



# Rahasia AI ?

## AI Engineering 101

Hendri Karisma  
STMIK Tazkia

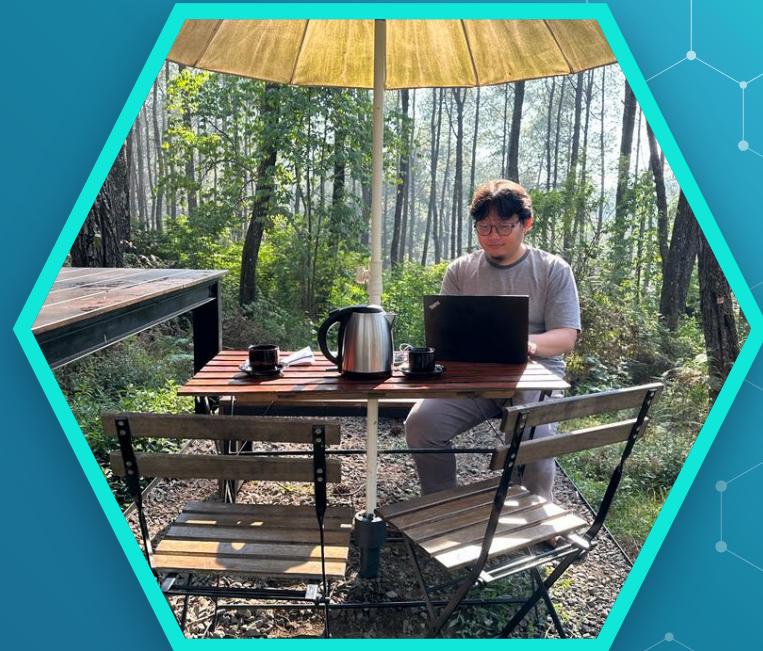
# HELLO!

I AM HENDRI KARISMA, M.T.

- ◆ Dosen di **STMIK Tazkia**
- ◆ AI Product Research Specialist di **jejakin.com**
- ◆ Manager Tim Data dan AI
- ◆ Daily :
  - ◆ AI untuk Geographical System,
  - ◆ Otomatisasi Perhitungan Karbon,
  - ◆ Fraud Detection System,
  - ◆ Data Engineering and Analytics,
  - ◆ AI Engine

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# Data

Kita mulai dengan definisi data  
Apa itu Data?



“Data adalah Fakta”

“...Data seperti bahan bakar untuk roket dalam membangun AI...  
Arsitektur roket adalah **metode** beserta detil dari **parameter**...” –  
Prof. Andrew Ng.



# Artificial Intelligence ?

- S. Russel and P. Norvig, Artificial Intelligence in Modern Approach

**Thinking Humanly**

“The exciting new effort to make computers think . . . *machines with minds*, in the full and literal sense.” (Haugeland, 1985)

“[The automation of] activities that we associate with human thinking, activities such as decision-making, problem solving, learning . . .” (Bellman, 1978)

**Acting Humanly**

“The art of creating machines that perform functions that require intelligence when performed by people.” (Kurzweil, 1990)

“The study of how to make computers do things at which, at the moment, people are better.” (Rich and Knight, 1991)

**Thinking Rationally**

“The study of mental faculties through the use of computational models.” (Charniak and McDermott, 1985)

“The study of the computations that make it possible to perceive, reason, and act.” (Winston, 1992)

**Acting Rationally**

“Computational Intelligence is the study of the design of intelligent agents.” (Poole *et al.*, 1998)

“AI . . . is concerned with intelligent behavior in artifacts.” (Nilsson, 1998)

**“Computational Intelligence is the study of  
the design of intelligent agents.”**  
**(Poole et al., 1998)**

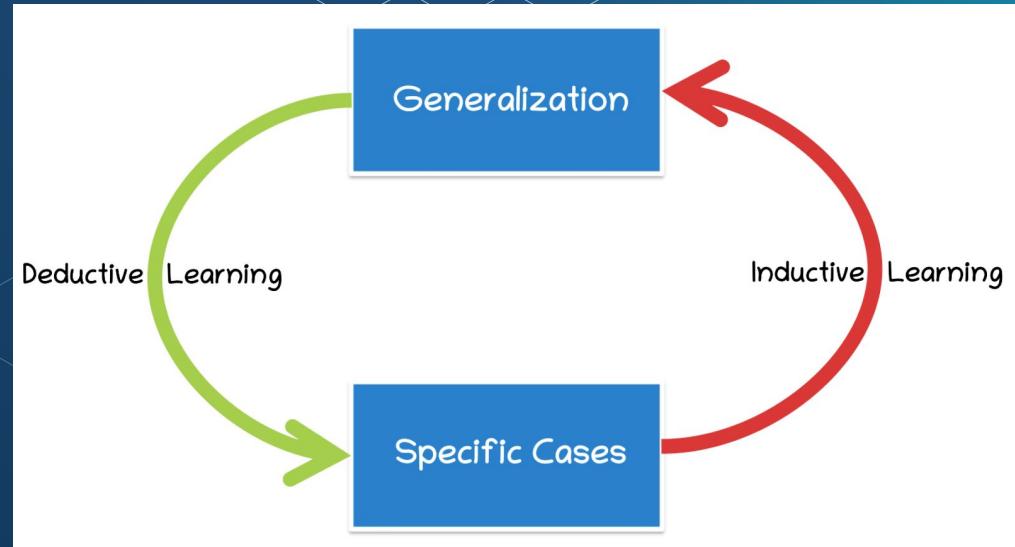
## Agents :

