Week 15

# Artificial Intelligence Program

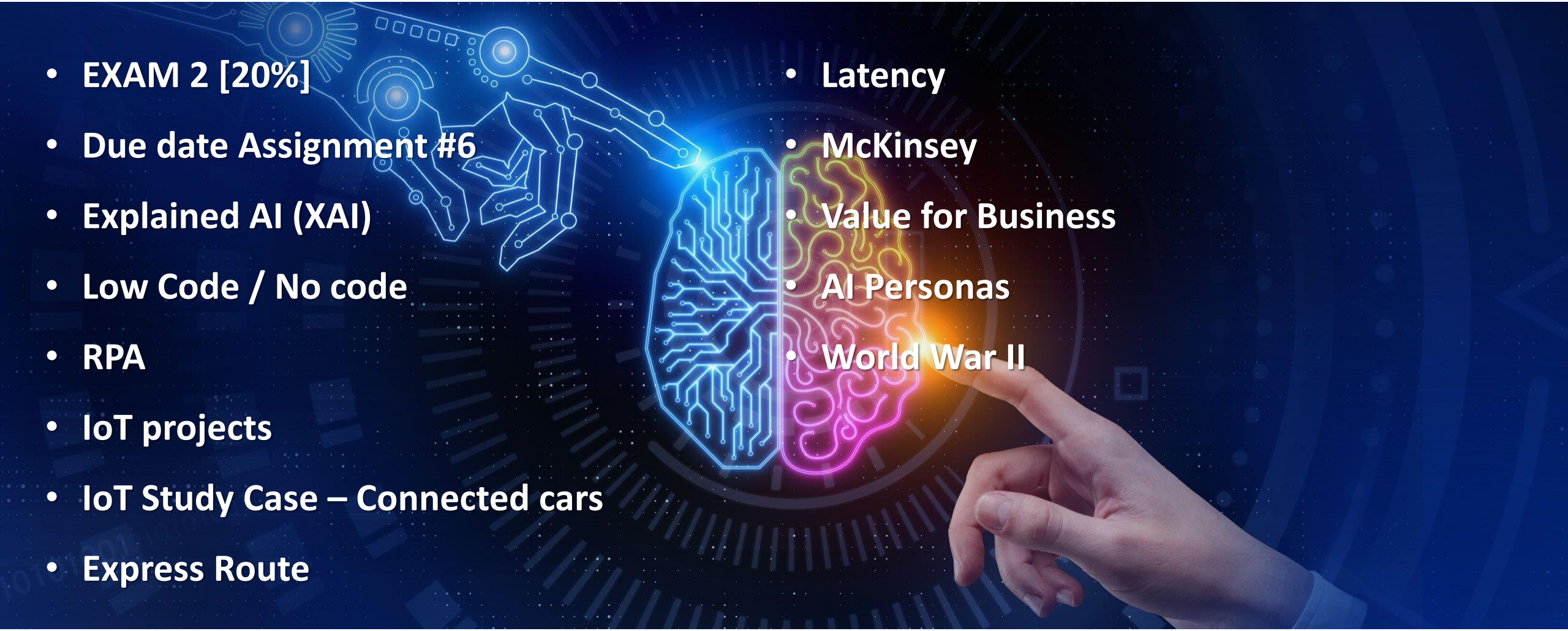
## Infrastructure and Architecture

# > Agenda // Program

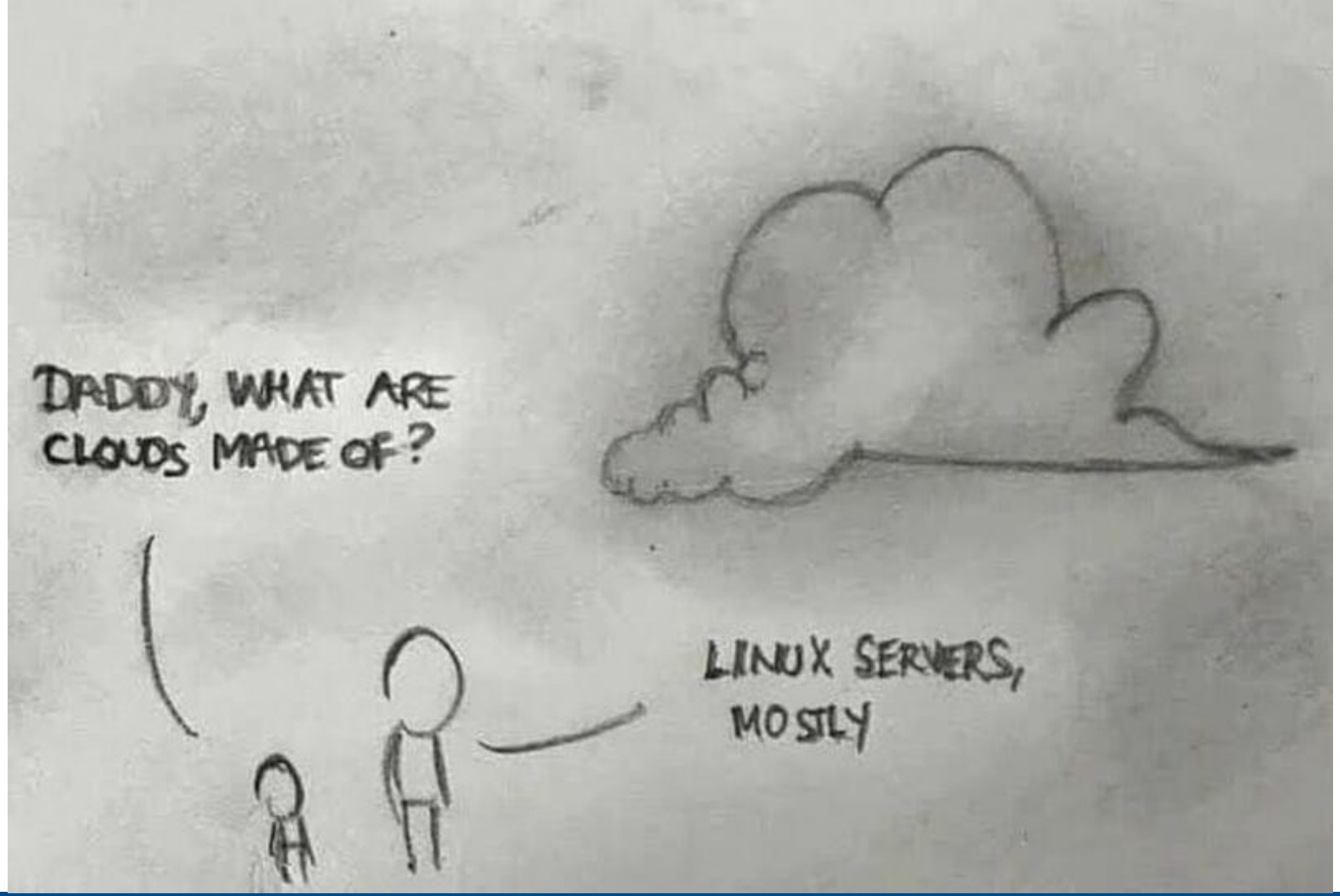
**Assignments [60%]**
**EXAMS [40%]**

| WEEK | SUBJECT | ASSIGNMENT / TO BE DELIVERED | DATES |
|---|---|---|---|
| 2 | Intro / AI Function / Enablers | | Sep 13 |
| 3 | Infra and Architecture / On-prem vs. Cloud / CSPs | C 1 | Sep 20 |
| 4 | Data Pipeline / Processes / Framework / AutoML | #1 Image Classifier **[5%]** | Sep 27 |
| 5 | Data Pipeline / Processes / Framework / AutoML | C 2 | Oct 4 |
| 6 | More Data / SSIS / ADF / Data Quality | #2 Machine Learning Studio **[10%]** | Oct 11 |
| 7 | Azure services – Intro **EXAM 1 [20%]** | C 3 | Oct 18 |
| **8** | **READING WEEK** | **NO CLASSES** | **Oct 25** |
| 9 | Azure services – Cognitive Services 1 | 41 | Nov 1 |
| 10 | Azure services – Cognitive Services 2 | #3 Draw your own Architecture (in class) **[5%]** 42 | Nov 8 |
| 11 | Azure services – Cognitive Services 3 | 43 | Nov 15 |
| 12 | Azure services – Cognitive Services 4 | #4 Azure pipeline // Sentiment Analysis **[20%]** 44 | Nov 22 |
| 13 | AWS Academy – Cloud Foundations | | Nov 29 |
| 14 | AWS Academy – Machine Learning | #5 AWS Academy – Cloud Foundations **[10%]** | Dec 6 |
| 15 | Enterprise Architecture **EXAM 2 [20%]** | #6 AWS Academy – Machine Learning **[10%]** | Dec 13 |

