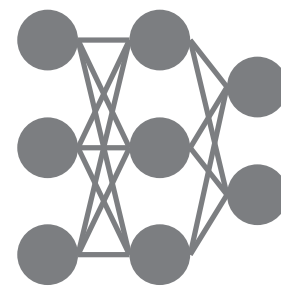


$$\begin{aligned} \min_{x \in \mathbb{R}, y \in \mathbb{Z}} \quad & (a - x)^2 + 50(y - x^2)^2 \\ \text{s.t.} \quad & y \geq \frac{1}{2}b, x^2 \leq b, x \leq 0, y \geq 0 \end{aligned}$$



Relaxed Solution Mapping

$$\pi_{\Theta_1}(a, b)$$

Input: $a = 3.83, b = 6.04$

Rounding Classification

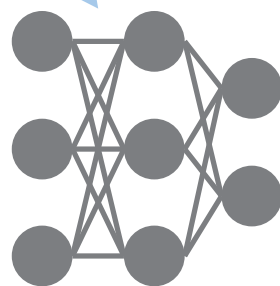
$$\varphi_{\Theta_1}(a, b, \bar{x}, \bar{y})$$

Hidden State:

$$h_x = -0.68, h_y = 9.49$$

Relaxed Solution:

$$\bar{x} = -1.17, \bar{y} = 2.98$$



Neural Network $\delta_{\Theta_2}(a, b, \bar{x}, \bar{y})$

Update Continuous Var:

$$\hat{x} = \bar{x} + h_x = -1.85$$

Round Integer Var:

$$\begin{aligned} \text{Gumbel_Sigmoid}(h_y) &\geq 0 \\ \rightarrow \hat{y} &= [\bar{y}] = 3 \end{aligned}$$

Mixed-Integer Solution: $\hat{x} = -1.85, \hat{y} = 3$

Loss Function: $\mathcal{L}_{Obj} + \lambda \cdot \mathcal{L}_{Viol}$