imagimob
An Infineon Technologies Company

# Benchmark Report: DEEPCRAFT™ Ready Model for Snore Detection

## Introduction

DEEPCRAFT™ Ready Model for Snore Detection is a commercial solution for consumer electronics manufacturers. We compare its performance against cutting-edge models and solutions to ensure real-world effectiveness. We evaluate our model against the most recent research paper with the highest accuracy and an industrial solution integrated into common mobile phones.

## Evaluation

We evaluate our model against the following models:

1. CNN/RNN[1]: a recently published research paper that adopts a CNN and a RNN to learn from audio sequences.
2. publicly available software for common mobile phones

The comparisons we performed on the models were in terms of the following:

- Model hardware performance
    - We compared the memory footprint and inference time of the Ready Model against CNN/RNN model
- Model accuracy performance
    - We compared the recall and the outlier accuracy against the model found in common mobile phones

We deployed our model, generated using DEEPCRAFT™ Studio code generation, onto the Infineon's PSOC™ 6 with an IoT sense expansion kit (CY8CKIT-028-SENSE).

The CNN/RNN model does not provide a pre-trained model, so we cannot evaluate the model accuracy. The model found in common mobile phones is not publicly available, so it's not included in the hardware evaluation.

[1] https://www.sciencedirect.com/science/article/pii/S0169260720317508

# Model Hardware Performance

In Figure 1, we present the performance of our model in terms of inference time and memory footprint. The DEEPCRAFT™ model requires 1500 times less memory than the CNN/RNN model. Moreover, the DEEPCRAFT™ model is >19 times faster than the CNN/RNN model in terms of inference time. Note that the actual inference time is hardware dependent. This is a relative comparison in a CPU, given that CNN/RNN cannot be deployed in a PSOC™ 6 microcontroller.

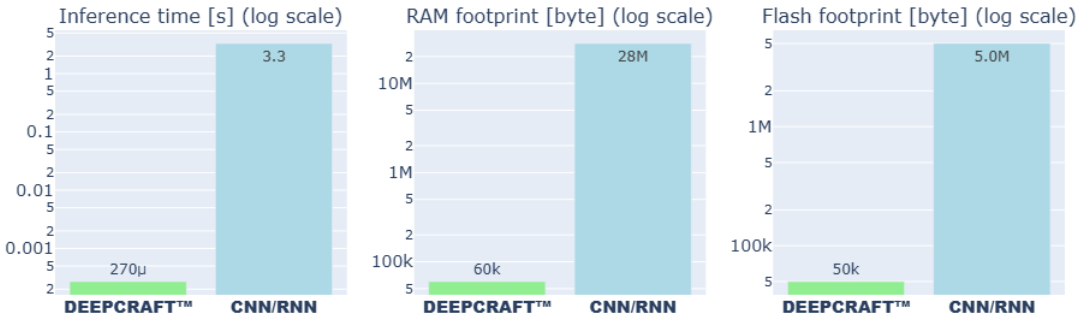


*Figure 1 Evaluation of our model against state-of-the-art research model regarding inference time and memory footprint.*

# Model Accuracy Performance

Figure 2 compares our model's performance with a model found in common mobile phones. Our model outperforms the other in recall and outlier accuracy. DEEPCRAFT™ model achieves high accuracy even in outlier sounds. The sounds

reported as false positive are rare sounds, that don't significantly impact our model's performance.


*Figure 2 Evaluation of our model against the industrial model found in common mobile phones.*

Accuracy is the number of correct detections (true positives) divided by the total number of events occurring (true positives). The higher the number, the better. In this case, the event is a snore sound.

$$Accuracy = \frac{True\ Positives}{Total\ Positives}$$

False Positive Rejection is the number of negative sounds correctly rejected or not triggered divided by the total number of negative sounds. The higher the number, the better. In this case, the negative sounds are any sound, not a snore, i.e., talking, laughing, etc.

$$False\ Positive\ Rejection = \frac{True\ Negatives}{Total\ Negatives}$$