Master Thesis Topics in Machine Learning

Master Thesis at RISE SICS in Kista, working on fast inference, uncertainty and online learning.

We are looking for students with a strong background in Machine Learning (ML) to work on state of the art research issues. The topics on offer deal with using ML for large scale data. More specifically we will investigate the following three topics:

Fast inference in deep networks: As neural networks grow deeper and more complex fast inference is becoming increasingly harder. In this thesis we plan to investigate architectural and system improvements to deep networks with the aim of offering faster inference. See [1] for related work.

Uncertainty in decision trees: Decision trees have been one of the most succesfull algorithms for classification and regression. However, research has lagged behind in determining the uncertainty over predictions in trees. This thesis will investigate various approaches in calculating uncertainty for decision trees. See [2] for related work.

Efficient online trees in high-dimensions: Mondrian Forests [3] have been recently proposed as an efficient algorithm for online decision trees, grounded in the non-parametric Mondrian process. However, they struggle in high dimensionality settings, and especially in the presence of irrelevant features. This thesis will investigate possible solutions that allow to scale Mondrian Forests to high dimensions while keeping their scalability.

Students are encouraged to propose their own topics on statistical learning as well.

Please contact
Theodore Vasiloudis
PhD Candidate, KTH
Researcher, RISE SICS
e-mail: tvas@sics.se

[1] Bolukbasi, T., Wang, J., Dekel, O. & Saligrama, V. (2017). *Adaptive Neural Networks for Efficient Inference*. Proceedings of the 34th International Conference on Machine Learning, in PMLR 70:527-536

[2] U. Johansson, C. Sönströd, H. Linusson and H. Boström, "Regression trees for streaming data with local performance guarantees," 2014 IEEE International Conference on Big Data (Big Data), Washington, DC, 2014, pp. 461-470.

[3] Balaji L., Daniel M. R., and Yee Whye Teh. 2014. Mondrian forests: efficient online random forests. In Proceedings of the 27th International Conference on Neural Information Processing Systems - Volume 2 (NIPS'14),

ID: 1616