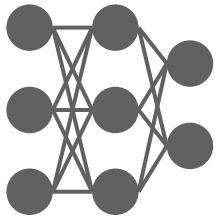
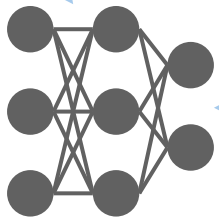
$$\min_{x\in\mathbb{R},y\in\mathbb{Z}} (a-x)^2 + 50(y-x^2)^2$$
$$s.t.\ y \geq \frac{1}{2}b, x^2 \leq b, x \leq 0, y \geq 0$$



Relaxed Solution Mapping $\pi_{\Theta_1}(a,b)$

Input: $a = 3.83, b = 6.04$

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



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

Hidden State: $h_x = -0.68, h_y = 9.49$

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

Update Continuous Var: $\hat{x} = \bar{x} + h_x = -1.85$

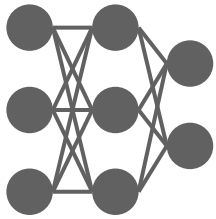
Round Integer Var: $\text{Gumbel\_Sigmoid}(h_y) \geq 0 \rightarrow \hat{y} = \lceil \bar{y} \rceil = 3$

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

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

$$\min_{x\in\mathbb{R},y\in\mathbb{Z}} (a-x)^2 + 50(y-x^2)^2$$

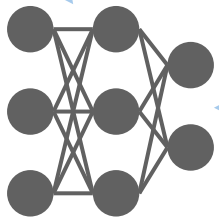
$$s.t.\ y \geq \frac{1}{2}b, x^2 \leq b, x \leq 0, y \geq 0$$



Relaxed Solution Mapping
$\pi_{\Theta_1}(a,b)$

Input: $a = 3.83, b = 6.04$

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



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

Hidden State:
$h_x = -0.69, h_y = -1.84$

Relaxed Solution:
$\bar{x} = -1.14, \bar{y} = 3.09$

Update Continuous Var:
$\hat{x} = \bar{x} + h_x = -1.83$

Round Integer Var:
$v = \text{Sigmoid}(h_y) = 0.14$
$\bar{y} - \lfloor\bar{y}\rfloor < v \rightarrow \hat{y} = \lfloor\bar{y}\rfloor = 3$

Mixed-Integer Solution: $\hat{x} = -1.83, \hat{y} = 3$

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