Tik-61.231 Principles of Pattern Recognition

Exercise 5: 23.10.2000

1. Prove that given $O(N, l)$ is the number of groupings that can be formed by $(l-1)$ dimensional hyperplanes to separate the N points into two classes, taking all possible combinations

$$O(N, l) = 2 \sum_{i=0}^{l} \binom{N-1}{i}$$

2. Prove that the marginal between the hyperplanes H_1 and H_2 in the Support Vector Machine (SVM) method is $\frac{2}{||w||}$.

3. Formulate the SVM Dual problem with constraints for the not linearly separable case shown in the picture below, with vectors $x_1 = [1\ 1]^T \in \omega_1$, $x_2 = [2\ 1]^T \in \omega_2$, $x_3 = [3\ 2]^T \in \omega_1$, $x_4 = [2\ 3]^T \in \omega_2$.