

## Additional database services :

### 1. Document DB →

- support, Mongo DB in cloud
- MongoDB, a document database, program

### 2. Amazon Neptune -

- It's a graph database service
- You can use Neptune that work with highly connected datasets, such as recommendation engines, fraud detection, knowledge graphs.

### 3. Quantum Ledger Database QLB →

- It's a ledger database service
- Review complete history of all the changes that have been made to your data

### 4. Managed Blockchain -

- It's to create and manage blockchain networks
- used for financial system
- It lets multiple parties run transaction and share data without central authority

### 5. Amazon ElastiCache -

- Adds a cache layer on top of your database help to improve read time
- support two type of data - Redis and Memcached.

### 6. Dynamo DB Accelerator -

- Memory cache for dynamo DB.
- Improves response time from single millisecond to microseconds.

## S3 : Module 2

It is a streamlined solution that satisfy two major needs:

- hosting and file storage
- The freenotes application uses S3 bucket to host website and also store the MP3 files produced by Amazon Polly.

## DynamoDB : (Storage)

- To store CRUD operation, application needs a database
- Amazon DynamoDB is fully managed NoSQL database that provides fast and predictable performance with seamless scalability.
- Scalability meet your application fluctuating capacity needs.

## AWS Lambda : (Compute)

Lets for the processing.

It provide a workload aware scaling solution.

## API Gateway : (Connecting)

- Amazon API Gateway connects all the application's service together.
- It directs the event-driven request to and from your users to your compute, database, and storage device.

## Amazon Cognito (User auth) :

- For the users secure authentication and authorization to the application.

- Two main component are:

1. User pool → They are user directories that create built-in sign-up and sign-in option for your application users.
2. Identity pool → It is used to grant user access to other AWS services.

You can use user pool and identity pool separately and together.

user pool <sup>help</sup> for better streamlining access control for users, focusing on sign-in and sign-up.

## Amazon CloudWatch :

- observability
- A Monitoring and troubleshooting of an application.
- Also fire alarms.
- use Metrics to represent the data.

- Dashboards
- Log
- Metrics
- Alarms
- Events

- # Amazon XRAY  $\Rightarrow$  • Trace • Analysis • Service maps
- It is a service that collects data about requests that your application serves.
- Provides tool to view, filter and gain insights.
- Traces requests to application, so you can also see detailed information.
- used for analyzing and debugging your distributed application.

### Module-3

#### AWS REST API :

- All AWS services support a dedicated (API) to expose their features.
- To connect programmatically to an AWS service, you use an AWS service endpoint. Endpoint is the URL of the entry point for an AWS offering where the API is exposed.
- For security, most requests to AWS must be signed with an access key, which consists of access key ID and secret access key. AWS supports:
  1. SignV4 (Signature version 4)  $\rightarrow$  Adds the process to add authentication information to AWS request sent by HTTP.

#### HTTP Status codes :

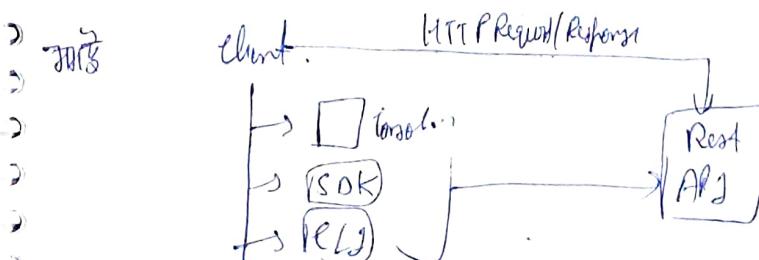
- 1. 100s  $\rightarrow$  Informational  $\rightarrow$  It indicates <sup>that</sup> everything is OK so far.
- 2. 200s  $\rightarrow$  Success
- 3. 300s  $\rightarrow$  ~~Bad~~ Redirectional  $\rightarrow$  Indicates that further action is necessary to complete request
- 4. 400s  $\rightarrow$  Client errors  $\rightarrow$  Incorrect syntax
- 5. 500s  $\rightarrow$  Server errors

#### Methods to access the AWS services :

1. Application programming interface (API)  $\rightarrow$  All services has dedicated API.
2. Software Development Kit (SDK)  $\rightarrow$  You can do everything by code.

#### AWS Management Console :

3. Command Line Interface (CLI)  $\Rightarrow$



## Benefits of using SDK

- API can automatically calculate signatures, handle errors, even reconnections.

