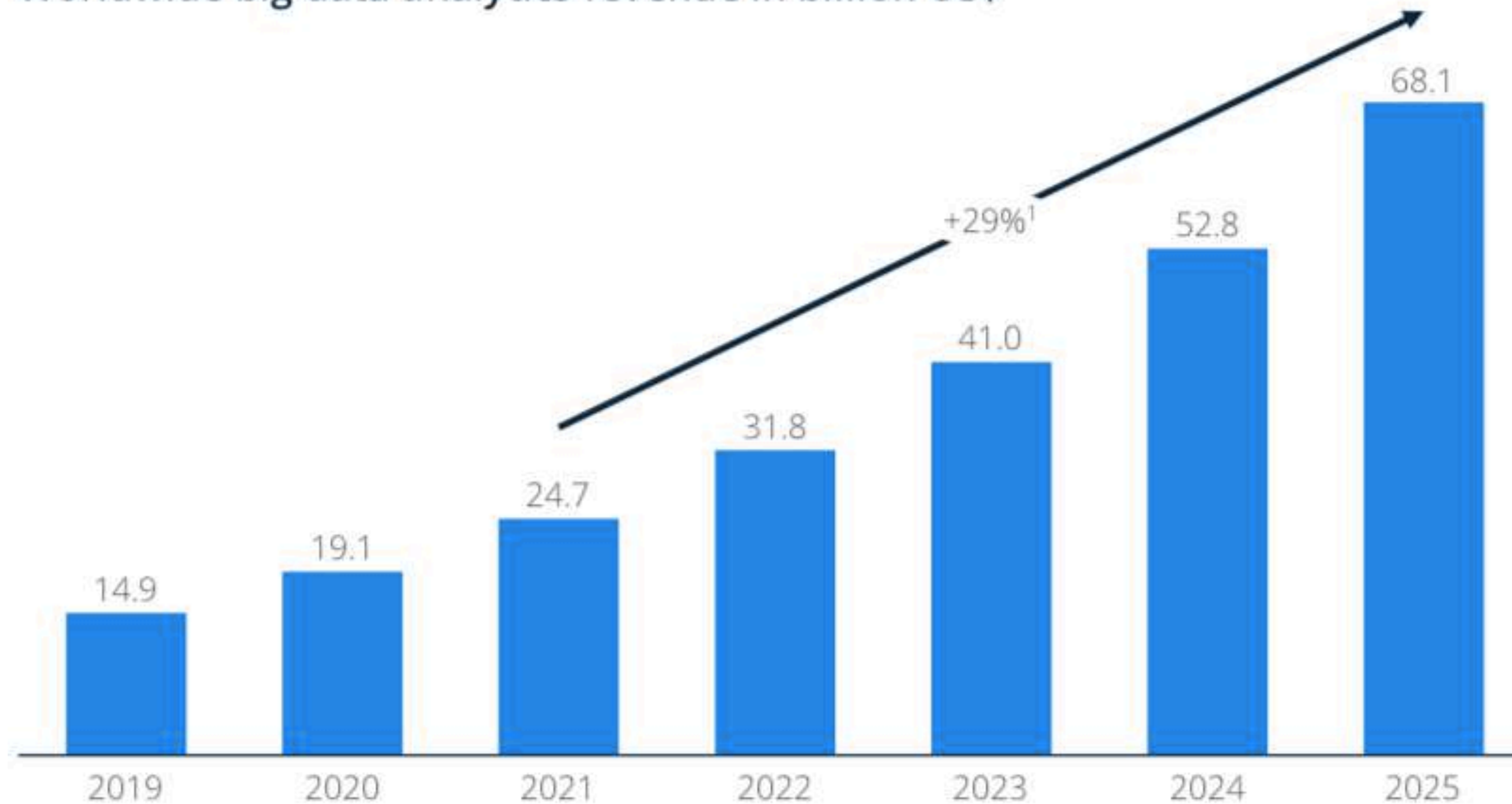
b/ Hardware

c/ Big Data

d/ Talent



Worldwide big data analytics revenue in billion US\$



Sources: Frost & Sullivan, as of September 2020

Understanding ML - Deep-Dive

Implementing AI

1. Machine Learning
2. Deep Learning
3. Neural Network
4. Headline Takeaways



Understanding ML - Deep-Dive

Diving into Machine Learning

1. The data frontier
2. ML everywhere
3. Using data to answer questions
4. Headline takeaways



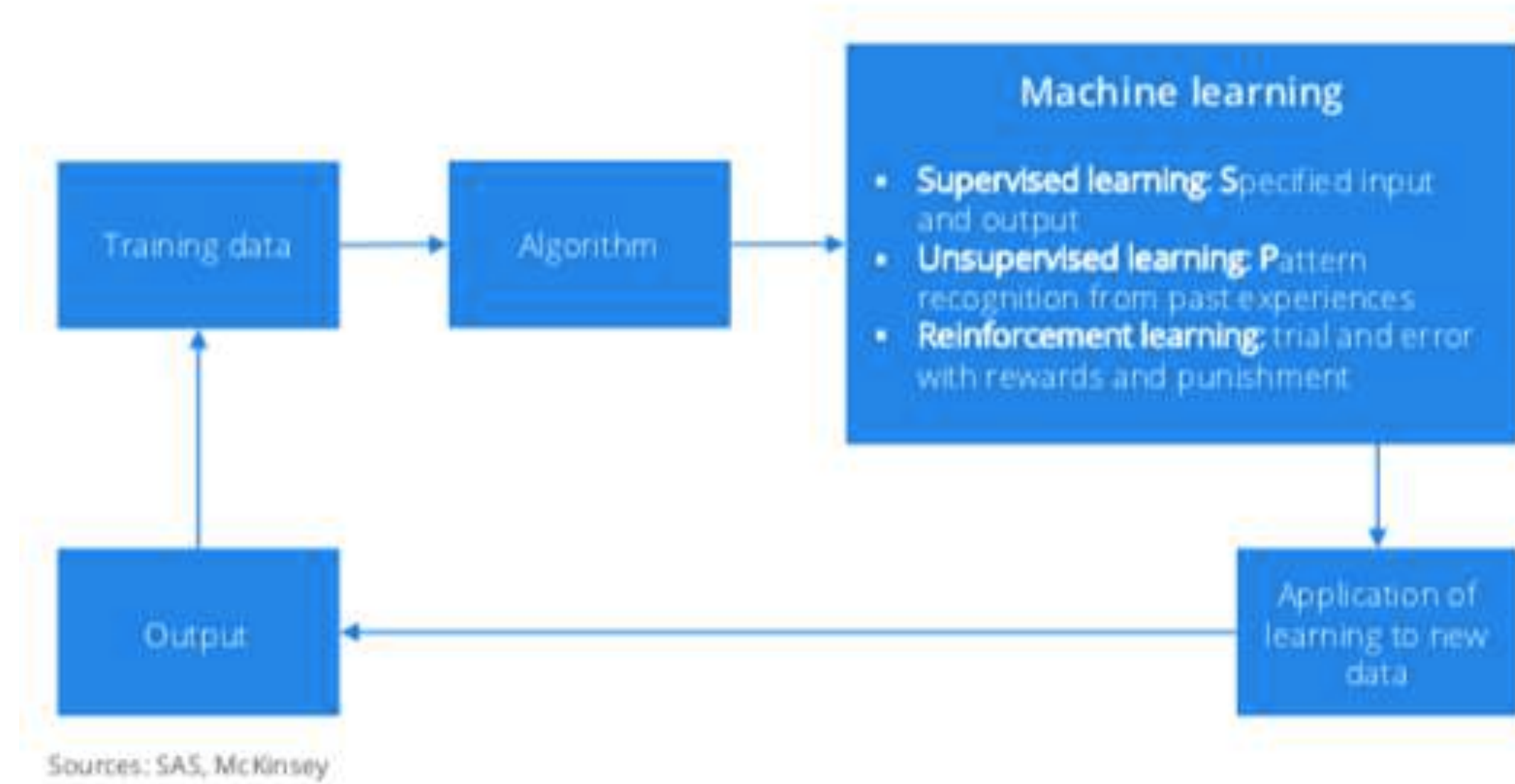
[Click](#)

Understanding ML - Deep-Dive

What is Machine Learning

1. Explaining ML
2. Headline takeaways

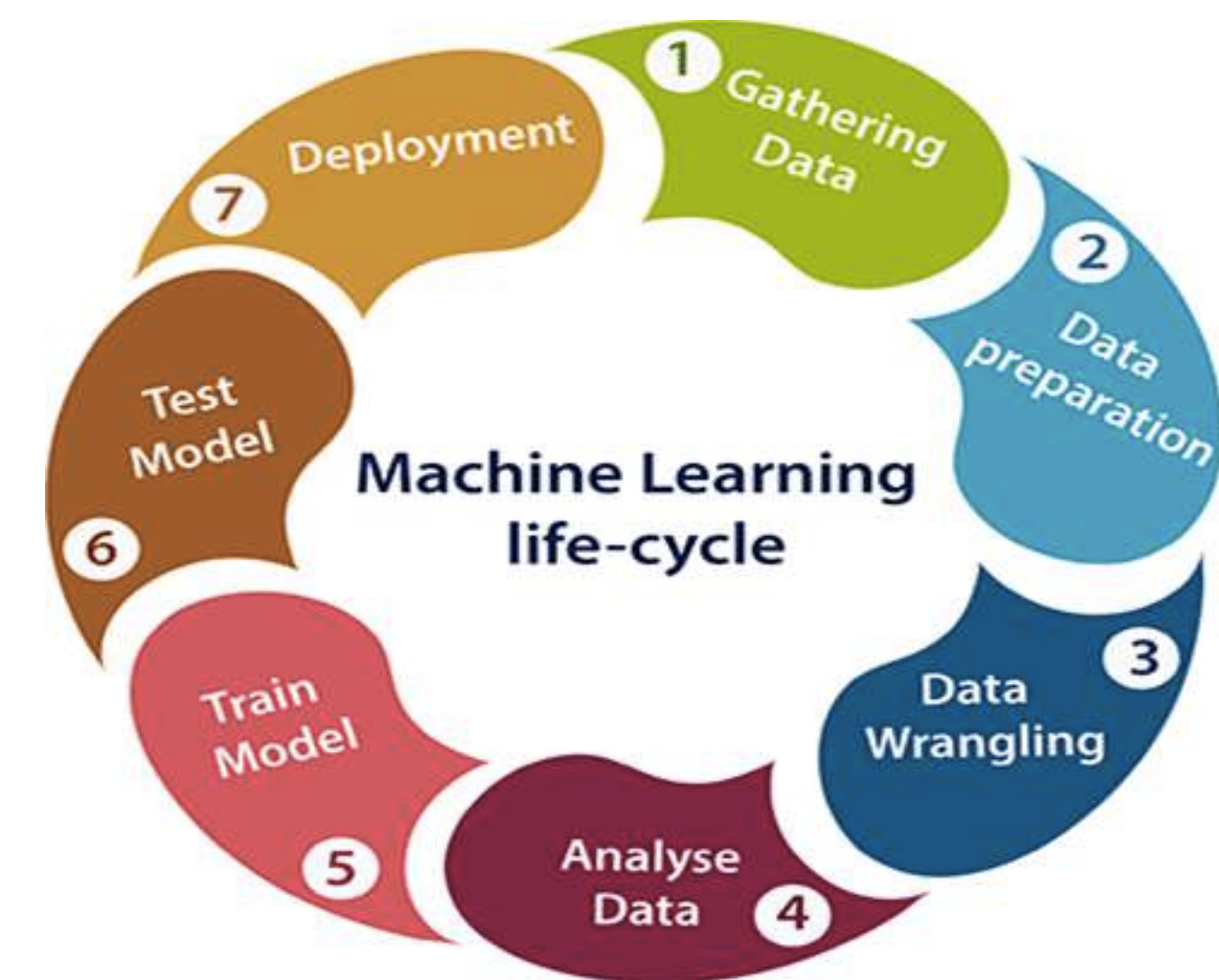
Illustration of the machine learning process



Understanding ML - Deep-Dive

Steps of Machine Learning

1. Explaining the steps
2. Headline takeaways



[Click](#)

Understanding ML - Deep-Dive

ML Model

PassengerId	Pclass	Name	Gender	Age	Fare	Cabin	Embarked	Survived
1	3	Braund, Mr. Owen Harris	male	22	7.25		S	0
2	1	Cumings, Mrs. John Bradley (Florence Briggs Thayer)	female	38	71.2833	C85	C	1
3	3	Heikkinen, Miss. Laina	female	26	7.925		S	1
4	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35	53.1	C123	S	1
5	3	Allen, Mr. William Henry	male	35	8.05		S	0
6	3	Moran, Mr. James	male		8.4583		Q	0
7	1	McCarthy, Mr. Timothy J	male	54	51.8625	E46	S	0
8	3	Palsson, Master. Gosta Leonard	male	2	21.075		S	0
9	3	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27	11.1333		S	1

Binary Classification

SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm	Species
5.1	3.5	1.4	0.2	Iris-setosa
7.7	2.6	6.9	2.3	Iris-virginica
4.7	3.2	1.3	0.2	Iris-setosa
7	3.2	4.7	1.4	Iris-versicolor
6.5	3	5.5	1.8	Iris-virginica
6.9	3.1	4.9	1.5	Iris-versicolor
7.7	3.8	6.7	2.2	Iris-virginica
6.4	3.2	4.5	1.5	Iris-versicolor
4.9	3	1.4	0.2	Iris-setosa

