

$$\mathcal{L}_{\text{Bal}} = \alpha \sum_{i=1}^{N_r} f_i P_i,$$

$$f_i = \frac{N_r}{K_r T} \sum_{t=1}^T \mathbb{1} \left(s_{i,t} \in \text{Topk}(\{s_{j,t} | 1 \leq j \leq N_r\}, K_r) \right),$$

$$s'_{i,t} = \frac{s_{i,t}}{\sum_{j=1}^{N_r} s_{j,t}},$$

$$P_i = \frac{1}{T} \sum_{t=1}^T s'_{i,t},$$