## Low level API (Service client API in Python): client

- Give you a full control over the request
- You can tightly control the behaviour and performance of your calls.
- Has one method per service operation

## High level API (Resource API in Python): resources

- Provide high level abstraction
- Has one class for conceptual resource.
- Define service resources and individual resources.

## AWS CLI:

### Command:

```
$ aws s3 ls s3://bucket --recursive
```

- The base call is aws
- The service command is s3
- The subcommand is ls with a target s3://bucket [operation performed on that service]
- optional parameter is --recursive  
you can get help by writing this command!

```
$ aws help
```

```
$ aws s3 ls help
```

## Service operation:

- Lambda can be invoked synchronously or asynchronously
- Amazon S3 invokes function asynchronously
- CreateTable operation for a DynamoDB is an asynchronous operation

Polling is necessary in asynchronous programming in some cases to determine the state of a service.

about and poll the resource for the state. loop

Waiting for creating table process wait until it is ready.

## Module 24

### IAM

#### How IAM works :

- 1. Principle → It is a person or application that uses the AWS account root user, an IAM user, role. To authorials from the API, you must provide your access key and secret key.

#### 2. Request :

- When a principle tries to use the AWS Management console, the AWS API, or the AWS CLI, that principle sends a request to AWS.

#### 3. Authorization :

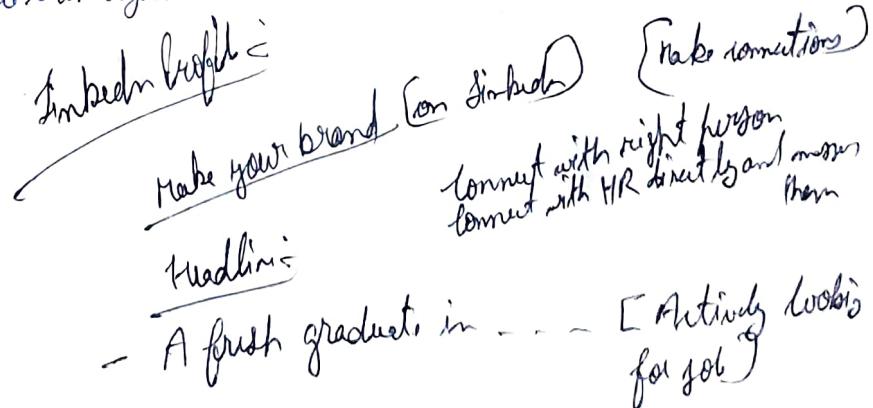
Two main policies are

- Identity based policy → It is attached to an IAM user, group or role. These policies let you specify what that identity can do. Identity based Policy (RBAC), not effect

Admin  
Resource

- Resource based policy → It is attached to the resource. Eg: You can attach resource based policy to Amazon S3 buckets. Resource based policies are popular for granting cross account access. Effect, Principal, Action, Resource. It is attached to resource such as S3 bucket. Resource based Policy.

- 4. Resource → A resource is an object that exists within a service.



- In about tell all your achievements, the about that company in which you are working.
- Politely talk with HR [Ask further] - [Follow this step respected them and mention phone no. in 6 lines]

## (Machine Learning)

DATE: \_\_\_ / \_\_\_ / \_\_\_  
PAGE: \_\_\_

Machine learning is a discipline of artificial intelligence that provides machines with the ability to automatically learn from data and past experiences while identifying patterns to make predictions with minimal human intervention.

Machine learning <sup>methods</sup> enables computers to operate autonomously without explicit programming. Machine learning applications are fed with new data, and they can independently learn, grow, develop and adapt.

JFG

Machine learning is the field of study that gives computers the capability to learn with out being explicitly programmed. Machine learning is one of the most exciting technologies that one would have ever come across. As it is evident from the name, it gives the computer that makes it more similar to humans. The Ability to learn. Machine learning is actively being used today, perhaps in many more places than one would expect.

Machine learning is a subset of the artificial intelligence that makes the computer to learn automatically. Machine learning enables the computer to behave like human beings by training them with the help of past experience and predicted data.

Machine learning is defined as a technology that is used to train machines to perform various actions such as predictions, recommendation estimation etc based on historical data or past experience.

There are three key aspects of Machine Learning, which are as follows.

- Task → A task is defined as the main problem in which we are interested. This task can be related to the predictions and recommendations and estimation etc.
- Experience → It is defined as learning from historical or past data and used to estimate and resolve future tasks.
- Performance → It is defined as the capacity of any machine to resolve any machine learning task or problem and provide the best outcome for the same. However, performance is dependent on the type of machine learning problems.

