Generative Adversarial Networks (GAN)— Concept Document

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Topic: Generative Adversarial Networks

1. **Definition:** A GAN is a model that learns to generate new, realistic data by pitting two neural networks against each other.
2. **Core Idea:** The **Generator** creates fake data, while the **Discriminator** learns to tell real from fake; both improve through competition.
3. **Workflow:**
    - Generator starts producing random outputs
    - Discriminator evaluates and gives feedback
    - Both update weights to outperform each other
4. **Goal:** Make generated samples indistinguishable from real ones.
5. **Implementation Used:** Built a simple GAN to generate handwritten digits (MNIST dataset).
6. **Applications:** Image synthesis, style transfer, deepfakes, and creative content generation.
7. **Conclusion:** GANs allow AI systems not only to understand data but to create new, realistic data from noise.

Reflection (5–6 Lines)

I learned how two networks can compete to produce better and more realistic results.
Initially, balancing the training between generator and discriminator was difficult.
Seeing generated digits improve over epochs made the process clear and exciting.
It was fascinating to realize that random noise can evolve into meaningful images.
GANs revealed the creative potential of deep learning models.