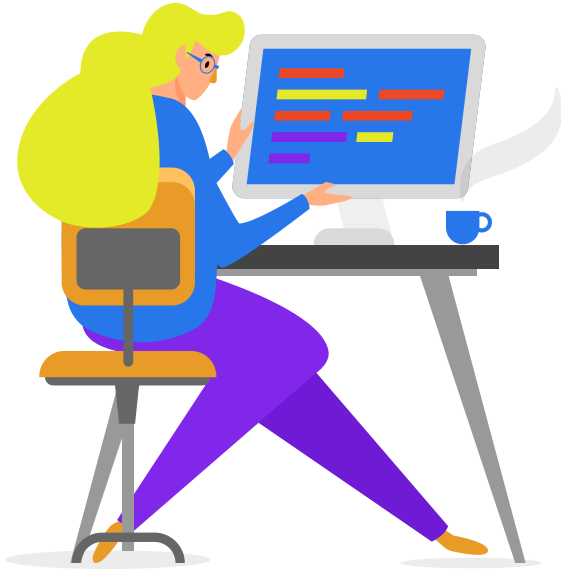# AI & Deep Learning Bootcamp

Sayed Husain Mohamed

Introduction to Machine Learning

Introduction

01

Introduction to the topic of the workshop.

Technical overview

03

We will cover the technical aspects of Machine Learning.
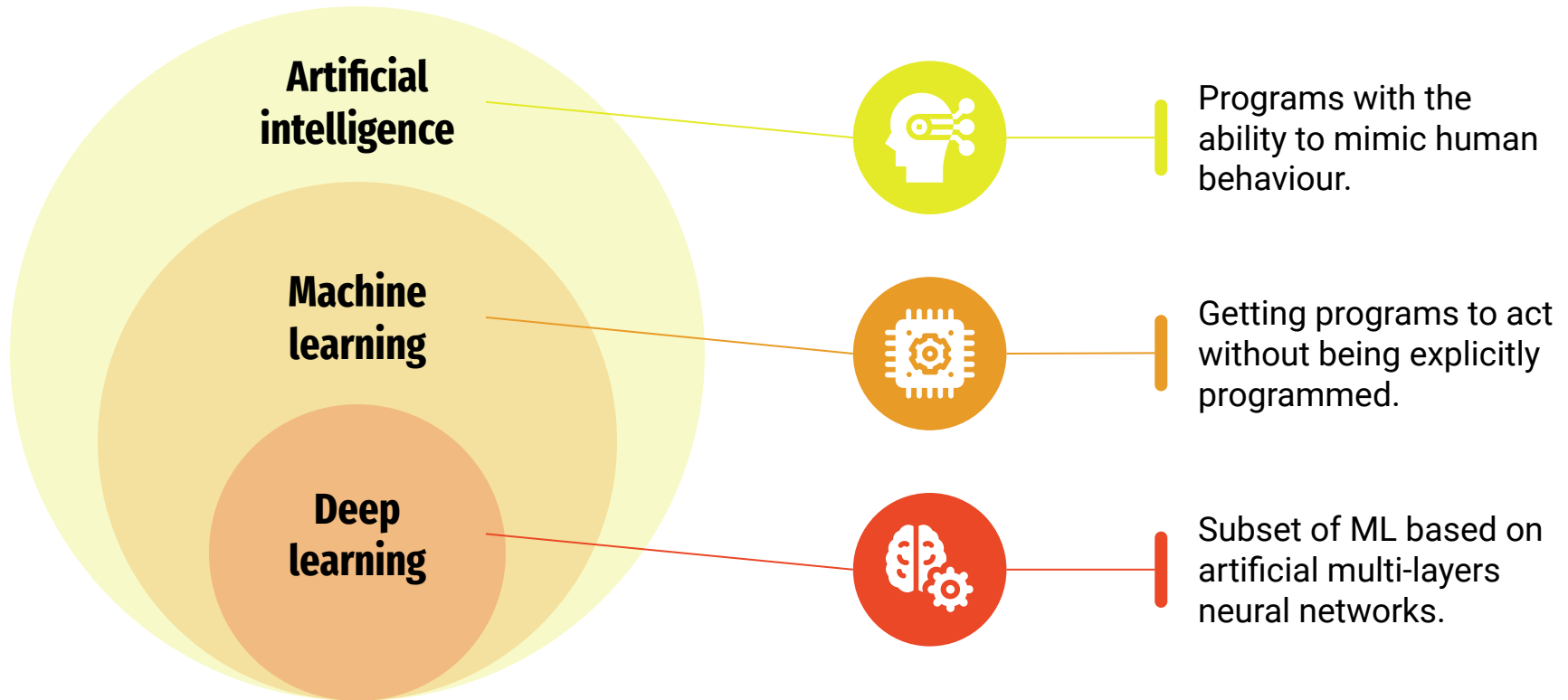
Non-technical overview

