

Machine Learning

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The main aim of machine learning is to reduce the error margin.

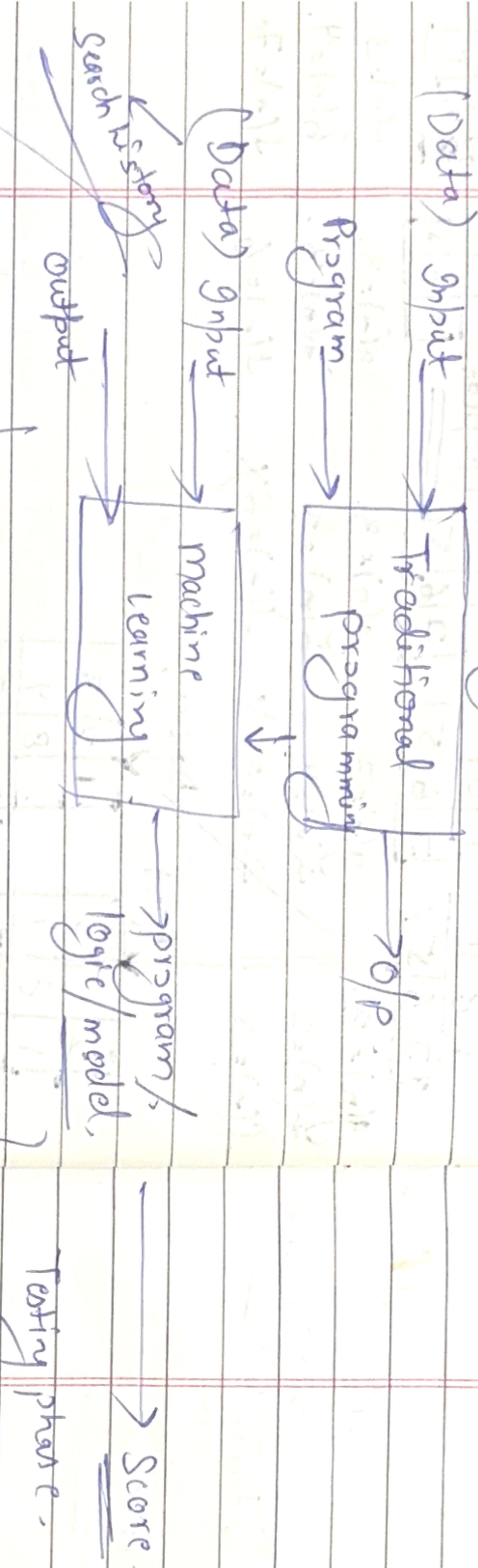
$$\text{Error Margin} = \text{Ideal output} - \text{Actual Output}$$

It is the field of study that gives computers the capability to learn without being explicitly programmed.

Ex → first time searching

better.

minimum difference it means its



Machine Learning learns with the help of data.

Types of machine learning

- (1) Supervised learning
- (2) Unsupervised learning
- (3) Reinforcement learning

Traditional programming fails then Machine Learning Implement.

Learning

Ex → Question → Answer.

learn question then learn Answer in

standard.

