# Master's Thesis

Machine Learning-based Resource Management for Many-Core Processors

Driven by the ever-increasing performance demand, multicore processors have emerged enabling concurrent computations on a single chip. To exploit the available multicore processors, multiple applications with parallel threads are simultaneously executed on the chip. To optimize for performance in multi-cores, it is necessary to employ resource management techniques that manage the resources of the chip by allocating cores to applications and/or upscaling the voltage and frequency levels of the cores to increase their speeds. While such potential decisions of resource management improve the performance, they may, unfortunately, elevate the on-chip temperatures, which have negative impacts on the reliability of the processor.

The most relevant research question in this project is how to maximize the performance of the multicore processors under a temperature constraint. **Supervised machine learning** algorithms (e.g., with **neural networks**) can be used to make predictions about the system and application behavior. Alternatively, **reinforcement learning** can be applied to learn the optimal actions of the resource management to satisfy the targeted goal. Another related question to this research project is to make the machine learning-based resource management **scalable** with the growing number of cores. Such open research questions shall be investigated and addressed in this thesis. We are currently working with **tensorflow** and **keras**, but you are free to use your favorite machine learning library.
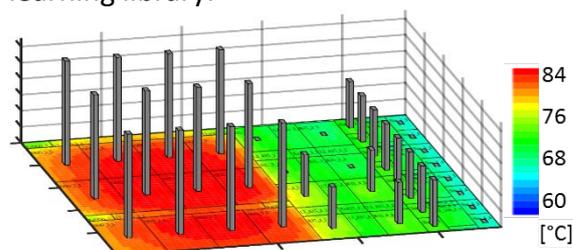
Multicore chip

Skills acquired with the thesis
- Learning research basics
- Good understanding of resource management & their impact on performance
- Employing your machine learning background to solve real-world problems

Skills required for the master thesis
- Programming skills (C++, Python)
- Sufficient English writing skills
- Background in Machine Learning, preferably neural networks

Language
The collaboration with the colleagues is in English or German.

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