# > Agenda

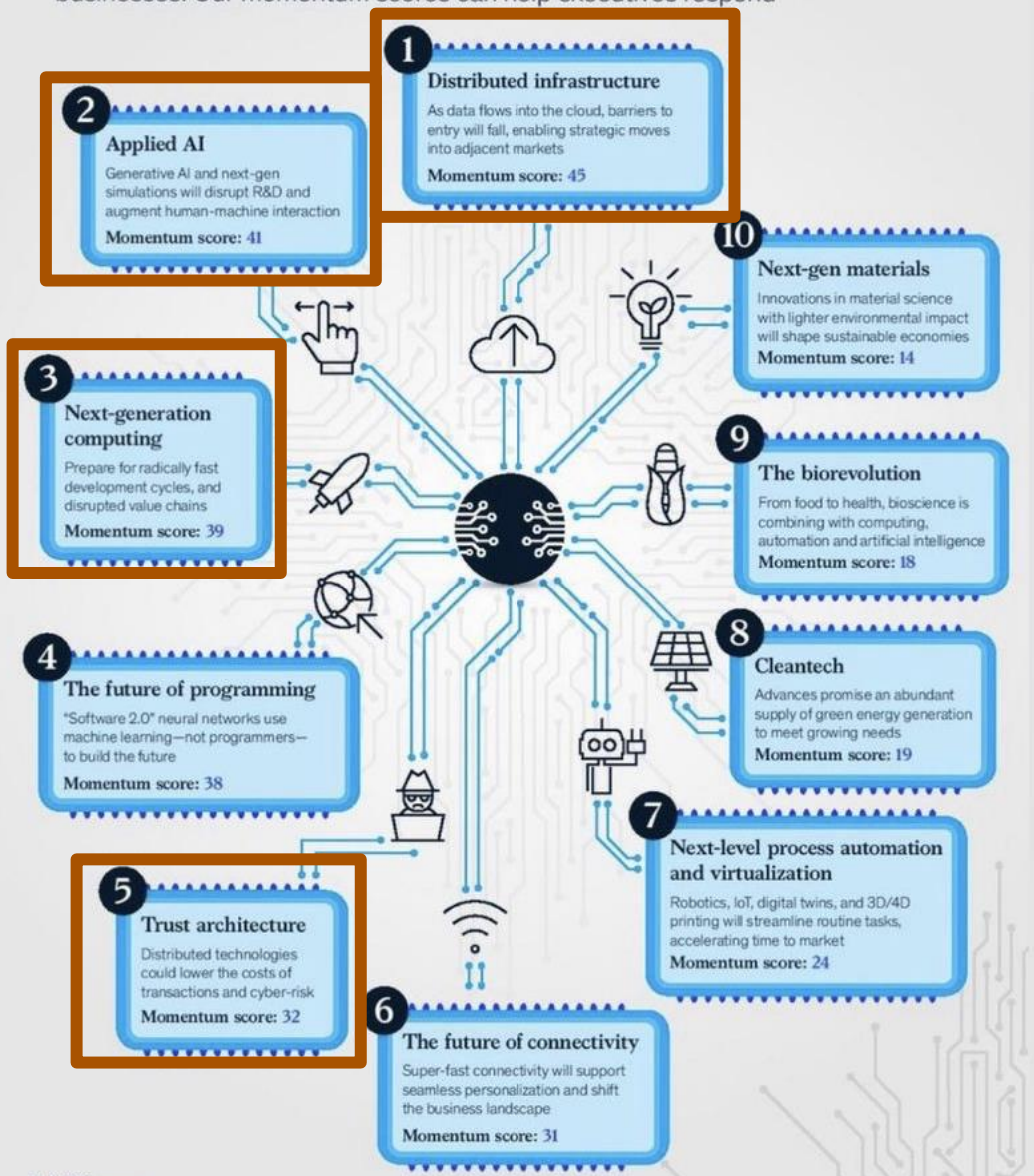


- EXAM 2 [20%]
- Due date Assignment #6
- Explained AI (XAI)
- Low Code / No code
- RPA
- IoT projects
- IoT Study Case – Connected cars
- Express Route
- Latency
- McKinsey
- Value for Business
- AI Personas
- World War II


DADDY, WHAT ARE CLOUDS MADE OF?
LINUX SERVERS, MOSTLY

# 10 tech trends with momentum

These tech trends may not be the coolest. But they're the ones with real impetus —attracting the most venture money and patent filings, with big implications for businesses. Our momentum scores can help executives respond




McKinsey & Company

*Momentum scores represent each trend's weighted growth rate across 6 categories: investments, companies, research publications, news, patents, search trends*

# Explained AI (XAI)

EXAM

# > Explained AI (XAI)

**Explainable AI (XAI)** refers to methods and techniques in the application of artificial intelligence technology (AI) such that the results of the solution can be understood by humans. It contrasts with the concept of the "black box" in machine learning where even its designers cannot explain why an AI arrived at a specific decision.

XAI may be an implementation of the **social right to explanation**. XAI is relevant even if there is no legal right or regulatory requirement—for example, XAI can improve the **user experience of a product or service** by helping end users trust that the AI is making good decisions. This way the aim of XAI is to explain what has been done, what is done right now, what will be done next and unveil the information the actions are based on. These characteristics make it possible:

(1) to confirm existing knowledge

(2) to challenge existing knowledge and

(3) to generate new assumptions.



https://en.wikipedia.org/wiki/Explainable_artificial_intelligence

EXAM

# > Explained AI (XAI) | Practical Application

**Sectors:**

- Antenna design (evolved antenna)
- Algorithmic trading (high-frequency trading)
- Medical diagnoses
- Autonomous vehicles
- Designing feature detectors from optimal computer designs (Computer Vision)
- Text analytics

**Regulation**

As regulators, official bodies and general users come to depend on AI-based dynamic systems, clearer accountability will be required for decision making processes to **ensure trust and transparency**

The European Union introduced a right to explanation in **General Data Protection Right (GDPR)** as an attempt to deal with the potential problems stemming from the rising importance of algorithms. The implementation of the regulation began in 2018. However, the right to explanation in GDPR covers only the local aspect of interpretability. In the United States, insurance companies are required to be able to explain their rate and coverage decisions.



https://en.wikipedia.org/wiki/Explainable_artificial_intelligence

EXAM

# > Explained AI (XAI) | Practical Application

**MFML 017 - Explainability and AI**

https://youtu.be/J-cst3PBK4E

**Interpretable Machine Learning**

A Guide for Making Black Box Models Explainable.

Christoph Molnar

2021-05-09

https://christophm.github.io/interpretable-ml-book/

# Low Code / No code

# > Low Code / No code

**Power Automate // low code ->**

https://www.microsoft.com/en-us/videoplayer/embed/RE4mERh?postJsllMsg=true

### Power Apps

Build apps in hours—not months—that easily connect to data, use Excel-like expressions to add logic, and run on the web, iOS, and Android devices.

### Power BI

Unify data from many sources to create interactive, immersive dashboards and reports that provide actionable insights and drive business results.

### Power Automate

Include powerful workflow automation directly in your apps with a no-code approach that connects to hundreds of popular apps and services.

### Power Virtual Agents

Easily build chatbots to create rich conversational experiences with your customers and employees—no coding required.

# > Low Code / No code

**Top 18 Low-Code and No-Code ML Platforms**

https://serokell.io/blog/top-no-code-platforms

https://venturebeat.com/2021/02/14/no-code-low-code-why-you-should-be-paying-attention/

# HUNDREDS OF LOW & NO-CODE MOBILE APP DEV TOOLS

Georgian

https://www.nowsecure.com/blog/2018/12/05/recognize-the-security-risks-of-low-and-no-code-mobile-apps/

# RPA

# > RPA | Robotic Process Automation

https://en.wikipedia.org/wiki/Explainable_artificial_intelligence

# > RPA | Robotic Process Automation

A recent **McKinsey** report notes that a large number of organizations underestimate the increasing momentum of digitization, the behavioral changes and technology driving it, and the scale of the disruption bearing down on them: Just 8 percent of companies surveyed said their current business model would remain economically viable if their industry keeps digitizing at its current course and speed.

