DDIM - Fast Sampling

Part 4/7: Sampling

⚠ Problem

DDPM requires many steps (1000) for good quality

✅ Solution

DDIM uses deterministic, non-Markovian process

DDPM

- All timesteps (1000)
- Stochastic process
- Random noise added
- Slower generation

DDIM

⚡ 20x Speedup

- ✓ Subset only (e.g., 50 steps)
- ✓ Deterministic ($\sigma_t = 0$)
- ✓ Skip: $\tau = [1,20,40,\ldots,1000]$
- ✓ Comparable quality

📐 DDIM Update Formula

$$x_{t-1} = \sqrt{\bar{\alpha}_{t-1}} \cdot \hat{x_0} + \sqrt{(1-\bar{\alpha}_{t-1})} \cdot \hat{\epsilon}_t$$

⚖ Trade-off: Can interpolate between DDPM and DDIM for speed-quality balance