# Applications of Machine Learning → Machine learning is widely being used in approximately every sector including healthcare, marketing, finance, automation etc. There are some important real world examples of machine learning are as follows.

Healthcare and Medical Diagnosis → Machine learning is used in healthcare industries that help in generating neural networks. These self learning neural networks help specialists for providing quality treatment by analysing external data on a patient condition, X-Rays, CT scans, various tests and screening.

## Self driving cars

Traffic prediction  $\rightarrow$  Machine Learning also help us to find the shortest route to reach our destination by using the Google Maps. It also helps us in predicting traffic conditions, whether it is cleared or congested through the real time location of the Google Maps and sensor.

Image Recognition  $\rightarrow$  Image Recognition is also an important application of machine learning for identifying objects, persons, places etc. Face detection and auto friend tagging suggestion is the most famous application of the image recognition used by Facebook, Instagram etc. When we upload photos with our Facebook friends, it automatically suggests their names through image recognition technology.

Automatic Translation  $\rightarrow$  Automatic language translation is also one of the most significant application of machine learning that is based on sequence algorithms by translating texts of one language into other desirable language. Google Neural Machine Translation provides this feature which is Neural Machine Learning. Further you can also translate the selected text on images as well as complete documents through Google Lens.

## Types of Machine Learning:

1. Supervised Machine Learning  $\Rightarrow$  Supervised learning is a type of machine learning in which machines are trained using well "labelled" training data. and on basis of that data machines predict the output. The labelled data means some input data is already tagged with the correct output.  
In supervised learning, the training data provided to the machines work as the supervisor that teaches the machines to predict the output correctly. It applies the same concept as a student learns in the supervision of the teacher.  
Supervised learning is a process of providing input data as well as correct output data to the machine learning model.

## Types of Supervised Machine Learning Algorithms:

1. Regression
2. Classification

1. Regression  $\Rightarrow$  Regression algorithms are used if there is a relationship between the input variables and the output variable. It is used for the prediction of continuous variables, such as weather forecasting, Market Trends, etc. Below are some popular Regression algorithms which come under the Supervised learning:
  - Linear Regression
  - Regression Trees
  - Non - Linear Regression
  - Bayesian Linear Regression
  - Polynomial Regression.

2. Classification → Classification algorithms are used when the output variable is categorical, which means there are two classes such as Yes-No, Male-Female, True-false etc.

- Random Forest
- Decision Trees
- Logistic Regression
- Support Vector Machines

### Classification Machine Types

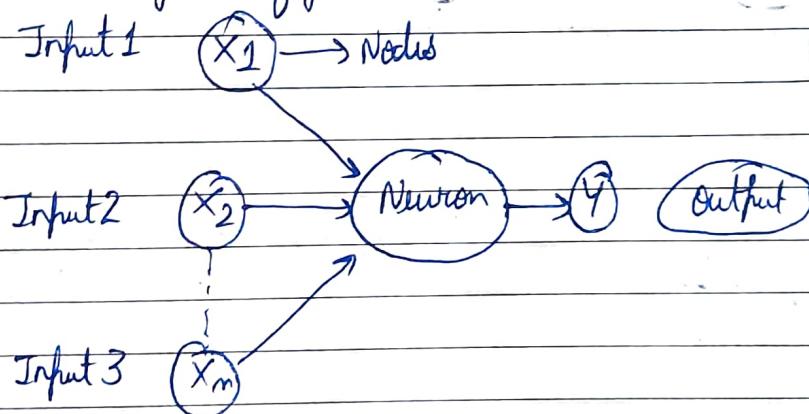
- (2) Unsupervised Learning → Unsupervised learning is a learning method in which a machine learns without any supervision. The training is provided to the machine with the set of data that has not been labelled, classified or categorized and the algorithm needs to act on that data without any supervision. The goal of the unsupervised learning is to restructure the input data into new features or a group of objects with similar patterns. In unsupervised learning, we don't have a predetermined result. The machine tries to find useful insights from the huge amount of data. It can be further classified in two categories of algorithms:
- Clustering
  - Association - find relationships in variables in large datasets  
(It is used for market strategy effectively)

- (3) Reinforcement Learning → Reinforcement learning is a feedback-based learning method, in which a learning agent gets a reward for each right action and gets a penalty for each wrong action. The agent learns automatically with these feedbacks and improves its performance.

In reinforcement learning, the agent interact with the environment and explores it. The goal of an agent is to get the most reward points, and hence it improves the performance.