Multi-Class Classification

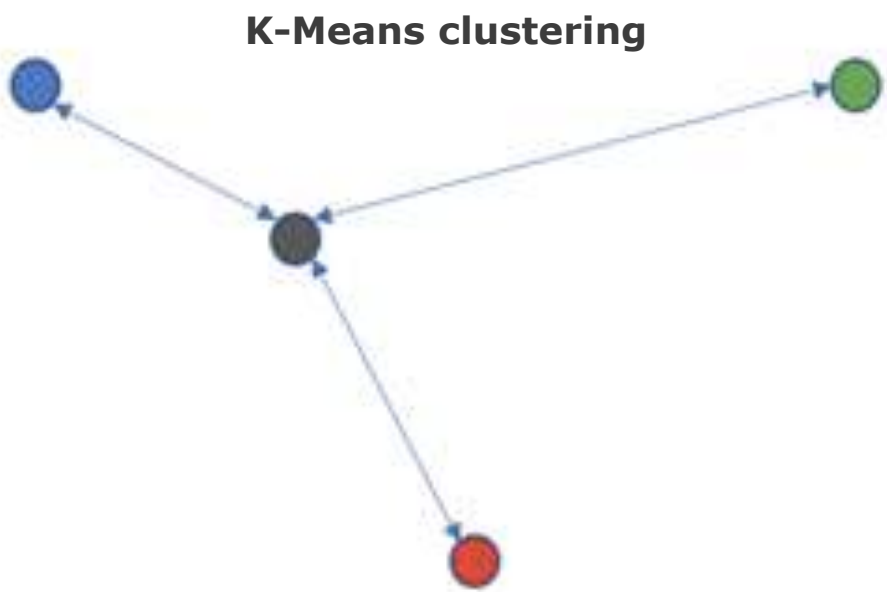


Understanding ML - Deep-Dive

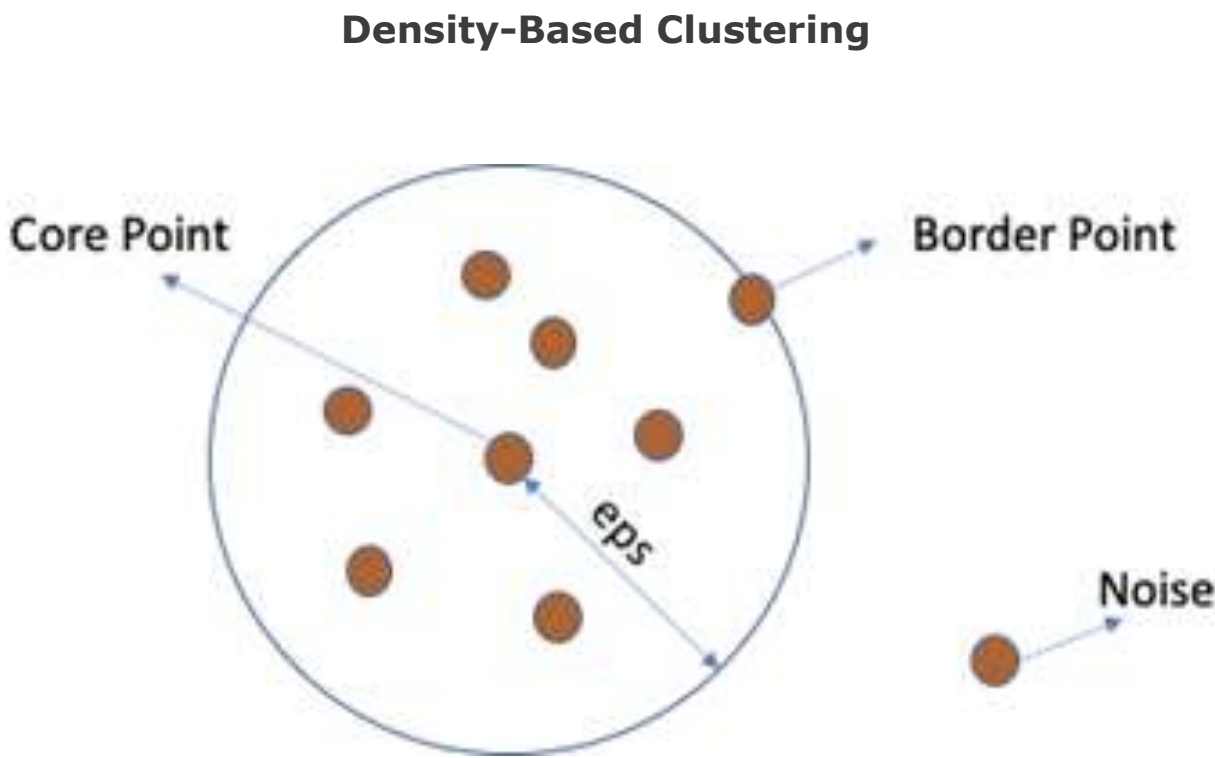
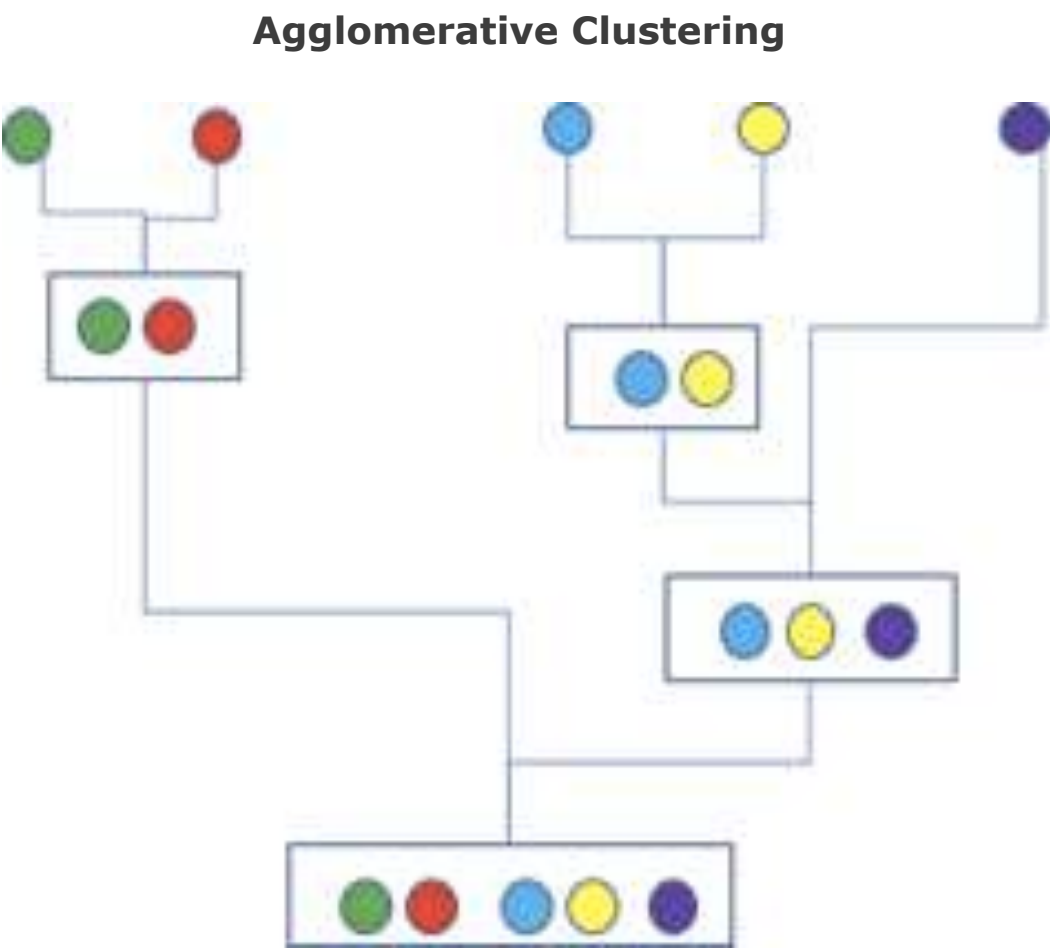
ML Model

gender	race/ethnicity	parental level of education	test preparation course	math score
female	group B	bachelor's degree	none	72
female	group C	some college	completed	69
female	group B	master's degree	none	90
male	group A	associate degree	none	47
male	group C	some college	none	76
female	group B	associate degree	none	71
female	group B	some college	completed	88
male	group B	some college	none	40
male	group D	high school	completed	64
female	group B	high school	none	38

Regression



In this picture, if the blue, green and red dots are the centroids, the grey data point will be grouped with the centroid closest to it. In this case, it will be grouped with the blue centroid.



Understanding ML - Deep-Dive

Classification and Regression in ML



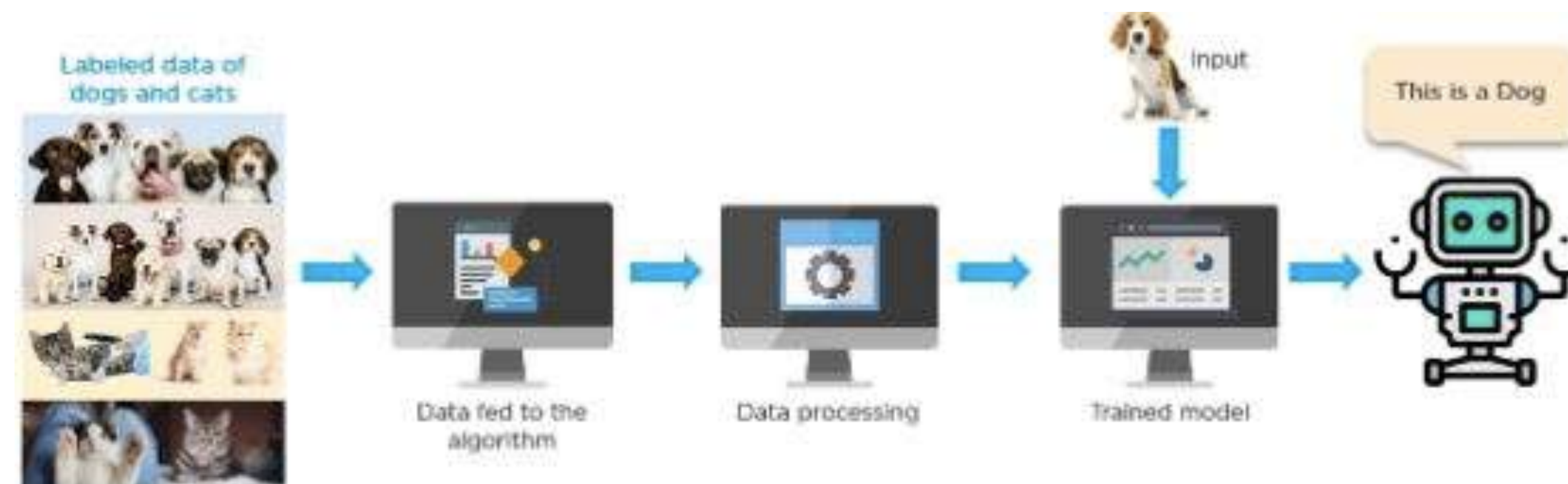
Understanding ML - Deep-Dive

How does ML work?

1. How to learn from data

Types of ML

2. Supervised Learning
3. Unsupervised Learning
4. Reinforcement Learning
5. Headline takeaways

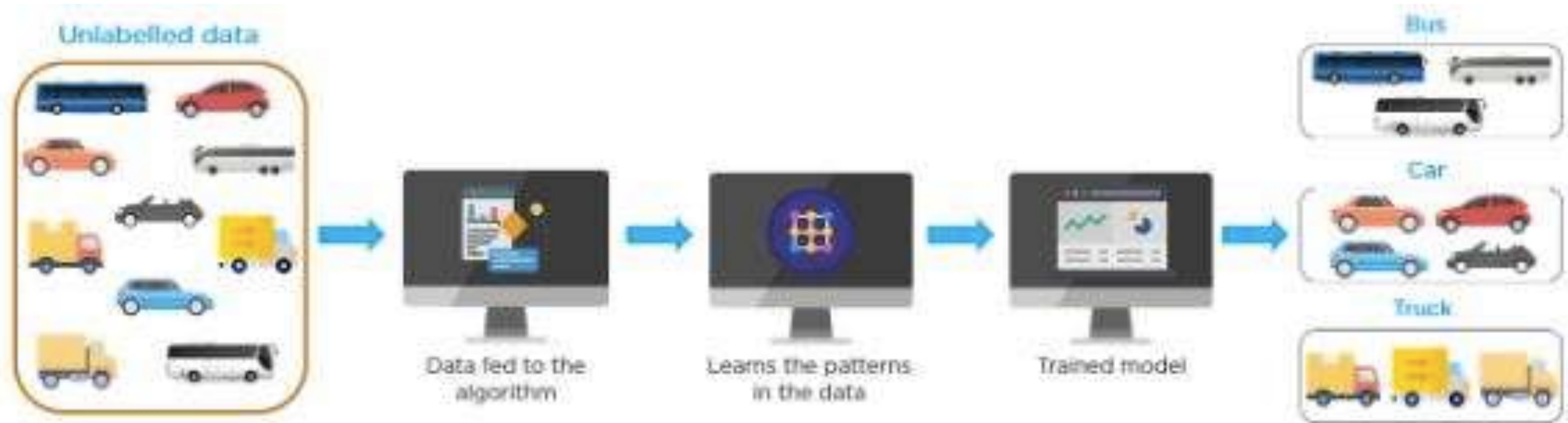


1. Supervised Learning

Understanding ML - Deep-Dive

How does ML work?