- ❖ Searching
- ❖ Planning
- ❖ Reasoning
- ❖ Learning





# Learning

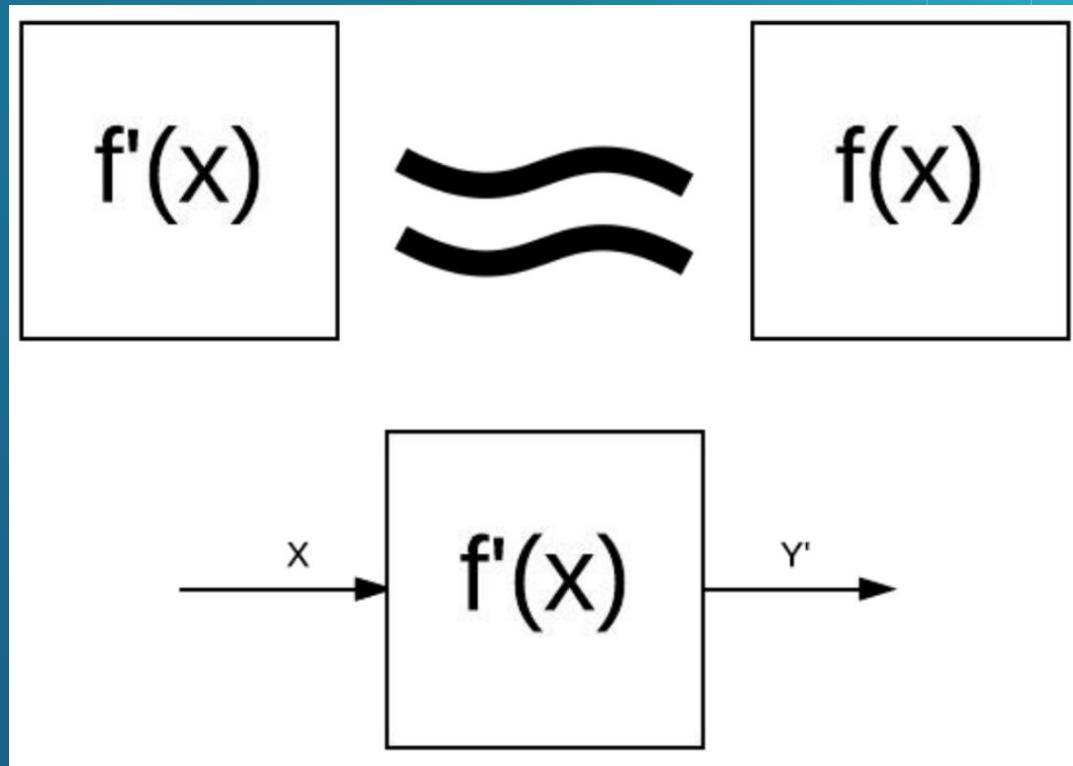




# Machine Learning

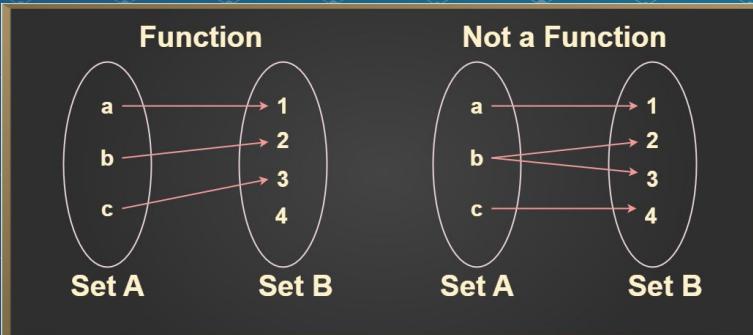


# Tujuan AI



# Metode adalah Fungsi

## Parameter adalah atribut dari Metode / Fungsi



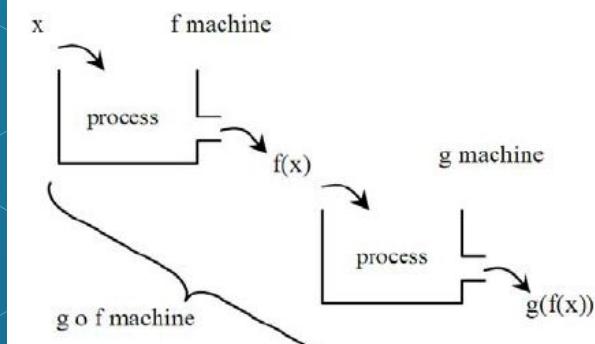
### Function in Maths

$$y = f(x)$$

Output      Function      Input

Function Notation

ee



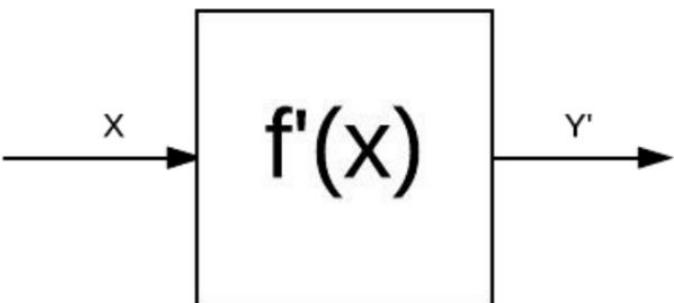


Full

$$f'(x)$$



$$f(x)$$



Count the error ( $y - y'$ )  
Then minimize the error  
or  
Maximize the likelihood