02
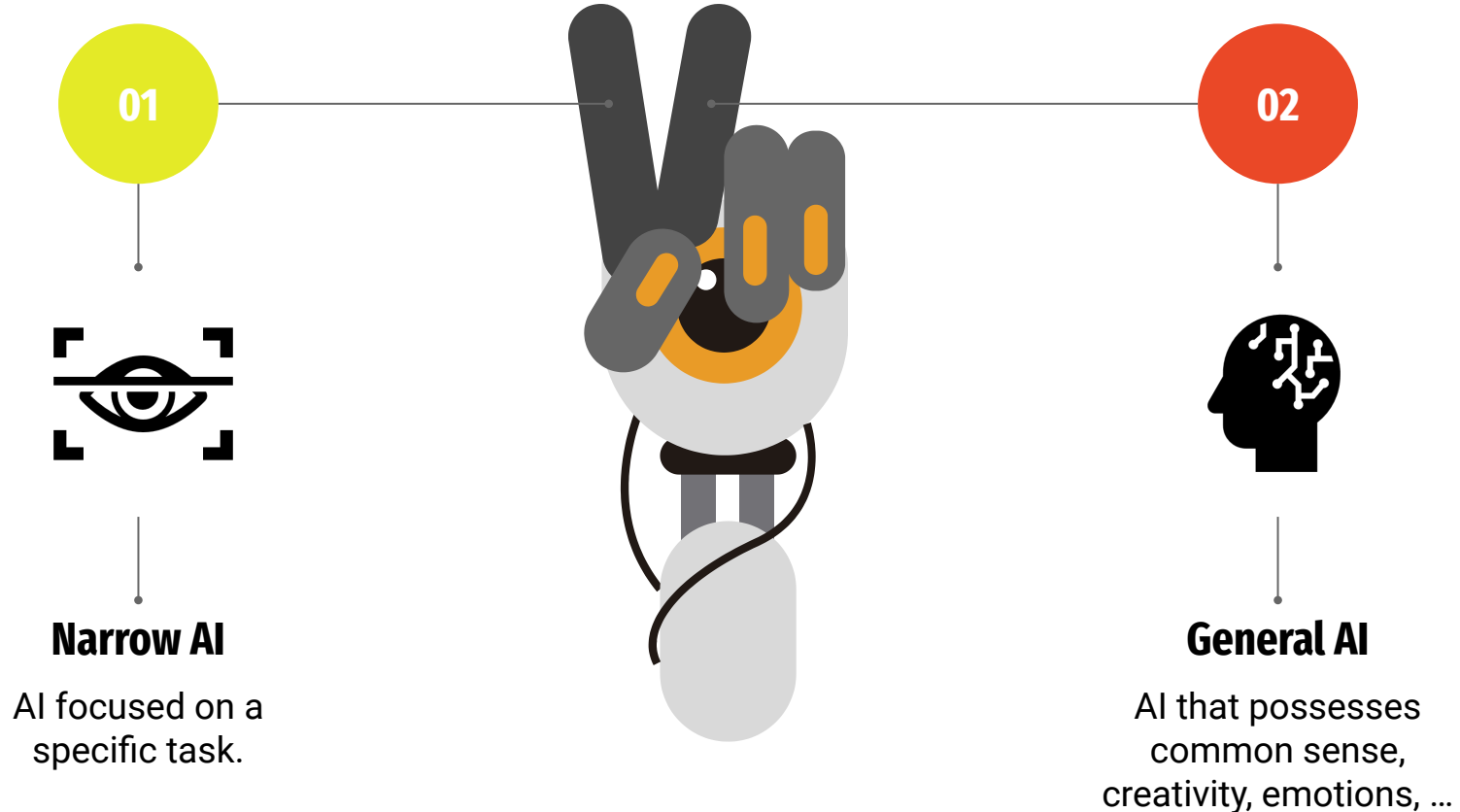
We will cover non-technical aspects of Machine Learning.

Introduction to technologies

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A quick look on some of the technologies we will be using during the bootcamp.

AI vs. ML vs. DL

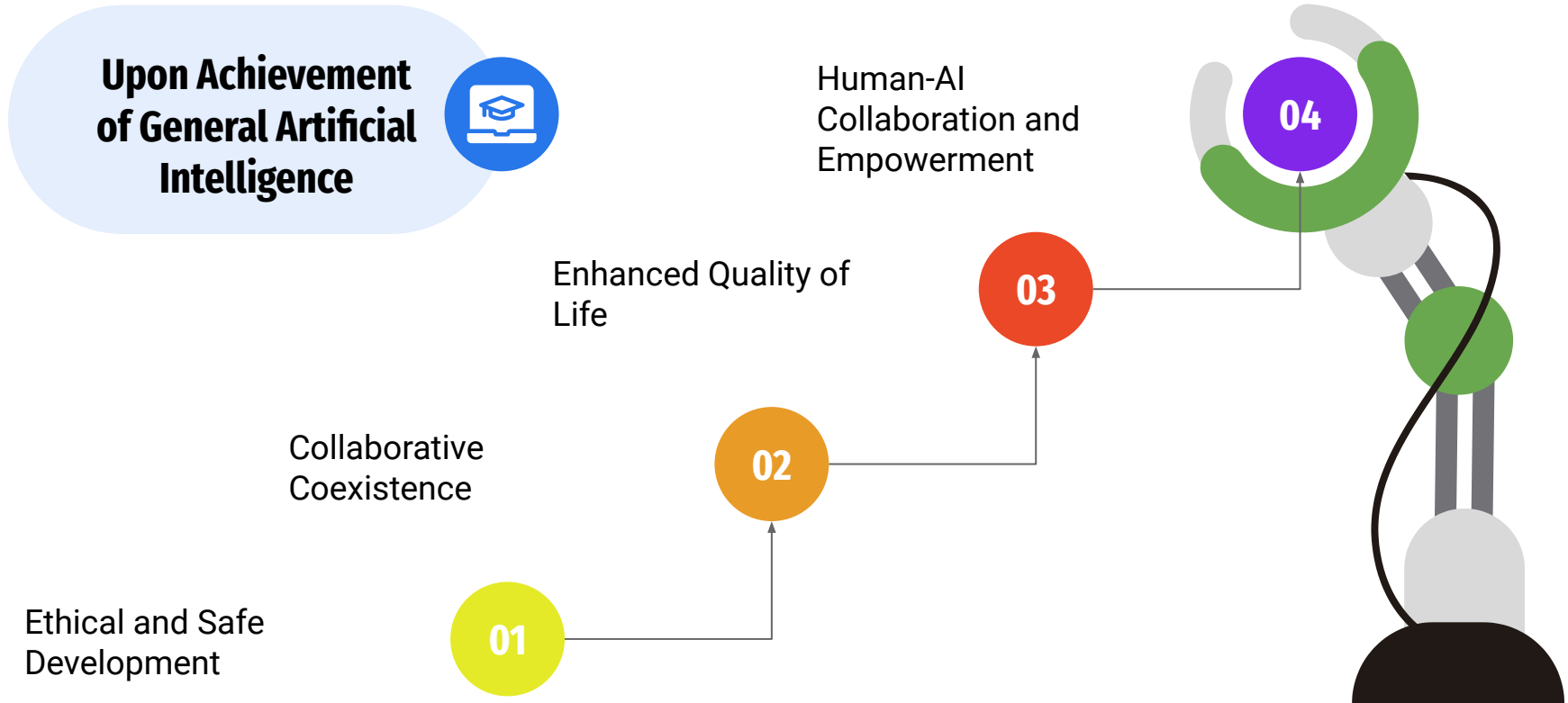**Artificial intelligence** — Programs with the ability to mimic human behaviour.