2. Unsupervised Learning



3. Reinforcement Learning



Poll No 13

With the rise of AI, more and more start-ups venture into the market. Most work in the field of

a/ Recommendation Engines

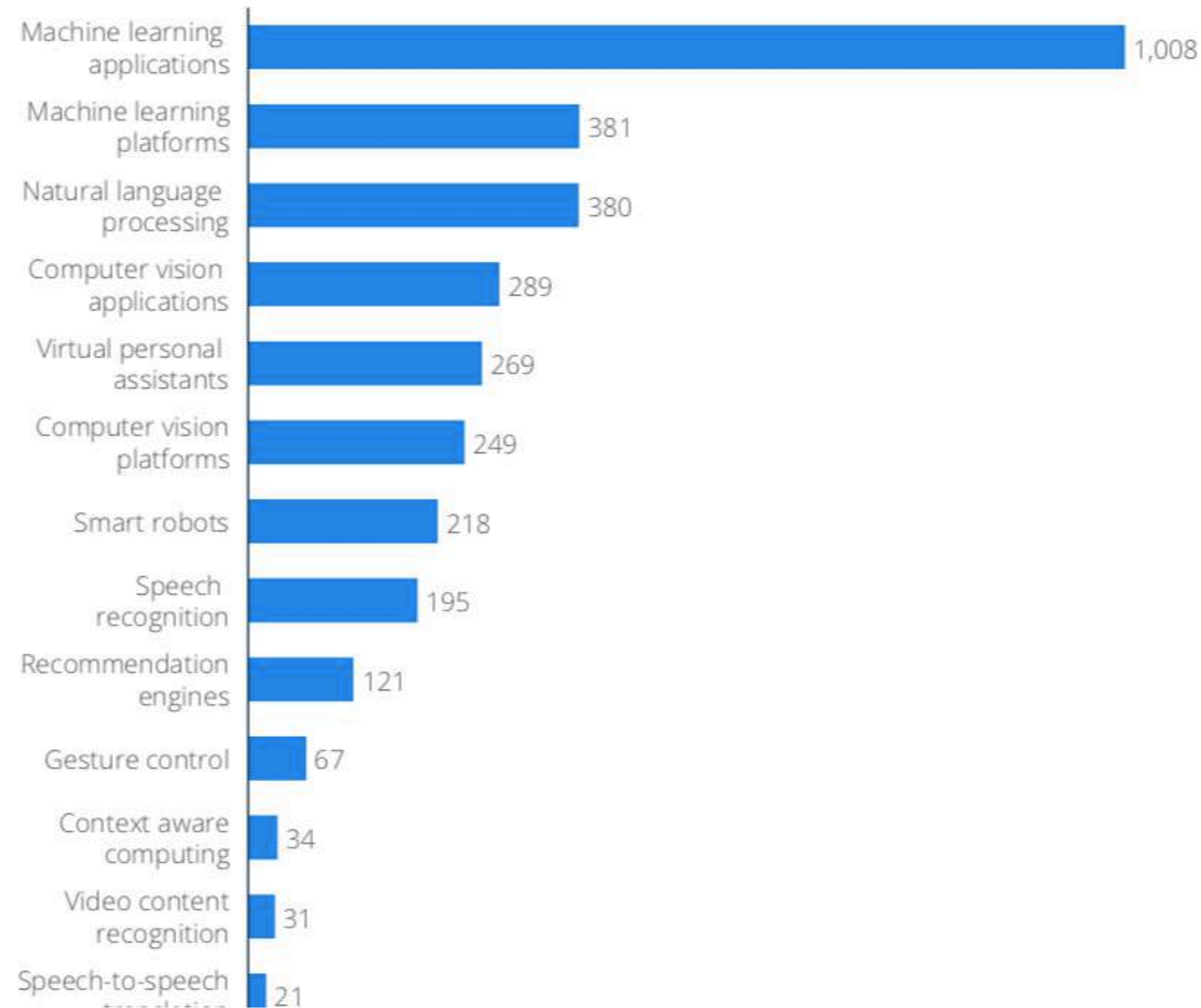
b/ Video content recognition

C/ ML applications

d/ virtual personal assistants



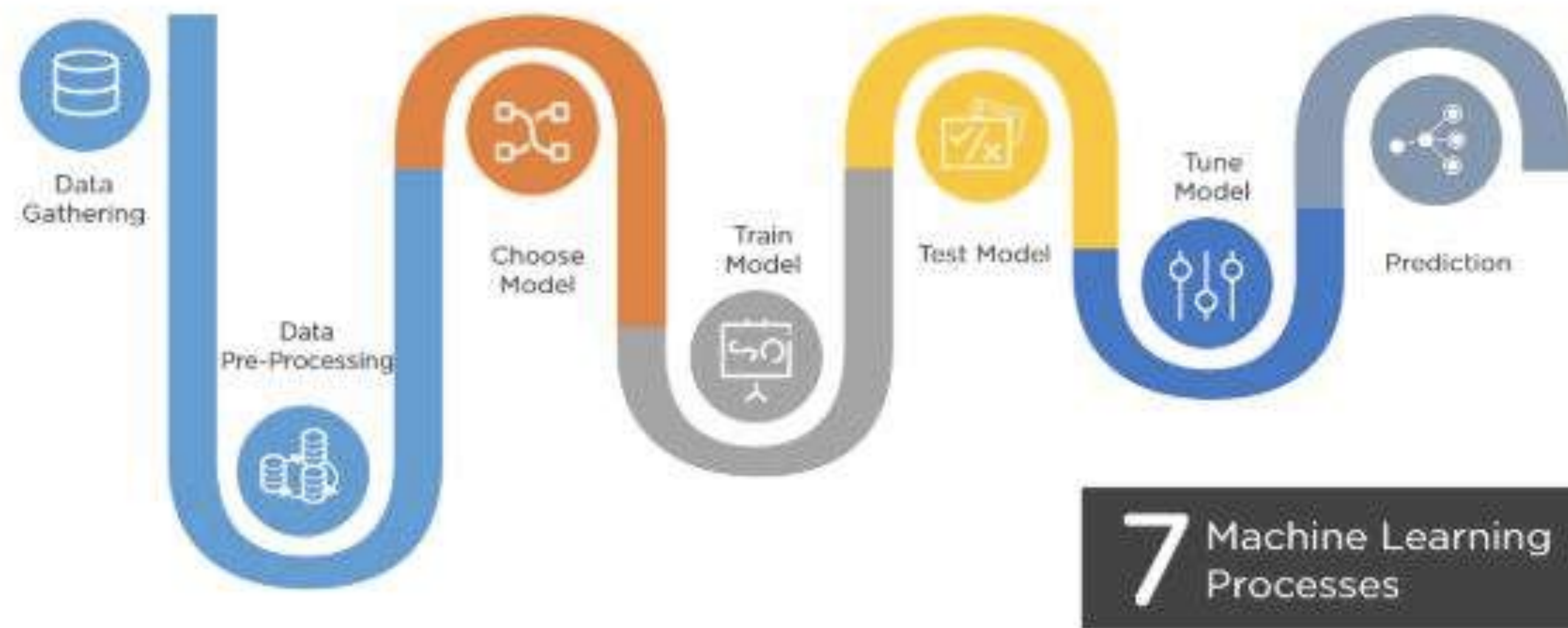
Number of AI start-ups



1: CAGR: Compound Annual Growth Rate/average growth rate per year Sources: Venture Scanner, as of September 2019

Understanding ML - Deep-Dive

How does ML work?



Machine Learning Applications

Company	Application	Sector	Inputs	Actions	Objective
	Trade execution platform for multiple strategies	Financial services 	200 plus market related data inputs	Sell, buy, hold stocks	To trade as close as possible to VWAP, a common price metric
NETFLIX	Test schedules for business partner devices	Technology	Historical test and device performance information	Which test to do next	Minimize device failure
 Spotify	Recommendation engine	Entertainment	Previous songs liked/disliked/not played	Which songs to put in your playlist	Maximize user listening time
J.P.Morgan	Financial derivatives risk and pricing calculations	Financial services 	Historical market data	Price and sell a financial product	Maximize future cash flows of an investment portfolio
Google	Data center cooling	Technology	Temperature/air pressure	Turn on fan; add water to air unit	Control temperature and reduce energy usage
 DiDi	Order dispatching	Ride-hailing	Number of idle vehicles, number of orders, location destinations	Match driver to passenger	Minimize pick up time and maximize revenue

Understanding ML - Deep-Dive

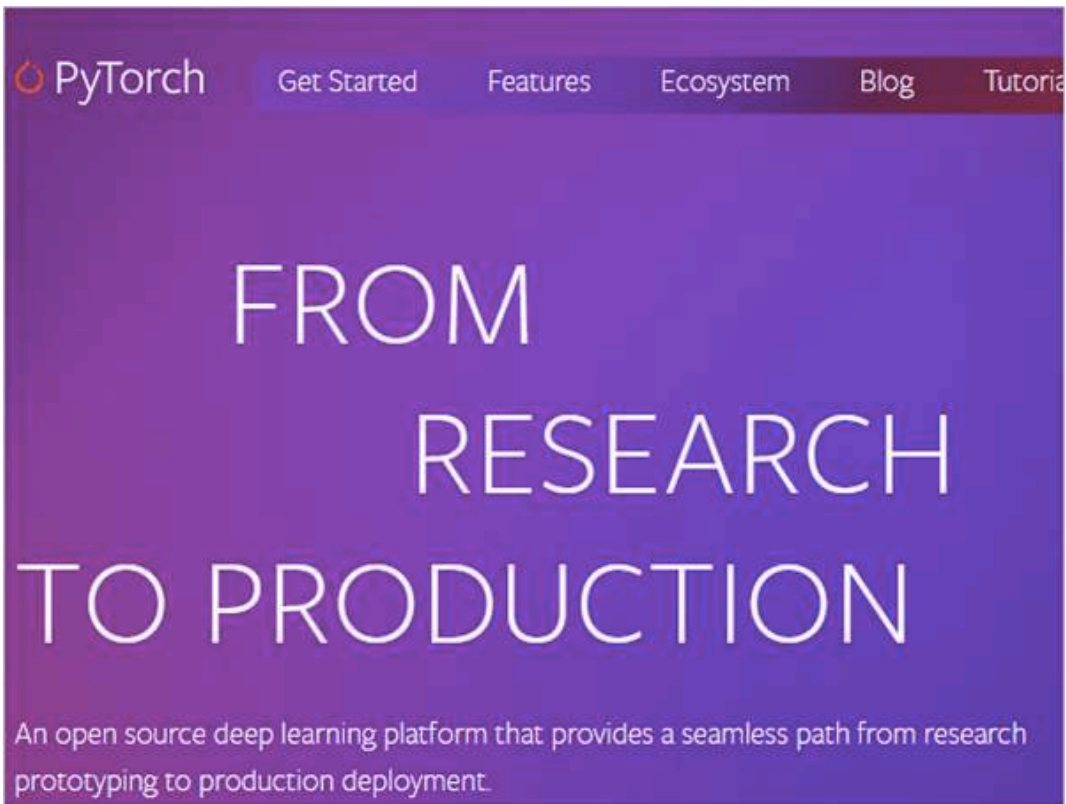
ML Software tools 2021

1. Scikit-learn
2. PyTorch
3. TensorFlow
4. Weka
5. KNIME
6. Colab
7. Apache Mahout
8. accord.Net
9. Shogun
10. keras.io
11. Rapid Miner,
12. Headline takeaways



