$|\mathbf{v}_k'| = \left[\Gamma^{\pm}[\mathbf{v}_k; \zeta_{\mathbf{v}_k}]
ight]$ 2. Update **half** of **x** via $\overline{m}_k \odot \mathbf{x}_k$:

1. Update **v**:

Invertible NN

$$egin{aligned} \mathbf{x}_k' &= m_k \odot \mathbf{x}_k + ar{ar{m}}_k \odot oldsymbol{\Lambda}^{\pm} \left[ar{\mathbf{x}}_k; \zeta_{ar{\mathbf{x}}_k}
ight] \end{aligned}$$

3. Update (other) **half** of **x** using $m^k \odot \mathbf{x}'_k$:

S. Update (other) half of
$$\mathbf{x}$$
 using $m^k \odot \mathbf{x}_k'$:
$$\mathbf{x}_k'' = \overline{m}^k \odot \overline{\mathbf{x}}_k' + m^k \odot \overline{\Lambda}^{\pm} \left[\mathbf{x}_k'; \zeta_{\mathbf{x}_k'} \right]$$

$$\mathbf{x}_k'' = \overline{m}^k \odot \overline{\mathbf{x}}_k' + m^k \odot \Lambda^{\perp} [\mathbf{x}_k'; \zeta_{\mathbf{x}_k'}]$$
4. Half-step full \mathbf{v} update:
 $\mathbf{v}_k'' = \Gamma^{\pm}[\mathbf{v}_k'; \zeta_{\mathbf{v}_k'}]$