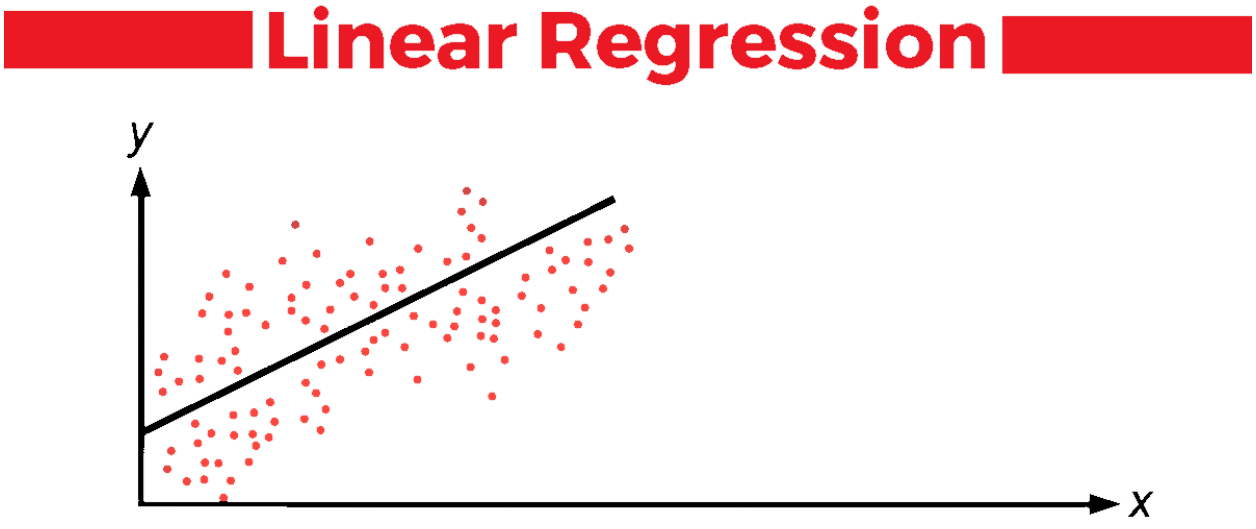
Types of Machine Learning Models

1. Linear Regression (Statistical Model)

Definition:
Linear regression is a statistical method used to model the relationship between a dependent variable and one or more independent variables using a straight line. It predicts outcomes based on the linear relationship between variables.

Use Case:
Predicting House Prices
Given the size of a house (in square feet), predict its price based on historical sales data.

Diagram:



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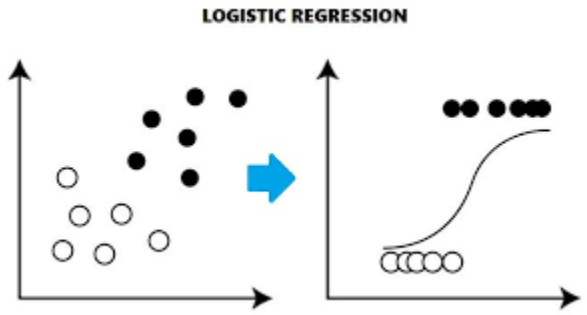
2. Logistic Regression (Statistical Model)

Definition:
Logistic regression is used to model binary outcomes (e.g., yes/no, 0/1). It estimates the probability that a given input belongs to a particular category using the logistic (sigmoid) function.

Use Case:
Email Spam Detection
Predict whether an email is spam (1) or not spam (0) based on features like keywords and sender address.

Diagram:



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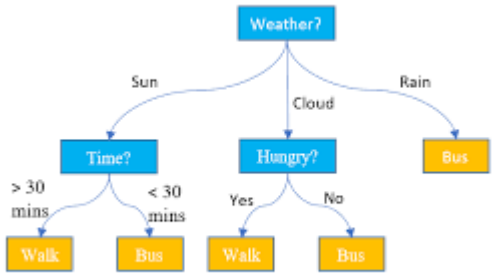
3. Decision Trees (Machine Learning Model)

Definition:
Decision Trees are flowchart-like structures that split data into branches to make predictions. Each internal node represents a decision on a feature, each branch is the outcome, and each leaf node is a final prediction.

