Seminar Description

"Intelligent Designs for Machine Learning"

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Language: English, but written reports in German will be accepted.

The seminar will be offered in every semester (i.e., in both WiSe and SoSe).

Abstract: Recent innovations in Deep Neural Networks (DNNs) provided us with breakthroughs in many Artificial Intelligence (AI) domains in which the error rate of some applications such as image and voice recognition has substantially dropped to merely 3% and even less. However, such great improvements in the accuracy of DNNs came with an immense increase in computation demands. Therefore, Neural Processing Units (NPUs) are becoming an integral part in all modern computing systems due to their big role in accelerating the training and inference of DNNs. In order to increase the efficiency of NPUs, several intelligent architectures and designs have been recently proposed. For instance, approximate computing in DNNs is rapidly emerging as a very attractive solution to trade-off accuracy with efficiency.

State-of-the-art scientific publications from the following fields will be covered:

- Recent Architectures for Neural Processing Units from Google and Samsung.
- Reliability and Temperature Challenges in Deep Neural Networks (DNNs).
- Low-Power Techniques to Implement Efficient Deep Neural Networks (DNNs).
- Hardware Accelerators for Deep Neural Networks (DNNs).
- Approximate Computing Methods in Machine Learning.

The following requirements are planned for the seminar:

- A 30-minute oral presentation in English.
- One set of presentation slides (PowerPoint, Latex, PDF, Open Office, etc.).
- A written report on the topic in Latex or Word. The report must be between 8 to 10 pages summarizing the research papers that the student studied. The report can be in German or English (student's choice).
- Attendance at the presentations of other participants, attendance at the regular meetings during the semester, and active participation in the discussions.

A detailed seminar description will be distributed in the first meeting (preliminary discussion), which contains the exact requirements for the presentation and the written report. This description will also contain a list of topics and list of research

papers, which the students are requested to read. The deadlines will also be discussed and decided in the first meeting.