

# Support Vector Machine Model Selection Using Strangeness

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## Abstract

We investigate the issue of model selection and the use of the nonconformity (strangeness) measure in batch learning. Using the nonconformity measure we propose a new training algorithm that helps avoid the need for Cross-Validation or Leave-One-Out model selection strategies. We provide a new generalisation error bound using the notion of nonconformity to upper bound the loss of each test example and show that our proposed approach is comparable to standard model selection methods, but with theoretical guarantees of success and faster convergence. We demonstrate our novel model selection technique using the Support Vector Machine.

We find these results encouraging as it constitutes a much needed shift from costly model selection based approaches to a faster method that is competitive in terms of generalisation error. Furthermore, in relation to the work of Özögür-Akyüz et al. (In Press) we have presented a method that is 1) not restricted to SVMs and 2) can use measures other than the margin to make predictions. Therefore the nonconformity measure approach gives us a general way of choosing to make predictions, allowing us the flexibility to apply it to algorithms that are not based on large margins. In future work we aim to investigate the applicability of our proposed model selection technique to other learning methods. Another future research direction is to apply different nonconformity measures to the SVM algorithm presented in this paper such as, for example, a nearest neighbour nonconformity measure (Shafer & Vovk, 2008).

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<sup>1</sup><http://www.lestrum.org>

<sup>2</sup><http://www.pineview.eu>

## References

- Özögür-Akyüz, S., Hussain, Z., & Shawe-Taylor, J. (In Press). Prediction with the SVM using test point margins. *Annals of Information Systems, Special Issue on Optimization methods in Machine Learning*.
- Shafer, G., & Vovk, V. (2008). A tutorial on conformal prediction. *Journal of Machine Learning Research*, 9, 371–421.