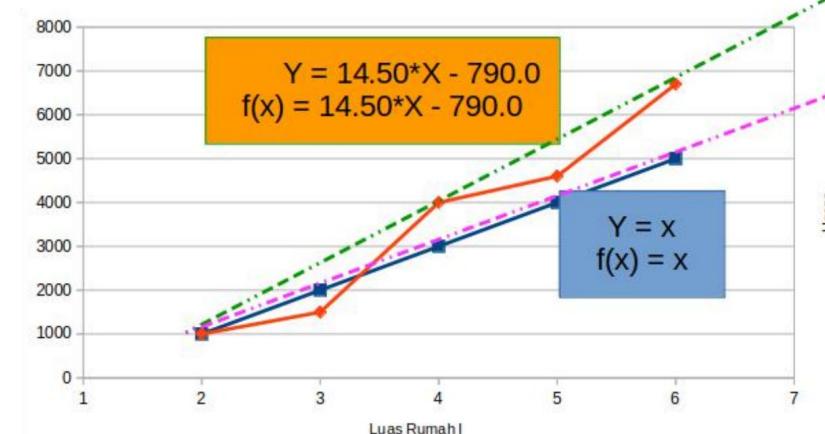
# Issues in Industry

Luas Rumah (m <sup>2</sup> )	Harga (Juta)
100	1000
200	2000
300	3000
400	4000
500	5000
600	?

Luas Rumah (m <sup>2</sup> )	Harga (Juta)
100	1000
200	1500
300	4000
400	4600
500	6700
600	?

