**ETH**
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

**TIK** Institut für Technische Informatik
und Kommunikationsnetze
Computer Engineering and
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Semester/Master Thesis:

# Audio Compression for Acoustic Sensing

**Motivation** Wireless sensor networks (WSN) with acoustic sensors can be used for acoustic event detection in environmental monitoring, e.g. for bird detection or hazard warning systems [1]. Since these devices are battery-powered, their energy efficiency is of paramount importance. The transmission of audio data through a WSN has a big impact on the energy budget due to its high data rate. Most acoustic event detection algorithms, however, rely on a continuous audio stream and are often deployed on the monitoring server. An example are novel acoustic event detection algorithms, based on convolutional neural networks (CNN), which achieve high detection accuracies but require the server's processing power [2]. To reduce the data transmission to the server it would be beneficial to use a data compression scheme which is specifically designed for such algorithms and can be implemented on the sensor node.
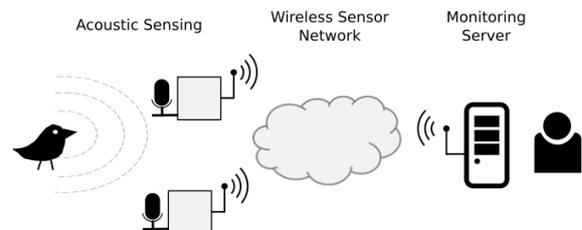
**Task** For this thesis you will evaluate different compression methods for audio signals. You will design and analyze a novel data-driven audio compression scheme based on existing work for audio and image compression. During your thesis you will learn about advanced signal processing and convolutional neural networks. You should be motivated to work closely with your supervisors on state-of-the-art signal processing techniques.

**Requirements** You should have basic knowledge in

- Signal processing (FFT, Convolutions, ...)

- High-level programming (Python, MATLAB, ...)

- Deep learning

- Embedded systems

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

**Contacts**

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# References

[1] 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.

[2] N. Takahashi, M. Gygli, B. Pfister, and L. Van Gool, Deep Convolutional Neural Networks and Data Augmentation for Acoustic Event Detection, arXiv:1604.07160 [cs], Apr. 2016.