Cumulative Effect

Part 2/7: Forward Process

✨ Closed Form Solution

Jump directly from x_0 to any x_t without iterating through all steps

✗ Iterative (Slow)

Need all intermediate steps

✓ Direct Sampling (Fast)

One-step computation

Mathematical Formulation

Alpha definitions:

$$\alpha_t = 1 - \beta_t$$

Cumulative product:

$$\bar{\alpha}_t = \prod_{i=1}^{t} \alpha_i$$

Direct Sampling Formula:

$$x_t = \sqrt{\bar{\alpha}_t} \cdot x_0 + \sqrt{(1-\bar{\alpha}_t)} \cdot \varepsilon$$

Efficient Training

Signal-to-Noise Control

Reparameterization