

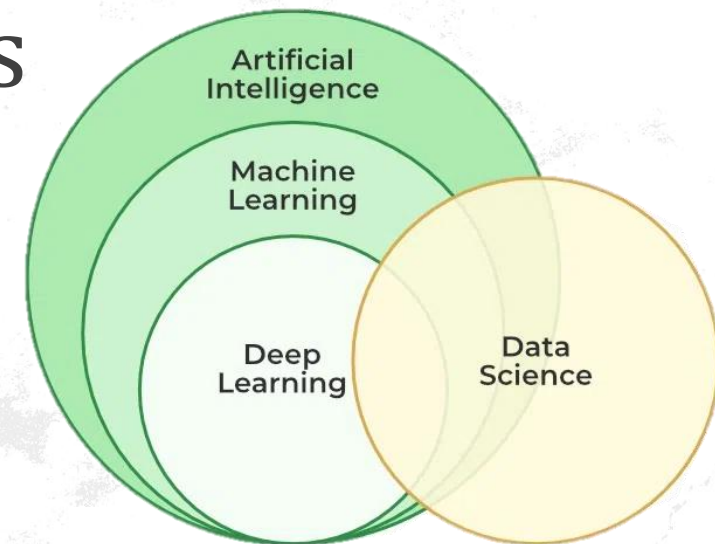
# Artificial Intelligence & Machine Learning



NIELIT Chandigarh/Ropar

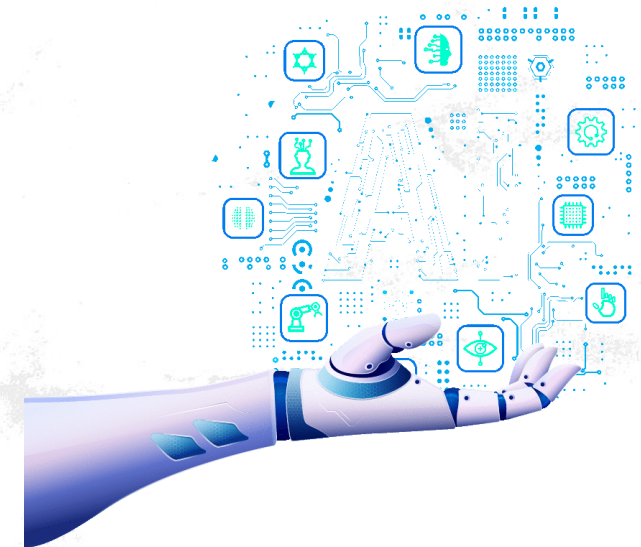
# Highlights

- What is Artificial Intelligence, Machine Learning and Deep Learning?
- Relationship between AI, ML and DL
- Major classes of learning algorithms
- Category of algorithms
- Diving into Machine Learning
- SciKit Learn Library



# What is artificial intelligence?

- Artificial intelligence can be loosely interpreted to mean incorporating human intelligence to machines.
- Artificial intelligence is the broader concept that consists of everything from Good Old-Fashioned AI all the way to futuristic technologies such as deep learning.
- Whenever a machine completes tasks based on a set of stipulated rules that solve problems (algorithms), then such an “intelligent” behavior is called artificial intelligence.



# What is artificial intelligence?

- Artificial intelligence (AI) makes it possible for machines to learn from experience, adjust to new inputs and perform human-like tasks.
- Most AI examples that you hear about today – from chess-playing computers to self-driving cars – rely heavily on deep learning and natural language processing.
- Using these technologies, computers can be trained to accomplish specific tasks by processing large amounts of data and recognizing patterns in the data.
- Machine learning is also a core part of AI. Learning without any kind of supervision requires an ability to identify patterns in streams of inputs, whereas learning with adequate supervision involves classification and numerical regressions.
- Mathematical analysis of machine learning algorithms and their performance is a well-defined branch of theoretical computer science often referred to as computational learning theory.



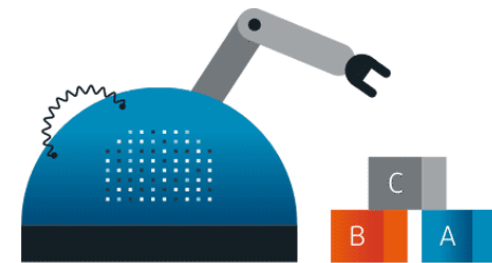
# Sub Fields of Artificial Intelligence

AI now consists of many sub-fields, using a variety of techniques, such as:

- Neural Networks – e.g. brain modelling, time series prediction, classification
- Evolutionary Computation – e.g. genetic algorithms, genetic programming
- Vision – e.g. object recognition, image understanding
- Robotics – e.g. intelligent control, autonomous exploration
- Expert Systems – e.g. decision support systems, teaching systems
- Speech Processing– e.g. speech recognition and production
- Natural Language Processing – e.g. machine translation
- Planning – e.g. scheduling, game playing
- Machine Learning – e.g. decision tree learning, version space learning

# What is Machine Learning?

- As the name suggests, machine learning can be loosely interpreted to mean empowering computer systems with the ability to “learn”.
- The intention of ML is to enable machines to learn by themselves using the provided data and make accurate predictions.
- ML is a subset of **artificial intelligence**; in fact, it's simply a technique for realizing AI.
- It is a method of training algorithms such that they can **learn** how to make decisions.



# What is Machine Learning?

- For example, here is a table that identifies the type of fruit based on its characteristics:

Weight (grams)	Texture	Type of Fruit
155	Rough	Orange
180	Rough	Orange
135	Smooth	Apple
110	Smooth	Apple
120	Smooth	?

