

## **Engineering tinyML models in sound recognition. An analysis of an entire specialist pipeline, from data collection to deployment.**

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In recent years, academic and industrial interest in sound recognition has grown significantly in the consumer electronics sector. Engineering compact tinyML models is becoming a key area in this field as more devices are pushing towards adopting cloudless AI to meet consumer privacy concerns and reduce ongoing cloud infrastructure costs. However, hardware and software space on devices is becoming more and more competitive and therefore constrained as the number of features increases.

Audio Analytic is a world leader in sound recognition and has worked closely with academics in this field for at least a decade, and before the first DCASE challenge in 2013. In that time, it has developed specialist processes and techniques to engineer high quality models which out-perform the rest of the industry.

This poster will outline how high-performing sound recognition can perform at the tinyML level whilst meeting the needs of developers and consumers.

The poster will focus on the following distinctive features:

- An extensive data set is needed to train and test sound recognition models to perform well.
- A specialist pipeline is required for sound recognition models to optimise performance, model size and computation.
- A specialist metric which analyses the performance of sound event detection tasks.
- Low level software optimisation ensures a tinyML model is adequately compact and functioning on the smallest devices.

To demonstrate the importance of all these areas, the poster will outline the process and features involved in engineering a fully-functioning tinyML sound recognition model on a device from data collection to final deployment. It will also showcase tinyML models being deployed and functioning on Arm Cortex-M0+ chips.