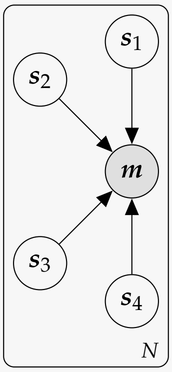

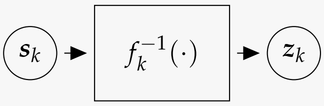

$$\mathbf{s} = [\boldsymbol{s}_1, \ldots, \boldsymbol{s}_N]^T \in \mathbb{R}^{N \times T}$$
$$\mathbf{m} = f(\boldsymbol{s}) \in \mathbb{R}^{1 \times T}$$

$$g : \mathbb{R}^{1 \times T} \mapsto \mathbb{R}^{N \times T}$$
$$g(\boldsymbol{m}) \approxeq \boldsymbol{s}$$

$$\arg\max_{\boldsymbol{\theta}} p_{\boldsymbol{\theta}}(\boldsymbol{s}_1, \ldots, \boldsymbol{s}_N | \boldsymbol{m})$$

$$\log p(\boldsymbol{m}) = \mathbb{E}^N_{q_{\boldsymbol{\phi}_k}(\boldsymbol{s}_k|\boldsymbol{m})}\left[\log p(\boldsymbol{m})\right] \tag{1}$$
$$= \mathbb{E}^N_{q_{\boldsymbol{\phi}_k}(\boldsymbol{s}_k|\boldsymbol{m})}\left[\log \frac{p(\boldsymbol{m}, \boldsymbol{s}_1, \ldots, \boldsymbol{s}_N)}{p(\boldsymbol{s}_1, \ldots, \boldsymbol{s}_N|\boldsymbol{m})}\right] \tag{2}$$
$$= \mathbb{E}^N_{q_{\boldsymbol{\phi}_k}(\boldsymbol{s}_k|\boldsymbol{m})}\left[\log \frac{p(\boldsymbol{m}|\boldsymbol{s}_1, \ldots, \boldsymbol{s}_N) \cdot \prod_k^N p(\boldsymbol{s}_k)}{\prod_k^N q_{\boldsymbol{\phi}_k}(\boldsymbol{s}_k|\boldsymbol{m})} + \log \frac{\prod_k^N q_{\boldsymbol{\phi}_k}(\boldsymbol{s}_k|\boldsymbol{m})}{p(\boldsymbol{s}_1, \ldots, \boldsymbol{s}_N|\boldsymbol{m})}\right] \tag{3}$$
$$\geq \sum_k^N \mathbb{E}_{q_{\boldsymbol{\phi}_k}(\boldsymbol{s}_k|\boldsymbol{m})}\left[\log \frac{p(\boldsymbol{s}_k)}{q_{\boldsymbol{\phi}_k}(\boldsymbol{s}_k|\boldsymbol{m})}\right] + \mathbb{E}_{q_{\boldsymbol{\phi}_k}(\boldsymbol{s}_k|\boldsymbol{m})}\left[p(\boldsymbol{m}|\boldsymbol{s}_1, \ldots, \boldsymbol{s}_N)\right] \tag{4}$$

$$p(\boldsymbol{m}, \boldsymbol{s}_1, \ldots, \boldsymbol{s}_N) \equiv p(\boldsymbol{m}|\boldsymbol{s}_1, \ldots, \boldsymbol{s}_N) \cdot \prod_k^N p(\boldsymbol{s}_k)$$

$$\mathbf{s}^{(t+1)} = \boldsymbol{s}^{(t)} + \eta \cdot \nabla_s \left(\log p(\boldsymbol{s}^{(t)}) + \frac{1}{2\gamma^2}\|\boldsymbol{m} - g(\boldsymbol{s}^{(t)})\|^2\right) + 2\sqrt{\eta}\epsilon_t$$

$$\hat{\mathbf{s}}_k \sim q_{\boldsymbol{\phi}_k}(\boldsymbol{s}_k|\boldsymbol{m})$$

$$\mathcal{L}(\boldsymbol{\phi}, \boldsymbol{m}) = \sum_k^N \mathbb{D}_{\mathrm{KL}}\left[q_{\boldsymbol{\phi}_k}(\boldsymbol{s}_k|\boldsymbol{m}) \| p(\boldsymbol{s}_k)\right] + \left(\frac{1}{N}\sum_k^N \hat{\mathbf{s}}_k - \boldsymbol{m}\right)^2$$