VIVEKANAND EDUCATION SOCIETY'S INSTITUTE OF TECHNOLOGY

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Department of Artificial Intelligence and Data Science

Subject: AAI lab **Class:** D16AD **Semester:** 8

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Exp. No.: 5	Title: To build and train a deep convolutional GAN (DCGAN)		
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AAI - Experiment 5

* Aim: To build and train a deep convolutional generative multi-layer (DCGAN) network model for an image-based dataset.

* Theory: DCGANs are a variant of basic/vanilla GANs. Specifically designed for generating high quality images. They leverage deep convolutional image neural networks to learn hierarchical representation of image data, enabling the generation of realistic images with fine grained details.

• Generator: Generator in DCGAN takes random noise as input and learns to generate synthetic images. It typically consists of convolutional layers followed by batch normalization and activation functions such as ReLU or Leaky ReLU. The generator aims to transform the input noise into images that resemble the training data distribution.

• Discriminator: In DCGAN, it acts a binary classifier, distinguishing b/w real images from the training set and fake images generated by the generator. It also comprises of convolutional layers with batch normalization and activation functions. The discriminator learns to assign high probabilities to real images and low probabilities to fake ones.

• Convolutional Architecture: DCGANs utilize convolutional layers, instead of fully connected layers, allowing them to capture spatial dependencies and local structures in images effectively.

• Training objective: They are trained using an adversarial training process, where the generator aims to fool discriminator by generating realistic images. While, the discriminator aims to accurately differentiate b/w real

and fake images. The training objective involves minimizing a loss f^n that balances the objectives of generator and discriminator.

- Image Quality and Stability: DCGANs are known for their ability to generate high quality images with realistic texture and structures. They often produce more stable training dynamics compared to earlier GAN architectures, thanks to architectural choices and training strategies specific to DCGANs.

* Conclusion: The experiment on building and training a DCGAN for an image based dataset. By leveraging Deep GANN, the DCGAN aimed to generate high quality images that closely resembled the training data distribution.