

A horizontal row of 15 empty square boxes, each with a black border, intended for drawing or writing.

Diffusion probabilistic Model

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1. 亂数生成
 2. ノイズ付与
◦ Denoise \rightarrow ノイズ予測器 \rightarrow step



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VAE



$q(z_t | z_{\{t-1\}})$ $p(z_t | z_{\{t-1\}})$

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%% $ p(x,z_1,z_2,\dots,z_T) = p(x,z_{1:T}) = p(z_T)p_{\theta}(z_{1:T}|z_t) $$

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\begin{aligned}
& \mathbb{E}[\phi(z_{1:T})] = \mathbb{E}[\phi(z_1) \dots \phi(z_T)] = \mathbb{E}[\phi(z_1)] \dots \mathbb{E}[\phi(z_T)] = q_\phi(z_1) \dots q_\phi(z_T) \\
& = \prod_{t=1}^T q_\phi(z_t) = \prod_{t=1}^T \int p(x_t | z_{1:t-1}) q_\phi(z_t) dz_t = \int p(x_{1:T}) q_\phi(z_{1:T}) dz_{1:T}
\end{aligned}

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$\square \square \square \$x\$ \square \$z\$ \square \square \square \$x_t\$ \square \square \square \square \square$

10

A horizontal row of twelve empty rectangular boxes, likely used for input fields or placeholder text in a form.

$\prod_{t=1}^T p(x_t | O; \theta) = q(x_0 | O) \prod_{t=1}^T q(x_t | x_{1:t-1}, O)$

$\prod_{t=1}^T p(x_t | \theta) = \prod_{t=1}^T p(x_t | f_{t-1}, \theta)$

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□□□□(ELBO)

VAE \$p(x_0) = \int p(x_{0:T}) dx_{1:T} = \text{ELBO}\$

$$\begin{aligned} & \ln p(x_0) = \ln \left(\int p(x_{0:T}) dx_{1:T} \right) \\ & \ln \left(\int p(x_{0:T}) dx_{1:T} \right) = \ln \left(\int p(x_{0:T}) dx_{1:T} \right) \end{aligned}$$

ELBO

- $\$mathbb{E}\{q(x\{1\}|x_0)\}[\ln\{p_{\theta}(x_0|x_1)\}]$ VAE
 $x_1\$mathbb{E}\{q(x\{1\}|x_0)\}$
 $x_1\$mathbb{E}\{q(x\{1\}|x_0)\}$
 - $\$mathbb{E}\{q(x\{T-1\}, x_T|x_0)\}[\ln\{\frac{p(x_T)}{q(x_T|x_{T-1})}\}]$ VAE
 $\dots\$mathbb{E}\{q(x\{T-1\}, x_T|x_0)\}$

- $\sum_{t=1}^{T-1} \mathbb{E} \{ q(x_{t-1}, x_t, x_{t+1} | x_0) \} \left[\ln \frac{p_{\theta}}{q(x_t | x_{t-1})} \right] - KL(p_{\theta} || q(x_t | x_{t-1}))$

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- 亂數生成器
亂數
 - 亂數生成器
亂數
 - 亂數生成器
亂數
DDPI
 - 亂數生成器VAE
亂數生成器VAE
 - 亂數生成器MCMC
亂數生成器

Denoising Diffusion Probabilistic Models(DDPM)

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1. $q(x_0) \propto \text{Uniform}(x_0, x_{0+})$
 2. $t \sim \text{Uniform}\{1, \dots, T\}$
 3. $N(0, \epsilon)$
 4. $\|\nabla \theta(\epsilon_t) - \theta(\epsilon_t)\| = \sqrt{\alpha_t} \|x_0 + \sqrt{1-\alpha_t} \epsilon_t\|^2$
 - $\alpha_t \propto \text{Uniform}(0, 1)$
 - $x_0 \sim \text{Uniform}(0, 1)$



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1. $\overline{\alpha_t} = \frac{1}{\sqrt{1-\alpha_t}} X_T$
 2. $\overline{\alpha_t} = \frac{1}{\sqrt{1-\alpha_t}} z$
 3. $x_{t-1} = \frac{1}{\sqrt{\alpha_t}} (\bar{x}_t - \frac{1-\alpha_t}{\sqrt{1-\alpha_t}} \overline{\alpha_t}) + \sigma_t z$
 - x_{t-1} is $t-1$ th observation
 - $\alpha_t, \overline{\alpha_t}$ are t th observations
 - ϵ_t is t th error term

