

## AI fundamentals Cheat Sheet

**What is AI?** Artificial intelligence (AI) is a field of computer science that focuses on creating machines that can perform tasks that typically require human intelligence, such as visual perception, speech recognition, decision-making, and language translation.

### Timeline

- 1935** Alan Turing, a British logician and computer pioneer, did the earliest substantial work in the field of artificial intelligence
- 1940** Edward Condon displayed Nimatron, a digital computer that played Nim perfectly. Konrad Zuse built the first working program-controlled computers.
- 1943** Warren Sturgis McCulloch and Walter Pitts published "A Logical Calculus of the Ideas Immanent in Nervous Activity," laying foundations for artificial neural networks.
- 1950** Alan Turing proposed the Turing test as a measure of machine intelligence. Claude Shannon published a detailed analysis of chess playing as search. Isaac Asimov published his Three Laws of Robotics
- 1955** John McCarthy, known as the father of AI, developed the programming language LISP and coined the term "artificial intelligence".
- 1956** The Dartmouth College summer AI conference was organized by John McCarthy, Marvin Minsky, Nathan Rochester of IBM, and Claude Shannon. McCarthy coined the term "artificial intelligence," and the conference is considered the formal founding of the field of AI.
- 1957-1974** AI flourished, and computers became faster, cheaper, and more accessible. Machine learning algorithms improved, and people got better at knowing which algorithm to apply to their problem. Early demonstrations such as Newell and Simon's General Problem Solver and John McCarthy's Advice Taker showed the promise of AI.
- 1980s** AI was reignited by two sources: an expansion of the algorithmic toolkit and a boost of funds. John Hopfield and David Rumelhart popularized "deep learning" techniques, which allowed computers to learn using experience. Edward Feigenbaum introduced expert systems, which used a knowledge base of rules to make decisions.
- 1990s** AI research shifted toward practical applications, such as speech recognition, computer vision, and robotics. The development of the World Wide Web and the explosion of digital data created new opportunities for AI.

### Type 1

- Narrow AI** This type of AI is designed to perform a specific task with intelligence. It is the most common and currently available AI in the world of artificial intelligence. Examples of narrow AI include playing chess, purchasing suggestions on e-commerce sites, self-driving cars, speech recognition, and image recognition.
- General AI** This type of AI is designed to perform any intellectual task with efficiency like a human. It is capable of understanding and learning any intellectual task that a human can perform.
- Super AI** This type of AI is hypothetical and does not exist yet. It is capable of performing intellectual tasks that are beyond human capabilities.

### Capabilities of AI

- Make Predictions
- Analyze images
- Interact in natural ways

### Type 2 AI

- Reactive Machines** These are the most basic types of AI that do not store memories or past experiences. They can only react to the current situation based on pre-programmed rules.
- Limited Memory** These types of AI can use past experiences to inform future decisions. They can learn from historical data and use that knowledge to make decisions.
- Theory of Mind** This type of AI can understand the emotions, beliefs, and intentions of others. It can predict the behavior of others based on their mental state.
- Self Aware** This is the most advanced type of AI that can have consciousness and understand its own existence. It can have desires, needs, and emotions.

### Machine Learning

Machine learning is an application of artificial intelligence that involves algorithms and data that automatically analyze and make decision by itself without human intervention. It describes how computer perform tasks on their own by previous experiences. Therefore we can say in machine language artificial intelligence is generated on the basis of experience.

**Supervised learning:** AI systems that learn from labelled training data. Example: Email spam filter

**Unsupervised learning:** AI systems that learn from unlabelled data. Example: Clustering customer data.

**Reinforcement learning :** AI systems that learn from the feedback of the environment. Example: AlphaGo.

### Supervised Learning

Classific- ation	Regression	Time series forecasting
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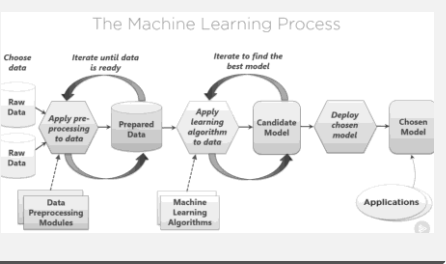
### Supervised Learning (cont)

to identify  
the  
category  
of new  
observ-  
ations on  
the basis  
of training  
data. In  
Classific-  
ation, a  
program  
learns  
from the  
given  
dataset or  
observ-  
ations and  
then  
classifies  
new  
observ-  
ation into  
a number  
of classes  
or groups.

