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● $G = (\circ, G)$

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● X

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● X

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● $G = G_1 \times \dots \times G_n$

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- $G_i X_i X_{j \neq i}$

- \rightarrow

- GG_i

- $f : X \mapsto Z$

$$\begin{array}{ccc} X & \xrightarrow{G} & X \\ f \downarrow & & f \downarrow \\ Z & \xrightarrow{G} & Z \end{array}$$

- $\rightarrow g \cdot f(x) = f(g \cdot x)$

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- $Z = Z_1 \times \dots \times Z_n$
- $Z_i G_i X$
- $Z_i G_{j \neq i}$

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- $G = G_{sequence} \times G_{segment}$
- $Z = (z_1, z_2)$
- $z_1 z_2$
- $f : W \mapsto Z z_2 G_{sequence}$

$$\mathcal{L}(\theta, \phi, X) = \sum_{n=1}^N \underbrace{\mathcal{L}(\theta, \phi; x^{(n)} | \mu_2) + \log p_{\theta}(\mu_2) + \text{const.}}_{\text{brown}} + \underbrace{\alpha \cdot \log (i | z_2^{(i,n)})}_{\text{blue}}$$

$$\begin{aligned} \mathcal{L}(\theta, \phi; x^{(n)} | \mu_2) &= \mathbb{E}_{q_{\phi}(z_1^{(n)}, z_2^{(n)} | x^{(n)})} \left[\log p_{\theta}(x^{(n)} | z_1^{(n)}, z_2^{(n)}) \right] \\ &\quad - \mathbb{E}_{q_{\phi}(z_2^{(n)} | x^{(n)})} \left[D_{KL}(q_{\phi}(z_1^{(n)} | x^{(n)}, z_2^{(n)}) || \underbrace{p_{\theta}(z_1^{(n)})}_{\text{brown}}) \right] \\ &\quad - D_{KL}(q_{\phi}(z_2^{(n)} | x^{(n)}) || \underbrace{p_{\theta}(z_2^{(n)} | \mu_2)}_{\text{brown}}) \end{aligned}$$

$$\log (i | z_2^{(i,n)}) = \log p(z_2^{(i,n)} | \mu_2^{(i)}) - \log \left(\sum_{j=1}^M p(z_2^{(i,n)} | \mu_2^{(j)}) \right)$$

μ_2

○ μ_2

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$g(\text{sequence id}) = \mu_2$

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$$\begin{aligned}
\mathcal{L}(\theta, \phi, X) = & \underbrace{\log p(x|z_1, z_2)}_{z_1} \\
& - \underbrace{D_{KL}(\mathcal{N}(\mu_{z_1}, \sigma_{z_1}) || \mathcal{N}(0, 1))}_{z_1} \\
& - \underbrace{D_{KL}(\mathcal{N}(\mu_{z_2}, \sigma_{z_2}) || \mathcal{N}(\mu_2, 0.5))}_{z_2 \mu_2} \\
& + \underbrace{\log p(\mu_2) \cdot \frac{1}{seq. length}}_{\mu_2}
\end{aligned}$$

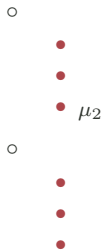
$$\log p(\text{sequence id}^{(i)} | z_2^{(i,n)}) = \log \frac{p(\mu_{z_2}^{(i,n)} | \mu_2^{(i)})}{\sum_{j=1}^{num\ seqs} p(\mu_{z_2}^{(i,n)} | \mu_2^{(j)})}$$

- $z_2^{(i)} \mu_2^{(i)}$
- $\mu_2^{(j \neq i)}$

$$\mathcal{L}^{dis}(\theta, \phi; x) = \mathcal{L}(\theta, \phi, X) + \alpha \cdot \log p(\text{sequence id} | z_2)$$

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- $\mu_1 z_1$

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