Problem –

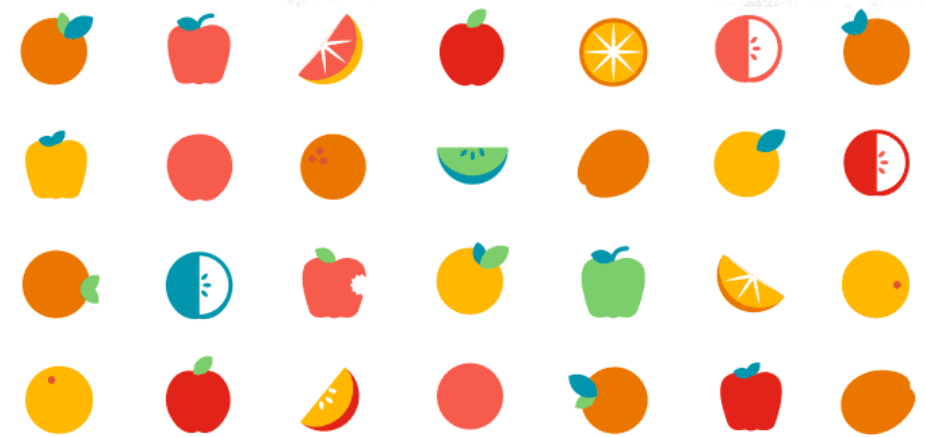
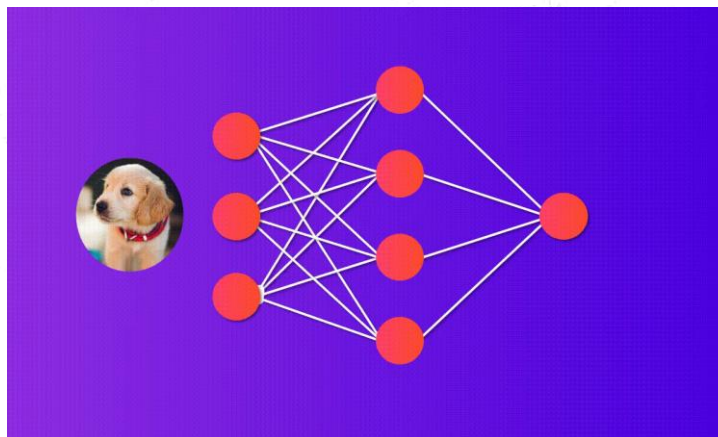
Distinguish Apple from Orange



- The last row gives only the weight and texture, without the type of fruit.
- A machine learning algorithm can be developed to try to identify whether the fruit is an orange or an apple.
- After the algorithm is fed with the training data, it will learn the differing characteristics between an orange and an apple.
- Therefore, if provided with data of weight and texture, it can predict accurately the type of fruit with those characteristics.

# What is deep learning?

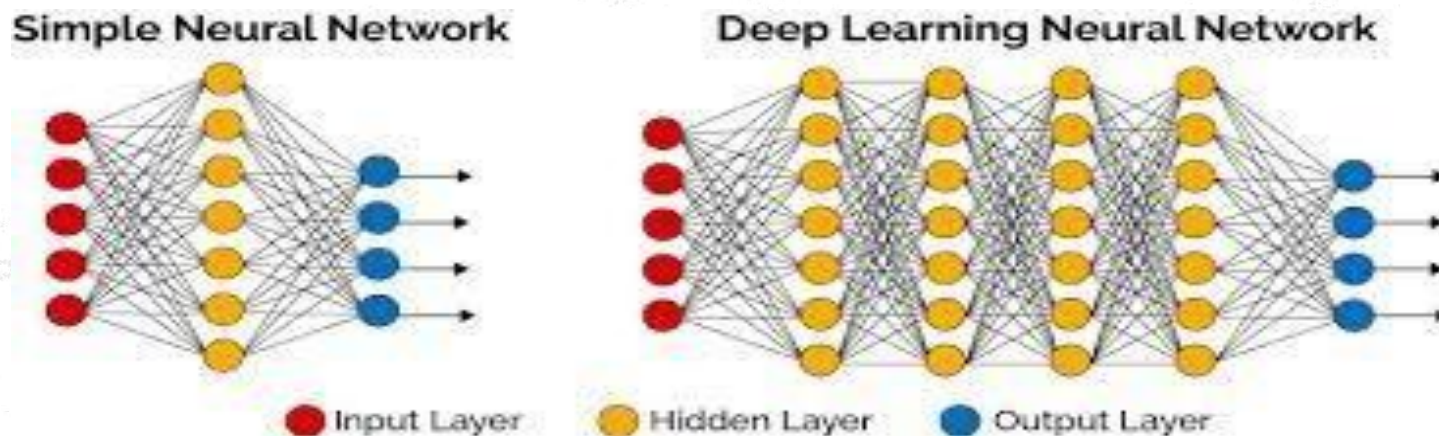
- Deep learning is a subset of ML.
- In fact, it's simply a technique for realizing machine learning. In other words, DL is the next evolution of machine learning.
- DL algorithms are roughly inspired by the information processing patterns found in the human brain. Just like we use our brains to identify patterns and classify various types of information, deep learning algorithms can be taught to accomplish the same tasks for machines.