Use Case:
Loan Approval
Determine whether to approve a loan based on applicant's income, credit score, and existing debt.

Diagram:



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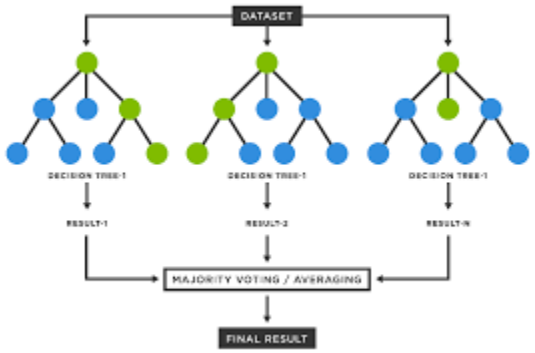
4. Random Forest (Machine Learning Model)

Definition:
Random Forest is an ensemble model that builds multiple decision trees and combines their outputs to improve accuracy and reduce overfitting.

Use Case:
Disease Prediction
Predict whether a patient has diabetes based on lab results by aggregating decisions from multiple decision trees.

Diagram:



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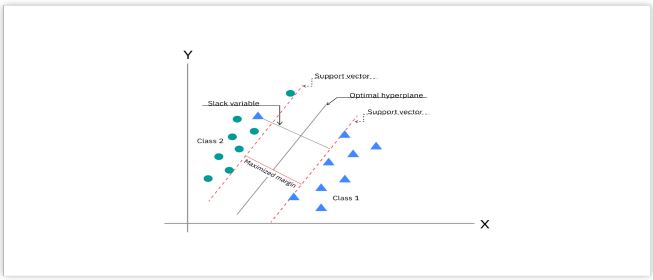
5. Support Vector Machines (SVM) (Machine Learning Model)

Definition:
SVM is a supervised learning model that finds the optimal boundary (hyperplane) to separate data points of different classes.

Use Case:
Face Detection
Classify images as containing a face or not based on pixel values.

Diagram:



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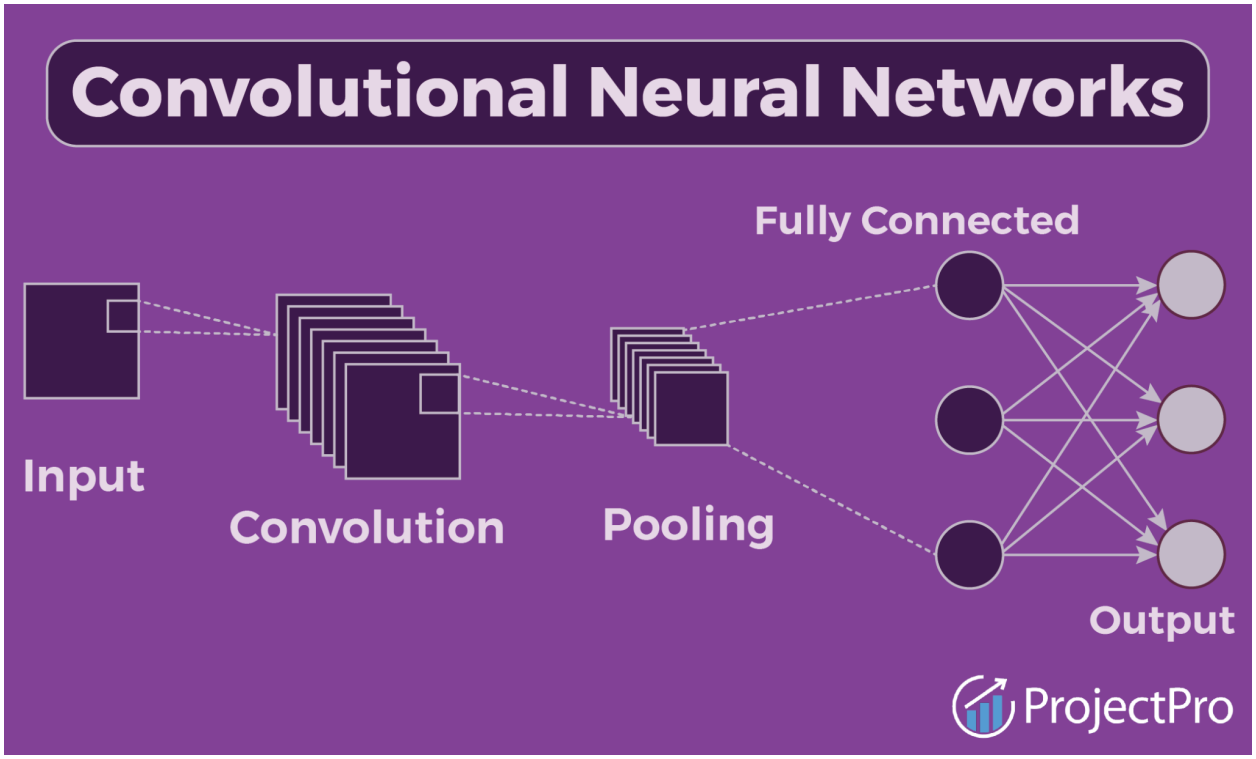
6. Convolutional Neural Networks (CNNs) (Deep Learning Model)

