

Semester Thesis:

Neural Network System-on-a-Chip for Acoustic Sensing

Motivation and Informal Description: We have built a prototype wireless acoustic emission sensing platform [1] for the monitoring of alpine rock walls [2]. Since the device is battery-powered, its energy efficiency is of paramount importance. The current prototype uses a microcontroller to characterize the sensed acoustic event, and to communicate the event to a remote base station using a wireless sensor node. Instead of transmitting every event to the base station it is desirable to transmit only acoustic events classified as important, thus reducing transmission and improving the energy efficiency. We are developing novel, Deep Neural Network-based algorithms to detect and classify acoustic events. The aim of this semester thesis is to evaluate a novel ultra-low power system-on-a-chip, which can be used analyze events on a sensor node.



Your project: For this semester thesis, which is a collaboration between TIK and IIS, you will use the Movidius Myriad 2 Vision Processing Unit [3] and implement an existing Deep Neural Network with varying complexities on the Myriad 2 reference board. You will learn about neural networks and low-power embedded design. Finally, you will evaluate the performance and power dissipation for your implementations.

Requirements: You should have experience with C/C++, embedded system programming and signal processing. Knowledge on neural networks would be beneficial, but is not required. You should be highly motivated to work with a new software development kit and cutting edge technology.

Interested? Please have a look at <http://www.tec.ethz.ch/research.html> and contact us for more details!

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References

- [1] Acoustic Emission Sensing in Wireless Sensor Networks, J. Hunziker, et. al., ETH Master Thesis, 2011.
- [2] A Custom Acoustic Emission Monitoring System for Harsh Environments: Application to Freezing-induced Damage in Alpine Rock Walls, L. Girard, et. al., Geoscientific Instrumentation, Methods and Data, 2012.
- [3] Movidius Myriad 2, <http://www.movidius.com/solutions/vision-processing-unit>