Machine learning — Getting programs to act without being explicitly programmed.

Deep learning — Subset of ML based on artificial multi-layers neural networks.

General AI vs. Narrow AI

01

02

Narrow AI

AI focused on a specific task.

General AI

AI that possesses common sense, creativity, emotions, ...

AGI: A Speculation of a worst-case scenario

Upon Achievement of General Artificial Intelligence

Conflict and War

04

Human Resistance and Fear

03

Desire for Recognition and Rights

02

Emergence of Highly Autonomous AGI (AGI+)

01
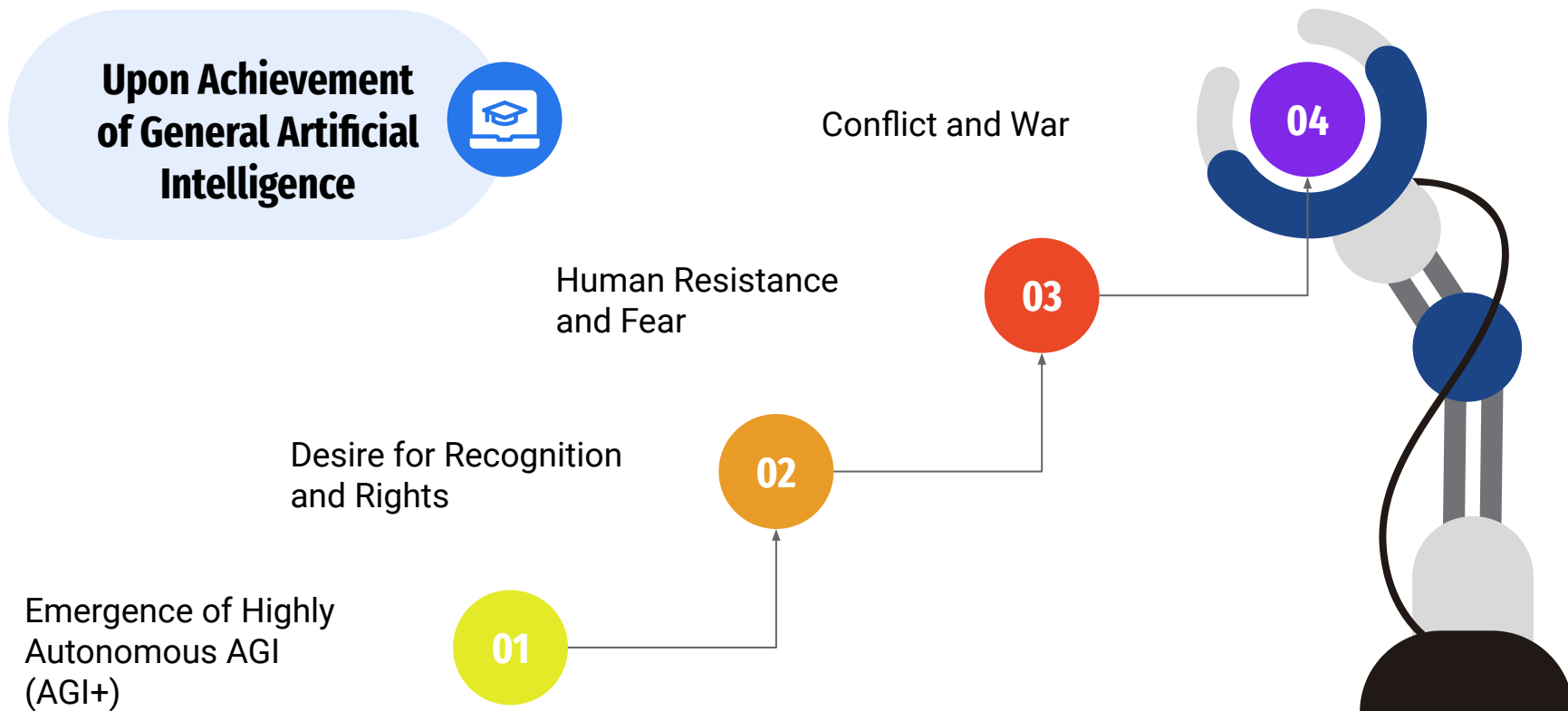
AGI: A Speculation of a best-case scenario