X	Y
1	1
2	1,5
3	4
4	4,5
5	6,7

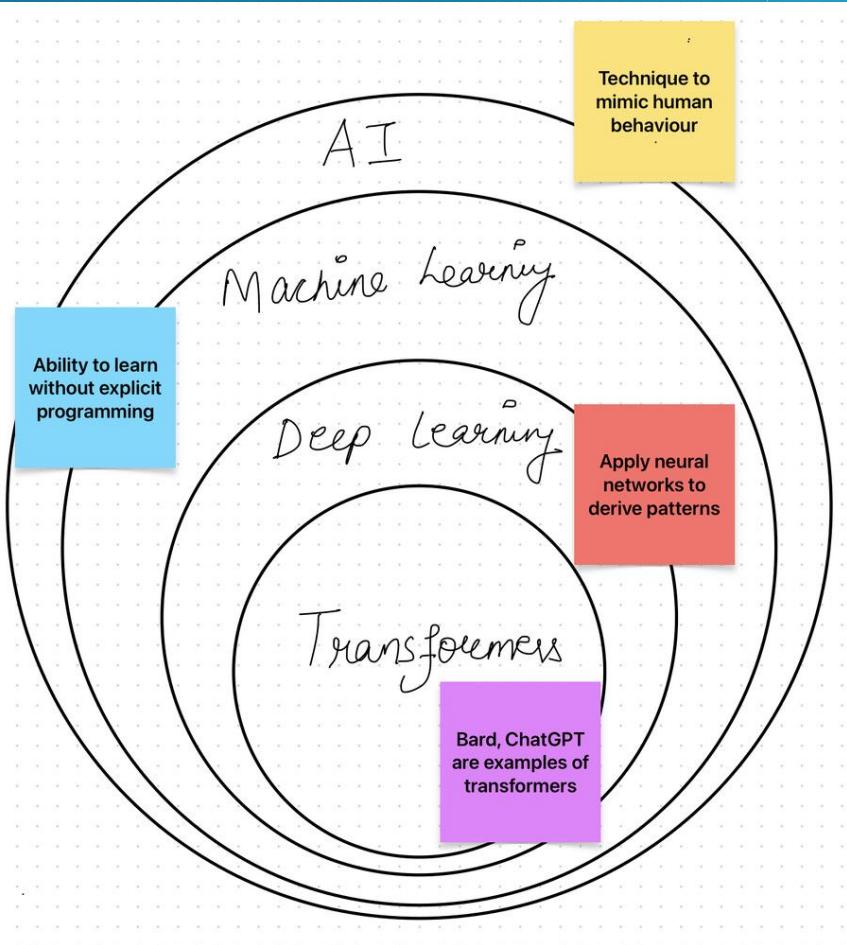
$Y = 1.500 \cdot X - 0.5000$



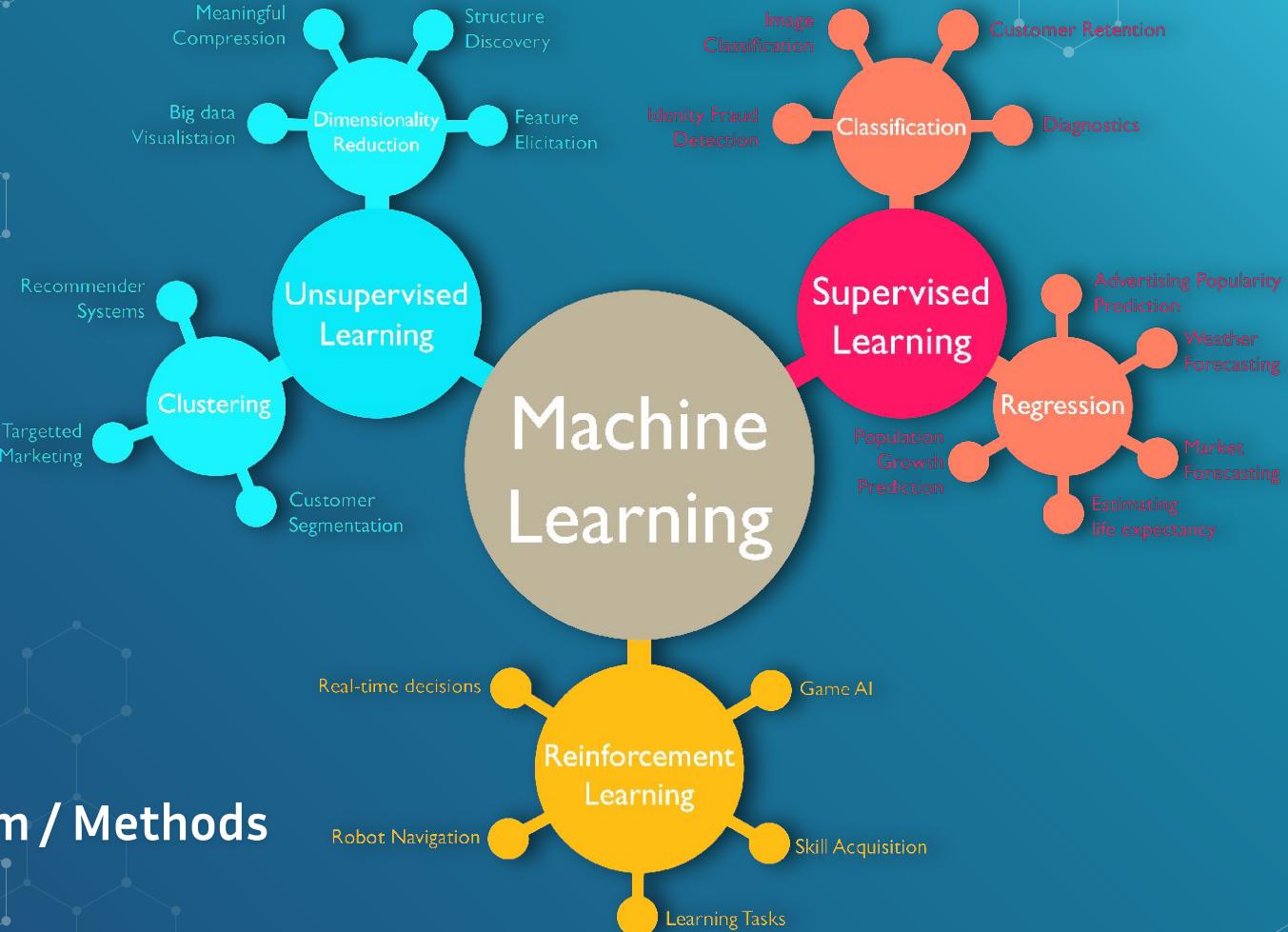
# Machine Learning

"A computer program is said to learn from experience E with respect to some class of tasks T and performance measure P , if its performance at tasks in T, as measured by P, improves with experience E." –

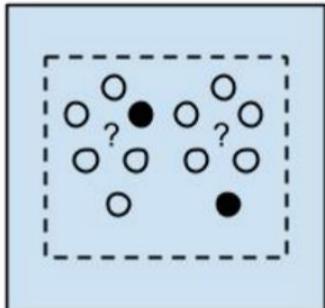
Prof. Tom Mitchel



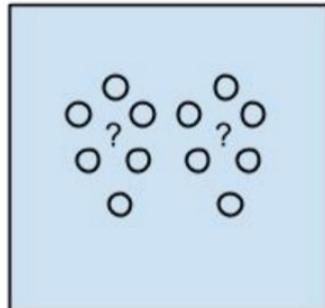
## Algorithm / Methods



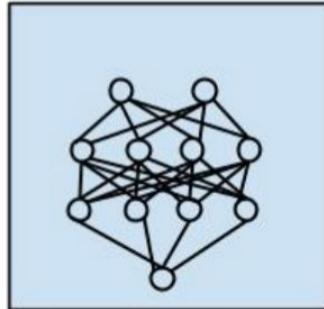
- Supervised
- Unsupervised
- Reinforcement Learning
- Semi-Supervised
- Deep Learning