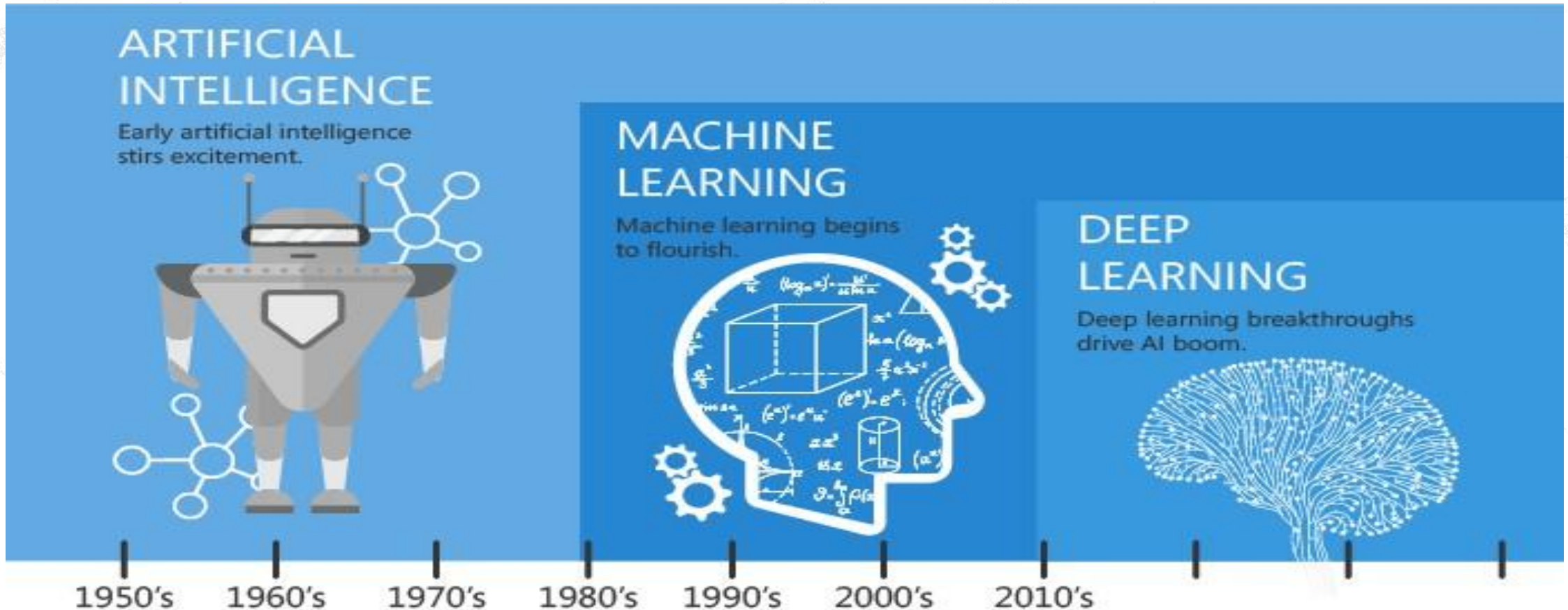


# What is deep learning?

- For example, while DL can automatically discover the features to be used for classification, ML requires these features to be provided manually.
- Furthermore, in contrast to ML, DL needs high-end machines and considerably big amounts of training data to deliver accurate results.
- For example, artificial neural networks (ANNs) are a type of algorithms that aim to imitate the way our brains make decisions.

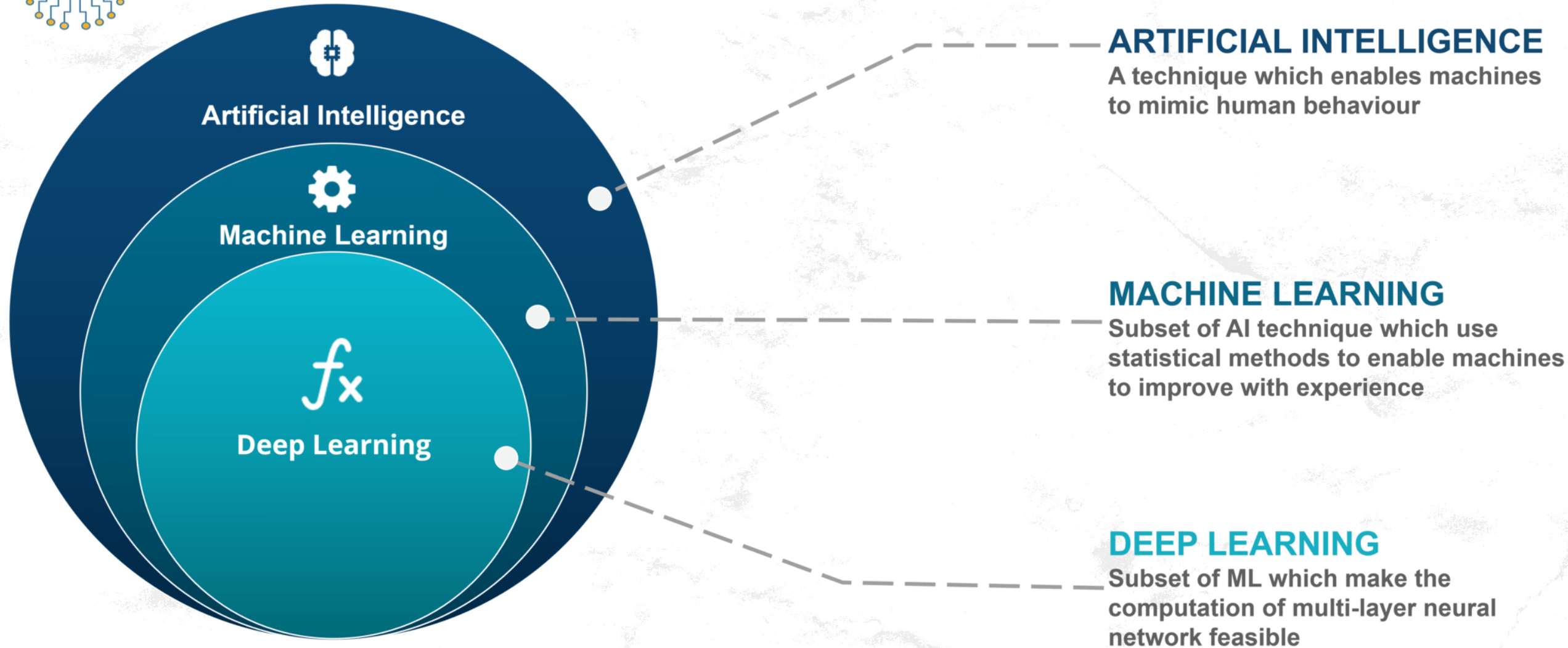


# Evolution of AI, ML and DL



Since an early flush of optimism in the 1950's, smaller subsets of artificial intelligence - first machine learning, then deep learning, a subset of machine learning - have created ever larger disruptions.