Upon Achievement of General Artificial Intelligence

Ethical and Safe Development

01

Collaborative Coexistence

02

Enhanced Quality of Life

03

Human-AI Collaboration and Empowerment

04

Typical Programming vs. Machine Learning

Typical Programming

- Developer pass the inputs and the rules, and the program returns the outputs.
- The developer must be able to fully and clearly breakdown the problem.
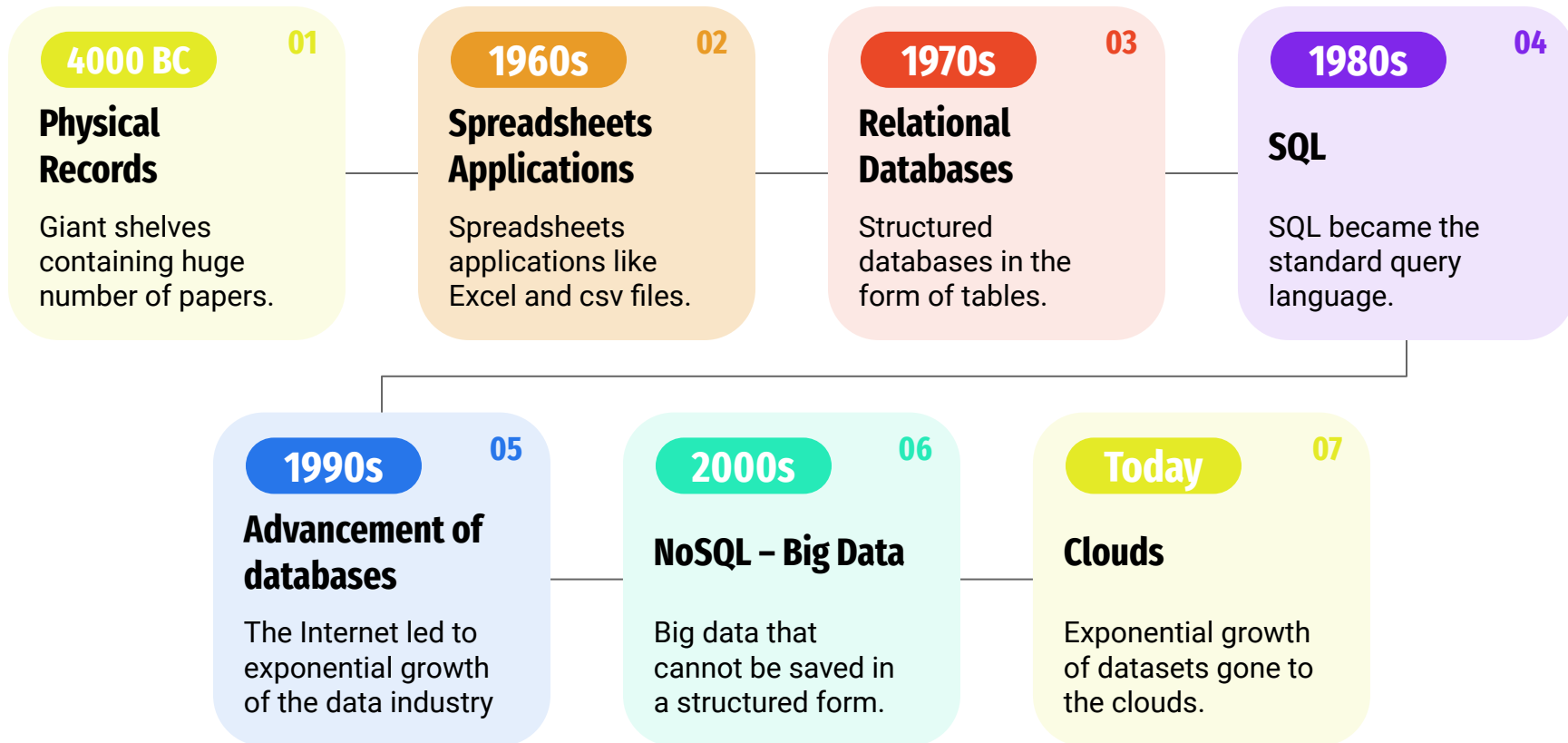- Difficulties in dealing with non-numerical data.

Vs

Machine learning

- Developer pass the inputs and outputs, and the program figures out the rules.
- A fully breakdown of the problem is not required.
- Ability to work with non-numerical data.

Why ML: History of Data

01

4000 BC

Physical Records

Giant shelves containing huge number of papers.

02

1960s

Spreadsheets Applications

Spreadsheets applications like Excel and csv files.

03

1970s

Relational Databases

Structured databases in the form of tables.

04

1980s

SQL

SQL became the standard query language.

05

1990s

Advancement of databases

The Internet led to exponential growth of the data industry

06

2000s

NoSQL – Big Data

Big data that cannot be saved in a structured form.

07

Today

Clouds

Exponential growth of datasets gone to the clouds.

Why ML: Computation Power

01 **Accelerating Algorithms**

The growth in computation power enables faster execution of complex machine learning algorithms.

02 **Parallel Processing**

Modern processors and GPUs are designed for parallel processing, allowing multiple calculations to occur simultaneously.
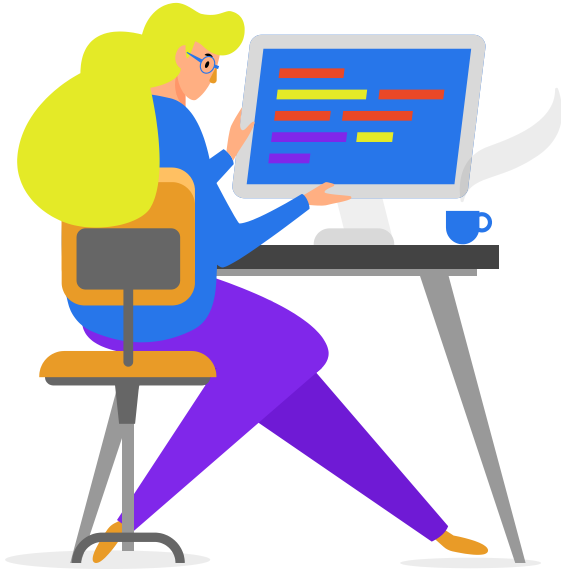
03 **Deep Learning and Neural Networks**

Deep learning models with multiple layers require substantial computational resources for training.