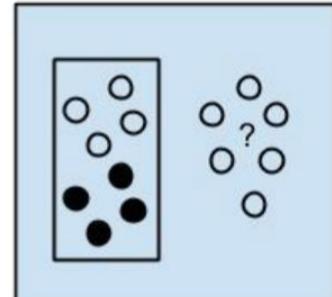
Semi-supervised  
Learning Algorithms



Unsupervised Learning  
Algorithms



Deep Learning  
Algorithms



Supervised Learning  
Algorithms

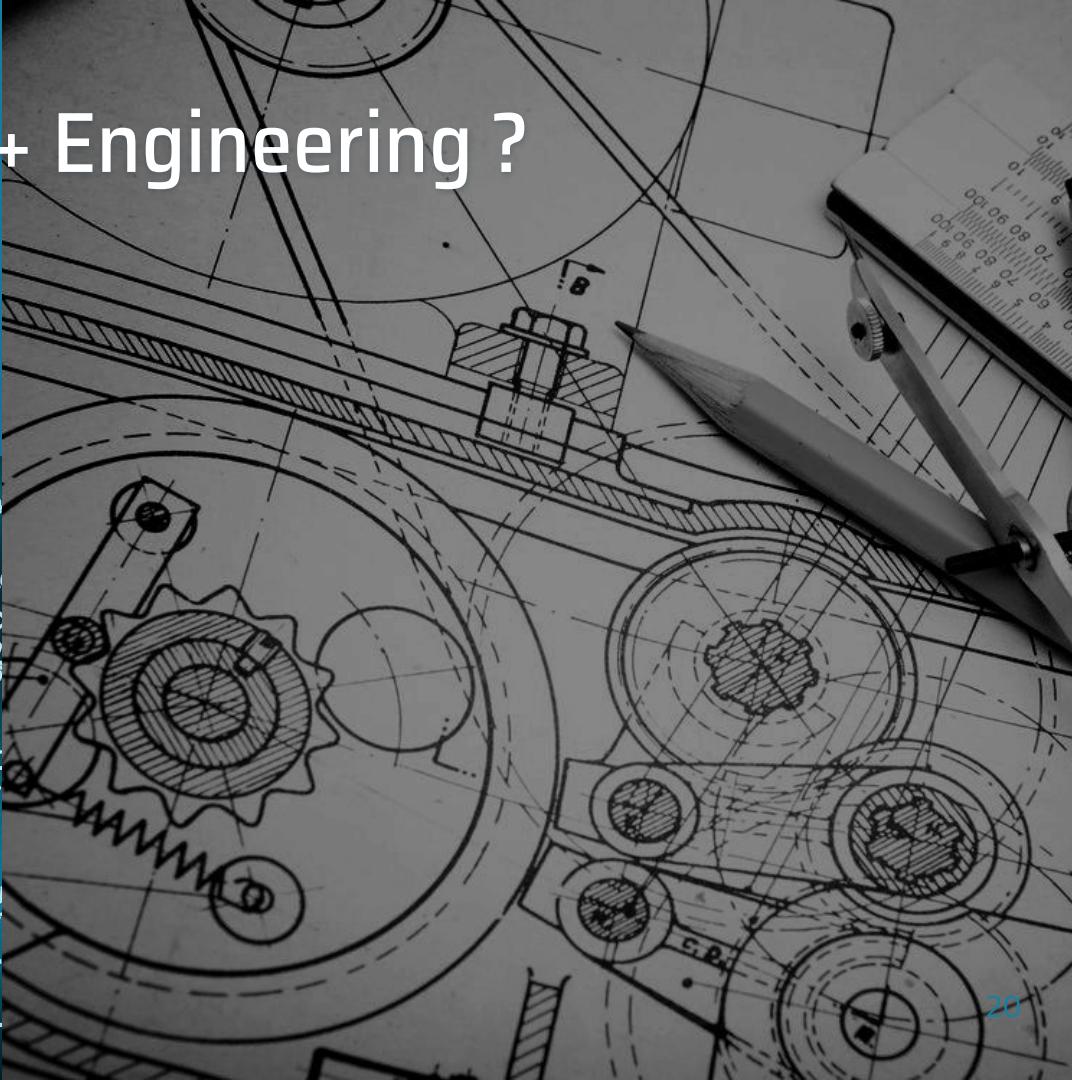
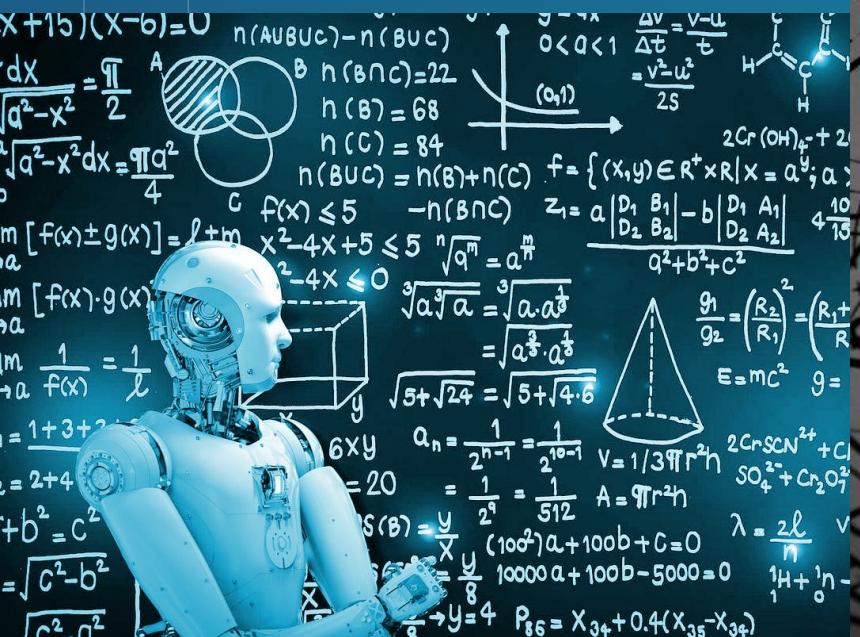