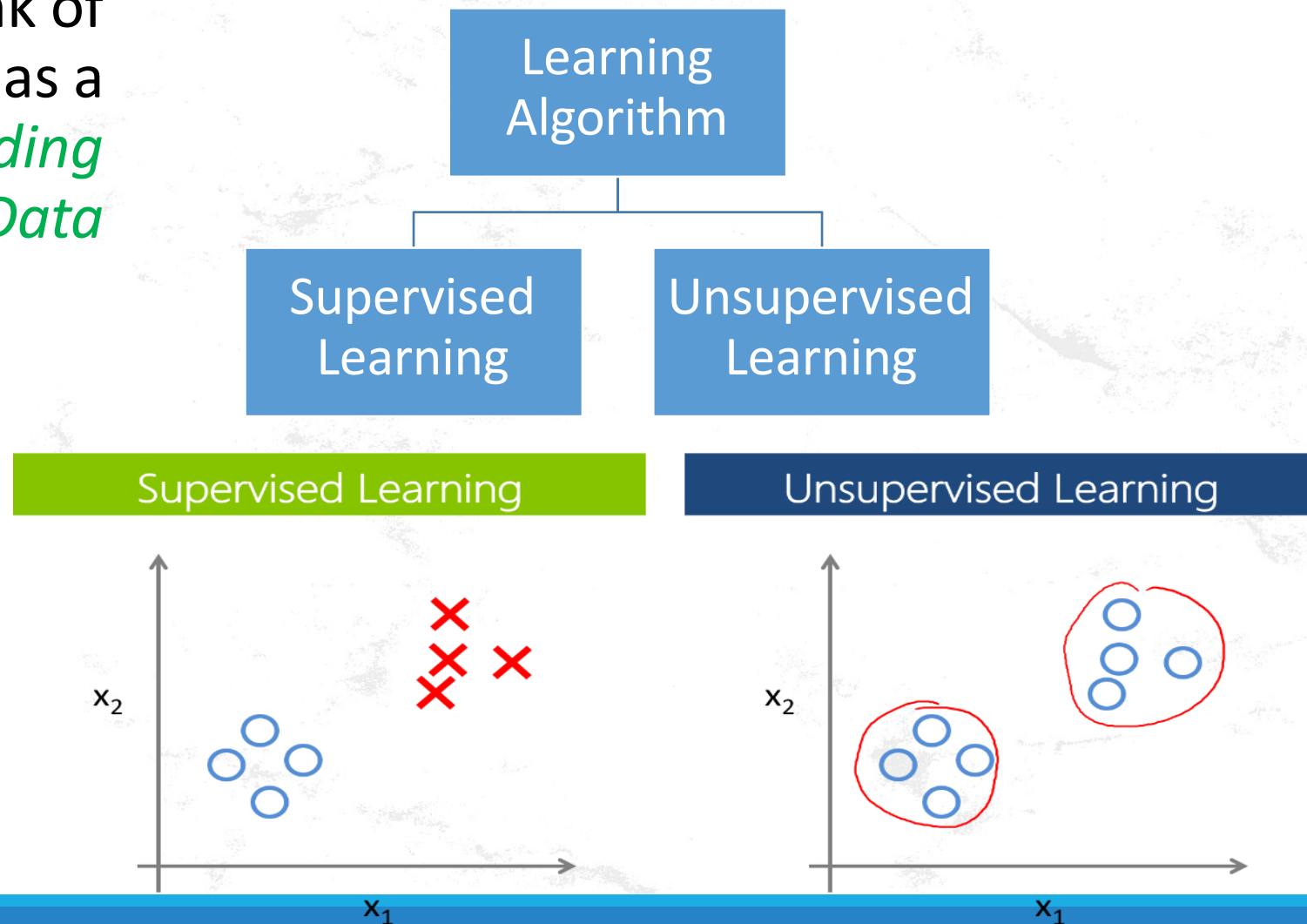
# Relationship between AI,ML and DL





# Major Classes of Learning Algorithms

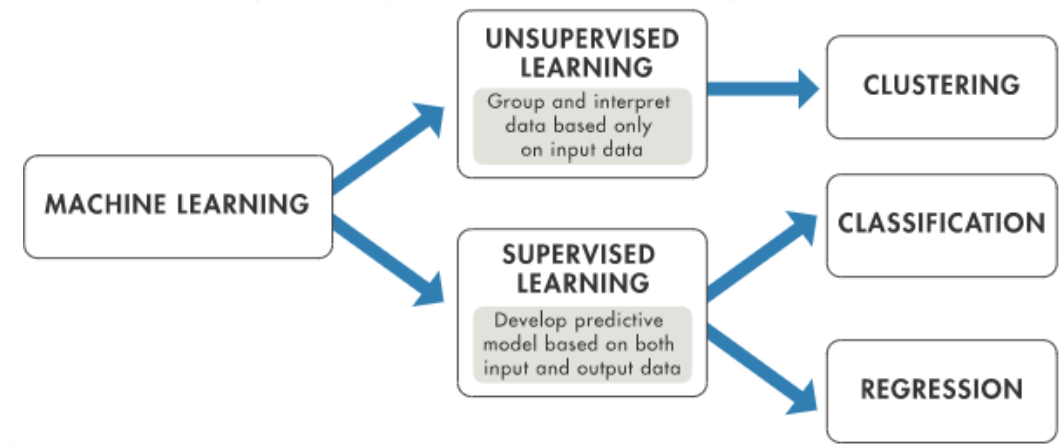
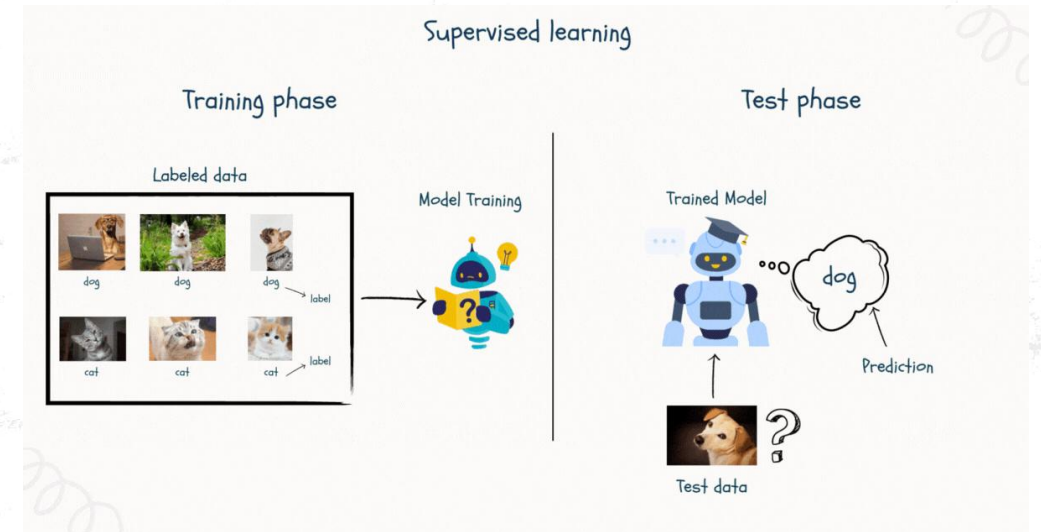
Better to think of machine learning as a *means of building models of Data*