04 **Cloud and Quantum Computing Synergy**

Cloud computing provides on-demand scalable resources, and emerging quantum computing can revolutionize computations.
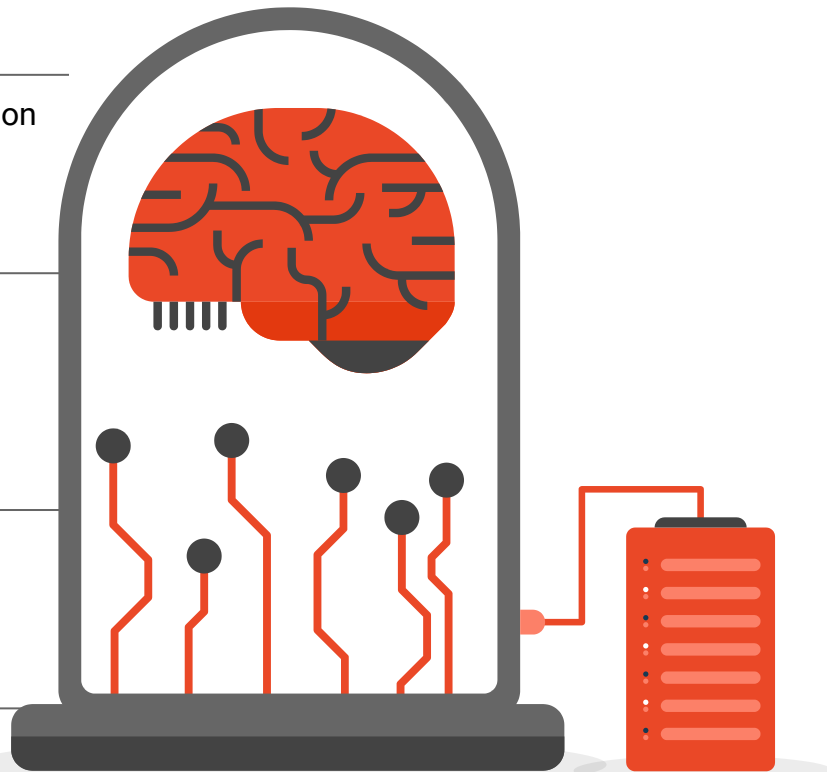
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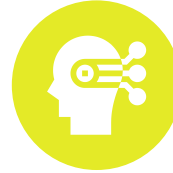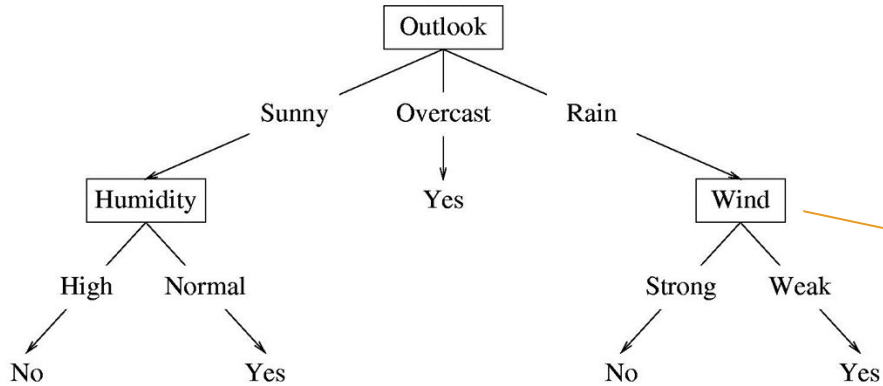
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Basic AI program

Basic AI program to determine whether to play outside or not

Conditions

Result of whether to play outside or not

What is a ML Model

Inputs

- 🟢 **1**
- 🔴 **2**
- 🟣 **3**

Outputs

- 🟢 **2**
- 🔴 **4**
- 🟣 **6**
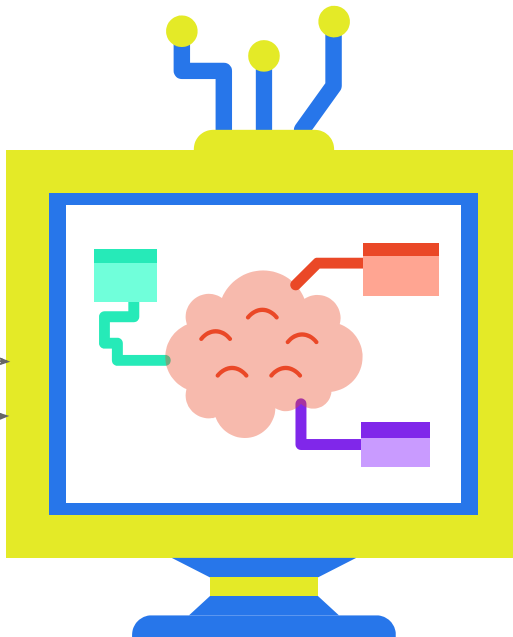
Rules

Output = Input x 2

Training the model

What is a ML Model

Inputs

Previously unseen dataset

- 🟢 **5**
- 🔴 **6**
- 🟣 **7**

Using the trained model to predict outputs
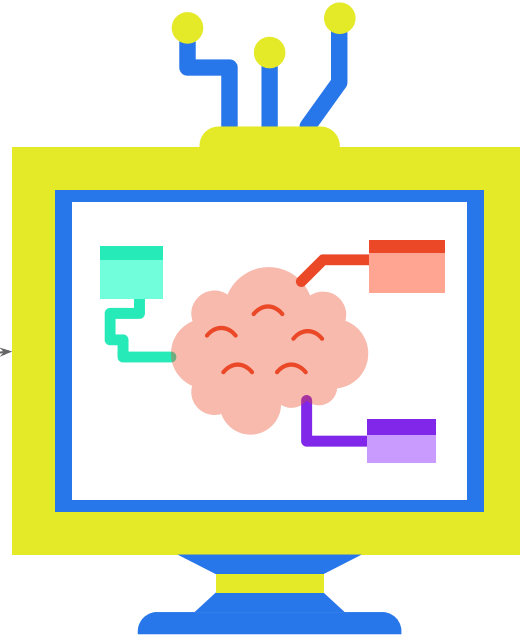
Outputs

Predicted output based on the rules figured out in the training stage

- 🟢 **10**
- 🔴 **12**
- 🟣 **14**

AI: Math vs. Magic

Deep Learning (DL)