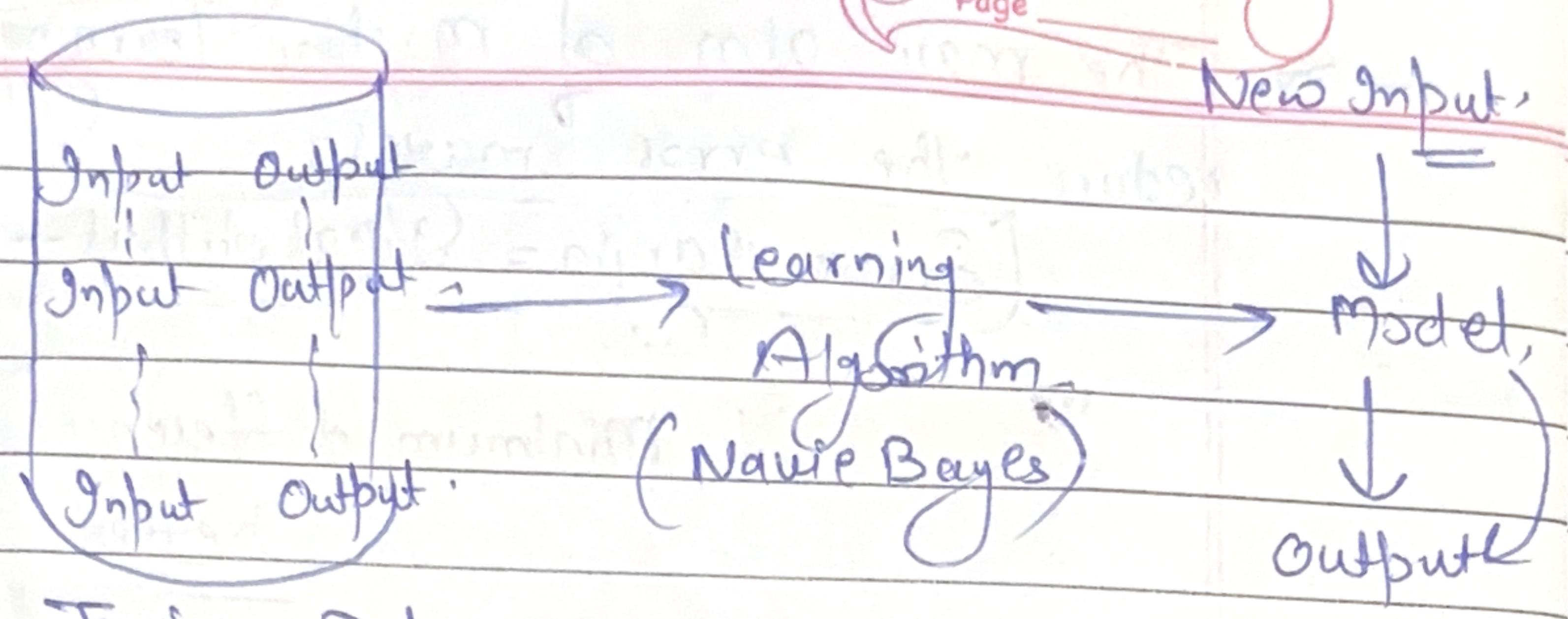
Both Inputs & Outputs.

Classification.

Student Brain/mind → program.

Training the Brain.

Input → Output → Training Data.



Training Data.

