

MA8701 Advanced methods in statistical inference and learning

Part 3: Ensembles. L14: Boosting

Mette Langaas

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Course homepage:

<https://wiki.math.ntnu.no/ma8701/2023v/start>

Before we start

Outline

Literature

- ▶ [ESL] The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Second Edition (Springer Series in Statistics, 2009) by Trevor Hastie, Robert Tibshirani, and Jerome Friedman. Ebook. Chapter 10.1-10.6, 10.9, 10.10, 10.12, (10.13 later), 16.1-16.2
- ▶ Video by Berent Lunde (link on Bb), covering Chapter 10 (in particular 10.10) and the Chen and Guestrin paper.
- ▶ Chen, T., & Guestrin, C. (2016). XGBoost: A Scalable Tree Boosting System. In Proceedings of the 22nd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (pp. 785–794). New York, NY, USA: ACM.
<https://doi.org/10.1145/2939672.2939785>. The mathematical notation is not in focus

Timeline

1997: Freund and Schapire: AdaBoost.M1 1995: Breiman
understand AdaBoost from different view : Gradient boosting

AdaBoost.M1

(10.1) Algorithm 10.1: AdaBost.M1

Figure 2: stump, 244-node tress, AdaBoost.M1

Forward Stagewise Additive Modelling with Exponential loss

(10.2-10.4)

Algorithm 10.2: Forward Stagewise Additive Modelling

Boosting trees

(10.9)

Regularization

(10.12)

References

- Breiman, Leo. 1996. "Bagging Predictors." *Machine Learning* 24: 123–40.
- Efron, Bradley, and Trevor Hastie. 2016. *Computer Age Statistical Inference - Algorithms, Evidence, and Data Science*. Cambridge University Press. <https://hastie.su.domains/CASI/>.
- Hastie, Trevor, Robert Tibshirani, and Jerome Friedman. 2009. *The Elements of Statistical Learning: Data Mining, Inference, and Prediction*. Vol. 2. Springer series in statistics New York. hastie.su.domains/ElemStatLearn.
- James, Gareth, Daniela Witten, Trevor Hastie, and Robert Tibshirani. 2013. *An Introduction to Statistical Learning*. Vol. 112. Springer.
- Ripley, Brian D. 1996. *Pattern Recognition and Neural Networks*. Cambridge University Press.