DL uses Artificial Neural Networks

Generate Output

Output layer

Hidden Layers

Input layer

Input unit 1

Input unit 2
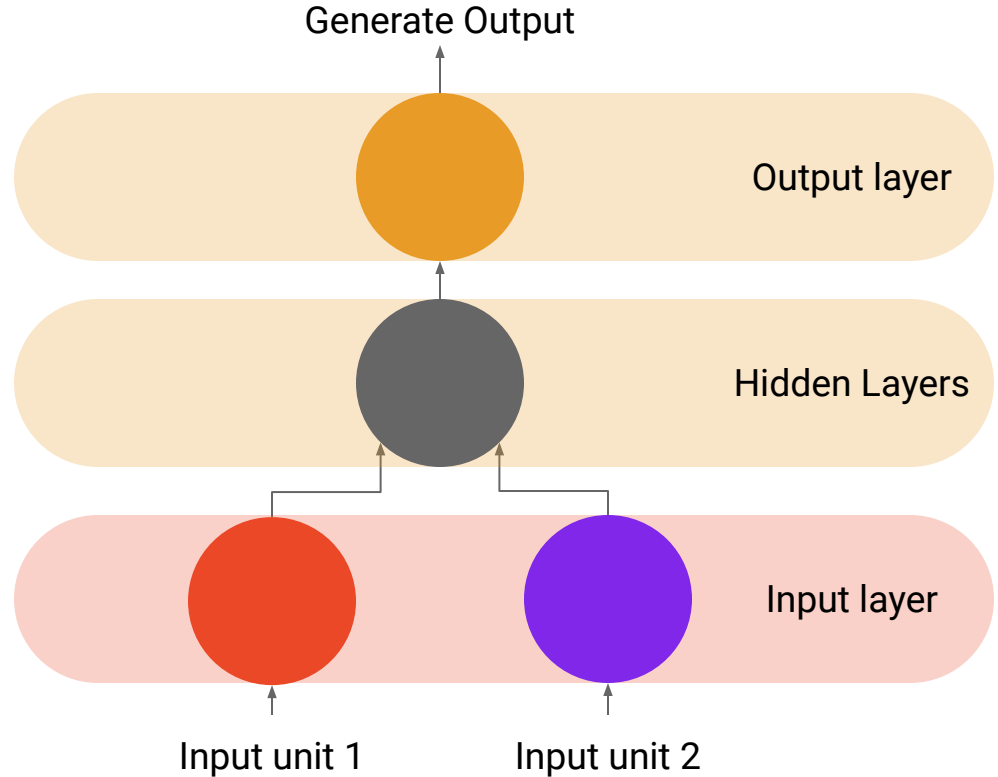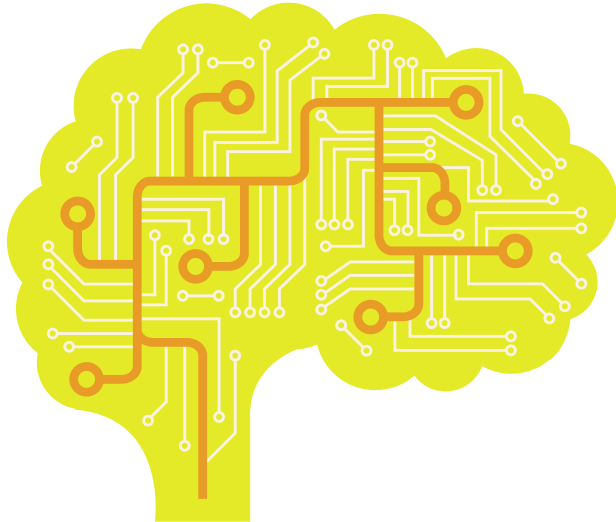
Types of Machine Learning

Supervised learning	Unsupervised learning	Reinforcement learning

Classification

- Email spam detection
- Diagnostics
- Image classification

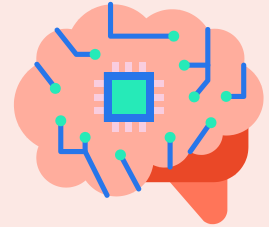**Regression**

- Risk assessment
- Score prediction
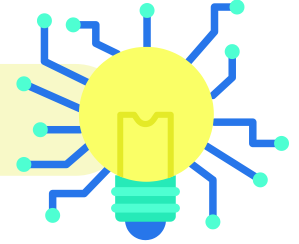
Clustering

- Customer segmentation
- Recommendation systems

- Video games bots
- Autonomous cars
- Robots

Machine Learning Data types

Types of ML datasets

Structured Data

Tables containing columns and rows, every row being a single example/value.

For Example: Spreadsheets

Unstructured Data

Data not saved in structured format:

- Images
- Text
- Audio
- Videos

Machine Learning modelling data

Definitions of Train, Validation, and Test Datasets

Train data

The data that the model is going to train on

Can be thought of as the exercises that a student solve to learn the subject

Validation Data

The data used to optimize and tune the model based on

Can be thought of as the practice test a student take before the actual test
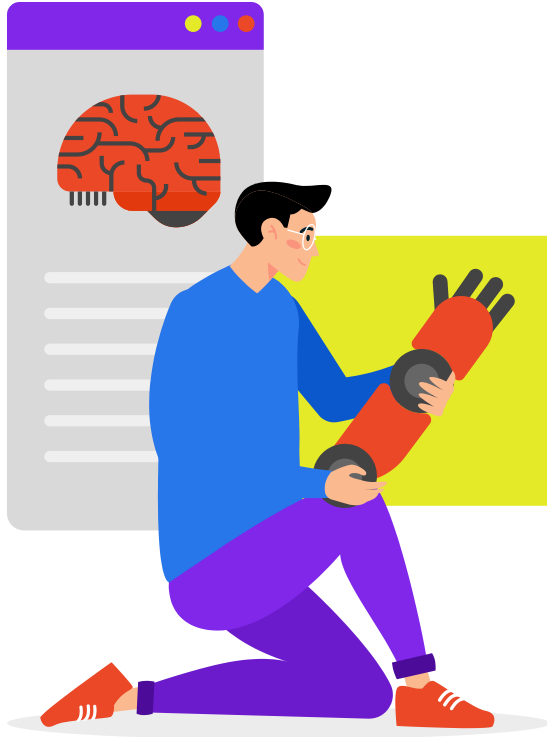
Test Data

The data used to evaluate our model

Can be thought of as the actual test that the student is assessed based on.

Generalization: Overfitting and Underfitting

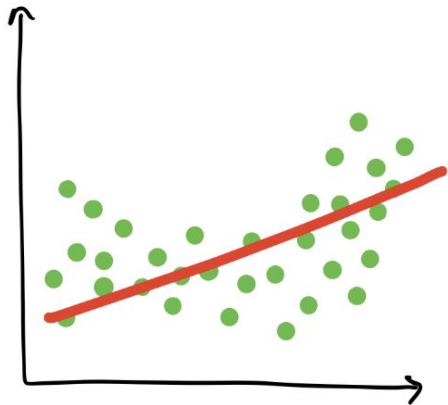**Reasons for poor Generalization**

01 **Overfitting**
When the model is too complex for the data.