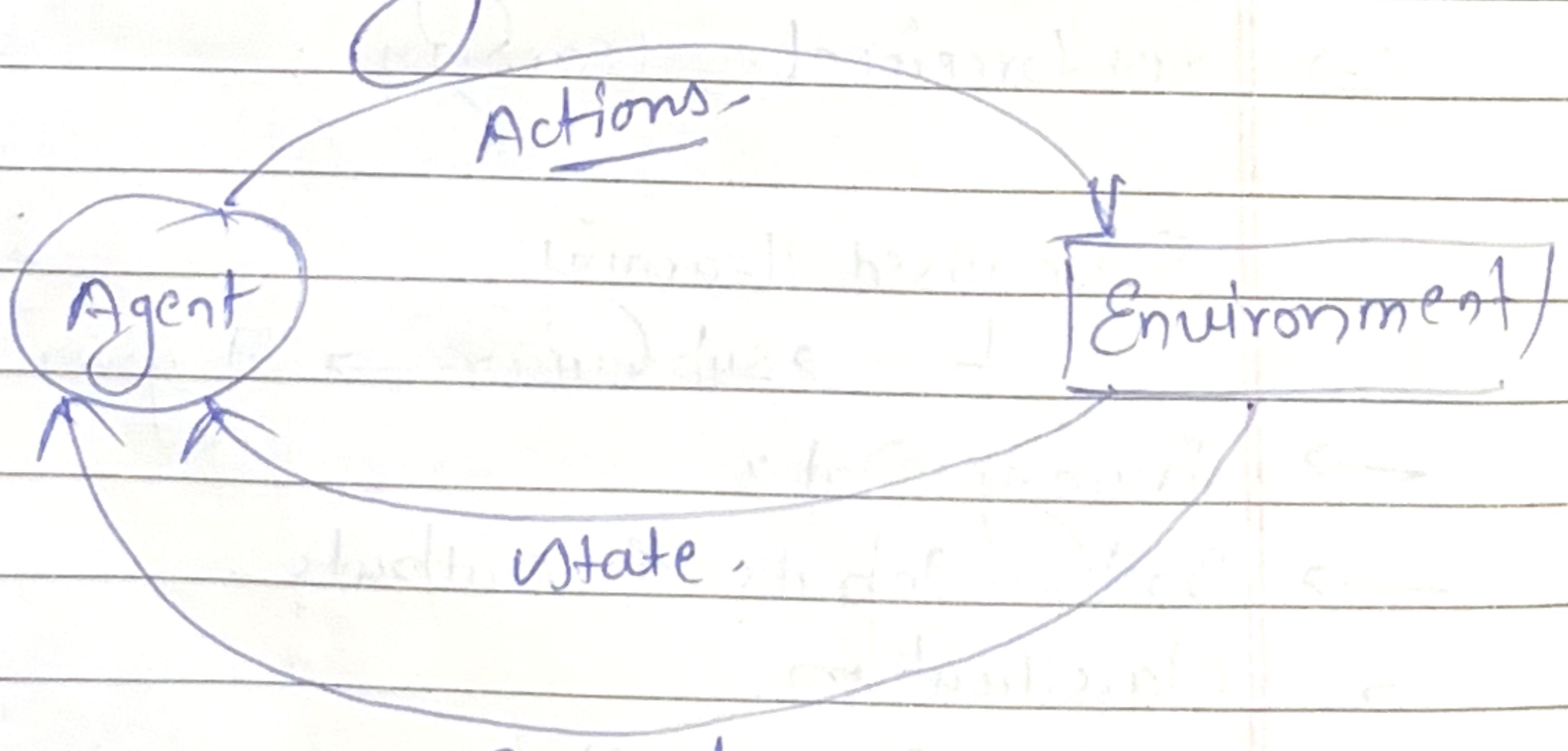
(2) Unsupervised Learning

- Only Inputs.
 - clustering [K-Mean clustering]
 - K-Mean
 - Ex → PK Movie.
- physical structure
color
Appearance
group

(3) Reinforcement learning (- point)

Reward / Penalty - (+ point)

Q-learning



In this we design a policy.

$$f(n) = j(n) + h(n)$$

$$\Rightarrow 1+2+5+0$$

$$\Rightarrow 8.$$

Reinforcement learning → It is semi-supervised learning.

→ The agent interacts with the Environment and identifies the possible actions he can perform.

→ It is a feedback based machine learning approach here an agent learns to which actions to perform by looking at the environment and the results of actions.

