Aalto University
School of Science

School of Science
http://sci.aalto.fi/en/

Dissertation press release 2.11.2018

Advanced machine learning methods are able to tune/calibrate and regularize complex models in nature and technological systems

Title of the dissertation	Training methods for climate and neural network models
Contents of the dissertation	When modeling complex phenomena in nature and in technological systems, one is often faced with the task of tuning/calibrating the models. In such cases, there typically exists a need for model parameter (and/or meta-parameter) value tuning for more effective modeling performance. Often such cannot be done manually, and in the machine learning approach, the tuning is done in an algorithmic and data-driven manner and is called model training. The thesis presents studies in which such methods are adopted, in the contexts of climate and artificial neural networks, and proposes novel techniques. One of the studies is on the suitability of a well-known machine learning method called Bayesian optimization (BO), for parametric tuning of chaotic systems such as climate and numerical weather prediction (NWP) models. The obtained results show that BO is a suitable method for such tuning tasks. A major desiderata for a trained machine learning model is the ability to generalize well to unseen data and thus the phenomena such as (so-called) under- and overfitting are to be avoided. In this context, adopting (so-called) regularization methods as part of the model training process has become a standard procedure. In this thesis, we introduce a regularization framework that is shown to have close connections with many existing state-of-the-art regularization approaches. An adversarial variant, derived from the proposed regularization framework, is used for solving a classification task, and the obtained results are compared to those of other regularization methods.
Field of the dissertation	Computer Science, Machine Learning
Doctoral candidate	Mudassar Abbas, M.Sc.(Tech.)
Time of the defence	15.11.2018 at 12 noon
Place of the defence	Aalto University School of Science, lecture hall AS2, Maarintie 8, Espoo
Opponent	Professor Jukka Heikkinen, University of Turku
Custos	Professor Kimmo Kaski, Aalto University School of Science, Department of Computer Science
Doctoral candidate's contact information	Mudassar Abbas, Department of Computer Science, tel.0504304773, mudassar.abbas@aalto.fi