

# DDPM Sampling

Part 4/7: Sampling

## 1 Initialize from Pure Noise

$$\mathbf{x}_T \sim N(0, \mathbf{I})$$



## Iterative Denoising

$t = T, T-1, \dots, 1$

### ① Predict Noise

$$\hat{\epsilon} = \epsilon_{\theta}(\mathbf{x}_t, t)$$

### ② Compute Mean

$$\mu_{\theta}(\mathbf{x}_t, t)$$

### ③ Sample Noise

$$z \sim N(0, \mathbf{I}) \text{ if } t > 1, \text{ else } z = 0$$

### ④ Update State

$$\mathbf{x}_{\{t-1\}} = \mu_{\theta}(\mathbf{x}_t, t) + \sigma_t \cdot z$$

## 3 Final Output

$\mathbf{x}_0$  is the generated sample



Time Complexity:  $O(T)$  forward passes • Typically  $T = 1000$