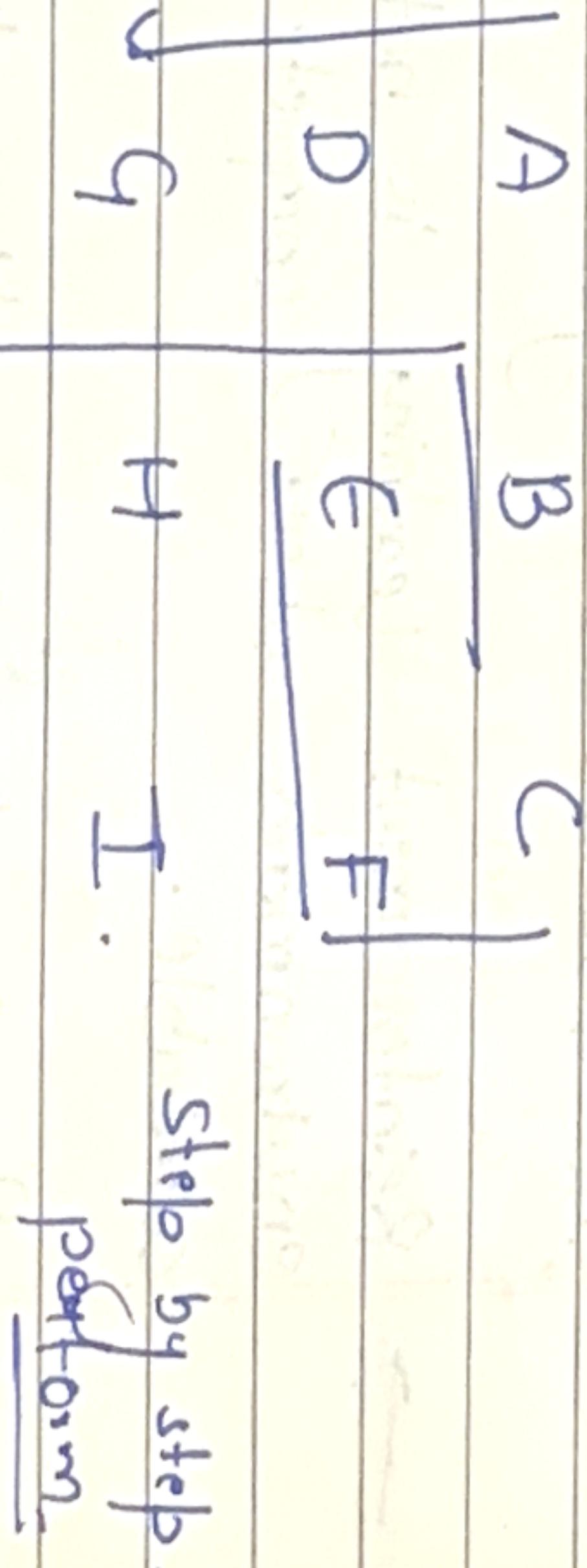
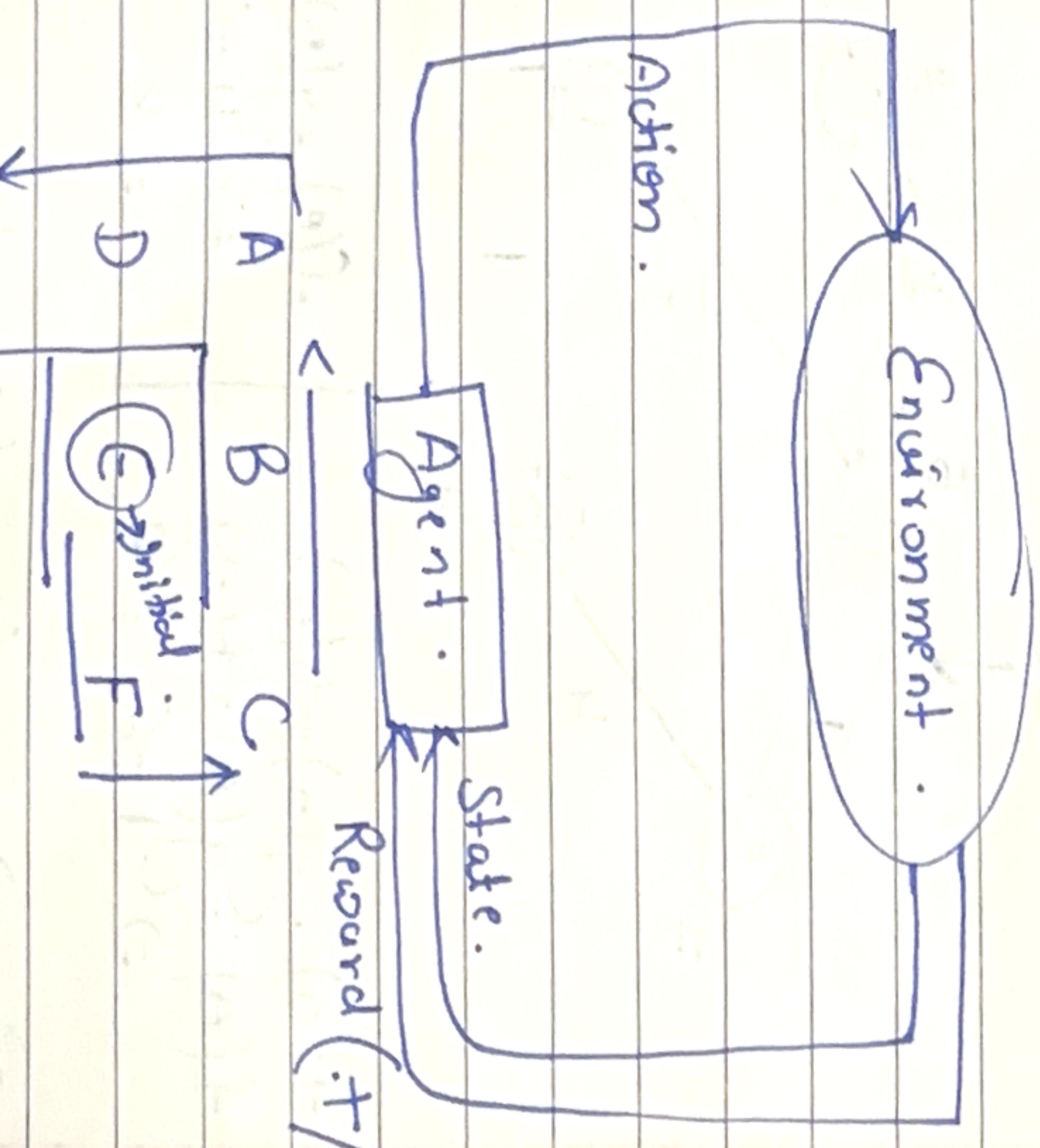
→ The primary goal of an agent in Reinforcement learning is to perform actions by looking at the Environment and get the maximum positive rewards.

