**Deep learning**

**1)Feedforward Neural Networks (FNN)**

The Structure Composed of an input layer, one or more hidden layers, and an output layer.Operation is Information flows in one direction, from input to output, without any feedback loops.

Use Cases: Commonly used for tasks such as image and speech recognition, as well as classification problems.

**2)Convolutional Neural Networks (CNN)**

The Structure Employs convolutional layers, pooling layers, and fully connected layers.Operation is Specialized for processing grid-like data, like images. Uses convolutional operations to automatically learn hierarchical representations.

Use Cases: Widely used in image and video recognition, object detection, and computer vision tasks.

**3)Recurrent Neural Networks (RNN)**

The Structure Contains recurrent connections, allowing information persistence over time.Operation is Suitable for sequential data, but struggles with long-term dependencies due to the vanishing gradient problem.

Use Cases: Used in natural language processing, time-series prediction, and speech recognition.

**4)Long Short-Term Memory Networks (LSTM)**

Enhancement is Addresses the vanishing gradient problem of traditional RNNs.Operation is Uses memory cells and gates to selectively learn, remember, and forget information.

Use Cases: Improved performance in tasks requiring modeling of long-term dependencies, such as speech recognition and language translation.

**5)Gated Recurrent Unit (GRU)**

It is a Simplified version of LSTM with fewer parameters. Operation Utilizes gates to control the flow of information, similar to LSTM.

Use Cases: Suitable for tasks where computational efficiency is important, such as real-time applications.

**6)Autoencoders**

Objective is Learn a compressed, lower-dimensional representation of input data.Structure Comprises an encoder and a decoder.

Use Cases: Dimensionality reduction, data denoising, and feature learning in unsupervised scenarios.

**7)Generative Adversarial Networks (GAN)**

Framework Consists of a generator and a discriminator in a adversarial training setup. Objective is Generator tries to create realistic data, while the discriminator tries to distinguish between real and generated data.

Use Cases: Image generation, style transfer, and data synthesis.

**8)Transformer**

Key innovation is the attention mechanism, allowing the model to focus on different parts of the input sequence.

Use Cases: Initially designed for natural language processing tasks like machine translation. Now widely used in various applications due to its effectiveness.

**9)BERT (Bidirectional Encoder Representations from Transformers)**

Pre-training is the process of Trained on a large corpus of text to learn contextualized representations.

Use Cases: Natural language understanding tasks, including sentiment analysis, named entity recognition, and question answering.

**10)Deep Q Network (DQN)**

Reinforcement Learning Utilizes deep neural networks to approximate the optimal action-value function.

Use Cases: Applied in reinforcement learning scenarios, such as game playing and robotic control.