1. Data: Hamiltonian system
$$\mathcal{H}(q,p) = p^2/2 + (1-\cos(q))$$

$$\mathcal{D} = \{q_i, p_i, \dot{q}_i, \dot{p}_i\}_{i=1}^K$$

2. Initial approximation (U-SWIM)

$$\widehat{\mathcal{H}}(q,p) = W_{L+1}\Phi^{(L)}(q,p) + b_{L+1}$$

$$\{W_l, b_l\}_{l=1}^L \quad \{W_{L+1}, b_{L+1}\}$$

$$q \quad \widehat{\mathcal{H}}$$

$$\{W_l, b_l\}_{l=1}^L \text{ are sampled (unsupervised)}$$

$$\{W_{L+1}, b_{L+1}\} = \arg\min \mathcal{L}(\nabla \Phi^{(L)}, \mathcal{D})$$

3. Resample using $\mathcal{H}(q,p)$ (A-SWIM) $W_{L+1}\Phi^{(L)}(q,p) + b_{L+1} \approx \mathcal{H}(q,p)$ $\{W_l, b_l\}_{l=1}^L \setminus \{W_{L+1}, b_{L+1}\}$ $\{W_l, b_l\}_{l=1}^L$ are SWIM-sampled

 $\{W_{L+1}, b_{L+1}\} = \arg\min \mathcal{L}(\nabla \Phi^{(L)}, \mathcal{D})$