$$\{\boldsymbol{w}_y^* \mid y \in \mathcal{Y}\} = \underset{\{\boldsymbol{w}_y \in \mathbb{R}^n \mid y \in \mathcal{Y}\}}{\operatorname{argmin}} \left[\frac{1}{2} \sum_{y \in \mathcal{Y}} \|\boldsymbol{w}_y\|^2 + C \sum_{i=1}^{m} \max_{y \in \mathcal{Y}} \Big([\![y \neq y_i]\!] + \langle \boldsymbol{w}_y - \boldsymbol{w}_{y_i}, \boldsymbol{x}_i \rangle \Big) \right]$$

$$\{(\boldsymbol{x}_1, y_1), \ldots, (\boldsymbol{x}_m, y_m)\} \in (\mathbb{R}^n \times \mathcal{Y})^m$$

$$\mathcal{Y} = \{1, \ldots, Y\}$$

$$\{\boldsymbol{w}_y^* \mid y \in \mathcal{Y}\}$$

$$f(\boldsymbol{x}) = \operatorname{sgn}\left(\langle \boldsymbol{w}^*, \boldsymbol{x} \rangle\right)$$

$$\langle \boldsymbol{w}^*, \boldsymbol{x} \rangle$$

$f(\boldsymbol{x}) = \operatorname{argmax}_{y \in \mathcal{Y}} \langle \boldsymbol{w}_y^*, \boldsymbol{x} \rangle$