NATIONAL UNIVERSITY OF MODERN LANGUAGES ISLAMABAD

Artificial Neural Network

Assignment: 02

Submitted to
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Q: Differentiate btw Autoencoder and PCA for dimensionality reduction.

Aspect	Principal Component Analysis (PCA)	Autoencoders
Approach	Uses a linear transformation to convert data into principal components.	Utilizes neural networks to learn nonlinear transformations.
Objective	Aims to maximize variance in the dataset with as few principal components as possible.	Seeks to minimize the reconstruction error between input and output.
Training Requirement	No training phase required; it's a direct computation based on the covariance matrix.	Requires training on a dataset through backpropagation.
Interpretability	Principal components are linear combinations of original features, making them easier to interpret.	Features are abstract and learned through nonlinear transformations, making them harder to interpret.
Complexity	Simpler and mathematically straightforward, involving eigenvalue decomposition.	More complex, involving the design and training of neural networks.
Performance	Effective for datasets with linear relationships.	Performs well with both linear and nonlinear data, capturing more complex patterns.
Applications	Commonly used in finance, image compression, and feature extraction for linear data.	Used in image denoising, anomaly detection, and handling complex, nonlinear data.