

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

**Input:**  $a = 3.83, b = 6.04$

**Solution Mapping  $\pi_{\Theta_1}$**   
as Continuous Relaxation

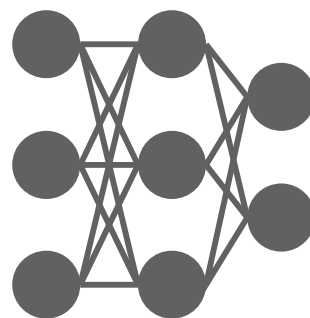
**Correction Layers  $\varphi_{\Theta_2}$**

**Hidden State:**

$$h_x = -0.69, h_y = -1.84$$

**Relaxed Solution:**

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



Neural Network  $\delta_{\Theta_2}$

**Update Continuous Var:**

$$\hat{x} = \bar{x} + h_x = -1.83$$

**Round Integer Var:**

$$v = \text{Sigmoid}(h_y) = 0.14$$

$$\bar{y} - \lfloor \bar{y} \rfloor < v \rightarrow \hat{y} = \lfloor \bar{y} \rfloor = 3$$

**Loss Function**