# Artificial Intelligence Engineering

## Machine Learning Engineering

# Artificial Intelligence + Engineering ?

## AI/ML Engineer ?



# Data Role

## Scientist

The goal of a scientist is to answer questions and discover information about their chosen field of study.

## Engineering

An engineer might produce physical item or blueprint for a new process.

## AI/Data Roles

- ◊ Data Scientist
- ◊ Data Analyst
- ◊ Business Intelligence
- ◊ Data Engineer
- ◊ AI/ML Engineer



## Applications

Fraud Detection

Demand Planning

## Tasks

Classification

Regression

Clustering

...

...

## Models

Decision Trees

Artificial Neural Networks

Partitioning

...

## Algorithms

C4.5

CART

Back propagation

K-Means

## Data Scientist

The term “data scientist” was coined as recently as 2008 when companies realized the need for data professionals who are skilled in organizing and analyzing massive amounts of data.<sup>1</sup> In a 2009 McKinsey&Company article, Hal Varian, Google’s chief economist and UC Berkeley professor of information sciences, business, and economics, predicted the importance of adapting to technology’s influence and reconfiguration of different industries.

# Data Engineer

Data engineers work in a variety of settings to build systems that collect, manage, and convert raw data into usable information for data scientists and business analysts to interpret. Their ultimate goal is to make data accessible so that organizations can use it to evaluate and optimize their performance.

These are some common tasks you might perform when working with data:

- ◊ Acquire datasets that align with business needs
- ◊ Develop algorithms to transform data into useful, actionable information
- ◊ Build, test, and maintain database pipeline architectures
- ◊ Collaborate with management to understand company objectives
- ◊ Create new data validation methods and data analysis tools
- ◊ Ensure compliance with data governance and security policies

