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Department of Computer Science and Engineering
Mini-Project Abstract – NM1009 - Generative AI for Engineering

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Project Title : Generating hand-written digit images

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ABSTRACT:-

This project explores the application of Generative Adversarial Networks (GANs) in generating high-resolution hand-written digit images using the MNIST dataset. GANs have gained prominence in recent years for their ability to generate realistic synthetic data by learning the underlying distribution of real data. In this implementation, a GAN architecture comprising a generator and a discriminator is employed. The generator network generates synthetic digit images from random noise vectors, while the discriminator network evaluates the authenticity of these generated images. Through an adversarial training process, the generator learns to produce images that are increasingly indistinguishable from real digit images, while the discriminator becomes more adept at discerning between real and fake images.

The training process involves optimizing the parameters of both networks using the Adam optimizer and backpropagation. The generator is trained to minimize the discrepancy between the distribution of generated images and that of real images, while the discriminator is trained to correctly classify real and fake images. This adversarial training dynamic leads to a Nash equilibrium, where the generator produces realistic images that can effectively fool the discriminator.

The effectiveness of the GAN architecture is evaluated through visualizations of generated digit images at different epochs during the training process. These visualizations demonstrate the progressive improvement of the generator in generating high-fidelity digit images. Additionally, the project provides insights into the hyperparameters, such as learning rate and batch size, which influence the training stability and quality of the generated images.