→ For each correct action, the agent gets positive feedback and for incorrect action, the agent gets negative feedback or penalty.

→ Since there is no labelled data, so the agent is bound to learn by its experience only.

Environment

→ Reinforcement learning is used to solve specific type of problem where decision making is step by step, and the goal is long term such as game playing etc.



Step by step performance.

→ Types of Reinforcement learning - Positive. (2) Negative.

Machine Learning -

(1) Positive Reinforcement learning
 It is a reinforcement of behaviour due to positive rewards.

Same behaviour performs again .

→ It increase the strength & frequency .

(2) Negative Reinforcement learning

Negative Reward are used as a deterrent

to weaken the behaviour and to avoid it ..

→ Rewards decrease strength & the frequency of a specific behaviour .

Q1. Where we use the Reinforcement learning .

Ans. Reinforcement learning is used in designing the Robots or in games .

→ Reinforcement learning is not suitable for environments where complete information is available .

→ For Example:- the problems like object detection, face recognition, fraud detection can be better solved using a classifier than by Reinforcement learning .

Algorithm Data .
Feature Engineering.

Feature is an attribute or property shared by all the independent units on which analysis or prediction is to be done .

Feature Engineering is the process to create feature / extract the features from existing features by domain knowledge to increase the performance of machine learning model .

→ Feature Engineering is an art .

Why is Feature Engineering Important ?

→ Quality Data always help to improve the accuracy and performance of machine learning model .

→ Machine learning algorithm follow the rule

(learn like kids)
 GIGO → Garbage in garbage out .
 Data → Feature Engineering → ML Model .

what are the process of feature Engineering

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- (1) Brainstorming or Testing features.

- (2) Deciding what features to create.
- (3) Creating features.
- (4) Checking how the features work with your model.
- (5) Implementing your feature if needed.
- (6) Go back to brainstorming/creating more features until the work is done.

Data preprocessing → Feature Engineering.

- Numpy
- Pandas
- Matplotlib
- Seaborn
- Scikit Learn

① Examples of feature Engineering.

→ Inbuilt feature. (Created feature.)

Train Boarding Time	Train Reached Time	Delayed or On time	Delay time in minutes.
Time	Station	On time	
10:00 AM	10:15 AM	Delayed	00:15
5:00 PM	5:00 PM	On time	00:00

Inbuilt feature → Created feature.

Values in a feature is called Variables.

② Date time.

Hour	Day	Month	Year	Day of week.
12	7	4	2020	2

A variable is any characteristic, number or quantity that can be measured or counted.

Inbuilt feature → Created feature.

③ Age.

Age	Gender	Male	Female	Age range.
23	Male	1	0	21-30

→ Created feature.

Age	Gender	Male	Female	Age range.
23	Male	1	0	21-30

→ Created feature.

Age	Gender	Male	Female	Age range.
23	Male	1	0	21-30

We use one feature and then create a multiple features.

Prerequisites for Feature Engineering

① Mathematics

→ Statistics

→ Probability

→ Calculus.

→ Linear Algebra.