# Artificial Neural Networks: The term artificial Neural Networks is derived from Biological neural networks that develop the structure of a human brain. Similar to human brain that has neurons interconnected to one another, artificial neural networks also have neurons that are interconnected to one another in various layers of the networks. These neurons are known as nodes.

The typical Artificial Neural Networks looks something like the given figure.



An artificial Neural Network in the field of Artificial intelligence where it attempts to mimic the network of neurons makes up a human brain so that computers will have an option to understand things and make decisions in a human like manner. The artificial neural network is designed by programming computer to behave simply like interconnected brain cells.

## Artificial Intelligence

Artificial Intelligence refers to the simulation of human intelligence in machines that are programmed to think like humans and mimic their actions. Artificial Intelligence is based on the principle that human intelligence can be defined in a way that a machine easily mimics it and execute tasks. The goal of artificial intelligence include computer enhanced learning, reasoning and perception.

A subset of artificial intelligence is machine learning which refers to the concept that computer program can automatically learn from and adapt to new data without being assisted by humans. Deep learning techniques enable this automatic learning through the absorption of huge amounts of unstructured data such as text, images or video.

### A brief history of artificial intelligence:

In 1950's English mathematician Alan Turing wrote a landmark paper titled "Computing Machinery and Intelligence" that asked the question: "Can machines think?"

Further work came out of a 1956 workshop at Dartmouth sponsored by John McCarthy. AI was revived in the 1990's with the expansion of the algorithmic toolkit and more dedicated funds. David Rumelhart introduced deep learning techniques that allowed computers to learn through experience. Then expert systems was introduced. Despite a lack of government funding and public hype, AI thrived and many landmarks goals were achieved in the next two decades.

In 1977 speech recognition software developed by Dragon Systems was implemented on windows. They robot named Kismet was developed who could recognize and display emotions.

Applications of Artificial Intelligence: AI has various applications in today society. It is becoming essential for today's time because it can solve complex problems with an efficient way in multiple industries. Following are some sectors which have the application of Artificial Intelligence:

1. AI in Astronomy → AI can be very useful to solve complex universe problems. AI technology can be helpful for understanding the universe such as how it works etc.
2. AI in Healthcare → Healthcare Industries are applying AI to make a better and faster diagnosis than humans. AI can help doctors with diagnosis and can inform when patients are worsening so that medical help can reach to the patient.
3. AI in Gaming: AI can be used for gaming purposes. The AI machines can play strategic games like chess, where the machine needs to think of a large number of possible places.
4. AI in Finance → AI and finance industries are the best matches for each other. The finance industry is implementing automation, adaptive intelligence, algorithm trading and machine learning.

into financial losses.

5. AI in Data Security  $\Rightarrow$  The security of data is crucial for every company and cyber attacks are growing very rapidly in the digital world. AI can be used to make your data more safe and secure. Some examples such as AEB bot, AI2 platform are used to determine software bug and your attack in a better way.
6. AI in Social Media  $\Rightarrow$  Social media sites such as Facebook, Twitter and Snapchat contain billions of user profiles, which need to be stored and managed in a very efficient way. AI can organize and manage massive amounts of data.
7. AI in Automotive Industry  $\Rightarrow$  Some automotive industries are using AI to provide virtual assistance to their user for better performance. Such as Tesla has introduced Tesla Bot, an intelligent virtual assistance.
8. AI in Robotics  $\Rightarrow$  Artificial Intelligence has a remarkable role in Robotics. Usually, general robots are programmed such that they can perform some repetitive task, but with the help of AI we can create intelligent robots which can perform tasks with their own experiences without pre-programmed. Humanoid Robot are the best examples for AI in robotics, recently the intelligent humanoid robot named Sophia has been developed which can talk and

behave like humans.

3. AI in Entertainment  $\Rightarrow$  We are currently using some AI based applications in our daily life with some entertainment services such as Netflix or Amazon. With the help of ML/AI algorithms, these services show the recommendations for programs or shows.
10. AI in agriculture  $\Rightarrow$  Agriculture is an area which requires various resources, labour, money, and time for best result. Now a day's agriculture is becoming digital and AI is emerging in this field also. Agriculture is applying AI as agriculture robotics, soil and crop monitoring, predictive analysis. AI in agriculture can be very helpful for farmers.
11. AI in education  $\Rightarrow$  AI can automate grading so that the tutor can have more time to teach. AI chatbot can communicate with students as a teaching assistant.
- AI in the future can work as a personal virtual tutor for students, which will be accessible easily at any time and any place.