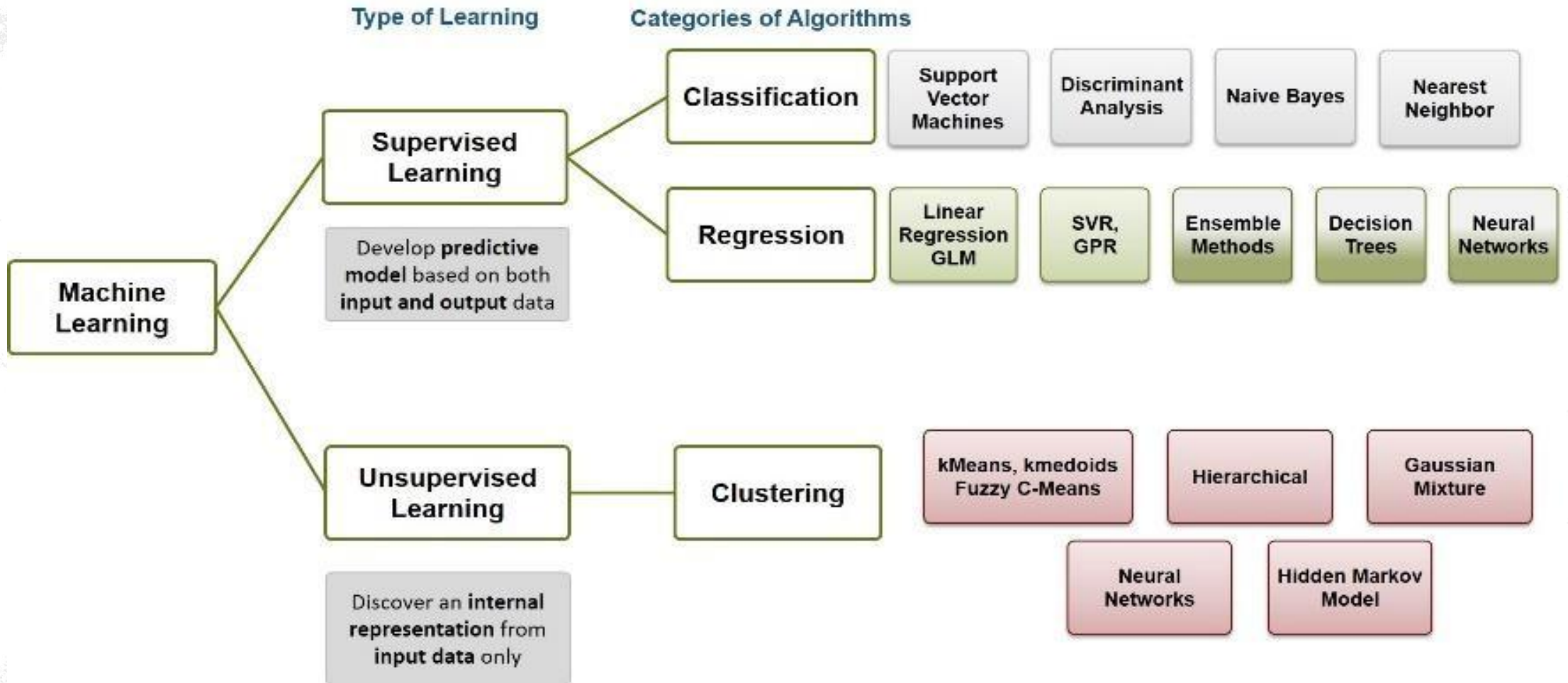


# Supervised learning

- The computer is presented with example inputs and their desired outputs, given by a "teacher", and the goal is to learn a general rule that maps inputs to outputs.
- The training process continues until the model achieves a desired level of accuracy on the training data. once this model is determined, it can be used to apply labels to new, unknown data.



# Category of Algorithms



# Diving into Machine Learning

**Python** : which is in the first place in the list of all AI development languages due to the simplicity.

There are plenty of libraries in python, which make our tasks easier.

The major deep learning frameworks like Tensorflow, Theano, Keras, neon, Caffe have Python interfaces.

## PYTHON FOR MACHINE LEARNING ROADMAP (2025)





# Diving into Machine Learning

**R:** which is one of the most effective language and environment for analyzing and manipulating the data for statistical purposes.

Using R, we can easily produce well-designed publication-quality plot, including mathematical symbols and formulae where needed.

Apart from being a general purpose language, R has numerous packages which are used in the field of machine learning.

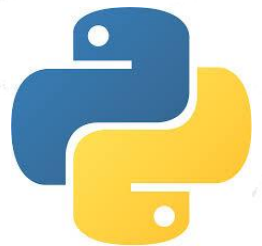
These packages make the implementation of machine learning algorithms easy, for cracking the business associated problems.





# Diving into Machine Learning

- **Java:** Java can also be considered as a good choice for AI development. Artificial intelligence has a lot to do with search algorithms, artificial neural networks and genetic programming.
- **JSAT** which stands for Java Statistical Analysis Tool, is a machine learning library developed in Java for solving machine learning problems.
- **Scala** is a rival of Java and Python in the world of Data Science and becoming more and more popular due to extensive use of Apache Spark in Big data Hadoop.



In a nutshell, **Python** is **better** for data manipulation and repeated tasks, while **R** is good for ad hoc analysis and exploring datasets. **R** has a steep learning curve, and people without programming experience may find it overwhelming.

# Python for Data Science and ML

In a nutshell, **Python** is **better** for data manipulation and repeated tasks, while **R** is good for ad hoc analysis and exploring datasets. **R** has a steep learning curve, and people without programming experience may find it overwhelming.