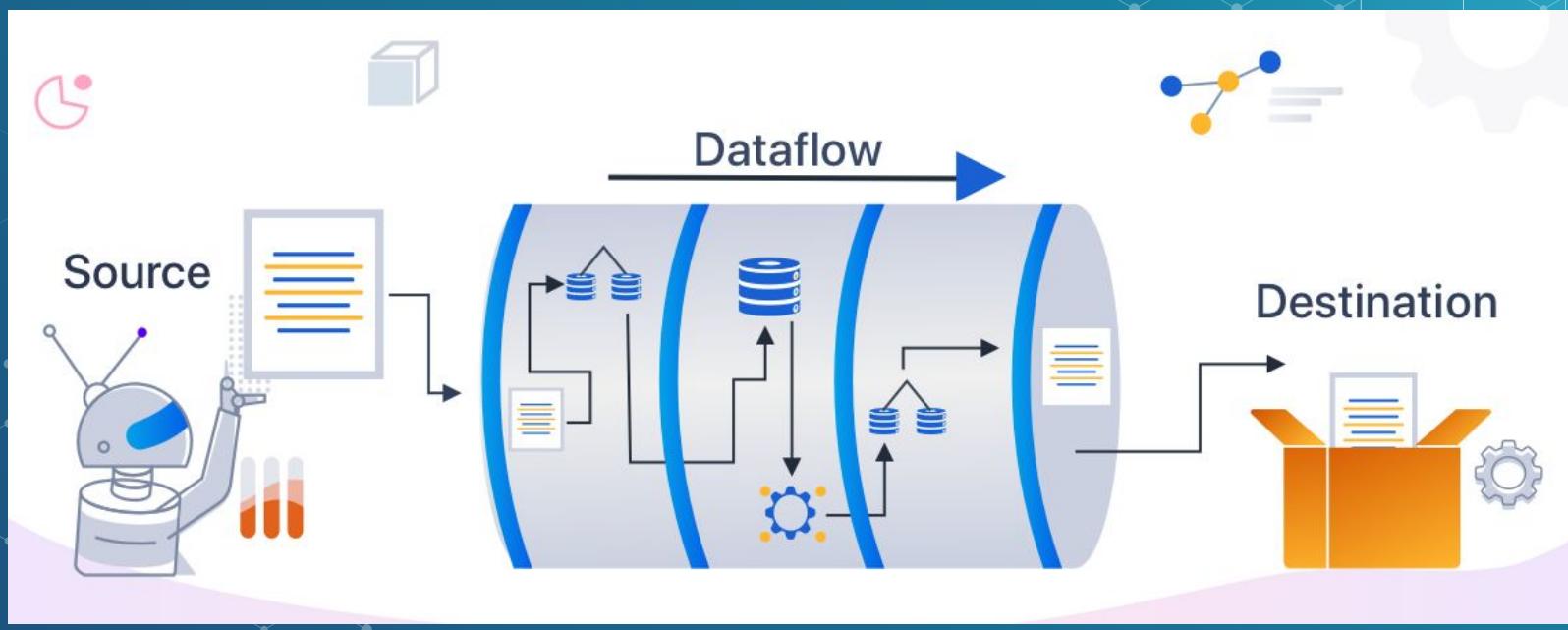
# AI/ML Engineer

Artificial intelligence (AI) engineers are responsible for developing, programming and training the complex networks of algorithms that make up AI so that they can function like a human brain. This role requires combined expertise in software development, programming, data science and data engineering. Though this role is related to data engineering, AI engineers are rarely required to write the code that develops scalable data sharing.

# AI/ML Engineer Skill set

- ◆ Build AI models from the ground up and explain results to product managers and stakeholders
- ◆ Develop, test, and deploy AI models
- ◆ Convert machine learning models into APIs so other applications can utilize it
- ◆ Build data ingestion and data transformation infrastructure
- ◆ Work alongside data and business analysts
- ◆ Execute statistical analysis and tune results to extract better insights
- ◆ Automate infrastructure used by the data science team
- ◆ Create and manage AI development and production infrastructure