Understanding ML - Deep-Dive

ML Software tools 2021



Understanding ML - Deep-Dive

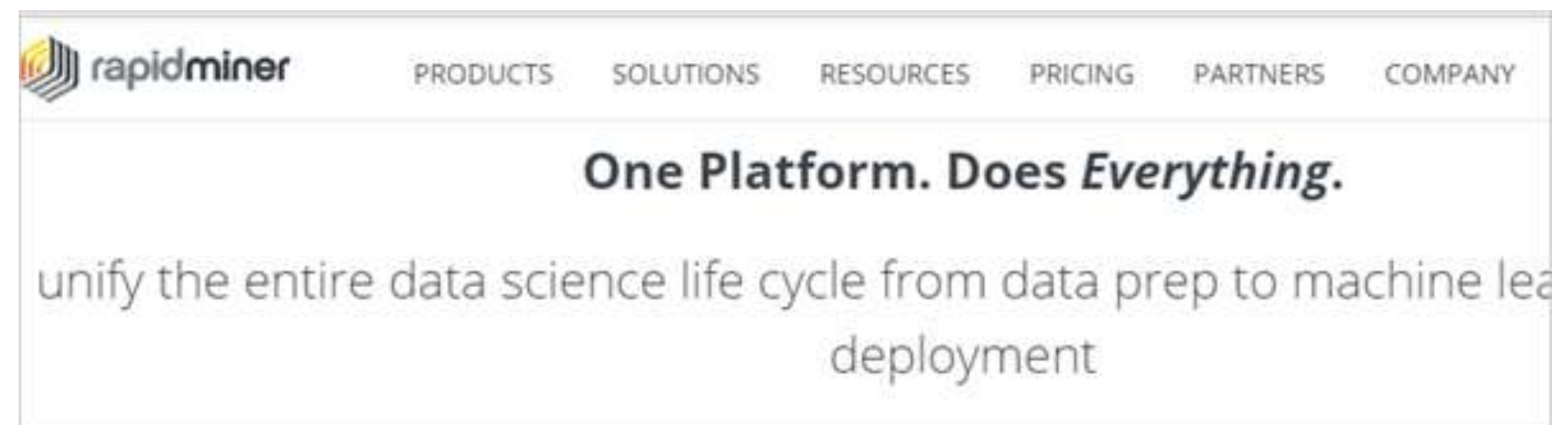
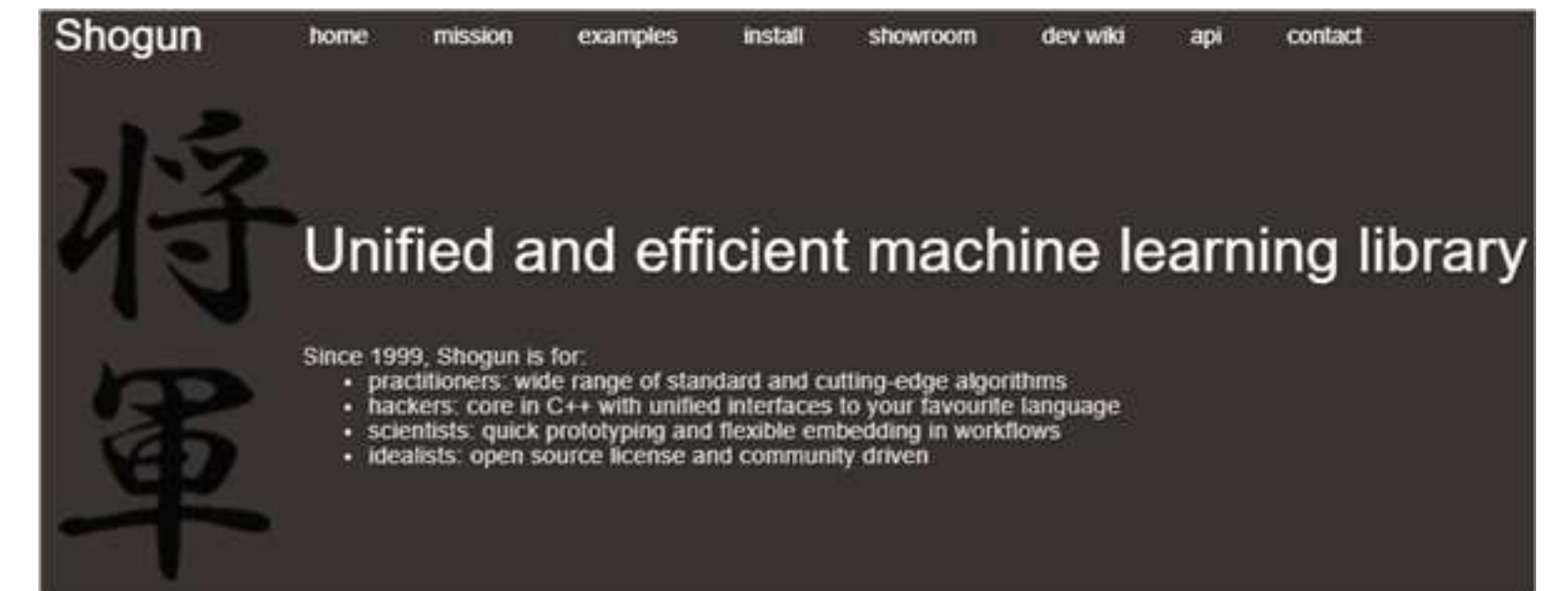
ML Software tools 2021

	Platform	Cost	Written in language	Algorithms or Features
Scikit Learn	Linux, Mac OS, Windows	Free.	Python, Cython, C, C++	Classification Regression Clustering Preprocessing Model Selection Dimensionality reduction.
PyTorch	Linux, Mac OS, Windows	Free	Python, C++, CUDA	Autograd Module Optim Module nn Module
TensorFlow	Linux, Mac OS, Windows	Free	Python, C++, CUDA	Provides a library for dataflow programming.
Weka	Linux, Mac OS, Windows	Free	Java	Data preparation Classification Regression Clustering Visualization Association rules mining
KNIME	Linux, Mac OS, Windows	Free	Java	Can work with large data volume. Supports text mining & image mining through plugins
Colab	Cloud Service	Free	-	Supports libraries of PyTorch, Keras, TensorFlow, and OpenCV



Understanding ML - Deep-Dive

ML Software tools 2021



Understanding ML - Deep-Dive

ML Software tools 2021

	Platform	Cost	Written in language	Algorithms or Features
Apache Mahout	Cross-platform	Free	Java Scala	Preprocessors Regression Clustering Recommenders Distributed Linear Algebra.
Accors.Net	Cross-platform	Free	C#	Classification Regression Distribution Clustering Hypothesis Tests & Kernel Methods Image, Audio & Signal. & Vision
Shogun	Windows Linux UNIX Mac OS	Free	C++	Regression Classification Clustering Support vector machines. Dimensionality reduction Online learning etc.
Keras.io	Cross-platform	Free	Python	API for neural networks
Rapid Miner	Cross-platform	Free plan Small: \$2500 per year. Medium: \$5000 per year. Large: \$10000	Java	Data loading & Transformation Data preprocessing & visualization.



Understanding ML - Deep-Dive

AI tools for personal use

1. ML Software tools
2. AI Personal Assistants
3. Work AI tools
4. In-home AI Tools
5. Social AI Tools
6. Medical/health AI Tools
7. Education AI Tools
8. Shopping AI Tools
9. Music AI Tools
10. Finance AI Tools
11. Research AI Tools
12. Travel AI Tools
13. Headline takeaways



Understanding ML - Deep-Dive

1. AI Personal Assistants
2. Headline takeaways

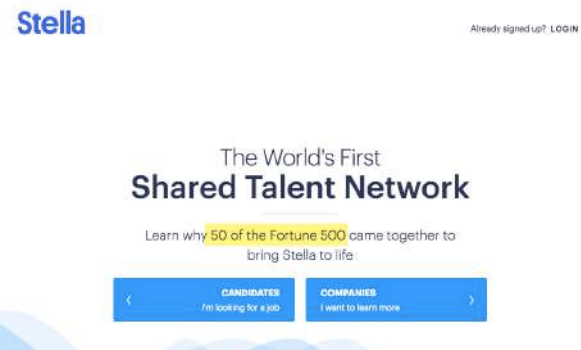
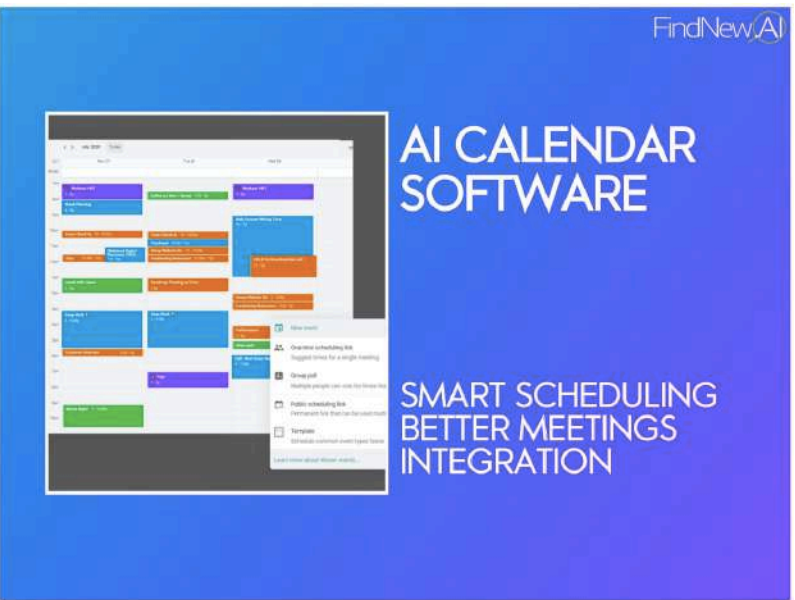
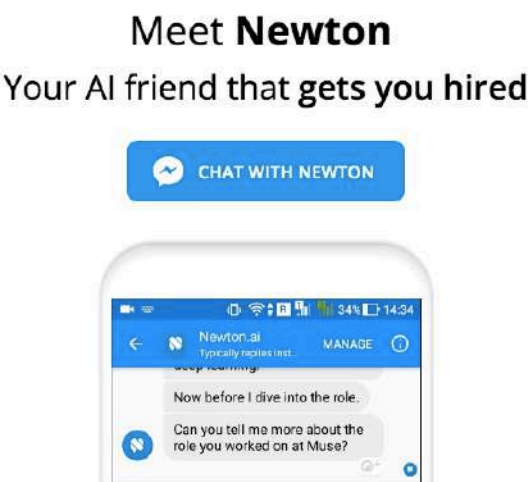
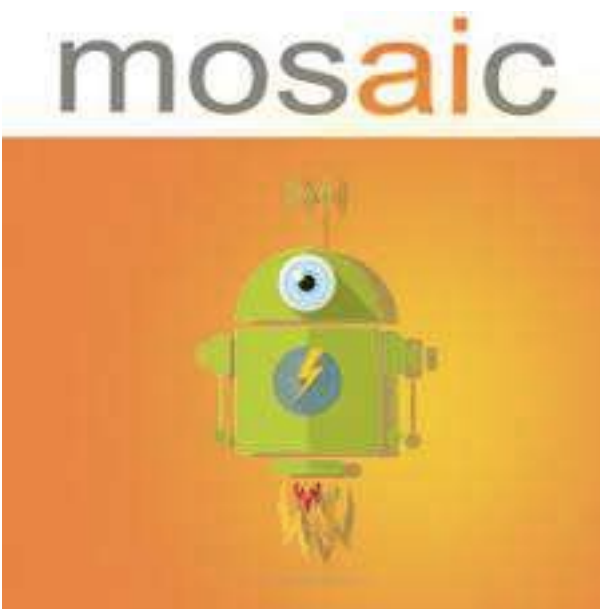
AI tools for personal use



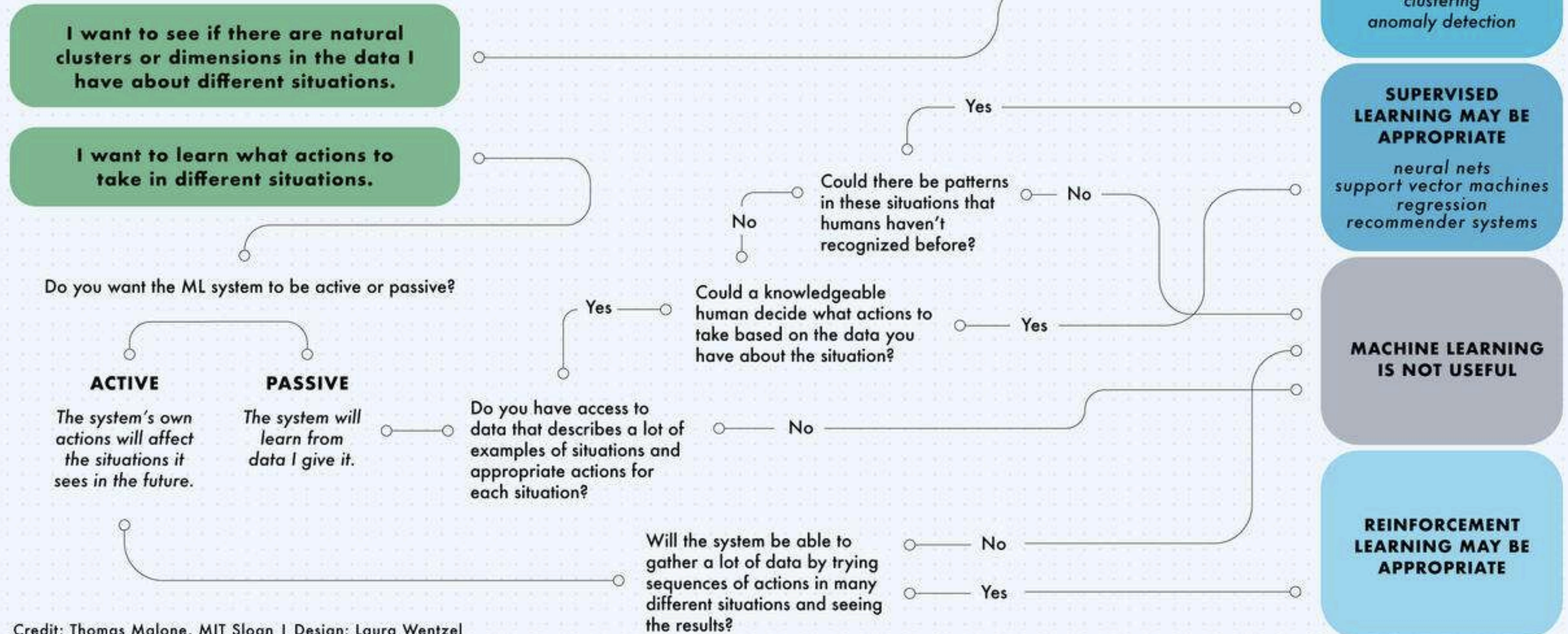
Understanding ML - Deep-Dive

AI tools for personal use

- 1. Work AI tools
- 2. Headline takeaways



What do you want the machine learning system to do?