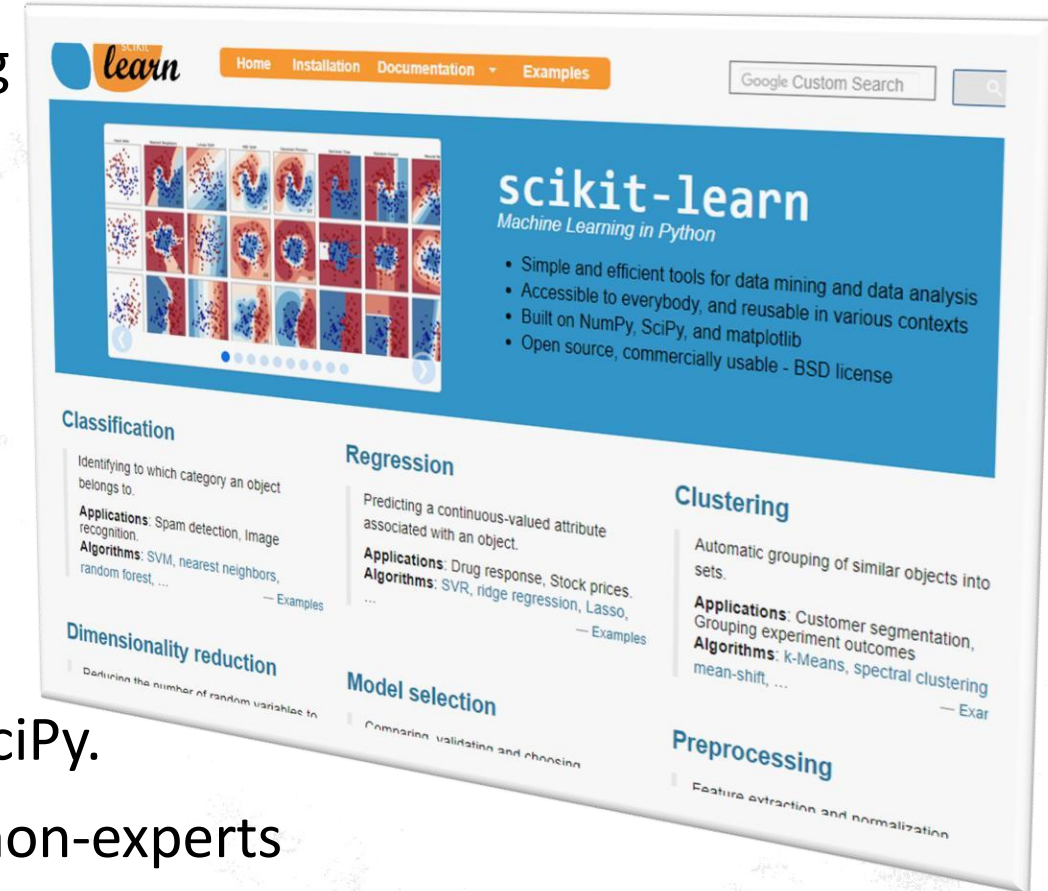
- **Python** is generally considered easier to pick up.

## Python EcoSystem



# Machine Learning in Python : Scikit Learn

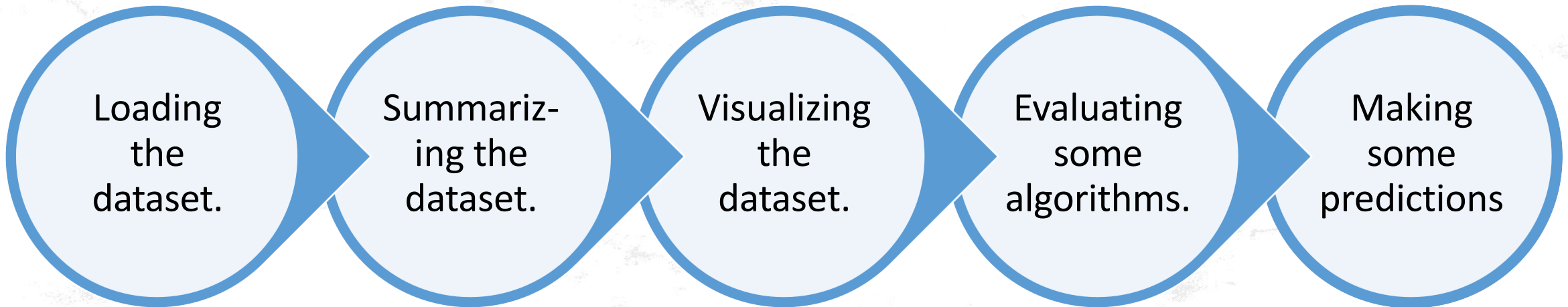
- Scikit-learn (sk-learn) is a free machine learning library for the **Python** programming language.
- It features various classification, regression and clustering algorithms including support vector machines, random forests, k-means, Naïve Bayes.
- It is designed to interoperate with the Python numerical and scientific libraries NumPy and SciPy.
- It is Simple and efficient, for both experts and non-experts
- It contains classical and well-established machine learning algorithms





# Layman's view of Machine Learning

- Loading the dataset.
- Summarizing the dataset.
- Visualizing the dataset.
- Evaluating some algorithms.
- Making some predictions.

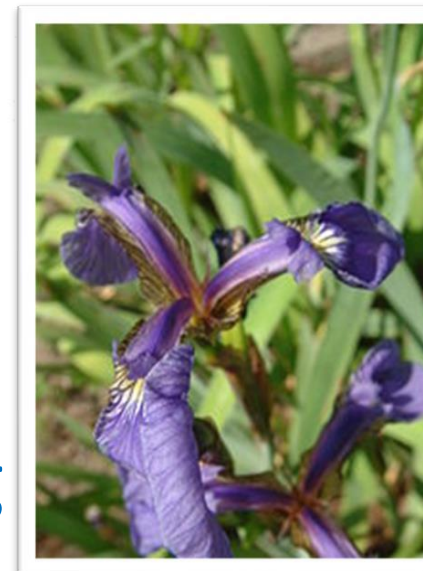




# Supervised Learning : Classification

First Machine Learning Project using Iris dataset

Hello world program of machine learning  
“classification of iris flowers”



*Iris setosa*



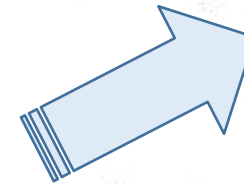
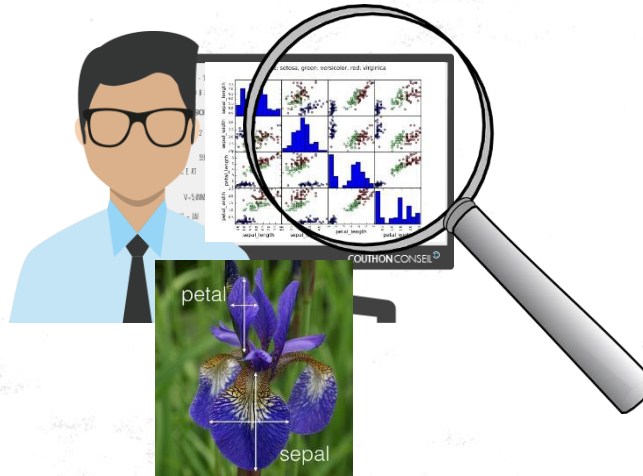
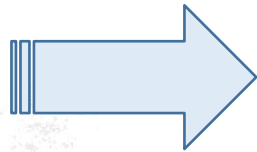
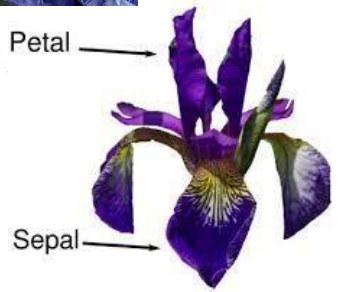
*Iris virginica*



*Iris versicolor*

# Question

- After looking at new flower in the field, could we make a good prediction about its species from its measurements?