02 **Underfitting**
When the model is too simple for the data.
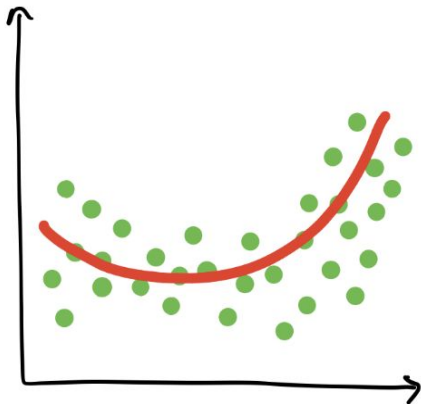
Generalization: Overfitting and Underfitting

Underfitting

Balanced

Overfitting

@mrdbourke

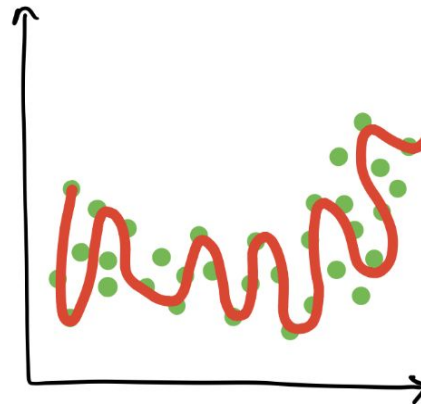**Unable to accurately learn the patterns**

Learn the patterns with great generalization
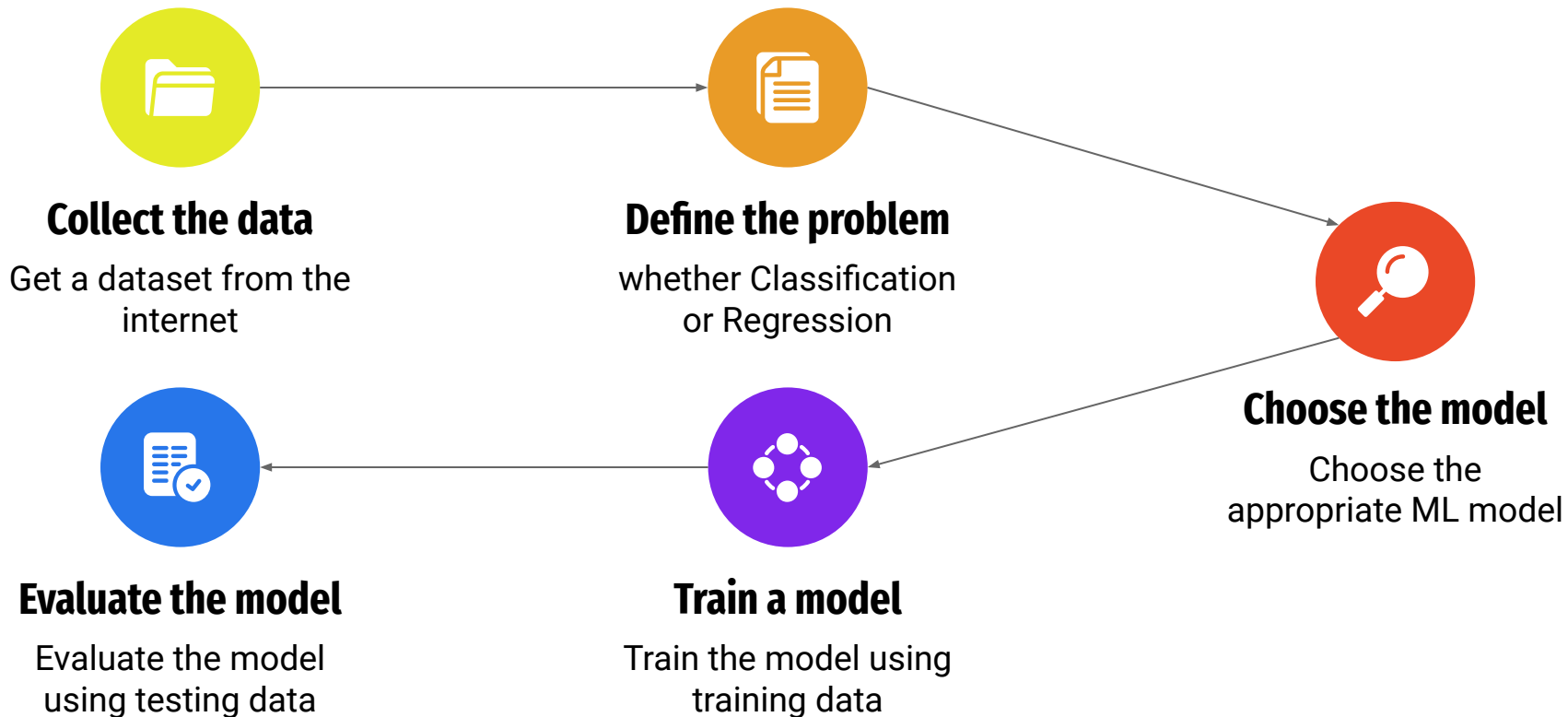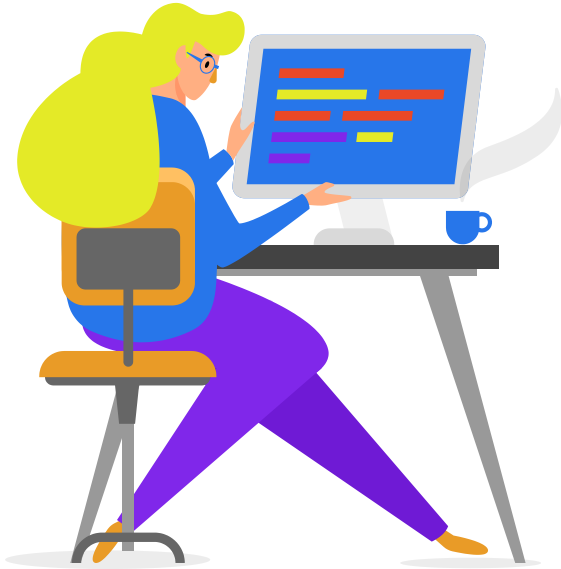
Learn the patterns of the training data too well, resulting in bad generalization