***What drives digital transformation success? In "The Essential Guide to Analytic Process Automation," discover how the convergence of analytics, data science, and process automation is accelerating successful digital transformation and fueling business outcomes.***

Learn how Analytic Process Automation platforms:

- Widen accessibility to data and analytics with hundreds of code-free building blocks
- Automate repetitive and complex analytic processes to accelerate insights and actions
- Scale analytics across the organization and amplify human output
- Transform business outcomes and workforces including top-line growth, bottom-line return, efficiency gains, and perpetual upskilling



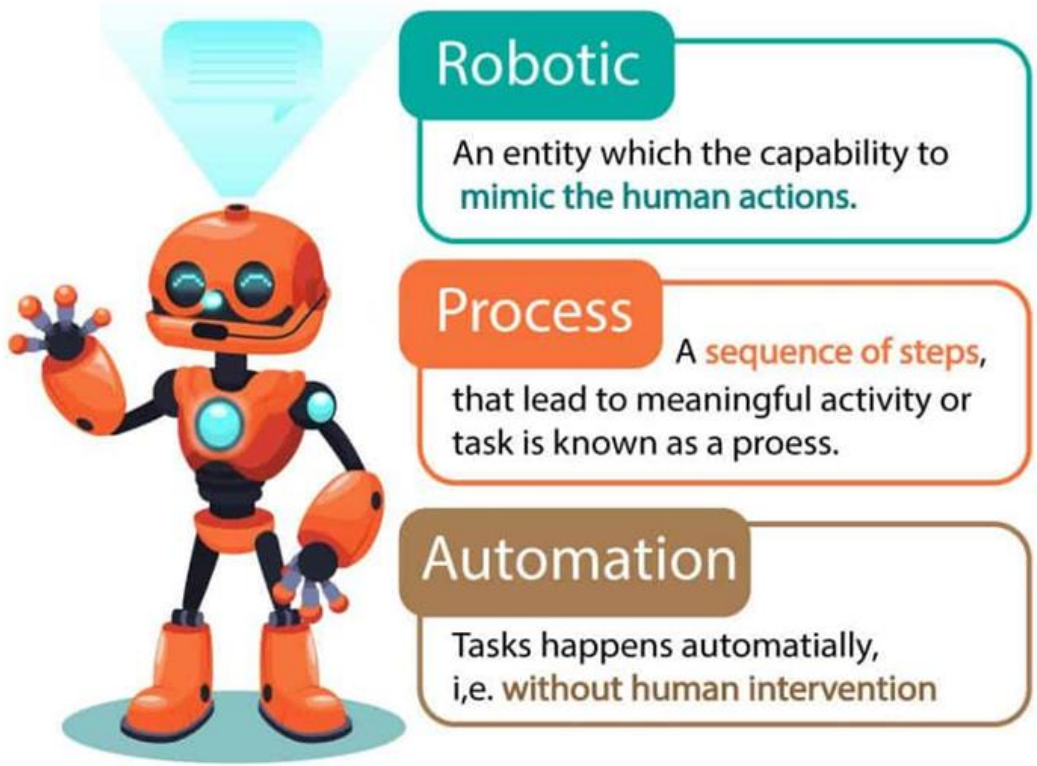
https://www.alteryx.com/whitepaper/essential-guide-to-analytic-process-automation

# > RPA | Robotic Process Automation

https://youtu.be/86adJiAyX74

**What is robotic process automation?**

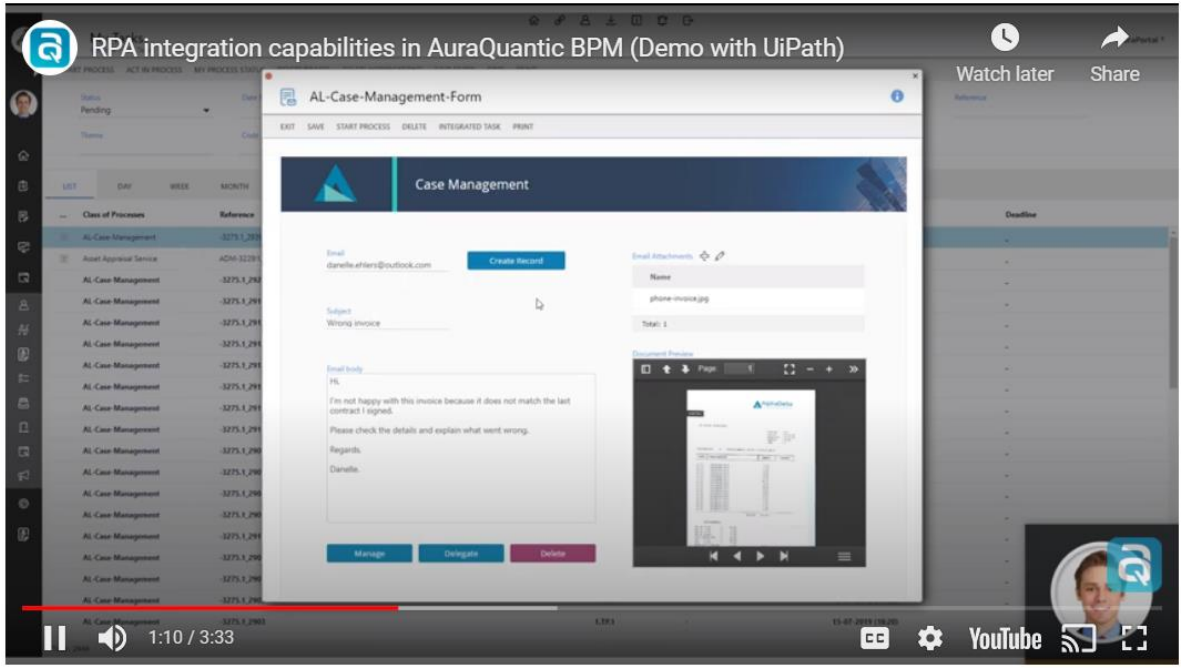
Robotic process automation (RPA) is a software technology that makes it easy to build, deploy, and manage software robots that emulate humans' actions interacting with digital systems and software. Just like people, software robots can do things like understand what's on a screen, complete the right keystrokes, navigate systems, identify and extract data, and perform a wide range of defined actions. But software robots can do it faster and more consistently than people, without the need to get up and stretch or take a coffee break.