② Python Libraries

→ Pandas

→ Matplotlib

→ Seaborn

→ Scikit Learn

Variables

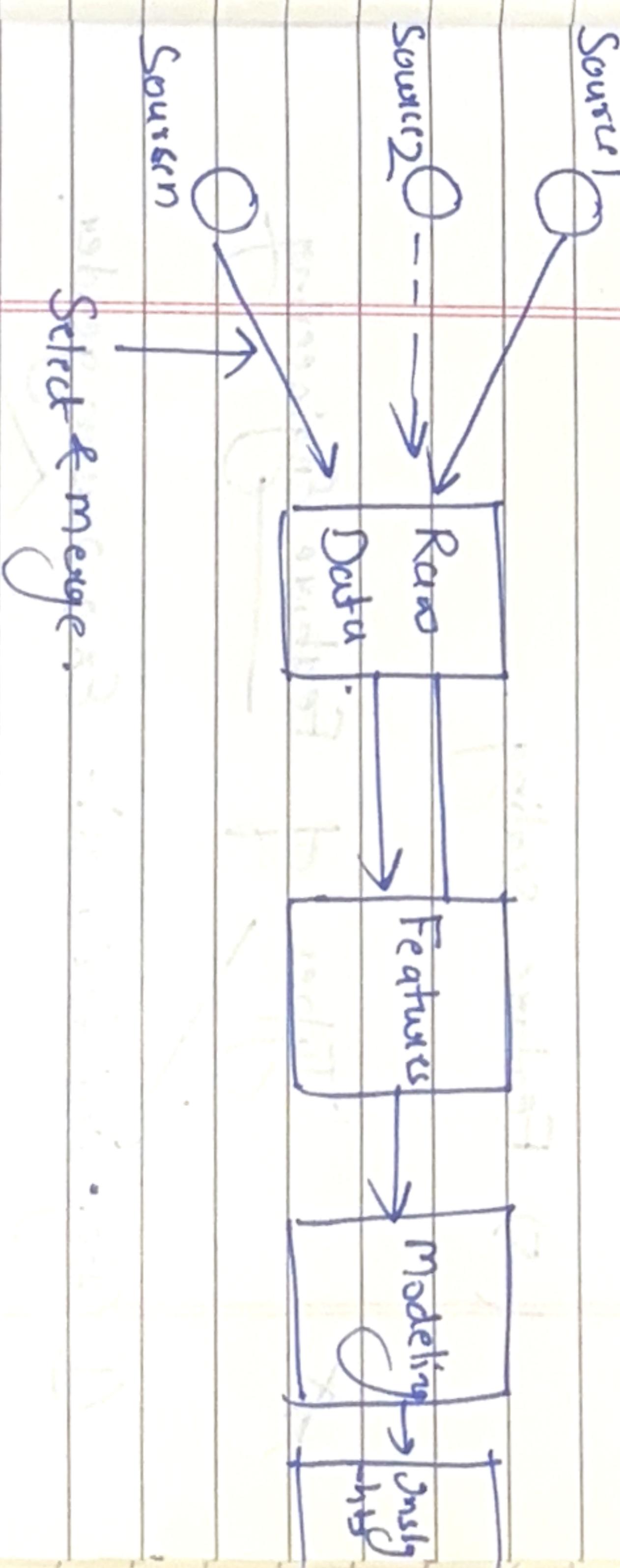
Variables	Numbers or
34	34

↓ Variables

Transforming Raw Data into Relevant Information

Feature Engineering

→ Feature Engineering is the process of turning raw data into useful features that help improve the performance of machine learning models.



Importance of Feature Engineering

- ① Improve Accuracy
- (2) Reduce Overfitting
- (3) Boost Interpretability
- (4) Enhance Efficiency

Types of variables

- ① Numerical (2) Categorical.
- Discrete (Continuous) Original Nominal

- (3) Date & time (4) mixed

utilizing

discretization

binning

normalization

standardization

z-score

min-max scaling

logarithmic scaling

sqrt scaling

inverse scaling

reciprocal scaling

square root scaling

cube root scaling

hyperbolic scaling

exponential scaling

sigmoid scaling

softmax scaling

softmax scaling

softmax scaling

softmax scaling

softmax scaling

softmax scaling

Techniques Involved in

(3)

Time-Series features:- It represent timely data such as stock price fluctuations over a year.

(1) Feature Creation

(4)

Textual features:- It contain only text data.
Ex → Product reviews or product description columns in a retail dataset.

(3) Feature Extraction

(4) Feature Selection

(5) Feature Scaling

Types of Feature Engineering

(1) Categorical features:- Ex → person gender.

Male Female

(2) Month Name

Jan ! Dec.

(3) Numerical Features:- Numerical features

are continuous and non-temporal like age.