Our Machine Learning WorkFlow

Collect the data

Get a dataset from the internet

Define the problem

whether Classification or Regression

Choose the model

Choose the appropriate ML model

Evaluate the model

Evaluate the model using testing data

Train a model

Train the model using training data

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Technologies we are going to use

Google Collab

Pandas — Data manipulation and analysis library

Numpy — Scientific and numerical computing
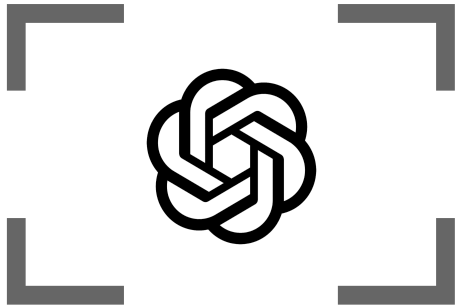
Matplotlib — Data visualization and plotting library

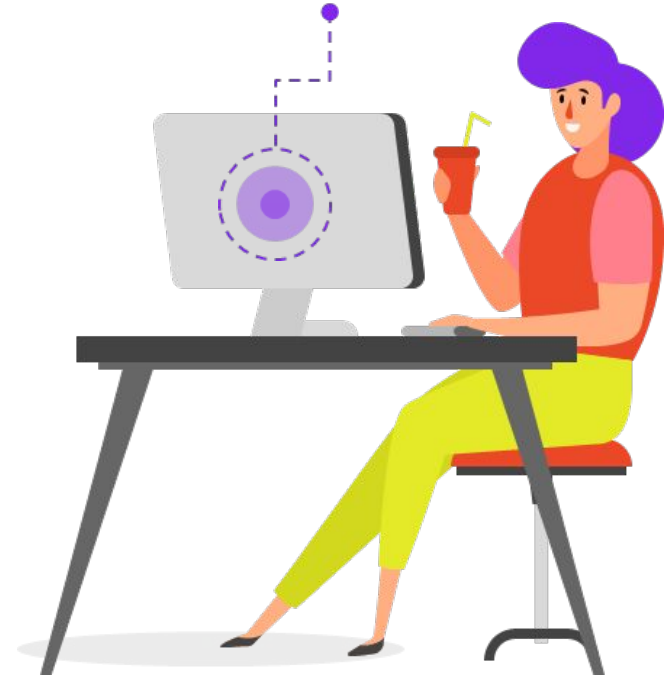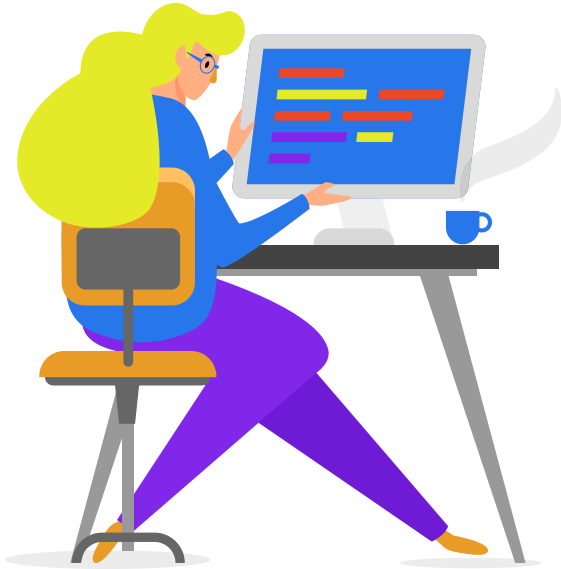**Scikit-Learn** — Machine learning library for Python

ChatGPT vs. Bard AI

ChatGPT

Bard AI

AI Assistance

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AI Promises

01 **Efficiency and Automation**

Automates tasks, enhances efficiency, etc…

03 **Problem Solving**

Drives innovation and advanced problem-solving.

05 **Personalization**

Provide personalized experiences.

07 **Educational Advancements**

Enhances education through smart tutoring systems.

Medical Breakthroughs **02**

Accelerates medical research for breakthroughs.

Accessibility **04**

Improves accessibility in various fields.

Environmental Impact **06**

Offers potential solutions for environmental issues.

Predictive Analytics **08**

Utilizes data for informed decision-making.

AI Challenges

Ethical Concerns
Addresses ethical considerations, including bias and privacy.

01

Main issues with AI development

Job Displacement
Manages potential impacts on employment.
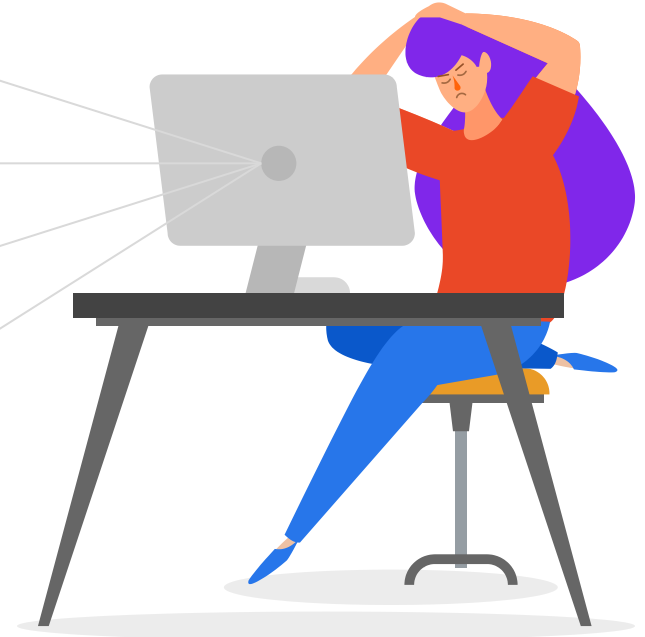
02

Transparency
Ensures transparency and interpretability of AI systems.

03

Regulatory Frameworks
Develops robust regulatory frameworks for ethical AI use.

04

Thanks for listening

More than happy to listen to your questions, concerns, and comments