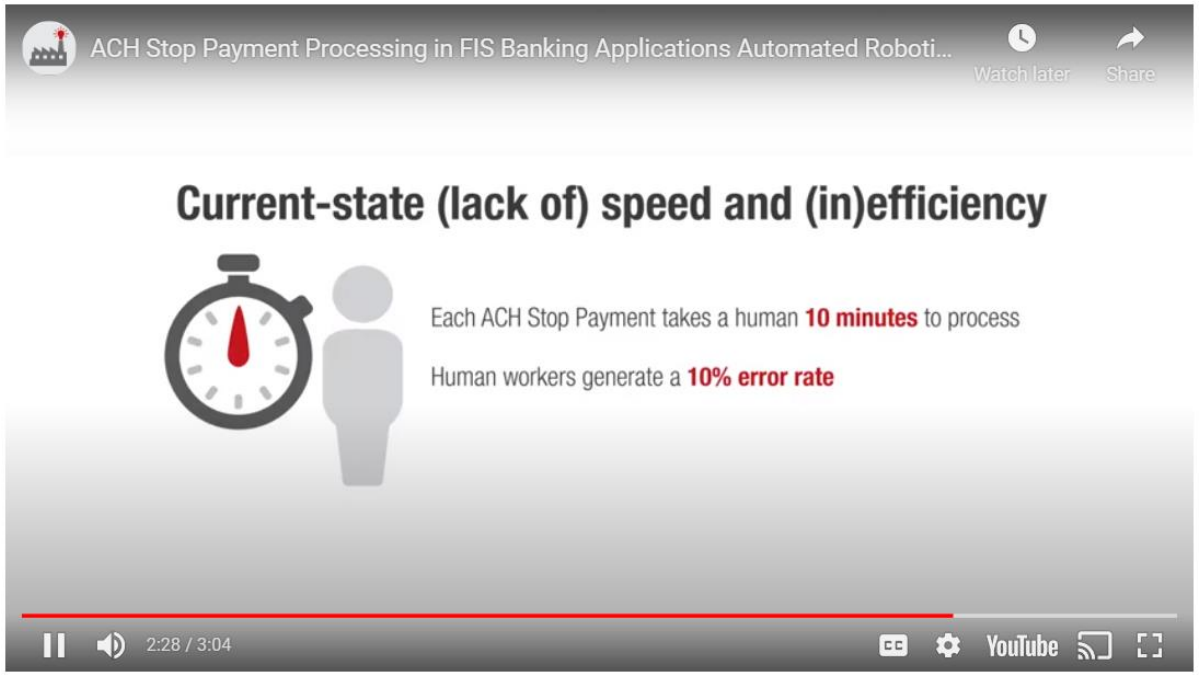



https://www.uipath.com/rpa/robotic-process-automation

# > RPA | Robotic Process Automation




https://youtu.be/yHeH1Qf9KWk



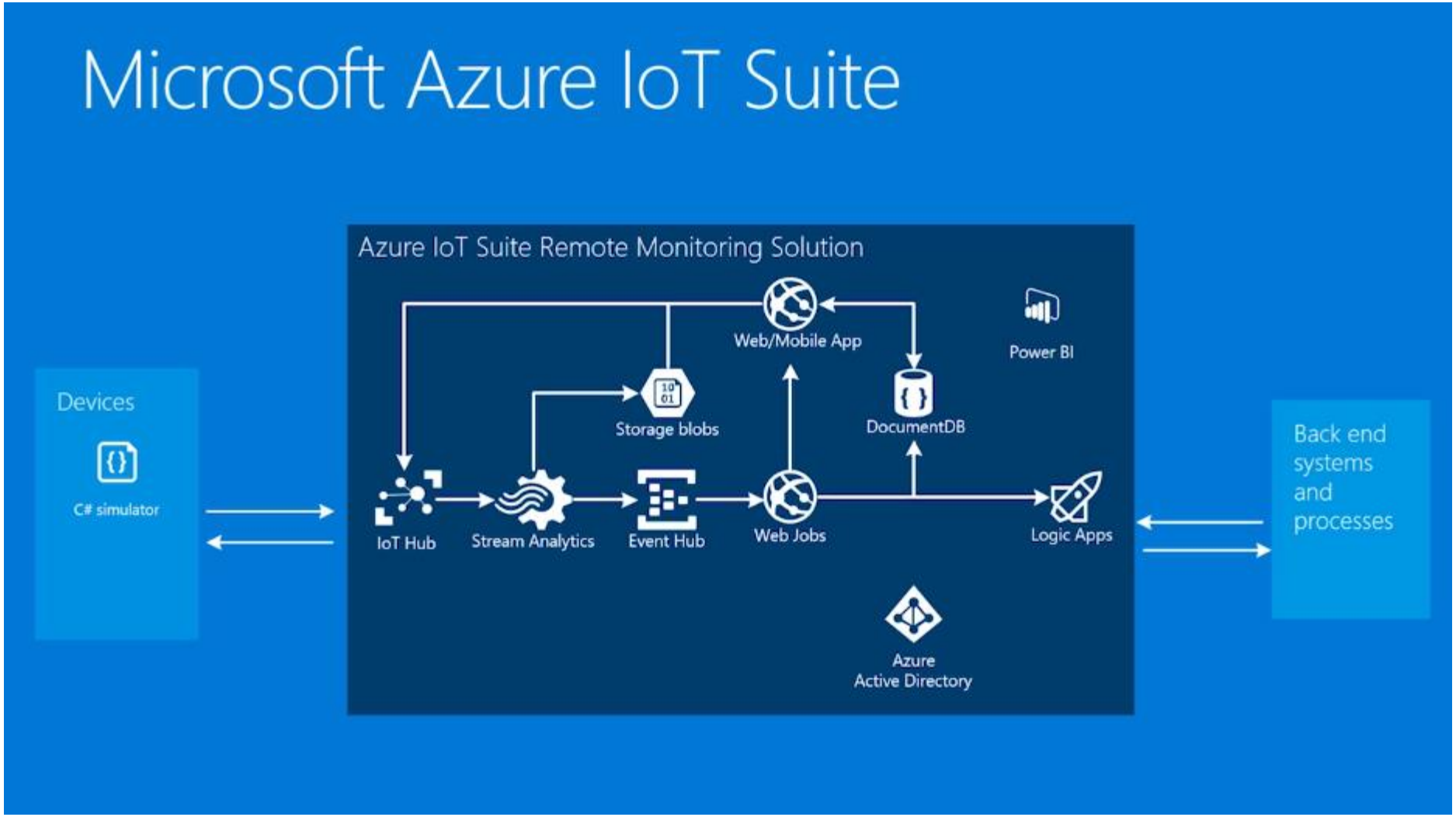

https://youtu.be/KrrLrxzPnEM



https://www.uipath.com/rpa/robotic-process-automation

# IoT

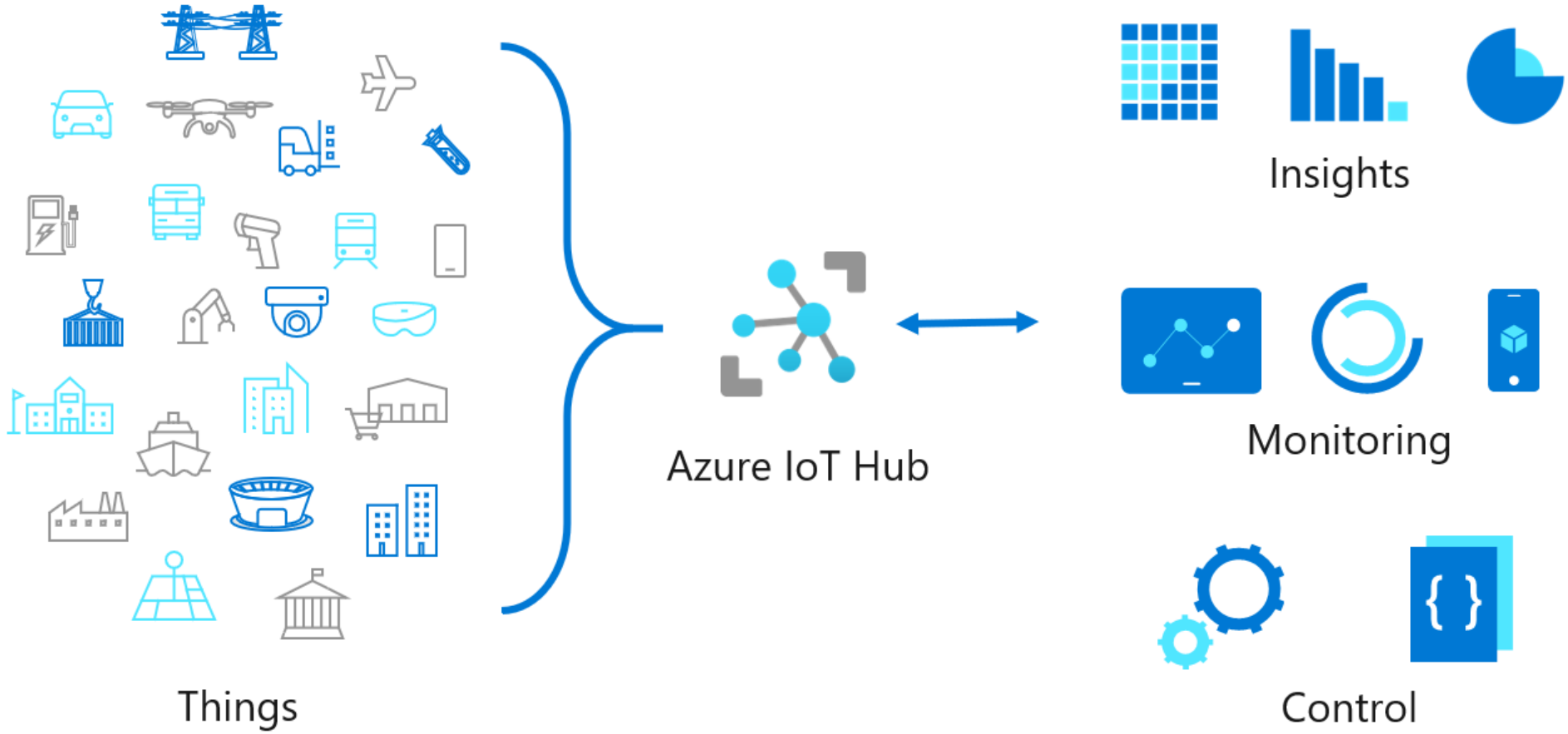
# > IoT Projects






https://blog.stackpath.com/latency/

# > IoT Projects

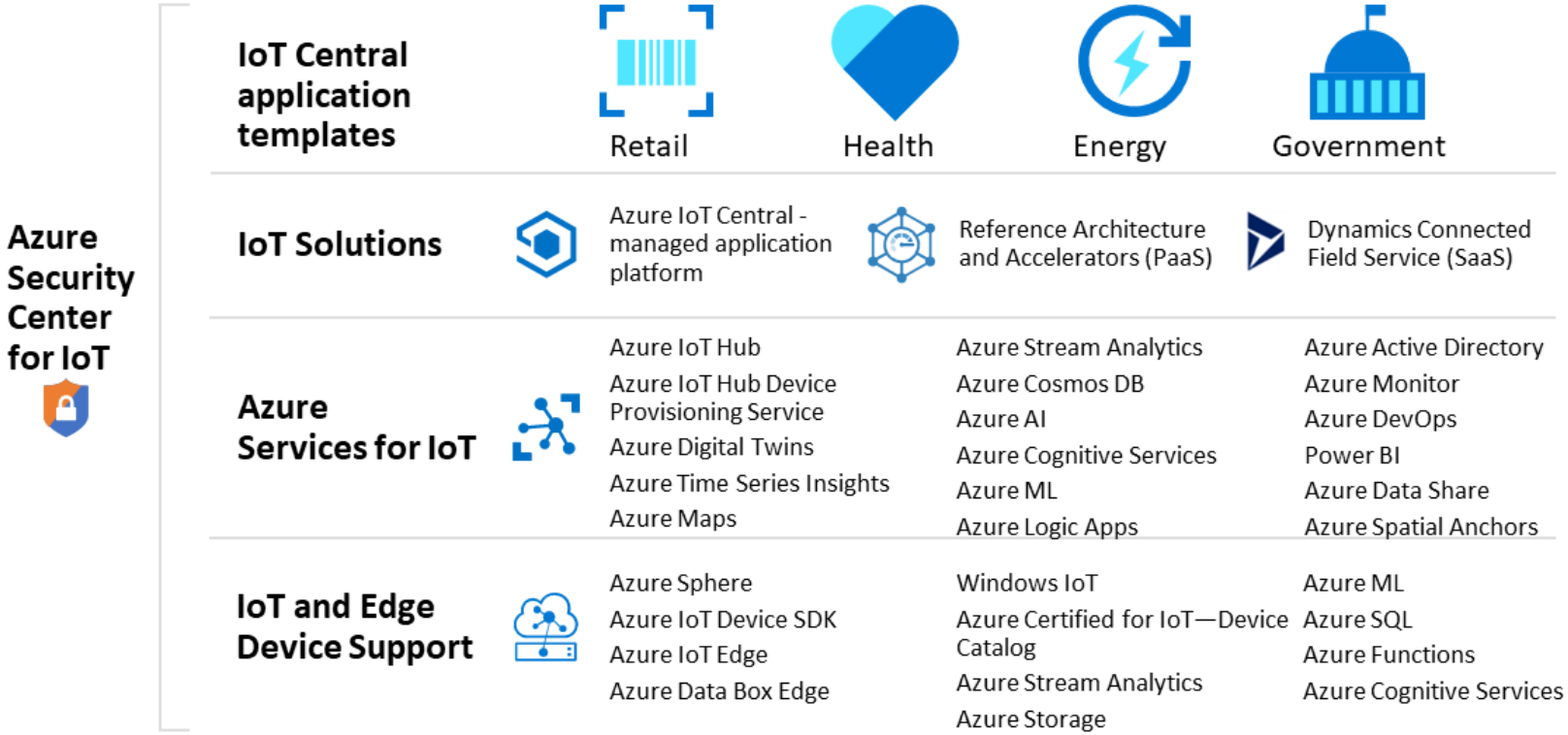





https://blog.stackpath.com/latency/

# > IoT Projects

## Azure IoT technologies, services, and solutions



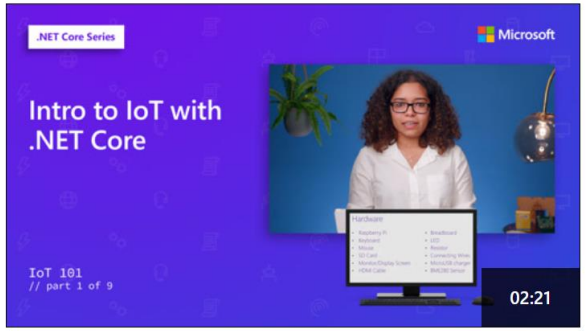



https://blog.stackpath.com/latency/

# > IoT Projects

https://docs.microsoft.com/en-us/azure/architecture/reference-architectures/iot

# > More About IoT




Intro to IoT with .NET Core [1 of 9]

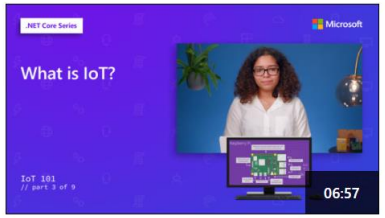
Jan 06, 2020 at 8:00AM
by pattynguyen

In this video tutorial, we explain what we are going to accomplish in this overall series. Learn what hardware and software components will be needed to join us in this journey of discovering the...

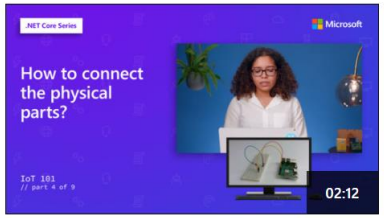
★★★★★ 6 ratings 2 comments

view episode

Raspberry Pi Setup Tutorial [2 of 9]




What is IoT? [3 of 9]




How to connect the physical parts? [4 of 9]

Channel 9

https://aka.ms/IoTNet101

# Express Route

EXAM

# > Express Route

ExpressRoute lets you extend your on-premises networks into the Microsoft cloud over a private connection with the help of a connectivity provider. With ExpressRoute, you can establish connections to Microsoft cloud services, such as Microsoft Azure and Microsoft 365.

Connectivity can be from an any-to-any (IP VPN) network, a point-to-point Ethernet network, or a virtual cross-connection through a connectivity provider at a colocation facility. ExpressRoute connections don't go over the public Internet. This allows ExpressRoute connections to offer more reliability, faster speeds, consistent latencies, and higher security than typical connections over the Internet. For information on how to connect your network to Microsoft using ExpressRoute, see ExpressRoute connectivity models.

**Key benefits**

Layer 3 connectivity between your on-premises network and the Microsoft Cloud through a connectivity provider. Connectivity can be from an any-to-any (IPVPN) network, a point-to-point Ethernet connection, or through a virtual cross-connection via an Ethernet exchange.

Connectivity to Microsoft cloud services across all regions in the geopolitical region.

Global connectivity to Microsoft services across all regions with the ExpressRoute premium add-on.

Dynamic routing between your network and Microsoft via BGP.