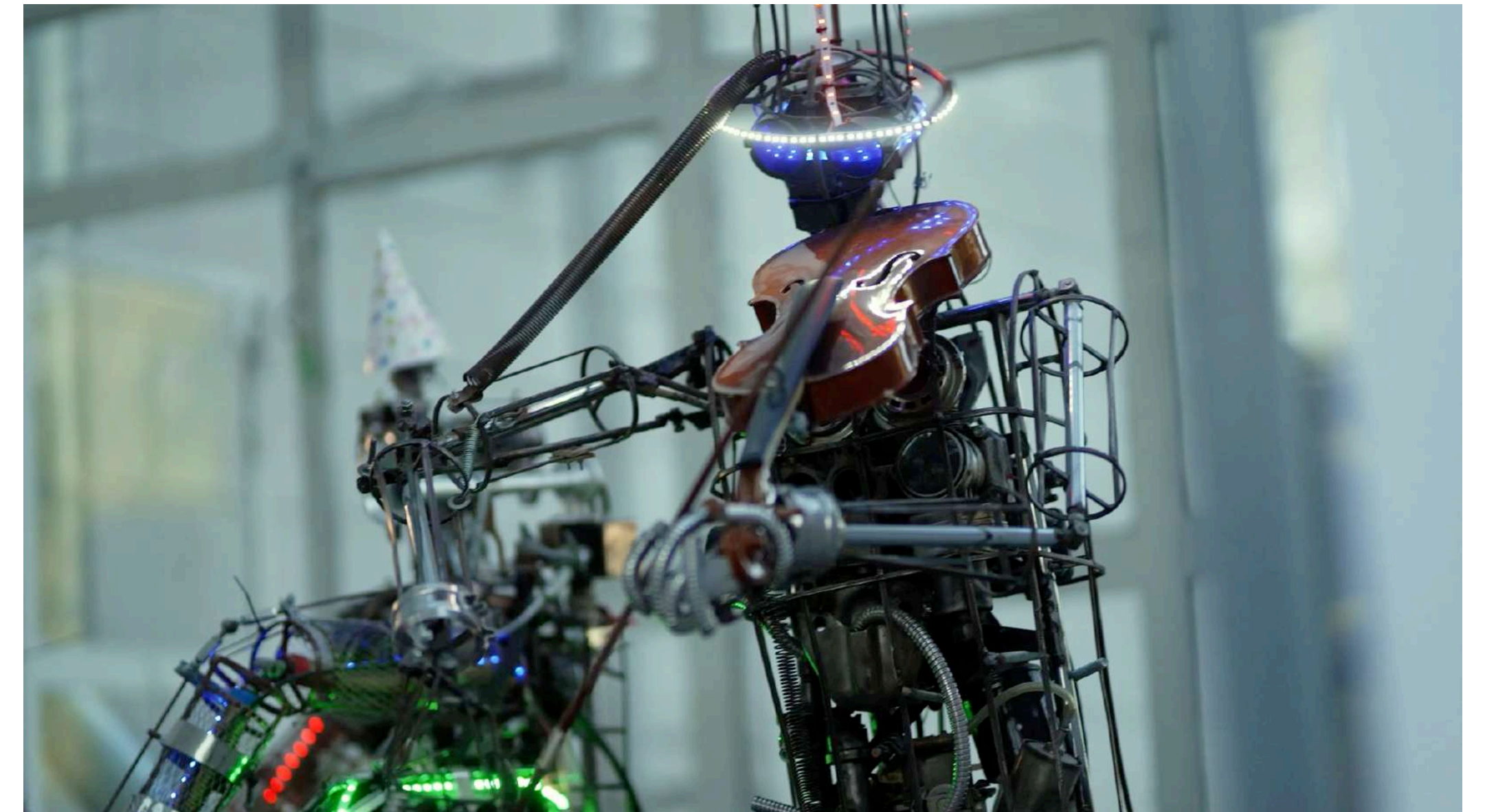
Credit: Thomas Malone, MIT Sloan | Design: Laura Wentzel



Summary

5/ Understanding ML - Deep-Dive

1. Implementing AI
2. What is ML
3. Steps in ML
4. Types of ML
5. Classification and Regression in ML
6. How does ML work?
7. ML Software tools 2021
8. AI Tools for personal use
9. Machine Learning Career - What to learn first
10. Machine Learning Career - Skills
11. AI in Numbers
12. Headline takeaways



X

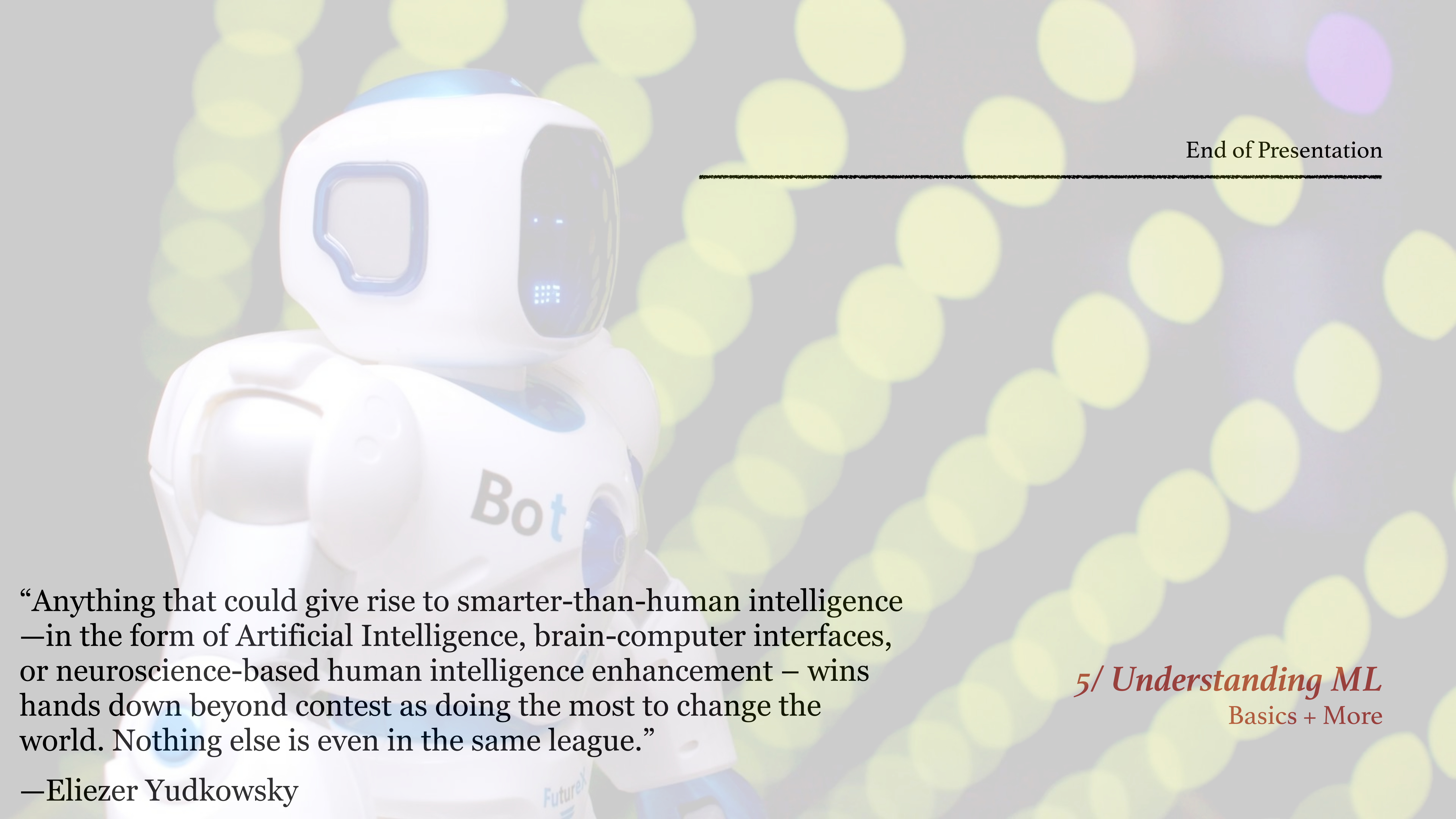
Breakout Room 5!

Algorithms are becoming an important part of how work is managed. What are the implications?

**AI - the new co-worker! or
Are algorithms replacing the human mind
as machines replaced the body!**



End of Presentation



“Anything that could give rise to smarter-than-human intelligence—in the form of Artificial Intelligence, brain-computer interfaces, or neuroscience-based human intelligence enhancement – wins hands down beyond contest as doing the most to change the world. Nothing else is even in the same league.”

—Eliezer Yudkowsky

5/ Understanding ML
Basics + More

Artificial Intelligence

Essential AI for Everyone

A Technology-Business-People Playbook!

+/ Resources

The +Bonus+ Section!



Resources: Read! Reports. White Papers (Clickable Links)

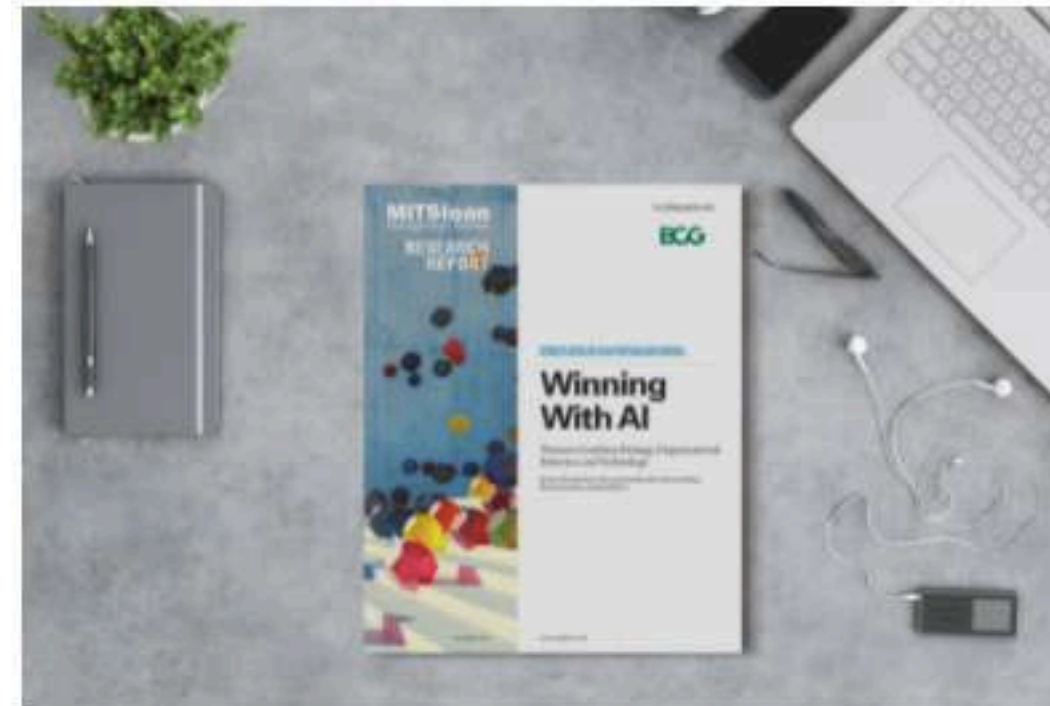


REPORT

Expanding AI's Impact With Organizational Learning

Most companies developing AI capabilities have yet to gain significant financial benefits from their efforts. Only when organizations add the ability to learn with AI do significant benefits become likely.

Sam Ransbotham et al.



REPORT

Winning With AI

AI promises rewards but also comes with risks — namely, that competitors figure out how to successfully leverage it before you do. The 2019 MIT SMR and BCG Artificial Intelligence Global Executive Study and Research Report shows early AI winners are focused on organization-wide alignment, investment, and integration.

Sam Ransbotham et al.



EXECUTING STRATEGY

Artificial Intelligence in Business Gets Real

The 2018 Artificial Intelligence Report by MIT SMR shows early leaders pushing forward with an eye toward scale.

Sam Ransbotham et al.

Resources: Read! Reports. White Papers (Clickable Links)



The 2021 AI Index: Major Growth Despite the Pandemic

by JACK CLARK AND DANIEL ZHANG
March 3rd, 2021

This year's report shows a maturing industry, significant private investment, and rising competition between China and...



TECHNOLOGY IMPLEMENTATION

Reshaping Business With Artificial Intelligence

The 2017 Artificial Intelligence and Business Strategy Report offers companies a starting point for developing an AI strategy.

Sam Ransbotham et al.



AI Index Diversity Report: An Unmoving Needle

by BETH JENSEN
March 3rd, 2021

Stanford HAI's 2021 AI Index reveals stalled progress in diversifying AI and a scarcity of the data needed to fix it.

Resources: Read! Articles. Working Papers. Chapter. Blogs. (Clickable Links)



AI & MACHINE LEARNING

Achieving Return on AI Projects

Thomas H. Davenport and Ren Zhang
July 20, 2021



TECHNOLOGY INNOVATION STRATEGY

The Pursuit of AI-Driven Wealth Management

Thomas H. Davenport and Randy Bean
July 07, 2021



DATA & DATA CULTURE

Empowering a Data Culture From the Inside Out

Jonathan Tudor, interviewed by Ally MacDonald
December 09, 2020



DATA & DATA CULTURE

Why Chief Data Officers Must Assume Leadership for Data Success

Randy Bean
November 30, 2020



How Has COVID Affected the AI Economy?

by SACHIN WAIKAR
March 3rd, 2021

The AI Index finds that despite the pandemic's economic hit, AI investment and hiring increased.



BUSINESS MODELS

How Organizations Will Produce in an Autonomous Future

James Gips et al.
April 18, 2018

Resources: Read! Articles. Working Papers. Chapter. Blogs. (Clickable Links)



AI & MACHINE LEARNING

Three Steps to Implement AI

Allison Ryder
August 23, 2019



AI & MACHINE LEARNING

AI's Prediction Problem

Sam Ransbotham
October 24, 2018



AI & MACHINE LEARNING

Global Competition With AI in Business: How China Differs

Philipp Gerbert et al.
July 24, 2018



What AI Will Do to Corporate Hierarchies?

The conventional wisdom says we can expect a more centralized structure. The author says the conventional wisdom has it wrong.