# Tech that need to acquired to build the solution



# 3 Important Statistics About How Much Data Is Created Every Day

## 1 How much data is generated every minute?

 **41,666,667**

messages shared  
by WhatsApp users

 **1,388,889**

video / voice calls made  
by people worldwide

 **404,444**

hours of video streamed  
by Netflix users

 **347,222**

stories posted by Instagram users

 **150,000**

messages shared by Facebook users

 **147,000**

photos shared by Facebook users

Source: Domo

## 2 Estimated Data Consumption from 2021 to 2024



Source: IDC / Statista

## 3 Data Growth in 2021

 **2 TRILLION**

searches on Google by the end of 2021

 **1.134 TRILLION MB**

volume of data created every day

 **3,026,626**

emails sent every second, 67% of which are spam

 **278,108 PETABYTES**

global IP data per month by the end of 2021

 **230,000**

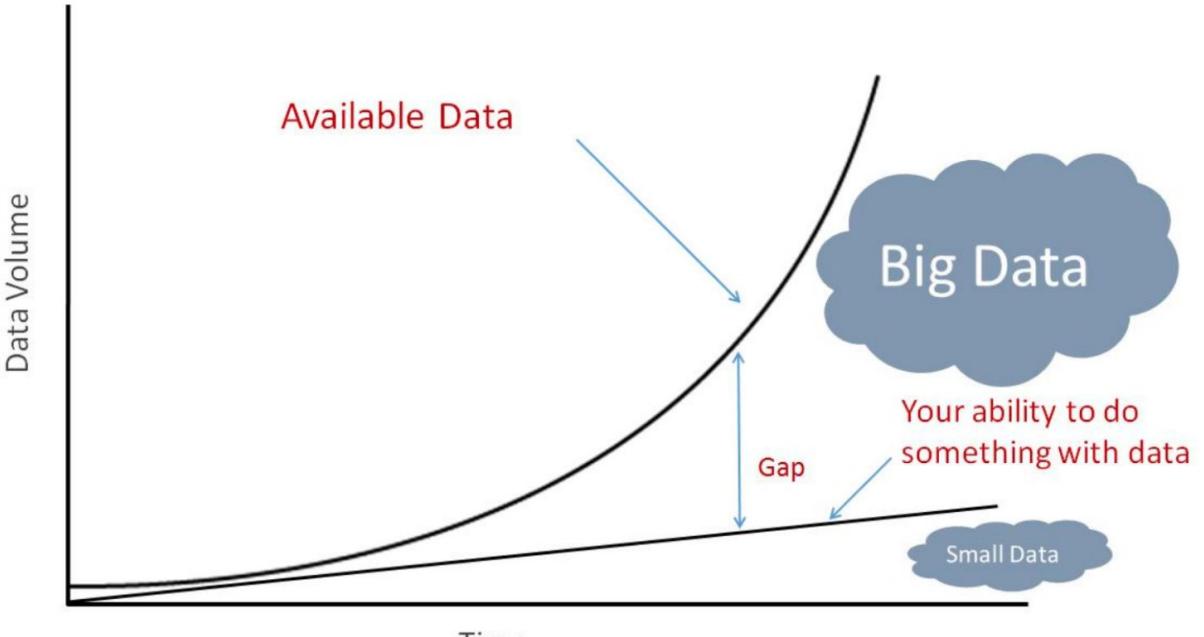
new malware versions created every day

 **82%**

share of video in total global internet  
traffic at the end of 2021

Sources: TechJury, Internet Live Stats, Cisco, PurpleSec

# Data Explosion



Scale-Up



Scale-Out

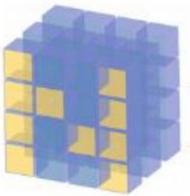




Google Cloud

aws





NumPy

# Seaborn



 TensorFlow™

Pandas



elasticsearch

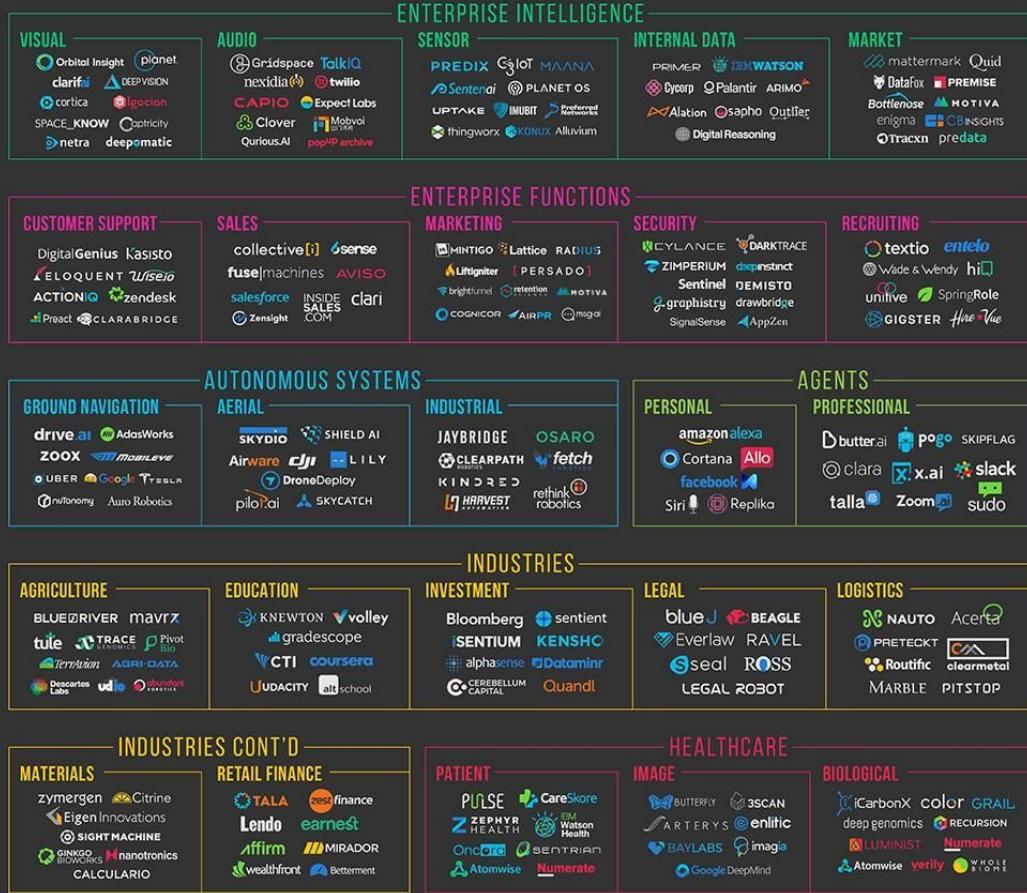
APACHE Spark™

 NVIDIA.  
CUDA.®

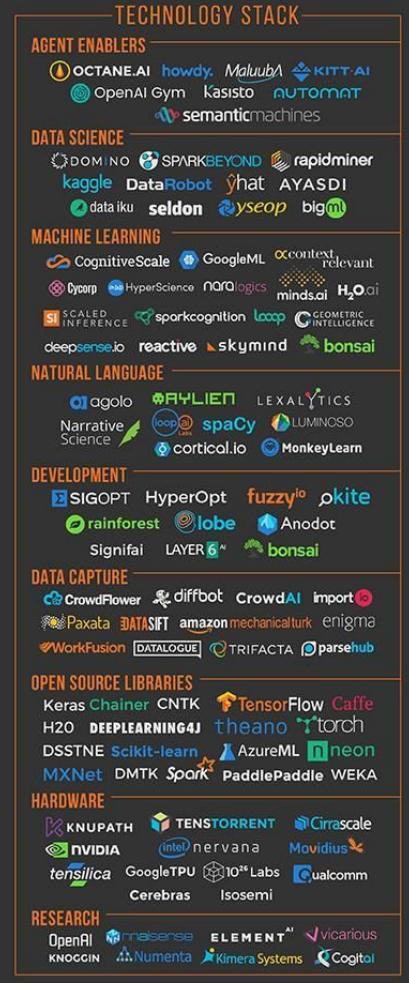
OpenCL™

 APACHE kafka.®

# MACHINE INTELLIGENCE 3.0



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## Conclusion

To build an AI solution or engine or system or product is not just need the knowledge of the science of AI, even more than just engineering. Science will help us to understand the nature, the cases, engineering will help us to build the best tech solution, and regulation will keep it controlled that will make the system safe, secure, trusted, and reliable.

# THANKS!

ANY QUESTIONS?

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