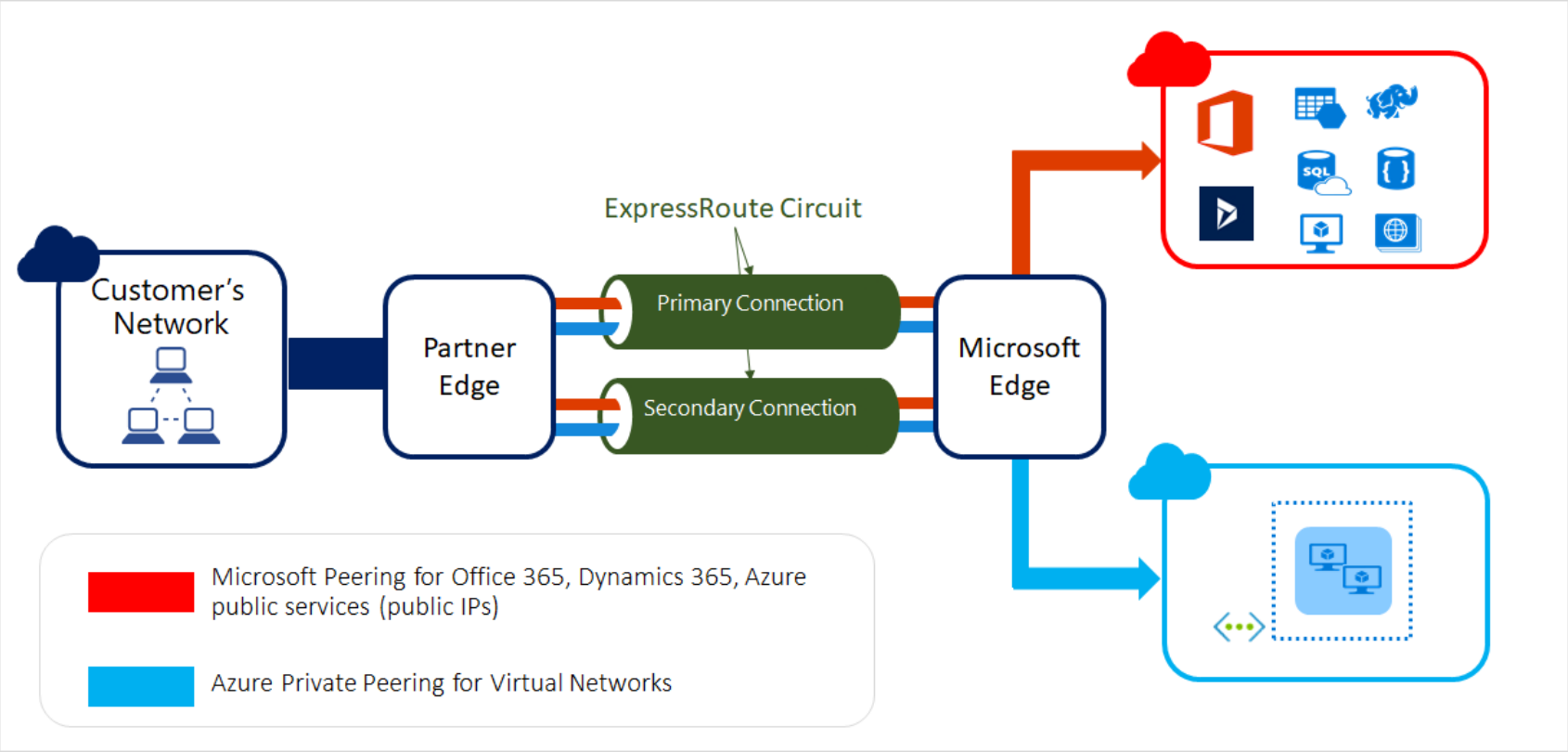
Built-in redundancy in every peering location for higher reliability.



https://docs.microsoft.com/en-us/azure/expressroute/expressroute-introduction

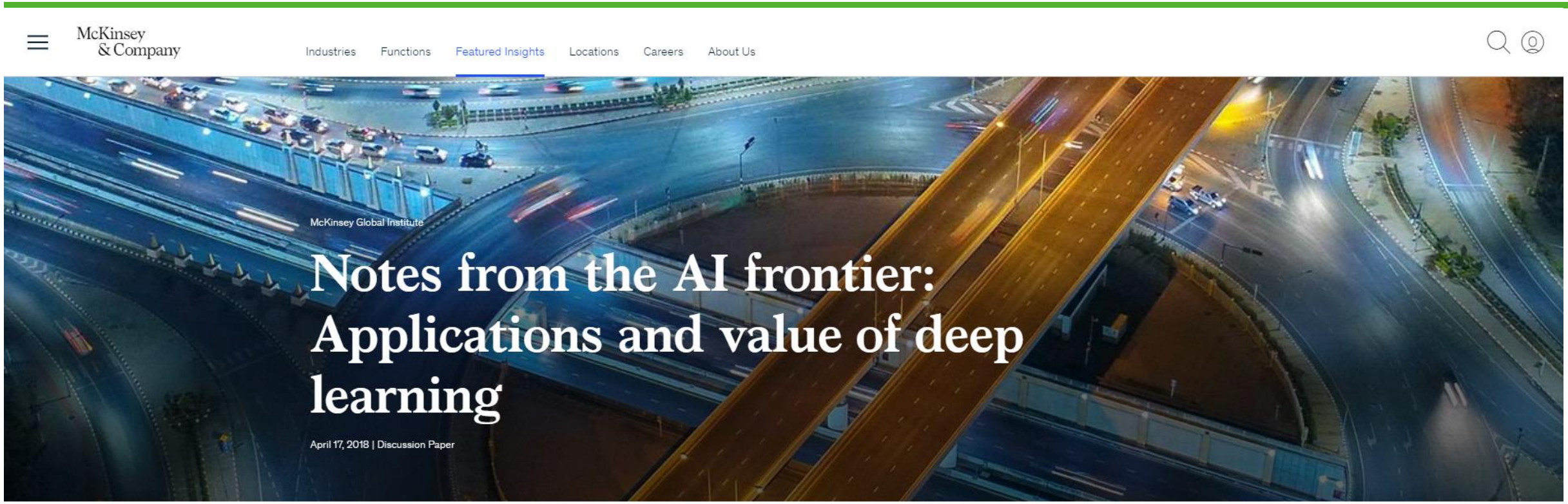
EXAM

# > Express Route



# Value | McKinsey

# > Value | McKinsey




By Michael Chui, James Manyika, Mehdi Miremadi, Nicolaus Henke, Rita Chung, Pieter Nel, and Sankalp Malhotra

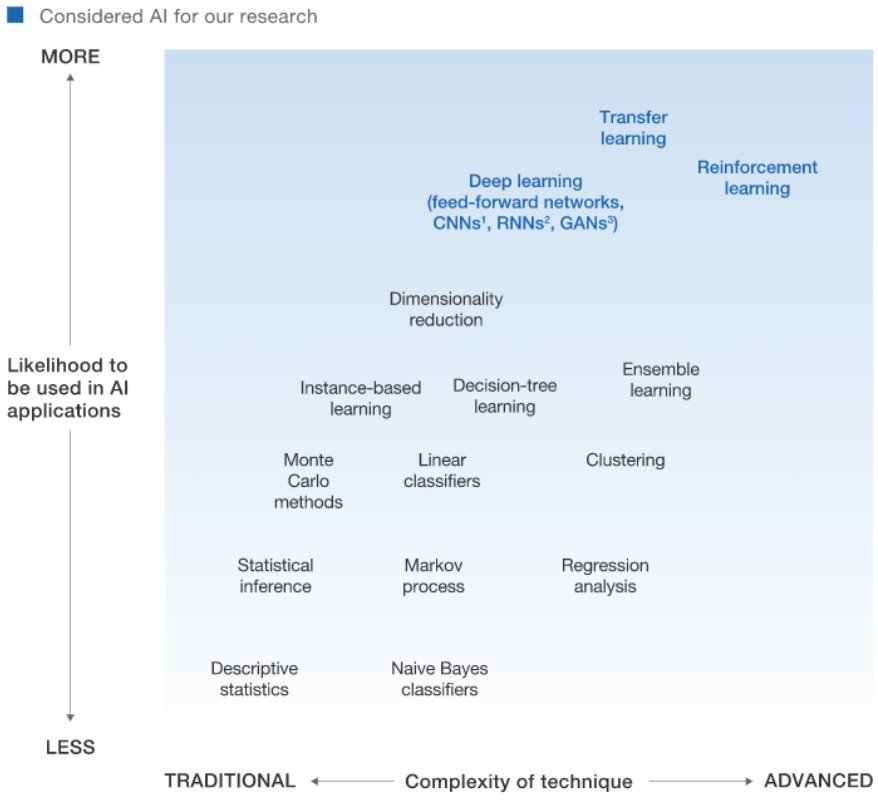
An analysis of more than 400 use cases across 19 industries and nine business functions highlights the broad use and significant economic potential of advanced AI techniques.



https://www.mckinsey.com/featured-insights/artificial-intelligence/notes-from-the-ai-frontier-applications-and-value-of-deep-learning#

# > Value | McKinsey

We examined artificial intelligence (AI), machine learning, and other analytics techniques for our research.




