Explain image processing and computer vision with applications.

1. Facial Recognition
Facial recognition uses AI and computer vision to identify or verify a person by analyzing facial features.
Example: Your phone unlocks when it recognizes your face using Face ID.
2. Medical Imaging
Medical imaging uses AI to analyze medical scans (like X-rays, MRIs) for diagnosing diseases or abnormalities.
Example: AI can detect tumors in an MRI scan faster and more accurately than a human doctor.
3. Self-driving Cars
Self-driving cars use AI, sensors, and cameras to understand the environment and drive without human input.
Example: A Tesla car can detect other vehicles, traffic signals, and pedestrians to drive safely on its own.
4. Object Detection in Security Systems
Object detection identifies and tracks objects (like people or bags) in video feeds to ensure safety.
Example: Security cameras at airports detect suspicious objects or unauthorized access in restricted areas.

What is ML? Explain its types

1. Supervised Learning
Uses labeled data where both input and output are known. The model learns to map inputs to correct outputs.
Example: Email spam detection – the model is trained on emails labeled as *spam* or *not spam*.
2. Unsupervised Learning
Uses unlabeled data where the model finds hidden patterns or groupings without predefined labels.
Example: Customer segmentation – grouping customers based on purchasing behavior without prior labels.
3. Reinforcement Learning
An agent learns by interacting with the environment and receiving rewards or penalties based on its actions.
Example: A robot learns to walk by trying different movements and getting rewarded when it moves forward.
4. Semi-supervised Learning
Uses a small amount of labeled data and a large amount of unlabeled data to improve learning accuracy.
Example: Classifying images when only a few are labeled – the model learns from both labeled and unlabeled images.

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With the concept of ANN explain different types of real time ML models.
Concept of ANN (Artificial Neural Network)
ANN is a computational model inspired by the human brain. It consists of layers of nodes (neurons) — input layer, hidden layers, and output layer — which process data and learn patterns through weights, biases, and activation functions.

Real-Time ML Models with ANN

Real-time ML models are designed to analyze and respond to data instantly or with minimal delay. ANN-based models are widely used in real-time applications due to their learning capacity and fast inference ability.

Here are different types of real-time ML models using ANN:

TYPES

1. Feedforward Neural Networks (FNN)

Description: Data moves in one direction — input → hidden layer(s) → output.

Use Case: Real-time image classification, text sentiment detection.

Example: Email spam detection system.

2. Convolutional Neural Networks (CNN)

Description: Specialized in processing grid-like data such as images using convolutional layers.

Use Case: Real-time object detection, facial recognition, medical imaging.

Example: Security camera identifying intruders instantly.

3. Recurrent Neural Networks (RNN)

Description: Neurons have memory; outputs depend on previous inputs (useful for sequential data).

Use Case: Real-time speech recognition, stock price prediction.

Example: Virtual assistant understanding voice commands.

4. Long Short-Term Memory Networks (LSTM)

Description: A type of RNN that solves the problem of vanishing gradients using gates and memory cells.

Use Case: Real-time language translation, anomaly detection in time-series.

Example: Predicting faults in industrial machinery from sensor data.

5. Generative Adversarial Networks (GANs)

Description: Consist of two networks — a generator and a discriminator — working against each other.

Use Case: Real-time image/video enhancement or synthesis.

Example: Enhancing low-light video in surveillance systems.