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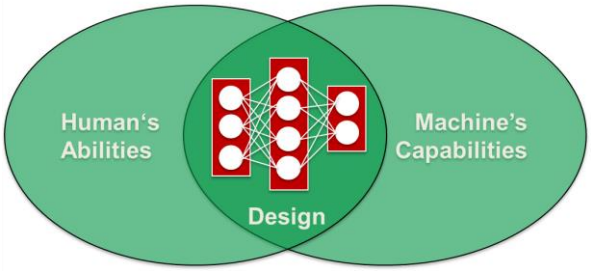
For our institute unit **Simulation and Software Technology** in **Braunschweig**, we wish to recruit a qualified

Master's Thesis

An Intelligent Cognitive Assistant for Architecting Deep Neural Networks

Your mission:

Machine learning (ML) is a popular approach to address problems involving complex datasets. ML algorithms detect patterns in data, which are otherwise very difficult for a human to identify. Data clustering, dimension reduction, and re-projection of high dimensional data (such that they are perceptible to a human) are some common ML applications. Analysis of satellite images, building a digital model of payload hardware from multi-sensory data, are some interesting machine learning research topics in the space-domain.



ML learning with deep neural networks is particularly interesting because of their ability to learn representation from dataset on their own. They are capable of building a generalized model through the data-space of a system without requiring explicit knowledge of the underlying physics. Neural network models are highly configurable to a specific problem through their model-parameters, so-called hyper-parameters. However, for the neural network model to perform well, it needs to be optimized for that particular task. The optimization of a neural network model is done by adjusting hyper-parameters to their optimum value. The optimum hyper-parameter value is highly dependent on the training set, network architecture, and the underlying problem. The search-space of an optimum hyper-parameter set is enormous therefore determining it manually is tedious and inefficient.

An Intelligent Cognitive Assistant (ICA) can be thought as a parallel system which is designed to help a human to perform a common task. Application of an ICA system is vast and very problem-centric. We are interested in an ICA system which aims to reduce/remove manual labor of designing neural network models as much as possible in order to solve a given problem.

Within this thesis, you will investigate hyper-parameters of neural networks in greater detail, which involves in understanding their role and measuring their effect and importance in the overall model design. Furthermore,

you will explore the data acquisition and data processing techniques with an ultimate goal of efficient neural network training. You will begin by understanding the hyper-parameters for the neural network models and their relationship. The next step could be to investigate the possibility of automatic detection of the cause-and-effect of hyper-parameters to the model's performance. Finally, you will conduct a feasibility study of an ICA system for designing neural network models.

Your qualifications:

- Master student in Computer Science or similar
- Good knowledge in programming, especially in Python
- General knowledge of neural network frameworks in Python (eg: Tensorflow, Keras, Pytorch)
- Motivated and self-reliant team-player

Your benefits:

Look forward to a fulfilling job with an employer who appreciates your commitment and supports your personal and professional development. Our unique infrastructure offers you a working environment in which you have unparalleled scope to develop your creative ideas and accomplish your professional objectives.
Disabled applicants with equivalent qualifications will be given preferential treatment.
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