[1]Convolutional neural networks.
[2]Recurrent neural networks.
[3]Generative adversarial networks.

McKinsey&Company | **Source:** McKinsey Global Institute analysis

## Mapping AI techniques to problem types

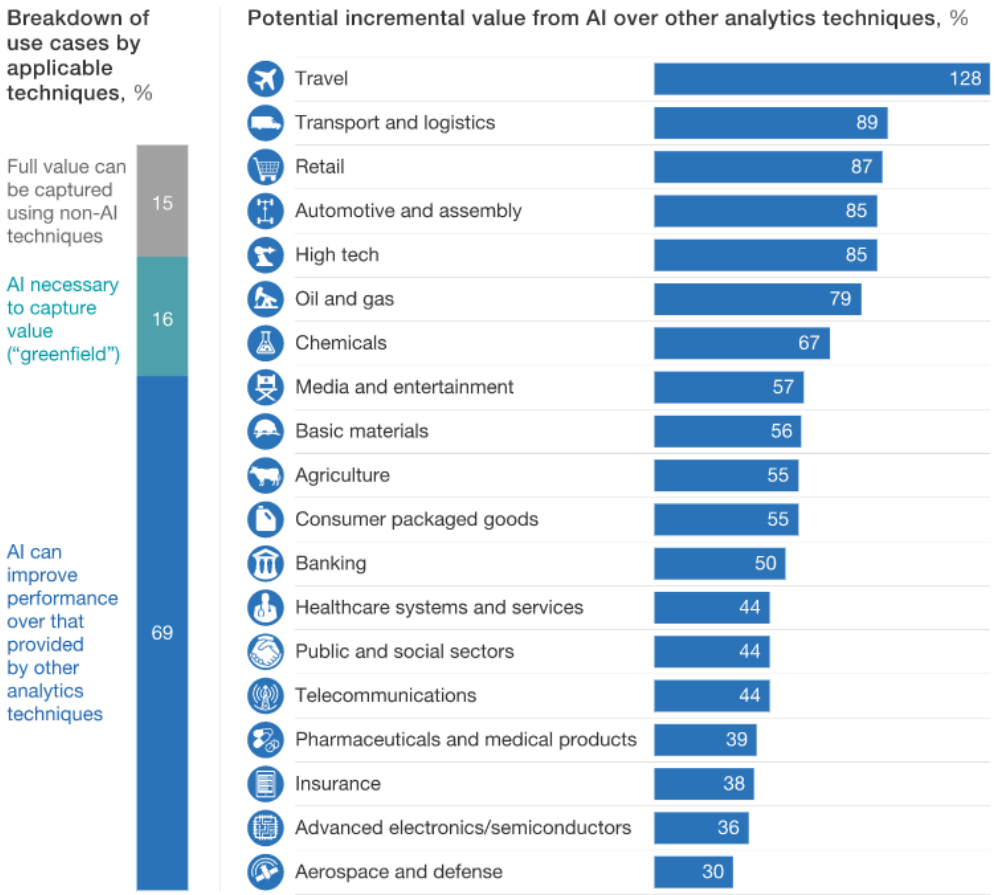
As artificial intelligence technologies advance, so does the definition of which techniques constitute AI. For the purposes of this briefing, we use AI as shorthand for deep learning techniques that use artificial neural networks. We also examined other machine learning techniques and traditional analytics techniques.



https://www.mckinsey.com/featured-insights/artificial-intelligence/notes-from-the-ai-frontier-applications-and-value-of-deep-learning#

# > Value | McKinsey

In more than two-thirds of our use cases, artificial intelligence (AI) can improve performance beyond that provided by other analytics techniques.




McKinsey&Company | **Source:** McKinsey Global Institute analysis

## Two-thirds of the opportunities to use AI are in improving the performance of existing analytics use cases.

In 69 percent of the use cases we studied, deep neural networks can be used to improve performance beyond that provided by other analytic techniques. Cases in which only neural networks can be used, which we refer to here as "greenfield" cases, constituted just 16 percent of the total. For the remaining 15 percent, artificial neural networks provided limited additional performance over other analytics techniques, among other reasons because of data limitations that made these cases unsuitable for deep learning.



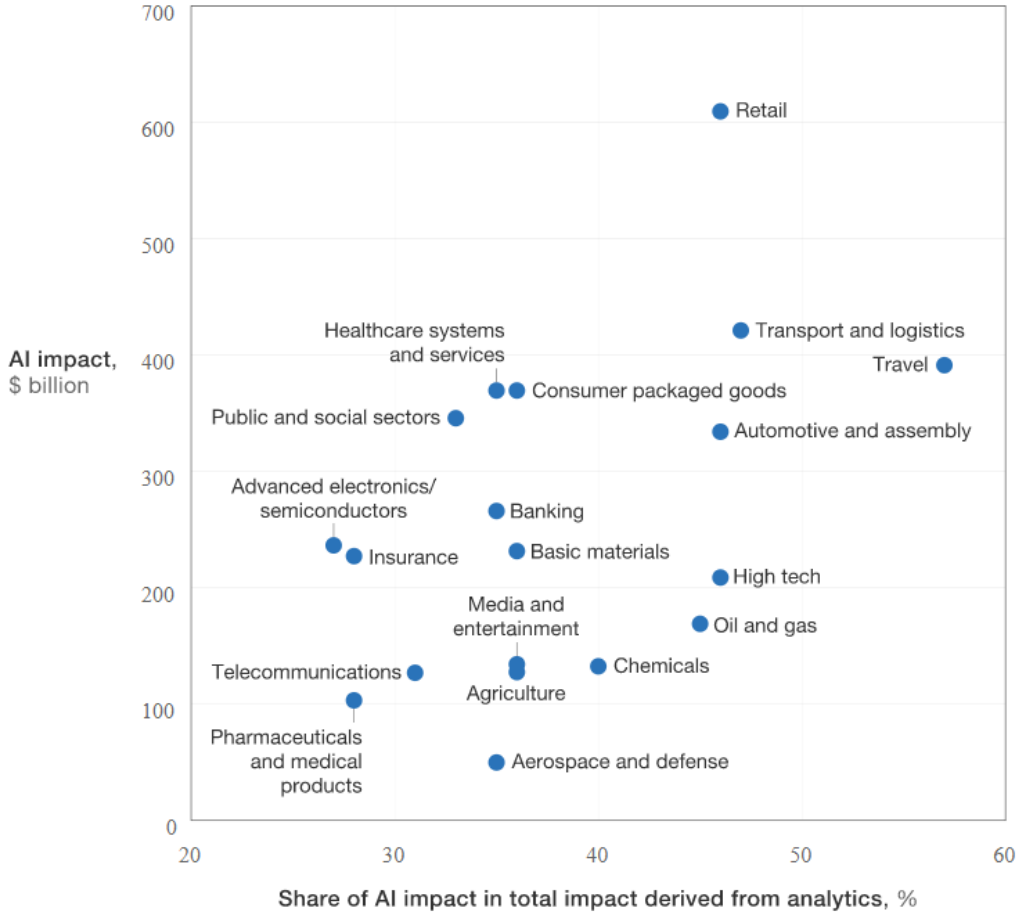
https://www.mckinsey.com/featured-insights/artificial-intelligence/notes-from-the-ai-frontier-applications-and-value-of-deep-learning#

# > Value | McKinsey

## Sizing the potential value of AI

We estimate that the AI techniques we cite in this briefing together have the potential to create between $3.5 trillion and $5.8 trillion in value annually across nine business functions in 19 industries. This constitutes about 40 percent of the overall $9.5 trillion to $15.4 trillion annual impact that could potentially be enabled by all analytical techniques.

Artificial intelligence (AI) has the potential to create value across sectors.




