**Tutorial - 01**

**Explore following topics**

**1) List Deep neural architecture.**

**Here are some popular deep neural network architectures:**

**Convolutional Neural Networks (CNNs):** Used primarily for image and video recognition tasks.

**Recurrent Neural Networks (RNNs):** Suitable for sequential data like time series or natural language.

**Long Short-Term Memory Networks (LSTMs):** A type of RNN designed to remember long-term dependencies.

**Gated Recurrent Units (GRUs):** Similar to LSTMs but with a simpler structure.

**Autoencoders:** Used for unsupervised learning tasks like dimensionality reduction and anomaly detection.

**Generative Adversarial Networks (GANs):** Consist of a generator and a discriminator, used for generating realistic data samples.

**Transformer Networks:** Used in natural language processing tasks, known for their self-attention mechanisms.

**Self-Organizing Maps (SOMs):** Used for clustering and visualization of high-dimensional data.

**Restricted Boltzmann Machines (RBMs):** Used for dimensionality reduction, classification, regression, collaborative filtering, feature learning, and topic modeling.

**Deep Belief Networks (DBNs):** Composed of multiple layers of RBMs, used for unsupervised learning

**2) List 10 Pre trained models.**

**Here are ten popular pre-trained models:**

**VGG16:** Known for its simplicity and depth, used for image classification.

**ResNet50:** Introduces residual connections to solve the vanishing gradient problem.

**InceptionV3:** Known for its efficiency and accuracy in image classification.

**MobileNet:** Designed for mobile and embedded vision applications.

**DenseNet121:** Connects each layer to every other layer in a feed-forward fashion.

**EfficientNetB0:** Balances accuracy and efficiency, scaling up in a balanced way.

**BERT:** Used for natural language processing tasks like question answering and language inference.

**GPT-3:** Known for its ability to generate human-like text.

**YOLOv3:** Used for real-time object detection.

**AlexNet:** One of the first deep learning models to achieve significant success in image classification

**3) Finalize 1 topic of research on deep learning.**

**Stock market prediction** is a challenging yet rewarding field due to the complex, volatile, and dynamic nature of financial markets.

**Here are some key areas and deep learning techniques that I can explore for stock market prediction:**

**Key Areas of Research**

**1. Time Series Analysis**

**Objective:** Analyze historical stock prices to predict future movements.

**Deep Learning Techniques:** RNNs (e.g., LSTM, GRU), Temporal Convolutional Networks (TCN).

**2. Sentiment Analysis**

**Objective:** Assess public sentiment from news articles, social media, and other textual data to predict stock market trends.

**Deep Learning Techniques:** Natural Language Processing (NLP) with Transformers (e.g., BERT, GPT).

**3. Market Feature Engineering**

**Objective**: Identify and construct relevant features from raw market data.

**Deep Learning Techniques**: Autoencoders, Feature Embedding techniques.

**4. Multi-Source Data Fusion**

**Objective:** Integrate diverse data sources such as financial news, trading volumes, and technical indicators to enhance prediction accuracy.

**Deep Learning Techniques:** Multimodal deep learning, attention mechanisms.

**5. Anomaly Detection**

**Objective:** Detect unusual market behaviors or anomalies that may precede significant market movements.

**Deep Learning Techniques:** Autoencoders, GANs for anomaly detection.

**6. Portfolio Optimization**

**Objective:** Optimize asset allocation to maximize returns and minimize risks.

**Deep Learning Techniques:** Reinforcement Learning (e.g., DQN, PPO), Deep Q-Networks.

**\*\*\*\*\*\* Deep Learning Techniques for Stock Market Prediction \*\*\*\*\*\***

**1. Recurrent Neural Networks (RNNs)**

**Example:** Long Short-Term Memory (LSTM)

**Use Case:** Predicting future stock prices based on historical price data.

**2. Convolutional Neural Networks (CNNs)**

**Example:** 1D-CNN for Time Series

**Use Case:** Extracting features from time series data for price prediction.

**3. Attention Mechanisms**

**Example: Transformer Models (e.g., BERT)**

**Use Case:** Sentiment analysis of financial news and social media.

**4. Autoencoders**

**Example: Variational Autoencoder (VAE)**

**Use Case:** Feature extraction and dimensionality reduction of market data.

**5. Generative Adversarial Networks (GANs)**

**Example:** GAN for Data Augmentation

**Use Case:** Generating synthetic stock market data for training models.

**6. Reinforcement Learning (RL)**

**Example:** Deep Q-Network (DQN)

**Use Case:** Portfolio management and trading strategy optimization.