

## Lasso type classifiers with a reject option

Marten H. Wegkamp, *FSU*

### Abstract

We consider the problem of binary classification where one can, for a particular cost, choose not to classify an observation. We present a simple proof for the oracle inequality for the excess risk of structural risk minimizers using a lasso type penalty.

AMS 2000 subject classifications: Primary 62C05; secondary 62G05, 62G08.

Keywords: Bayes classifiers, classification, convex surrogate loss, empirical risk minimization, hinge loss, large margin classifiers,  $\ell_1$  penalties, local mutual coherence, margin condition, reject option, support vector machines.



Full Text: [PDF](#)

Wegkamp, Marten H., Lasso type classifiers with a reject option, *Electronic Journal of Statistics*, 1, (2007), 155-168 (electronic). DOI: 10.1214/07-EJS058.

## References

- [1] P.L. Bartlett and M.H. Wegkamp (2007). Classification with a reject option using a hinge loss. Technical report M980, Department of Statistics, Florida State University.
- [2] S. Boucheron, O. Bousquet and G. Lugosi (2004). Introduction to statistical learning theory. In *Advanced Lectures in Machine Learning* (O. Bousquet, U. von Luxburg, and G. Rätsch, Editors), 169–207. Springer, New-York.
- [3] S. Boucheron, O. Bousquet and G. Lugosi (2005). Theory of Classification: a Survey of Recent Advances. *ESAIM: Probability and Statistics*, 9:323-375. [MR2182250](#)
- [4] F. Bunea, A.B. Tsybakov and M.H. Wegkamp (2004). Aggregation for Gaussian regression. Technical Report M972, Department of Statistics, Florida State University. To appear in the *Annals of Statistics*.
- [5] F. Bunea, A.B. Tsybakov and M.H. Wegkamp (2006). Aggregation and sparsity via  $\ell_1$ -penalized least squares. *Proceedings of 19th Annual Conference on Learning Theory, COLT 2006. Lecture Notes in Artificial Intelligence*, 4005, 379–391. Springer-Verlag, Heidelberg. [MR2280619](#)
- [6] F. Bunea, A.B. Tsybakov and M.H. Wegkamp (2006). Sparsity oracle inequalities for the Lasso. Technical Report M979, Department of Statistics, Florida State University.
- [7] F. Bunea, A.B. Tsybakov and M.H. Wegkamp (2007). Sparse density estimation with  $\ell_1$  penalties. *Proceedings of 20th Annual Conference on Learning Theory, COLT 2007. Lecture Notes in Artificial Intelligence*, 4539, 530–543. Springer-Verlag, Heidelberg.
- [8] F. Bunea and M.H. Wegkamp (2004). Two-stage model selection procedures in partially linear regression. *Canadian Journal of Statistics*, 32(2), 105–118. [MR2064395](#)
- [9] C.K. Chow (1970). On optimum error and reject trade-off. *IEEE Transactions on*

- [10] L. Devroye and G. Lugosi (2000). Combinatorial Methods in density estimation. Springer, New York. [MR1843146](#)
- [11] R. Herbei and M. H. Wegkamp (2006). Classification with reject option. Canadian Journal of Statistics, 34(4), 709–721.
- [12] M. Ledoux and M. Talagrand (1991). Probability in Banach Spaces. Springer, New York. [MR1102015](#)
- [13] B. D. Ripley (1996). Pattern recognition and neural networks. Cambridge University Press, Cambridge. [MR1438788](#)
- [14] B. Tarigan and S. A. van de Geer (2006). Classifiers of support vector machine type with  $\ell_1$  complexity regularization. Bernoulli, 12(6), 1045–1076 [MR2274857](#)
- [15] A. B. Tsybakov (2004). Optimal aggregation of classifiers in statistical learning. Annals of Statistics, 32, 135–166. [MR2051002](#)
- [16] S.A. van de Geer (2000). Empirical processes in M-estimation. Cambridge Series in statistical and Probabilistic Mathematics. Cambridge University Press, Cambridge.
- [17] S.A. van de Geer (2006). High dimensional generalized linear models and the Lasso. Research report No.133. Seminar für Statistik, ETH.