McKinsey&Company | **Source:** McKinsey Global Institute analysis



https://www.mckinsey.com/featured-insights/artificial-intelligence/notes-from-the-ai-frontier-applications-and-value-of-deep-learning#

# > Business Value

$$(S+D)^{AI} = BV$$

Situation, Data

Artificial Intelligence

**Enablers and Inhibitors**

Business Value

## Enablers:

en·a·bler

/iˈnāblər,eˈnāblər/

*noun*

plural noun: **enablers**

a person or thing that makes something possible.
"the people who run these workshops are crime enablers"

- a person who encourages or enables negative or self-destructive behavior in another.
  "being an enabler to an addict does more harm than good"

## Inhibitors:

in·hib·i·tor

/inˈhibədər/

*noun*

plural noun: **inhibitors**

a thing which inhibits someone or something.

- a substance which slows down or prevents a particular chemical reaction or other process or which reduces the activity of a particular reactant, catalyst, or enzyme.
- GENETICS
  a gene whose presence prevents the expression of some other gene at a different locus.

# AI Personas

# > AI Personas

## Data Scientist

Machine Learning Engineer

Data Engineer
Data Analyst

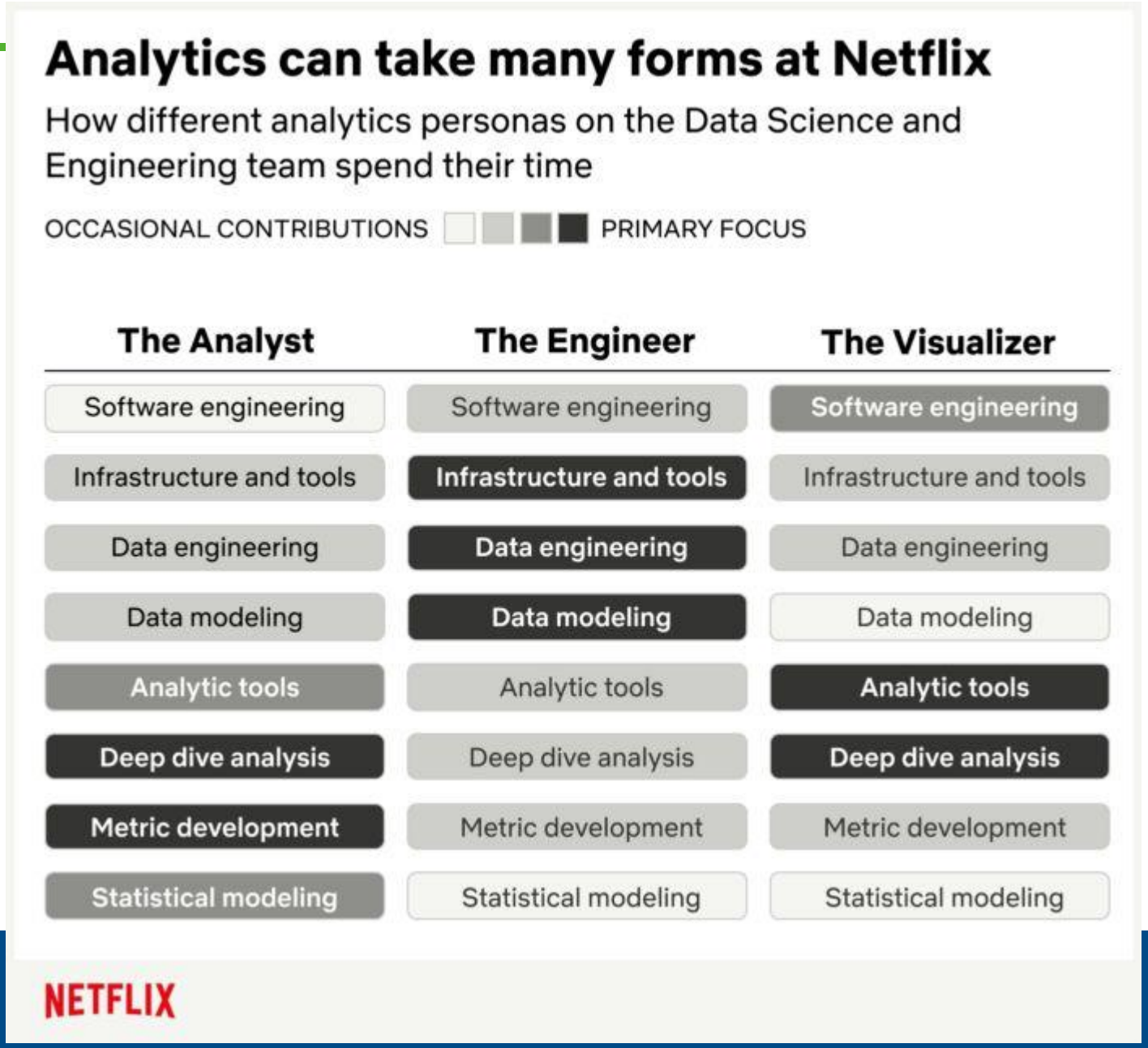
Business Analyst
Business side professional

**AI (S+D) = BV**

Business Analyst
Data Analyst
Business side professional

Machine Learning Engineer
Developers
Software Engineers

# > AI Personas


Analytics can take many forms at Netflix
How different analytics personas on the Data Science and Engineering team spend their time
OCCASIONAL CONTRIBUTIONS
PRIMARY FOCUS
The Analyst
The Engineer
The Visualizer
Software engineering
Software engineering
Software engineering
Infrastructure and tools
Infrastructure and tools
Infrastructure and tools
Data engineering
Data engineering
Data engineering
Data modeling
Data modeling
Data modeling
Analytic tools
Analytic tools
Analytic tools
Deep dive analysis
Deep dive analysis
Deep dive analysis
Metric development
Metric development
Metric development
Statistical modeling
Statistical modeling
Statistical modeling
NETFLIX

# WWII Airplanes

# > WWII

In World War II, many planes were downed in combat, costing lives and precious equipment. To reduce losses, the Americans decided to **reinforce the armor of the planes**. As the planes would be very heavy if all the armor was reinforced, they carried out a study to define **which parts of the armor should be reinforced**.

Mapped with points where planes that returned from combat were hit, creating the image you see.

# > WWII

There, they decided to reinforce the fuselage in the areas where there were most points.

Until *Abraham Wald* saw the image and came to the **opposite conclusion**: the dots represented only the damage to the planes that managed to return. The areas that really needed reinforcement were those where there were no stitches. The planes hit in those areas were shot down and were unable to return.

The most important information was outside the visible data.

This phenomenon, **called survival bias**, affects a lot of data that we analyze and is just one example of how misunderstanding the information that each data can and cannot bring leads to wrong conclusions, which are sometimes fervently defended. In an era in which data availability and the computational capacity to organize it are only growing, ***knowing how to analyze data correctly will be an increasingly important competitive advantage for the career of any professional and for the success of any company.***

# > WWII // Reflection

***Do not trust 100% in your data***

# References

# > References


- Big Data Analytics Program, 2019/2020 – Georgian College, Barrie, Ontario
- Explained AI, Terence Parr, website, https://explained.ai/
- Wikipedia, website, https://en.wikipedia.org/wiki/Explainable_artificial_intelligence
- Interpretable Machine Learning, A Guide for Making Black Box Models Explainable, Christoph Molnar, 2021-05-09, https://christophm.github.io/interpretable-ml-book/
- Microsoft, What is Azure ExpressRoute?, https://docs.microsoft.com/en-us/azure/expressroute/expressroute-introduction
- StackPath, Blog, What is Latency?, https://blog.stackpath.com/latency/
- Microsoft, Azure IoT reference architecture, https://docs.microsoft.com/en-us/azure/architecture/reference-architectures/iot
- Microsoft, How to reduce inter-VM latency with Proximity Placement Groups, https://azure.microsoft.com/en-ca/resources/videos/azure-friday-how-to-reduce-inter-vm-latency-with-proximity-placement-groups/
- McKinsey, Notes from the AI frontier: Applications and value of deep learning, https://www.mckinsey.com/featured-insights/artificial-intelligence/notes-from-the-ai-frontier-applications-and-value-of-deep-learning#
- Microsoft, Success by Design Implementation Guide, First Edition, 2021

**END OF DAY 14**