Probabilistic Constraints $C - SVC$: TP2

Let $(X_i, y_i),\ i = 1, \dots, n$ such that: $n \in \{20{,}50{,}100\}$

- $X_i = (X_i^1, X_i^2)^T,\ i = 1, \dots, n$:
- $y_i = \begin{cases} 1 & i = 1, \dots, m \\ -1 & i = m+1, \dots, n \end{cases}$

- For $i = 1, \dots, m$, you randomply generate $n_i = 30$ samples for any of
  - $X_i^1 \sim \mathcal{U}(a_i, b_i)$ where $a_i \in \,]1{,}2[, b_i \in \,]2{,}3[$
  - $X_i^2 \sim \mathcal{U}(c_i, d_i)$ where $c_i \in \,]2{,}3[, d_i \in \,]3{,}4[$
- For $i = m+1, \dots, n$, you randomply generate $n_i = 30$ samples for any of
  - $X_i^1 \sim \mathcal{U}(a_i', b_i')$ where $a_i' \in \,]2{,}3[, b_i' \in \,]3{,}4[$
  - $X_i^2 \sim \mathcal{U}(c_i', d_i')$ where $c_i' \in \,]1{,}2[, d_i' \in \,]2{,}3[$
- Compute $\bar{x}_i = \left(\frac{1}{n_i}\sum_{k=1}^{n_i} x_{ik}^1, \frac{1}{n_i}\sum_{k=1}^{n_i} x_{ik}^2\right)^T = (\bar{x}_i^1, \bar{x}_i^2)^T,$
- Consider $C = 200$ $a = 2$, and $p_i \in \{0{,}9; 0{,}8{,}0{,}7; 0{,}6; 0{,}5; 0{,}4; 0{,}3; 0{,}2; 0{,}1\}$
- Solve the optimization problem ($D - SVC$ or C$-SVC$) and contruit :

  the separating hyperplane $h_{w^*,b^*}(x) = (w^*)^T x + b^*$