*Iris virginica*



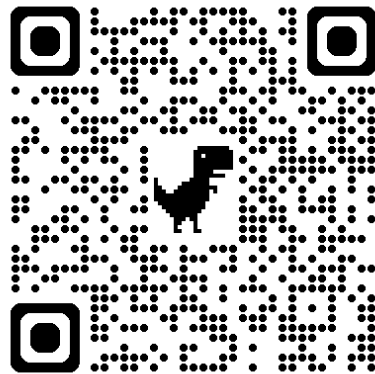
*Iris setosa*



*Iris versicolor*

# Iris Flower Classification Project using ML

- IRIS FLOWER PREDICTION
- Iris Classifier using Scikit-Learn
- **Source Code:**  
<https://glitch.com/edit/#!/sklearn>
- **Live View:** <https://sklearn.glitch.me/>



Sepal Width

Sepal Height

Petal Width

Petal Height

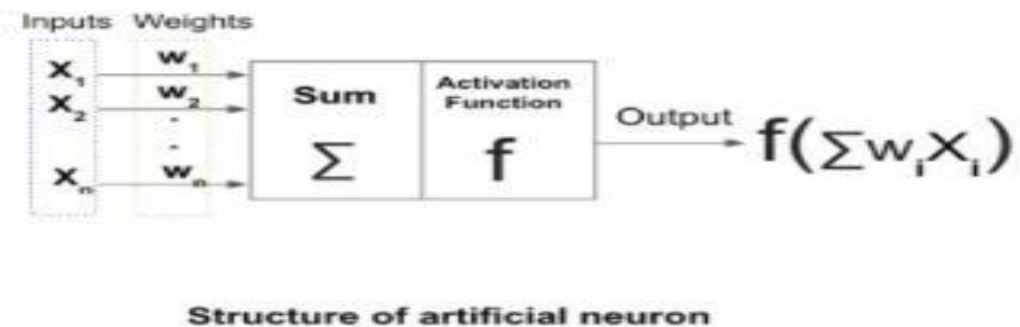
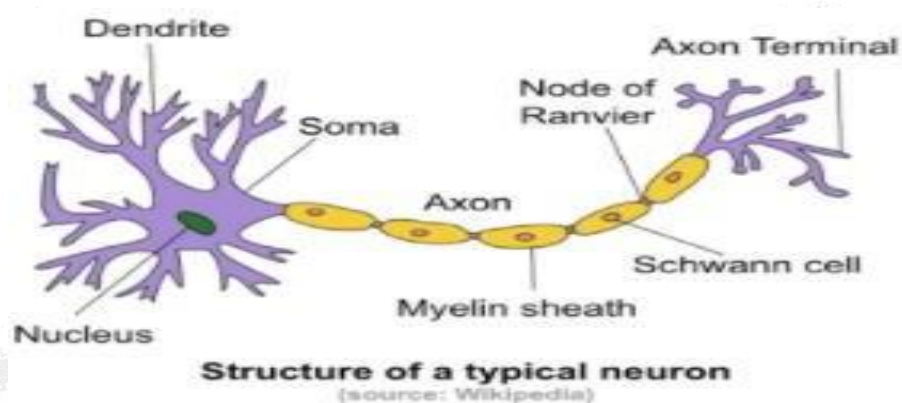
The Flower Name is: setosa





# Artificial Neural Networks

- An Artificial **Neuron** Network (**ANN**), popularly known as Neural Network comprises of Set of Techniques which were inspired by human nervous system.
- It is s a computational model based on the structure and functions of biological neural networks.
- It is like an artificial human nervous system for receiving, processing, and transmitting information in terms of Computer Science.





# Examples of Supervised Learning

## Visual Recognition

- An AI that is learning to identify pedestrians on a street is trained with 2 million short videos of street scenes from self-driving cars.
- Some of the videos contain no pedestrians at all while others have up to 25.
- A variety of learning algorithms are trained on the data with each having access to the correct answers
- Each algorithm develops a variety of models to identify pedestrians in fast moving scenes. The algorithms are then tested against another set of data to evaluate accuracy and precision.



# Examples of Supervised Learning

## Decision Support

- An AI is learning to estimate investing risk.
- It is fed a large number of trades that real investors made and asked to estimate a risk/reward ratio for each trade based on company fundamentals, price and other factors such as volume.
- The estimated risk/reward ratio is then compared to the historical results of the trade at a variety of time intervals such as a day or a year.

# Examples of Unsupervised Learning

## Human Behavior

- A learner that possesses visual highly developed visual and speech recognition capabilities could watch a large number of television shows to learn about human behavior.
- For example, a learner might be able to build a model that detects when people are smiling based on correlation of facial patterns and words such as "what are you smiling about?"
- Personalised Recommendation Systems?



# Example of Deep Learning

Speech Recognition

Self Driving Car

Robotics

Face Detection

Signature Detection

Customer Discovery

Character Recognition (Multiple cat.)



# Natural Language Processing

- It's a form of artificial intelligence that focuses on analyzing the human **language** to draw insights, create advertisements, help you text (yes, really) and more.
- A field of computer science related to understanding and generating human language.
  - Auto Summarization of Text
  - Spelling Correction
  - Text Classification
  - Sentiment Analysis
  - Topic Analysis

