

**SE4050**

**Deep Learning**

**4th Year, 1st Semester**

**Lab 07**

Submitted to

Sri Lanka Institute of Information Technology

In partial fulfillment of the requirements for the

Bachelor of Science Special Honors Degree in Information Technology

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01

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02

**Linear Autoencoder (AE) vs. Principal Component Analysis (PCA)**

Linear AEs without activation functions work similarly to PCA. Both reduce data dimensionality, but PCA is a purely statistical method, while AEs are neural network based. AEs with linear layers can produce results like PCA by learning to project data into a lower-dimensional space.

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04

**Performance: Vanilla CNN AE vs. Dense AE**

The Vanilla CNN AE performs better than the Dense AE because CNNs are designed to capture spatial patterns in images, while dense layers ignore this structure. CNNs reduce the number of parameters, making the model more efficient and better at reconstructing images.

05

06

**Performance: Image Denoising AE vs. Vanilla CNN AE**

The Image Denoising AE improves over the Vanilla CNN AE by adding noise during training, helping the model focus on key features and become more robust. This method reduces overfitting, leading to better generalization on unseen data.

07

**Autoencoder (AE) vs. Variational Autoencoder (VAE)**

AEs encode data deterministically, while VAEs add a probabilistic element, learning a distribution in the latent space. VAEs are used for generating new data and include a KL divergence loss, which ensures the latent space follows a Gaussian distribution, unlike regular AEs.