Training Day-81 Report:

Generative Models Using GAN and Semi-Supervised Learning

Generative Models Using GAN:

Generative Adversarial Networks (GANs) are a type of machine learning model designed to generate new data similar to a given dataset. They consist of two neural networks: a **Generator** and a **Discriminator**. These networks are trained simultaneously using an adversarial process.

Generator: The role of the generator is to create synthetic data that resembles the original dataset. For instance, in the case of image data, it generates images similar to real ones.

Discriminator: The discriminator acts as a classifier, distinguishing between real and generated data.

The objective of the GAN is to make the generated data indistinguishable from real data. Over time, the generator improves to produce highly realistic outputs, while the discriminator gets better at identifying fake data.

Applications:

Image generation

Data augmentation

Style transfer

Video frame prediction

Example: A GAN trained on a dataset of human faces can generate photorealistic images of people who don’t exist.

Semi-Supervised Learning Using GAN:

Semi-supervised learning with GANs leverages the ability of the discriminator to function as a classifier. In addition to distinguishing between real and fake data, the discriminator is trained to classify a subset of labeled data into specific categories.

Key Features:

Utilization of Unlabeled Data: Semi-supervised learning allows GANs to utilize large amounts of unlabeled data, which significantly reduces the dependency on labeled data.

Improved Performance: The adversarial training mechanism helps the model learn better features, improving classification accuracy.

Example Use Case: In medical imaging, where labeled data is scarce and expensive to obtain, semi-supervised GANs can be used to classify diseases using a mix of labeled and unlabeled patient scans.

Advantages:

Reduces the need for large labeled datasets.

Enhances the robustness of machine learning models.

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