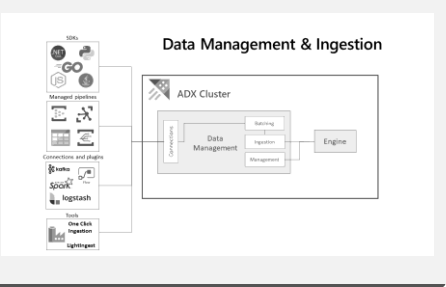
is a  
process of  
finding the  
correl-  
ations  
between  
dependent  
and indepe-  
ndent  
variables.  
It helps in  
predicting  
the  
continuous  
variables  
such as  
prediction  
of Market  
Trends,  
prediction  
of House  
prices, etc.

Time series  
forecasting is the  
process of  
analyzing time  
series data using  
statistics and  
modeling to  
make predictions  
and inform  
strategic deci-  
sion-making. It's  
not always an  
exact prediction,  
and likelihood of  
forecasts can  
vary wildly-es-  
pecially when  
dealing with the  
commonly fluctu-  
ating variables in  
time series data  
as well as  
factors outside  
our control.

### Machine Learning Process



### Data Ingestion



### Interdependency and Key Features of AI

**Artificial Intelligence** Any technique that enables computers to mimic human intelligence, using logic, if-then rules, decision trees, and machine learning (including deep learning).

**Machine Learning** A subset of AI that includes abstruse statistical techniques that enables machines to improve the tasks with experience. The category includes deep learning.

## Interdependency and Key Features of AI (cont)

**Deep Learning** The subset of machine learning composed of algorithms that permit software to train itself to perform task, like speech and image recognition, by exposing multilayered neural networks to vast amount of data

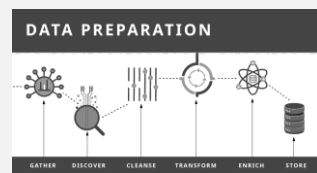
**Key Features of AI**

1. Machine Learning
2. Deep Learning
3. Natural Language Processing
4. Computer Vision
5. Neural Network
6. Cognitive Computing

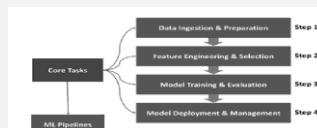
## Labelled and Unlabelled Data

Labelled Data	Unlabelled Data
Data that has some predefined tags such as name, type, or number.	Contains no tags or no specified name.
Used in Supervised Learning techniques.	Used in Unsupervised Learning.
Difficult to get.	Easy to acquire.
e.g., An image has an apple or banana.	e.g., Anomaly detection, association rule learning.

## Data Preparation



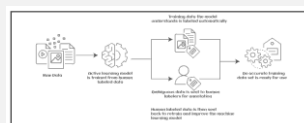
## ML solutions



## Labels and Features in Machine Learning



## How Data Labelling Works



## Benefits and Challenges of Data Labelling

Benefits	Challenges
Precise Prediction	Costly and time-consuming

## Approaches to Data Labeling

- Internal / In-house data labeling
- Synthetic Labeling
- Programmatic Labeling
- Outsourcing
- Crowdsourcing

## Labels and Features in Machine Learning

### Labels

1. Also known as tags. Give an identification to a piece of data. Provide some information about that element.

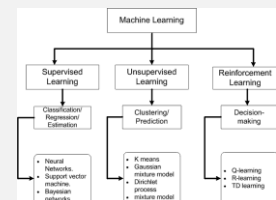
### Features

1. Individual independent variables. Work as input for the ML system.

## Unsupervised Learning

**Clustering** An unsupervised learning method is a method in which we draw references from datasets consisting of input data without labeled responses. Generally, it is used as a process to find meaningful structure, explanatory underlying processes, generative features, and groupings inherent in a set of examples.

## Types of Machine Learning



## Data Ingestion