[Read More](#)



It is time to build a new economy. Digital data and artificial intelligence can help

The COVID-19 pandemic and ensuing economic crisis have revealed many ways in which American society isn't working. We have a fragile and reactive healthcare system; an opaque, winner-takes-all economy; and a government that few people trust. These problems



[Read More](#)



What business leaders need to know about artificial intelligence

AI isn't coming for your job — yet. But leaders do need to understand how machine learning, natural language processing, and other intelligence will impact your business.

[Read More](#)

Resources: Read! Articles. Working Papers. Chapter. Blogs. (Clickable Links)



DATA & DATA CULTURE

Top-Down Leadership for Data: Seven Ways to Get Started

Thomas C. Redman
December 02, 2020



DATA & DATA CULTURE

Developing a New Leadership Mindset for Data

Ally MacDonald
November 16, 2020



DATA & DATA CULTURE

Execs Bullish on AI but Wary of Data Leadership

Only a third of data executives feel that their role is "successful and established."

Thomas H. Davenport and Randy Bean • March 05, 2021

Resources: Read! Articles. Working Papers. Chapter. Blogs. (Clickable Links)

2020 BOOK

Work, Mate, Marry, Love: How Machines Shape Our Human Destiny

By: [Debora L. Spar](#)

Covering a time frame that ranges from 8000 BC to the present, and drawing upon both Marxist and feminist theories, the book argues that nearly all the decisions we make in our most intimate lives—whom to marry, how to have children, how to have sex, how to think about... [View Details](#)

2019 CHAPTER

The Impact of Artificial Intelligence on Innovation: An Exploratory Analysis

By: Iain M. Cockburn, [Rebecca Henderson](#) and Scott Stern

2020 BOOK

Competing in the Age of AI: Strategy and Leadership When Algorithms and Networks Run the World

By: [Marco Iansiti](#) and [Karim R. Lakhani](#)

In industry after industry, data, analytics, and AI-driven processes are transforming the nature of work. While we often still treat AI as the domain of a specific skill, business function, or sector, we have entered a new era in which AI is challenging the very... [View Details](#)

Keywords: [Artificial Intelligence](#); [Technological Innovation](#); [Change](#); [Competition](#); [Strategy](#); [Leadership](#); [Business Processes](#); [Organizational Change and Adaptation](#)

SEPTEMBER 2020 ARTICLE

Creativity, Artificial Intelligence, and a World of Surprises

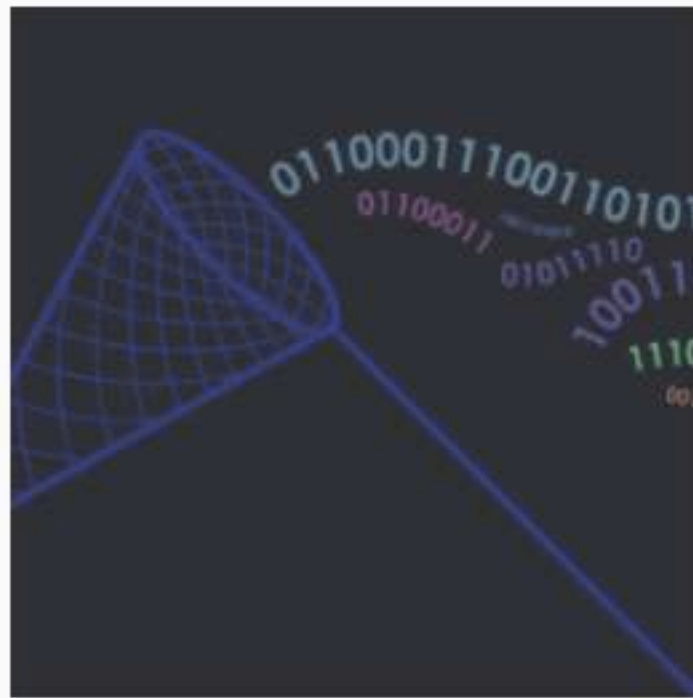
By: [Teresa M. Amabile](#)

In recent years, progress has been made toward AI Creativity, which I define as the production of highly novel, yet appropriate, ideas, problem solutions, or other outputs by autonomous machines. I argue that organizational researchers of creativity and innovation... [View Details](#)

Keywords: [Artificial Intelligence](#); [AI Creativity](#); [Computer Science](#); [Organizational Behavior](#); [Psychology](#); [Creativity](#); [Technological Innovation](#)



Resources: Read! Articles. Working Papers. Chapter. Blogs. (Clickable Links)



How to Kickstart an AI Venture Without Proprietary Data

Despite the tremendous innovation and entrepreneurial opportunities around AI, breaking into AI can be a daunting task for entrepreneurs as they face a chicken-and-egg problem before they even begin, something existing companies are less likely to contend with.

[Read article »](#)



How Can Financial Institutions Prepare for AI Risks?

Artificial intelligence (AI) technologies hold big promise for the financial services industry, but they also bring risks that must be addressed with the right governance approaches, according to a white paper by a group of academics and executives from the financial services and technology industries, published by Wharton AI for Business.

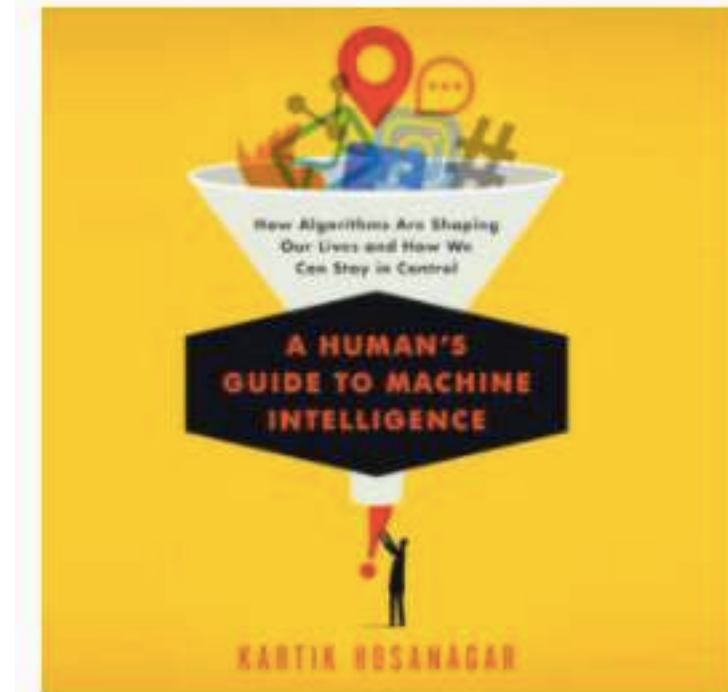
[Read article »](#)



Your Next Job Interview May Be With a Robot—Whether You Realize It Or Not

The use of artificial intelligence has become increasingly widespread in recruitment over the last few years. Candidates are often asked to complete video interviews or online tests without any awareness that an algorithm will be the first assessor of their application.

[Read article »](#)



A Human's Guide to Machine Intelligence

Kartik Hosanagar surveys the brave new world of algorithmic decision-making and reveals the potentially dangerous biases they can give rise to as they increasingly run our lives

[Learn more »](#)

Resources: Read! Articles. Working Papers. Chapter. Blogs.

10 breakthroughs in statistics that have helped drive the revolution in AI

1. Hirotugu Akaike (1973). [Information Theory and an Extension of the Maximum Likelihood Principle](#). Proceedings of the Second International Symposium on Information Theory.

2. John Tukey (1977). [Exploratory Data Analysis](#).

3. Grace Wahba (1978). [Improper Priors, Spline Smoothing and the Problem of Guarding Against Model Errors in Regression](#). Journal of the Royal Statistical Society.

4. Bradley Efron (1979). [Bootstrap Methods: Another Look at the Jackknife](#). Annals of Statistics.

5. Alan Gelfand and Adrian Smith (1990). [Sampling-based Approaches to Calculating Marginal Densities](#). Journal of the American Statistical Association.

6. Guido Imbens and Joshua Angrist (1994). [Identification and Estimation of Local Average Treatment Effects](#). Econometrica.

7. Robert Tibshirani (1996). [Regression Shrinkage and Selection Via the Lasso](#). Journal of the Royal Statistical Society.

8. Leland Wilkinson (1999). [The Grammar of Graphics](#).

9. Ian Goodfellow, Jean Pouget-Abadie, Mehdi Mirza, Bing Xu, David Warde-Farley, Sherjil Ozair, Aaron Courville, and Yoshua Bengio (2014). [Generative Adversarial Networks](#). Proceedings of the International Conference on Neural Information Processing Systems.

10. Yoshua Bengio, Yann LeCun, and Geoffrey Hinton (2015). [Deep Learning](#). Nature.



Resources: Watch! Video. Webinar. Tutorial. (Clickable Links)



VIDEO

The Key to Success With AI Is Human-Machine Collaboration

The *MIT SMR* and BCG 2020 report on artificial intelligence and business strategy found that the companies who get the most out of AI are the ones that focus on having AI and human workers learn from one another.

Allison Ryder



WEBINAR

The State of AI: Lessons from the Field

A webinar summarizing lessons learned in AI implementation from the 2019 *Winning With AI* Report.

Ranjeet Banerjee et al.



WEBINAR

Learn to Make the Most of Your Relationship With AI

In this webinar, *MIT SMR*'s Sam Ransbotham, BCG's Shervin Khodabandeh, and Walmart's Prakhar Mehrotra share how human-AI collaboration leads to measurable results.

Sam Ransbotham et al.

Resources: Watch! Video. Webinar. Tutorial. (Clickable Links)



AI into Healthcare

Learn about the challenges of integrating AI into healthcare in a way that maximizes its potential while also protecting patient safety and privacy.

FEBRUARY 2021 TUTORIAL

What is AI?

By: [Tsedal Neeley](#)

This video explores the elements that constitute artificial intelligence (AI). From its mathematical basis to current advances in AI, this video introduces students to data, tools, and statistical models that make a computer 'intelligent.' Through an explanation of... [View Details](#)

Keywords: [Artificial Intelligence](#); [Digital](#); [Technological Innovation](#); [Leadership](#)



How to use AI to enhance user experience

Learn how to design better, smarter user interactions by integrating artificial intelligence into your user experience.

Resources: Explore! Institutions

Organisations doing imp work in AI

AI and You

ARM

Baker McKenzie

Equal AI

I.AM+

Imperial College London

INSEAD

Institute of AI

International Trade Union Confederation (ITUC)

Northwestern University

Organisation for Economic Co-operation and Development (OECD)

Patrick J. McGovern Foundation

RAI

Schwartz Reisman Institute

UNESCO

United Nations Children's Fund (UNICEF)

University of Toronto

Academic Partners

Imperial College Business School at Imperial College London, UK

Trust & Technology Initiative at University of Cambridge, UK

The Justice Collaboratory at Yale Law School, US

KULeuven, Belgium

NUS Enterprise, Singapore

The N.1 Institute for Health, Singapore

Entrepreneurial and corporate ecosystem

AI & Social capital

AI*Autonomous, Co-founder William Lee

Blackbox AI, Jason J Sosa, founder, www.blackboxai.com

BrainTech Pte Ltd, Eddy Zhang, CEO of the AI-leadership coaching company

JobKred (start-up, block 71, NUSEnterprise)

Negobot: Aniruddha Ganguly | CEO and Co-Founder

Novartis (Basel HQ)

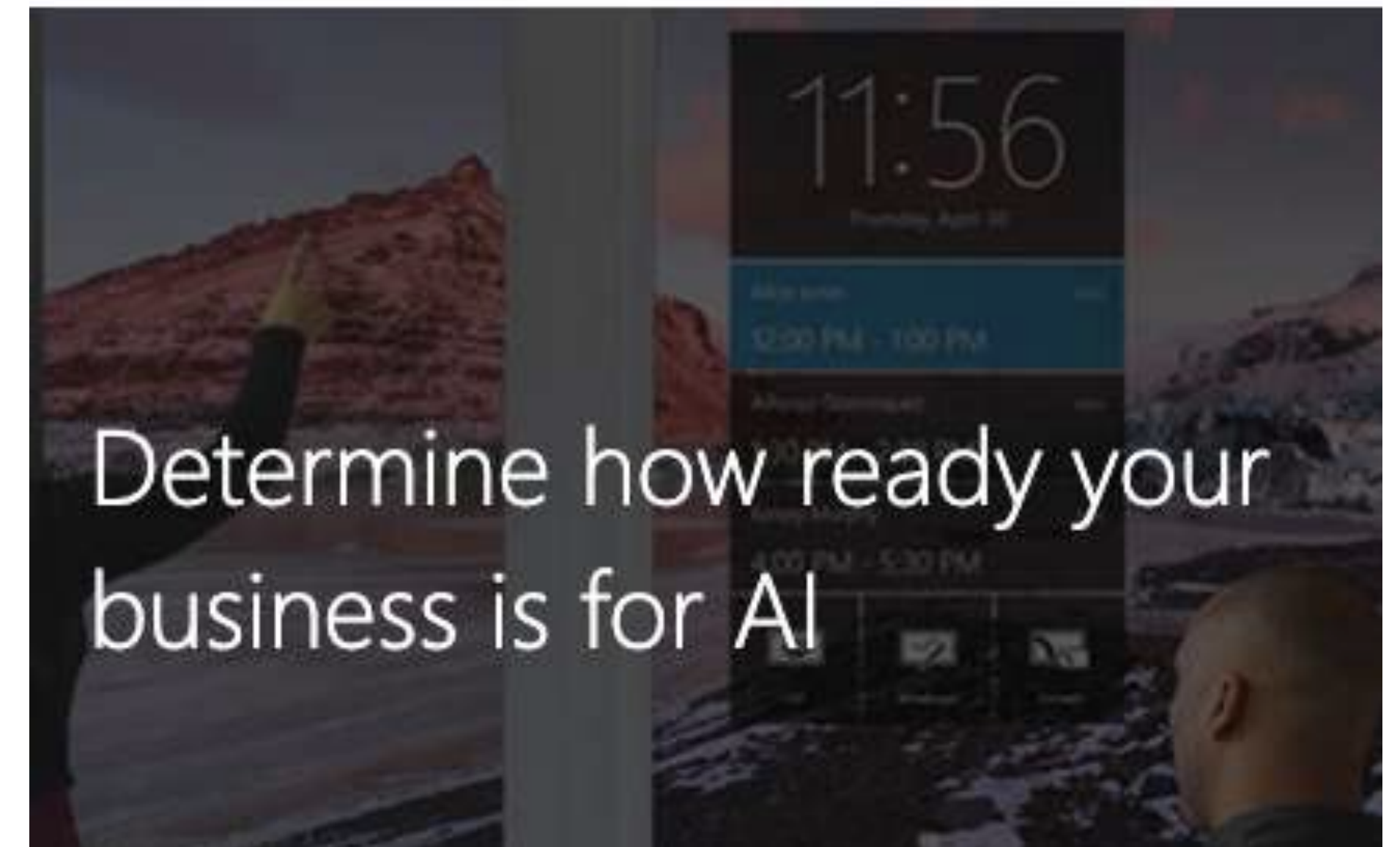
Microsoft (Singapore campus)



Resources: Test! AI readiness. (Clickable Links)

Evaluate AI readiness

1. Compare with other firms in similar industries and geographies.
2. The survey serves as a research tool, a diagnostic tool, and a benchmark tool.