# Diabetes Analysis and Prediction using Machine Learning

Diabetes Prediction

File Graphs

## Diabetes Analysis and Prediction

Thu Jul 19 15:47:01 2018

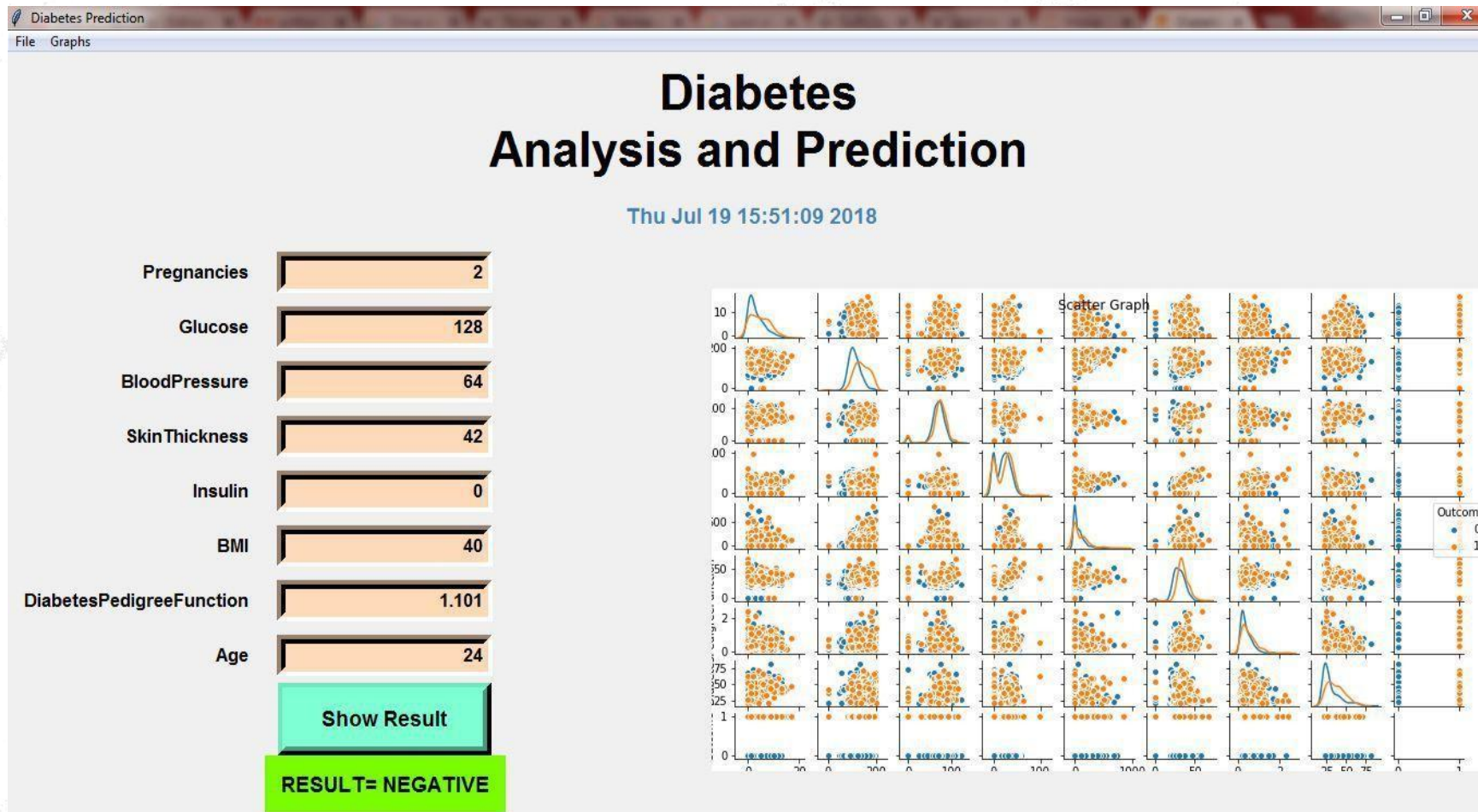
Pregnancies	<input type="text" value="0"/>
Glucose	<input type="text" value="141"/>
BloodPressure	<input type="text" value="0"/>
SkinThickness	<input type="text" value="0"/>
Insulin	<input type="text" value="0"/>
BMI	<input type="text" value="42.9"/>
DiabetesPedigreeFunction	<input type="text" value="0.205"/>
Age	<input type="text" value="29"/>

Show Result

RESULT= POSITIVE



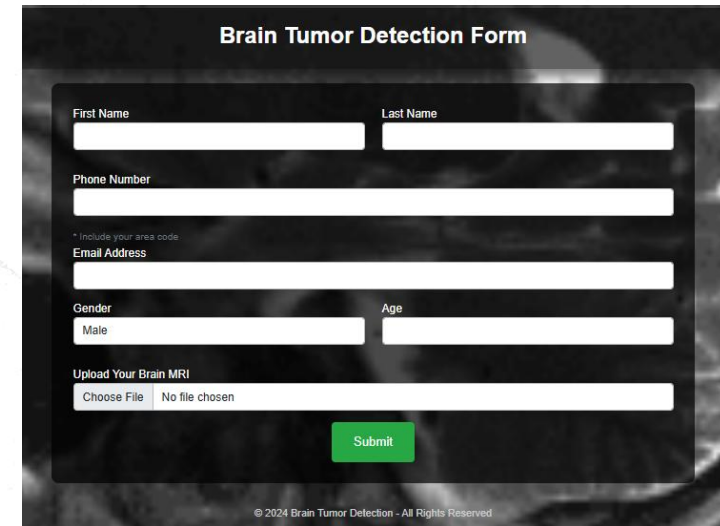
# Data Science : Diabetes Analysis Patients with Diabetes Prediction Negative



# Brain Tumor Detection Using Deep Learning

This **Flask web application** utilizes **Deep Learning (CNN)** to detect brain tumors from MRI images. Users can upload an MRI scan, and the system will analyze the image using a **pre-trained Convolutional Neural Network (CNN) model** to determine the presence of a brain tumor. The results are stored securely in **MongoDB Atlas**, allowing for patient record management and statistical analysis.

- **Dataset:**  
<https://www.kaggle.com/datasets/princelv84/brain-tumor-dataset-yesno-class>
- **Training Code:**  
<https://colab.research.google.com/drive/1c7S07QIDgW4K73jo5AcxlaBMfcbvU2GL?usp=sharing>
- **Source Code:**  
<https://huggingface.co/spaces/LovnishVerma/braintumor/tree/main>
- **Live View (FLASK):**  
<https://huggingface.co/spaces/LovnishVerma/braintumor>
- **Live View (GRADIO):**  
<https://huggingface.co/spaces/nielitropar/braintumor>



**Brain Tumor Detection Form**

First Name  Last Name

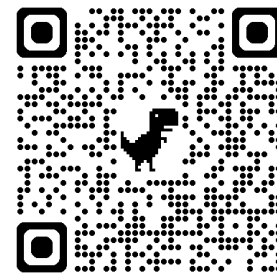
Phone Number

\* Include your area code  
Email Address

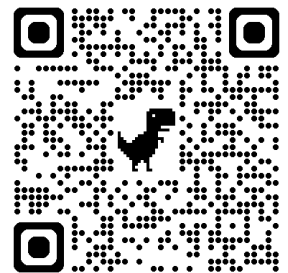
Gender  Age

Upload Your Brain MRI  
Choose File  No file chosen

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**FLASK**



**GRADIO**