Definition:
CNNs are deep learning models specially designed to process and analyze visual data by using filters to detect spatial features in images.

Use Case:
Image Classification
Classify images of animals (e.g., cat vs dog) based on pixel patterns and features.

Diagram:



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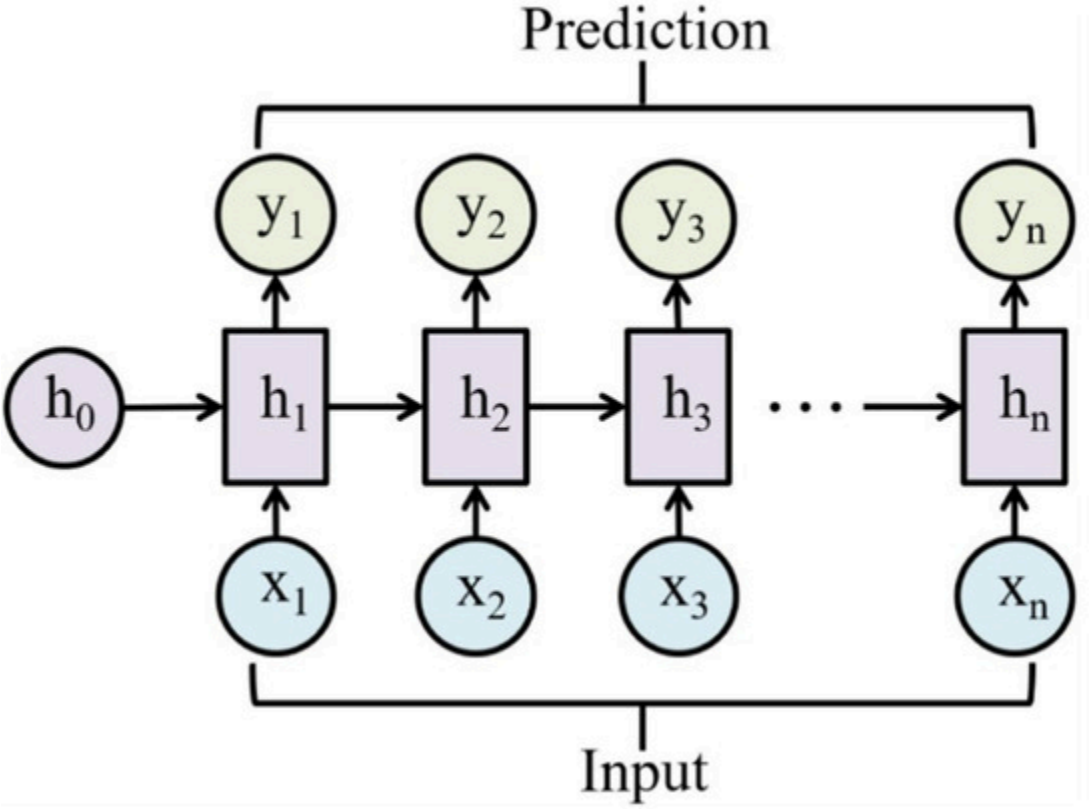
7. Recurrent Neural Networks (RNNs) (Deep Learning Model)

Definition:
RNNs are neural networks designed to process sequential data by maintaining memory of previous inputs, making them suitable for time-dependent data.