Resources: Listen! Podcasts (Clickable Links)



DATA & DATA CULTURE

AI and the COVID-19 Vaccine: Moderna's Dave Johnson

Moderna's chief data and AI officer explains how AI helped the pharma company develop a COVID-19 vaccine in record time.

Sam Ransbotham and Shervin Khodabandeh • July 13, 2021



ETHICS

Starting Now On Technology Ethics: Elizabeth Renieris

Elizabeth Renieris of the Notre Dame-IBM Technology Ethics Lab discusses how businesses can responsibly govern AI projects.

Sam Ransbotham and Shervin Khodabandeh • June 22, 2021



ANALYTICS & BUSINESS INTELLIGENCE

No Need for AI Unicorns: PepsiCo's Colin Lenaghan

PepsiCo's Colin Lenaghan discusses AI's role in the company's pricing strategy and ongoing digital transformation.

Sam Ransbotham and Shervin Khodabandeh • June 08, 2021



DIGITAL MARKETING

DIY With AI: The Home Depot's Huiming Qu

Home Depot's Huiming Qu discusses how the home improvement retailer leverages AI to improve the customer experience.

Sam Ransbotham and Shervin Khodabandeh • May 25, 2021



INNOVATION STRATEGY

Prototypes, Pilots, and Polymers: Cooper Standard's Chris Couch

The *Me, Myself, and AI* podcast delves into how automotive supplier Cooper Standard uses open innovation to leverage AI.

Sam Ransbotham and Shervin Khodabandeh • May 11, 2021



IT GOVERNANCE & LEADERSHIP

Designing a Better Future: Mastercard's JoAnn Stonier

JoAnn Stonier, chief data officer at Mastercard, discusses how design thinking enables better AI implementation.

Sam Ransbotham and Shervin Khodabandeh • April 27, 2021

Resources: Listen!

Podcasts (Clickable Links)



PLATFORMS & ECOSYSTEMS

Learning, Engagement, and Empowerment: 1-800-Flowers' Amit Shah

Amit Shah, president of 1-800-Flowers, explains why lifelong learners are the best technical talent.

Sam Ransbotham and Shervin Khodabandeh • April 13, 2021



COLLABORATION

Games, Teams, and Moonshots: Google Cloud's Will Grannis

Will Grannis of Google Cloud explains the organization's collaborative approach to AI and machine learning innovation.

Sam Ransbotham and Shervin Khodabandeh • March 30, 2021



TECHNOLOGY IMPLEMENTATION

Less Algorithm, More Application: Lyft's Craig Martell

Lyft's Craig Martell talks education, eliminating bias, and cross-functional collaboration on machine learning projects.

Sam Ransbotham and Shervin Khodabandeh • March 16, 2021



IT GOVERNANCE & LEADERSHIP

Tech and Ethics: The World Economic Forum's Kay Firth-Butterfield on Doing the Right Thing in AI

Business — and society — should think of the governance of AI as an enabler rather than a constraint.

Sam Ransbotham and Shervin Khodabandeh • November 17, 2020



ANALYTICS & BUSINESS INTELLIGENCE

Fashion Forecasting: Arti Zeighami on Implementing AI at H&M Group

The fashion retailer's chief data and analytics officer uses agile pilots to assess and scale technology initiatives.

Sam Ransbotham and Shervin Khodabandeh • November 10, 2020



TECHNOLOGY INNOVATION STRATEGY

Better Together: Mattias Ulbrich on Combining Coffee, Business, and Technology at Porsche

Porsche is accelerating innovation by emphasizing the need for collaboration between humans and AI technology.

Sam Ransbotham and Shervin Khodabandeh • November 03, 2020

Resources: Listen!

Podcasts (Clickable Links)



INNOVATION STRATEGY

'The First Day Is the Worst Day': DHL's Gina Chung on How AI Improves Over Time

AI is a powerful tool for innovation when leaders communicate its benefits.

Sam Ransbotham and Shervin Khodabandeh • October 27, 2020



AI & MACHINE LEARNING

Advancing Health Care With AI: Humana's Slawek Kierner Talks Synthetic Data and Real Lives

Using AI and simulations in health care can help doctors better serve patients.

Sam Ransbotham and Shervin Khodabandeh • October 20, 2020



DATA & DATA CULTURE

This Crazy Wave We're Riding: Walmart's Prakhar Mehrotra on the Ups and Downs of AI

Walmart's Prakhar Mehrotra discusses leading AI teams and workstreams in this episode of the *Me, Myself, and AI* podcast.

Sam Ransbotham and Shervin Khodabandeh • October 20, 2020

Resources: Watch! Movie Clips (Clickable Links)



Stealth (2005) - Collateral Damage Scene (5/10) | Movieclips

Movieclips ✓ 2.1M views • 3 years ago

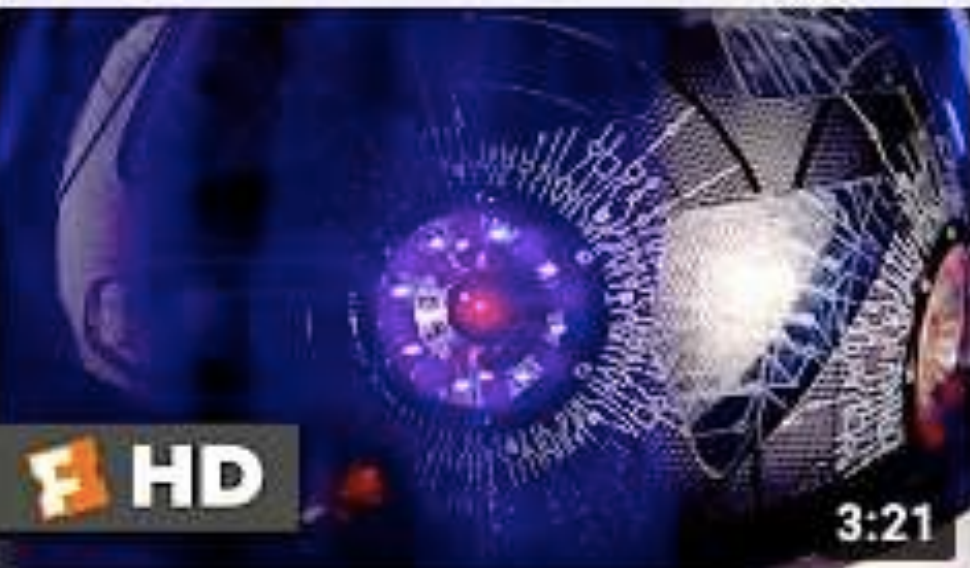
Stealth - Collateral Damage: Ben (Josh Lucas) orders an 'Abort Mission' after discovering a nearby civilian population, but their A.I. partner ignores him. BUY THE MOVIE: <https://www.fandangonow.co...>



I, Robot (1/5) Movie CLIP - Rogue Robot (2004) HD

Movieclips ✓ 5.5M views • 6 years ago

I, Robot movie clips: <http://j.mp/1MlA8p> BUY THE MOVIE: FandangoNOW - <https://www.fandangonow.com/details/movie/i-robot-2004/1MV54fd842889a1c43ad926fc2456675244?...>



Stealth (2005) - High Dive Missile Attack Scene (2/10) | Movieclips

Movieclips ✓ 1M views • 3 years ago

Stealth - High Dive Missile Attack: On a mission to take out terrorists in a populated area, Gannon (Josh Lucas) risks a dangerous flight maneuver suggested by artificial intelligence EDI....

Resources: Watch!

Movie Clips (Clickable Links)



Ex Machina (4/10) Movie CLIP - How Ava Was Created (2015) HD

Movieclips ✓ 255K views • 5 years ago

Ex Machina movie clips: <http://j.mp/29wLH3G> BUY THE MOVIE: <http://j.mp/29y8JUi> Don't miss the HOTTEST NEW TRAILERS: <http://bit.ly/1u2y6pr> CLIP DESCRIPTION: Nathan (Oscar Isaac) shows Caleb...



Ex Machina (2/10) Movie CLIP - Breaking the Ice (2015) HD

Movieclips ✓ 354K views • 5 years ago

Ex Machina movie clips: <http://j.mp/29wLH3G> BUY THE MOVIE: <http://j.mp/29y8JUi> Don't miss the HOTTEST NEW TRAILERS: <http://bit.ly/1u2y6pr> CLIP DESCRIPTION: Caleb (Domhnall Gleeson) meets Ava...



Upgrade (2018) - Cyborg vs. Cyborg Scene (7/10) | Movieclips

Movieclips ✓ 1.3M views • 2 years ago

Upgrade - Cyborg vs. Cyborg: Grey (Logan Marshall-Green) confronts Fisk (Benedict Hardie). BUY THE MOVIE: <https://www.fandangonow.com/details/movie/upgrade-...>

CC

Resources: Watch!

Movie Clips (Clickable Links)



Technology in Film Through the Years Mashup | Movieclips

Movieclips ✓ 164K views • 2 years ago

There's a long history of technology appearing in cinema from the cheesy hackers scenes to the futuristic predictions of artificial intelligence. What's been your favorite portrayal or prediction...



Ex Machina (3/10) Movie CLIP - You Shouldn't Trust Him (2015) HD

Movieclips ✓ 197K views • 5 years ago

Ex Machina movie clips: <http://j.mp/29wLH3G> BUY THE MOVIE: <http://j.mp/29y8JUi> Don't miss the HOTTEST NEW TRAILERS: <http://bit.ly/1u2y6pr> CLIP DESCRIPTION: Ava (Alicia Vikander) warns Caleb...



Vice (2015) - A.I. Technical Difficulties Scene (2/10) | Movieclips

Movieclips ✓ 5.9K views • 4 years ago

Vice movie clips: <http://j.mp/2jv6VAE> BUY THE MOVIE: <http://bit.ly/2jOi67T> Don't miss the HOTTEST NEW TRAILERS: <http://bit.ly/1u2y6pr> CLIP DESCRIPTION: Kelly (Ambyr Childers) experiences unprecede...

Resources: Watch!

