

MLCV: Programming Assignement 1

Mohamed N'AITN'BARK

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1 Linear regression versus logistic regression:

After training linear regression and logistic regression on our dataset, we get the following results:

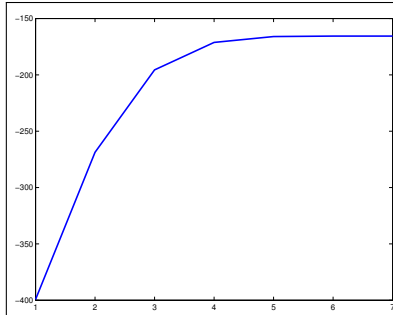


Figure 1: Log likelihood at each iteration of the maximization algorithm. The curve suggest that we have convergence.

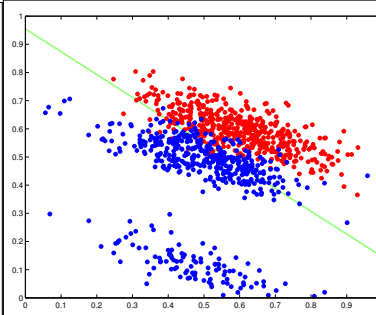


Figure 2: Linear regression: the linear regression is affected by the blue points located far from the boundary area. Misclassification error: 11%.

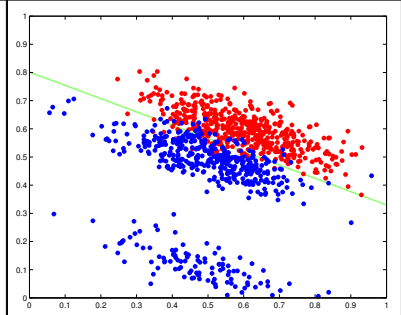


Figure 3: Logistic regression: logistic regression is robust as it is not affected by points far from the boundary area, this is due to the saturation property of the function sigmoid. Misclassification error: 6,4%.

2 Logistic regression and regularization

The gradient and hessian of the regularized score function are given by: $J_r(w) = J(w) - 2\lambda w$ and $H_r(w) = H(w) - 2\lambda I$ where $J(w)$ and $H(w)$ are the gradient and hessian in the non regularized case. In order to find the value of λ that minimizes the classification error we use cross-validation. The number of errors committed on the test set after using the optimal value of $\lambda = \lambda^*$ is 49 out of 200.

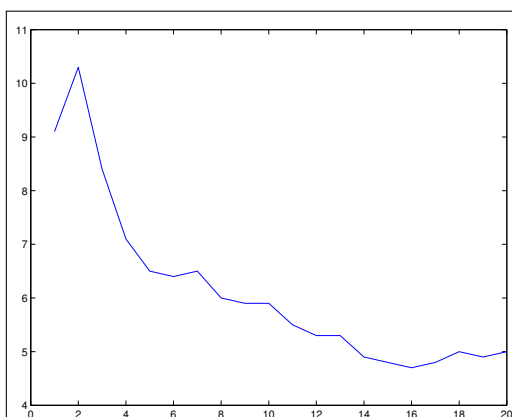


Figure 4: Missclassification error as a function of λ . The optimal value is $\lambda^* = 5,46$.

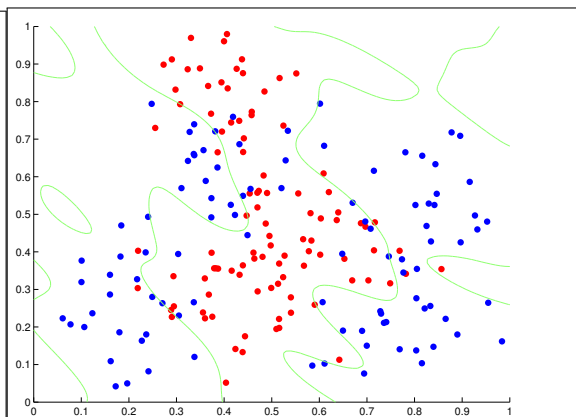


Figure 5: The data set and the classification boundary for $\lambda = \lambda^*$.