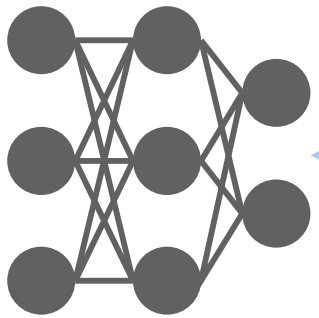
$$\min_{x\in\mathbb{R},y\in\mathbb{Z}} (a-x)^2 + 50(y-x^2)^2$$

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

Solution Mapping π_{Θ_1}
as Continuous Relaxation

Input: $a = 3.83, b = 6.04$



Neural Network φ_{Θ_2}

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:
$v = \text{Sigmoid}(h_y) = 0.14$
$\bar{y} - \lfloor \bar{y} \rfloor < v \rightarrow \hat{y} = \lceil \bar{y} \rceil$

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