Naan Mudhalvan Massive Upskilling Platform
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Final Project

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Auto Encoder Using ANN(Artificial Neural Networks) Algorithm

AGENDA

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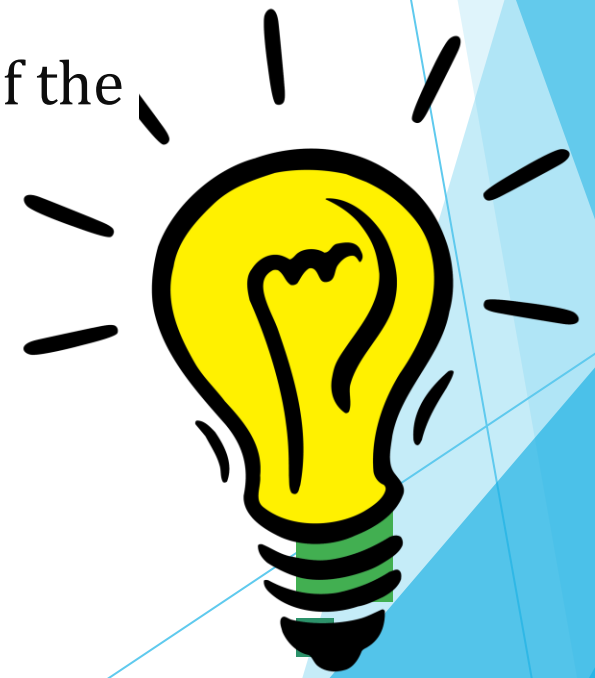
PROBLEM STATEMENT

The task is to design and implement a denoising autoencoder to remove Gaussian noise from images in the MNIST dataset and reconstruct clean images. The autoencoder should be trained on a dataset of noisy images and learn to produce clean reconstructions of the original images.



PROJECT OVERVIEW

Developing a denoising autoencoder for image reconstruction using the MNIST dataset. The autoencoder is trained on noisy images and learns to remove Gaussian noise, producing clean reconstructions. This involves preprocessing the data, designing and training the autoencoder model, and evaluating its performance. The project aims to demonstrate the effectiveness of the denoising autoencoder in restoring images to their original state while dealing with noise. Visualization of original, noisy, and reconstructed images provides insights into the quality of the reconstruction achieved by the model.

END USERS

1. Data Scientists and Machine Learning Researchers:
They can utilize the denoising autoencoder implementation as a reference or baseline model for image reconstruction tasks.

2. Software Developers:
Developers may integrate the denoising autoencoder into image processing pipelines or applications where noise removal is critical, such as medical imaging or document scanning software.

3. Image Processing Engineers:
Professionals working in image processing may use the denoising autoencoder to improve the quality of images in various applications, including surveillance systems, satellite imaging, or digital photography.

YOUR SOLUTION AND ITS VALUE PROPOSITION

- The solution entails the development and implementation of a denoising autoencoder for image reconstruction, specifically targeting the MNIST dataset. The autoencoder is trained on noisy images, learning to remove Gaussian noise and reconstruct clean versions of the original images.

Value propositions are,

- Noise Removal
- Simplified Implementation
- Improved Image Quality
- Versatility
- Educational Resource

THE WOW FACTOR IN OUR SOLUTION

Real-Time Noise Removal:

The denoising autoencoder provides an impressive capability to remove Gaussian noise from images in real time, making it suitable for applications where immediate noise reduction is crucial, such as live video processing or real-time image analysis in autonomous systems. This Wow Factor highlights the solution's ability to not only enhance image quality but also do so swiftly and efficiently, enabling seamless integration into time-sensitive processes and applications.

MODELLING

Data Preprocessing:

Normalize pixel values and introduce Gaussian noise to MNIST images.

Model Architecture:

Design a denoising autoencoder with an encoding and decoding layer using TensorFlow/Keras.

Training:

Compile and train the autoencoder on noisy training images to learn noise removal.

Evaluation:

Assess the model's performance by evaluating reconstruction quality on noisy test images.

Visualization:

Display original, noisy, and reconstructed images to demonstrate the effectiveness of noise removal.

RESULTS

- Successful implementation of a denoising autoencoder for image reconstruction using the MNIST dataset.
- The autoencoder effectively removes Gaussian noise from images, producing clean reconstructions.
- Evaluation demonstrates significant improvement in image quality, with reduced noise artifacts.
- Visualization of original, noisy, and reconstructed images showcases the model's performance.
- The project serves as a valuable resource for noise reduction in image processing applications.

https://github.com/rithika55/Auto-encoder-