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Assigment writeup (FAQs):

1. How does Deep Learning differ from Traditional Machine Learning?

Ans: i. Feature Extraction:
- In traditional ML manual feature extraction is needed whereas in deep learning; model automatically extracts from raw data.

ii. Data Dependency:
- Traditional ML performs well with small datasets whereas Deep learning requires large datasets for effective learning.

iii. Architecture:
- Traditional ML relies on algorithms like SVM, decision trees, etc whereas deep learning uses neural networks with multiple layers.

iv. Computational Power:
- Traditional ML works well on standard computing resources whereas deep

learning requires GPUs or TPUs for high computational needs.

v. Performance:
- Traditional ML has limited improvement with more data whereas Deep Learning's performance increase significantly with more data.

2. What are Activation functions and why are they important?

Ans:- Activation functions define the output of a neuron in a neural network, introducing non-linearity.

- They enable the network to learn and model complex patterns in data.

- They allow neural networks to approximate non-linear relationships, which linear models cannot achieve.

- Types:

i) Sigmoid: Outputs values between 0 and 1.

ii) ReLU: Introduces sparsity by outputting zero for negative values.

iii) Tanh: Outputs values between -1 and 1

iv) Softmax: Converts outputs into probabilities.

- Gradient flow is impacted by Activation functions during backpropagation

- The choice of activation function depends on the problem (e.g., classification often uses softmax)

3 How do you evaluate the performance of a Deep learning Model?

Ans: i) Accuracy:
- Measures the percentage of correctly predicted instances (useful for balanced datasets).

ii) Loss function:
- Evaluates the error between predicted and actual values (e.g., Cross-Entropy).

iii) Confusion Matrix:
- Provides metrics like precision, recall, and F1-score for classification problems

iv) ROC-AUC:
- Evaluates classification models by analyzing the trade-off between true

positives and false positives.

v) Validation Metrics:
- Monitors performance on validation data to detect overfitting or underfitting.

vi) Cross-Validation:
- Ensures robustness by evaluating performance across multiple data splits.

4. What are the main types of layers in Keras?

Ans: i) Dense Layer:
- Fully connected layer; connects every neuron to all neurons in previous Layer.

ii) Convolutional Layer (Conv2D):
- Extracts spatial features from input data, commonly used in image processing.

iii) Pooling Layer:
- Reduces spatial dimensions, e.g., MaxPooling2D or AveragePooling2D.

iv) Dropout Layer:
- Randomly disables neurons during training to prevent overfitting.

v) Recurrent layers:
- Handles sequential data, e.g., LSTM or GRU layers.

vi) Normalization layers:
- Includes BatchNormalization and LayerNormalization for stabilizing training.

~~5. What are the main type of layers in Keras?~~

5. Define Tensorflow graph and Tensorflow Session.

Ans Tensorflow Graph:
- A computational graph representing operations (nodes) and data (edges).

- It defines the flow of computations and dependencies.

- It enables Modularity during building complex models with reusable components.

- The Graph is executed in a session

Tensorflow Session:
- A runtime environment to execute operations defined in Tensorflow graph.

- Loads and runs the computation graph.
- Manages resources like memory and devices (GPU / CPU).
- Allows feeding input data during execution.

6. Difference between CNN, RNN and MLP in tabular form.

Ans:

CNN	RNN	MLP
Convolutional Neural Network	Recurrent Neural Network	Multi-layer Perceptron
Inputs grid-like data	Sequential data	Fixed-size input vectors.
Uses convolutional and pooling layers	Includes recurrent layers	Fully connected layers only.
Spatial feature extraction	Temporal dependencies & sequence modeling	General-purpose; no specific feature focus.
Spatial relationship are crucial	Handles sequential relationships.	Assumes independent features.
No memory of previous data	Maintains memory via hidden states	No memory of previous data.

7. What is Edge Computing? How does Edge Computing work?

Ans: Edge Computing:

- A distributed computing paradigm where data processing and storage occur near the data source, reducing latency and bandwidth usage.

- It enables real-time decision-making and efficient resource usage for IoT, AI, and other applications.

How does edge computing works?

- Data source: Devices (e.g., IOT sensors, cameras) generate data at the edge of the network.

- Local Processing: Data is processed locally on edge devices or edge servers.

- Reduced Transmission: Only essential data is sent to the central cloud, minimizing bandwidth.

- Real-Time Insights: Processes data locally to provide immediate responses.

- Examples: Autonomous vehicles, smart home systems.

8. What are the benefits of Edge Computing?

Ans: i) Reduced latency:
- Processes data closer to the source, enabling real-time responses.

ii) Bandwidth Efficiency:
- Minimizes data transmission to the cloud, saving network bandwidth.

iii) Improved Privacy and Security:
- Keeps sensitive data local, reducing exposure to cyber threats.

iv) ~~Ehan~~ Enhanced Reliability:
- Operates independently of cloud connectivity, ensuring uninterrupted performance.

v) Scalability:
- Handles increasing IoT data without overburdening centralized systems.

vi) Cost Savings:
- Lowers operational costs by reducing data storage and cloud processing expenses.

9. What are the main components of a GAN?

Ans: i) Generator:
- Creates fake data from random ~~image~~ noise
- Learns to generate data that resembles

real data.

ii) Discriminator :
- Differentiates between real and fake data.
- Provides feedback to the generator to improve its output.

iii) Loss Function:
- Generator loss: Measures how well the generator fools the discriminator.
- Discriminator loss: Measures how accurately the discriminator identifies real vs fake data.

iv) Training Process:
- The generator and discriminator are trained in a competitive game, improving each other over time.

v) Optimization:
- Both networks are optimized using backpropagation, typically with gradient descent.