Movie Clips (Clickable Links)



Weird Science (2/12) Movie CLIP - Making a Girl (1985) HD

Movieclips ✓ 7.5M views • 9 years ago

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CC



RoboCop (2014) - End This Nightmare Scene (2/10) | Movieclips

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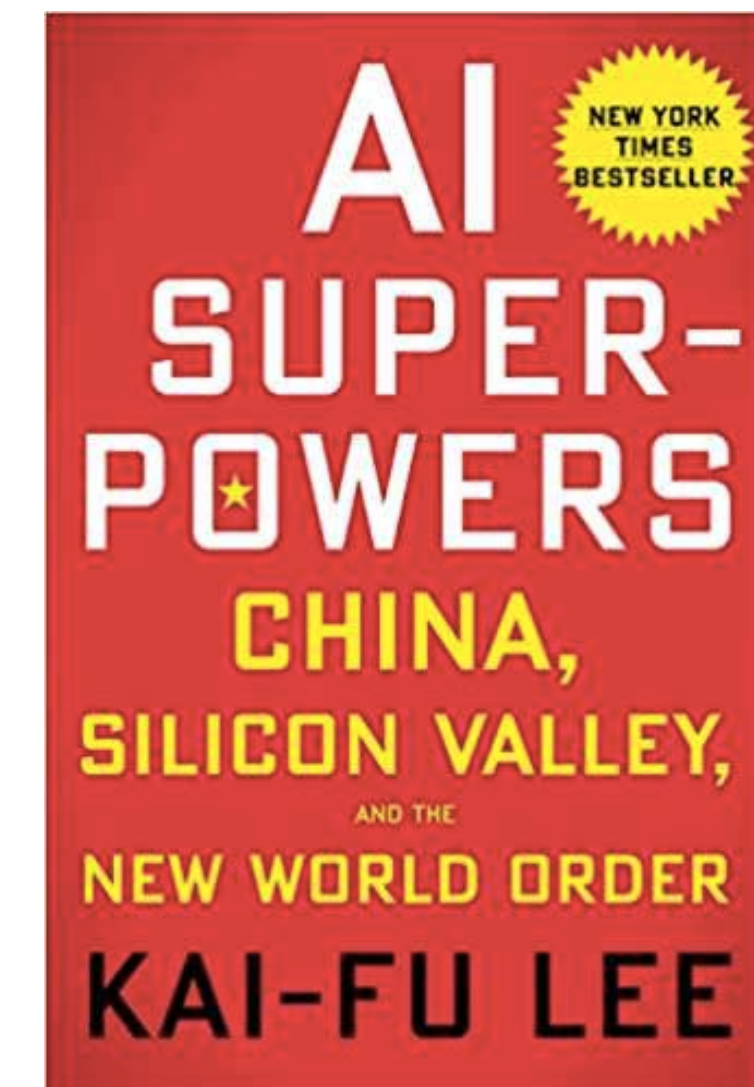
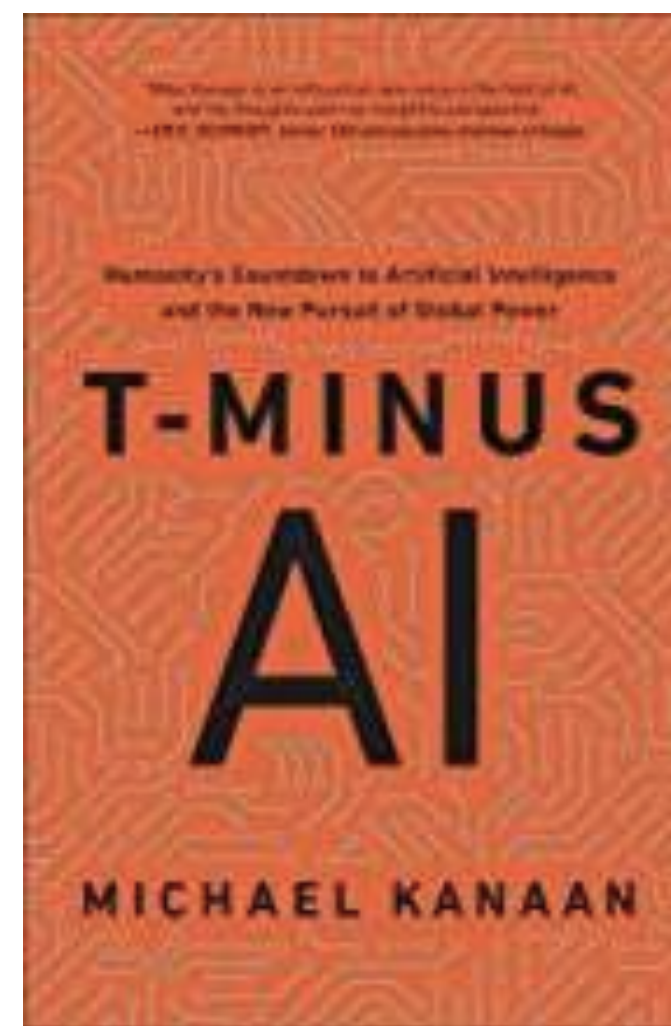
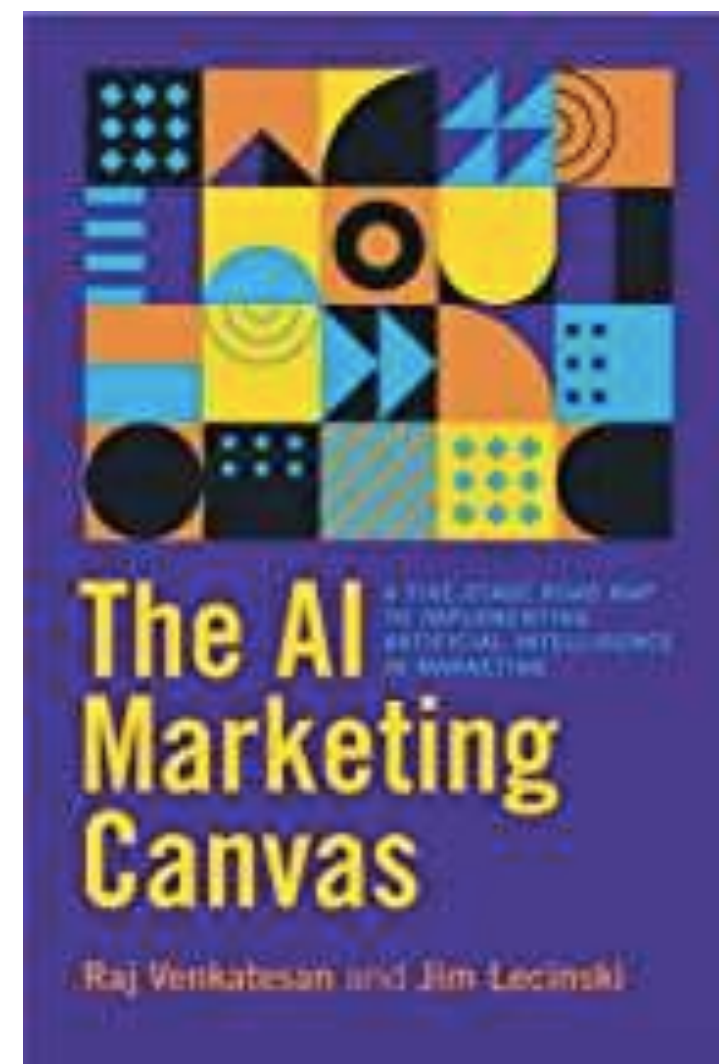
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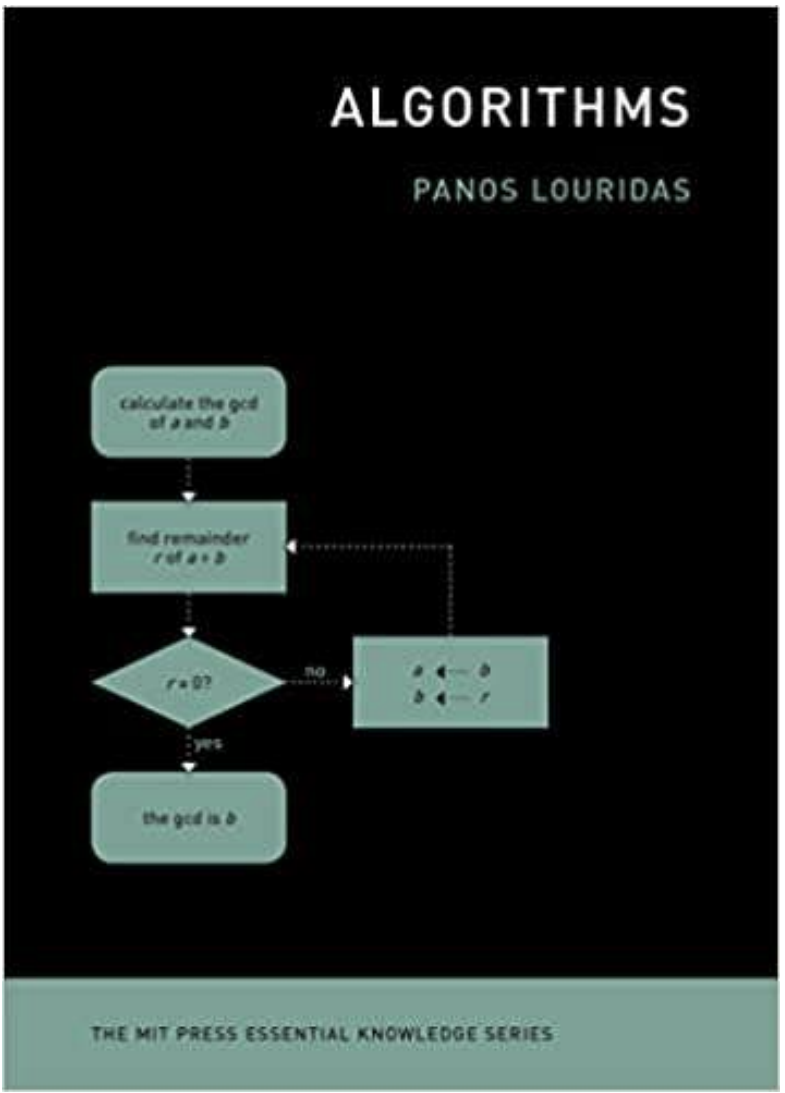
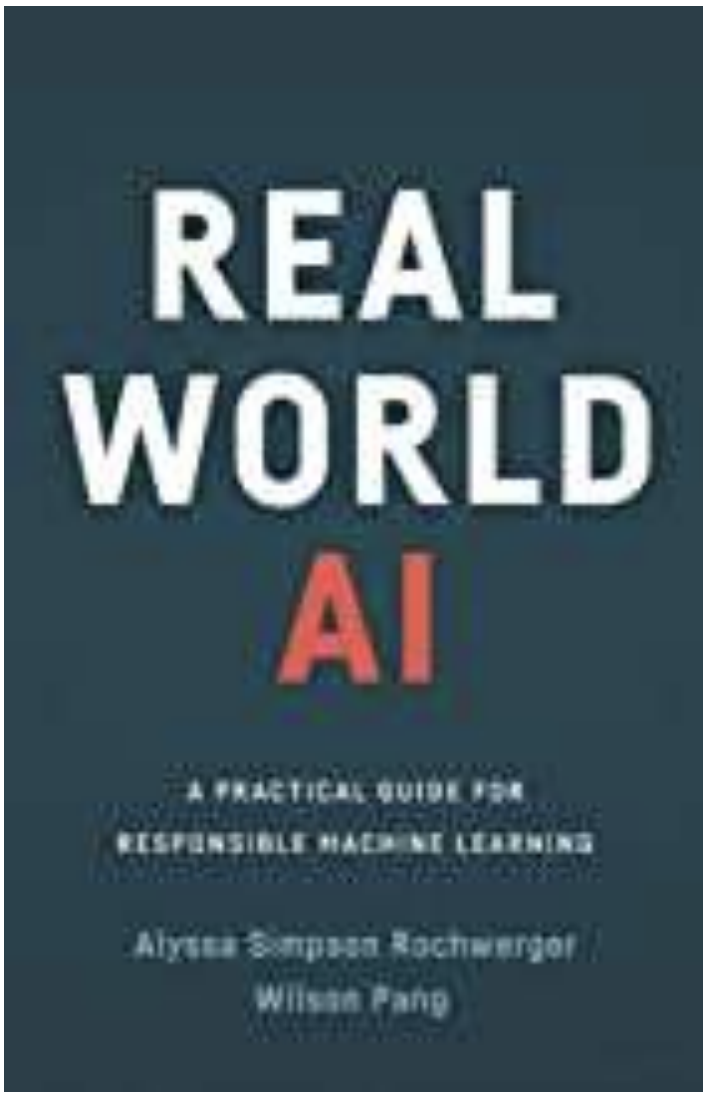
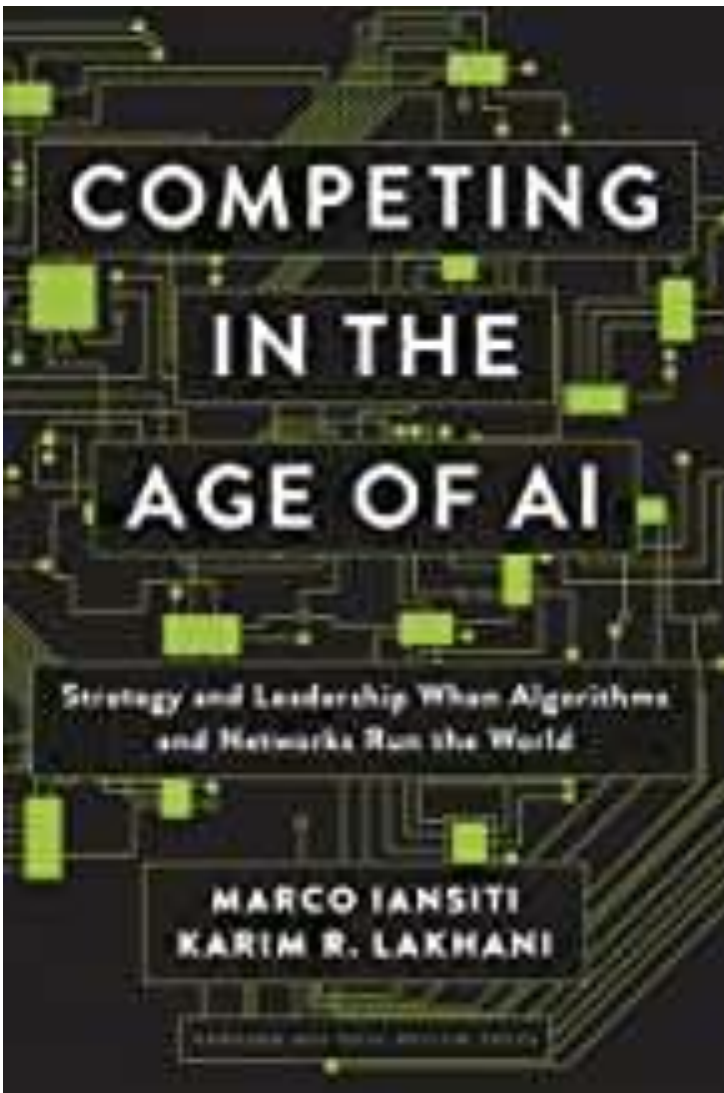
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