Use Case:
Text Prediction
Predict the next word in a sentence based on previous words.

Diagram:

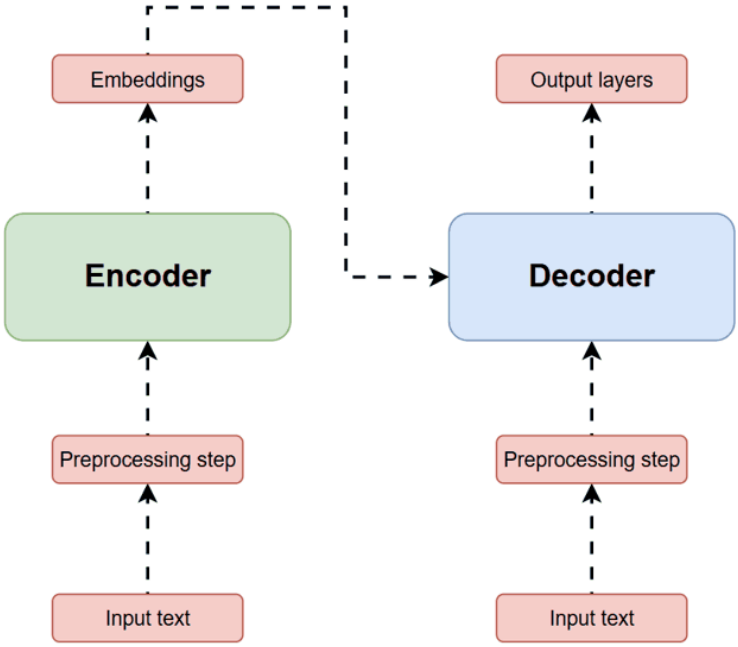


8. Transformers (Deep Learning Model)

Definition:
Transformers are advanced neural networks designed to handle sequential data using self-attention mechanisms. They allow parallel processing and long-range dependency capture.

Use Case:
Language Translation
Translate a sentence from English to French using contextual relationships between all words.

Diagram:



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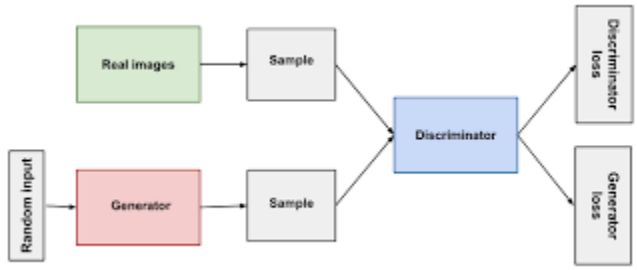
9. Generative Adversarial Networks (GANs) (Generative Model)

Definition:
GANs consist of two networks (generator and discriminator) that compete with each other. The generator creates data, and the discriminator evaluates it, improving the generator over time.

Use Case:
Generate Realistic Human Faces
Create realistic images of human faces that don't exist.

Diagram:



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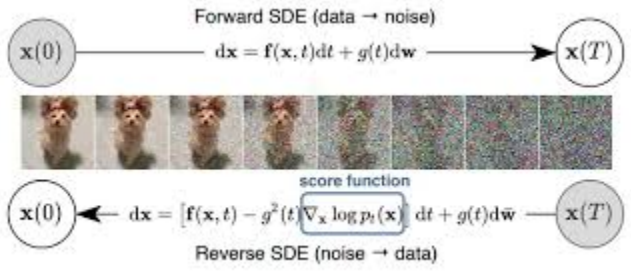
10. Diffusion Models (Generative Model)

Definition:
Diffusion models generate data by gradually removing noise from a random signal, reversing a diffusion process.

Use Case:
AI Image Generation
Generate high-quality artwork or images from text prompts (e.g., in tools like DALL·E or Stable Diffusion).

Diagram:



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11. Large Language Models (LLMs) (Generative Model)

Definition:
LLMs are deep learning models trained on massive text data to understand and generate human-like language.

Use Case:
Chatbots or Virtual Assistants
Power tools like ChatGPT to answer questions, generate text, or assist in writing.

Diagram: