Learning Theory Approach to the Adaptive Regularization with Case Studies Illustrations

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This talk is concerned with an adaptive regularization for addressing the problem of the function reconstruction inside/outside the scope of given data points. We analyze the state of the art methods and, by doing that, we show a need for a novel and a more sophisticated approach to a data-driven and a problem-oriented regularization.

We analyze the problem of the adaptive regularization in the framework of a meta-learning approach. The concept of meta-learning presupposes that the parameters of the algorithm are selected on the base of previous experience with similar learning tasks. Therefore, selection rules developed in this way are intrinsically problem-oriented. Moreover, meta-learning is very much dependent on the quality of data extracted from previous experience. In the literature [2] it is usually difficult obtaining good results since such data (meta-examples, meta-features) are, in general, very noisy. This gives a good reason for using regularization methods [1] in meta-learning, because these methods are aimed for treating noisy data. Despite the naturalness of this approach, the idea of a combination of meta-learning and regularization seems to be new.

In this way we have developed the Fully Adaptive Regularized Learning (FARL) approach [3, 4, 5, 6], which allows a dynamic adjustment of the unknown parameters to each particular input. The efficient applicability of the FARL-algorithm is demonstrated on the problem of prediction of the blood glucose levels of diabetic patients. The developed approach allows the construction of blood glucose predictors which, as it has been demonstrated in the extensive clinical trials, outperform the state of the art. Finally, we discuss the versatility and effectiveness of the proposed approach for other applications from diabetes therapy management.

REFERENCES