Neural Network Wireless IoT Device

Over 3x energy saved vs standard wireless IoT sensor implementations.

Proposed use

Wireless IoT sensors are becoming increasingly widespread in both wearables and environmental applications. With an increase in the data being captured, edge-processing is becoming more commonplace where data is wholly or partially pre-processed, before being sent to the cloud.

Problem addressed

The problem is that wireless IoT sensors are constrained in terms of power, memory and bandwidth. Computer Science researchers from Imperial College London have devised an efficient IoT sensor device, based on neural network training and very energy-efficient on-chip classification. This technology supports any number of IoT sensors of any type (e.g. pressure, temperature etc).

Initial testing suggests the new implementation saves 3x as much energy vs standard implementations. This IoT sensor device will enable better and more efficient on-chip machine-learning classification of data for a variety of application areas. *We are seeking licensing partners interested in improving their products using this patented technology.*

Technology overview

Raw data measured by wireless IoT devices can often be relatively large, and require substantial power and processing resources to transmit to an external device (or server). The data is transmitted over a wireless communications channel with typically limited bandwidth which limits the speed of transfer. Furthermore, the wireless transmission can be power intensive and quickly drains the battery of a wireless IoT device.

Thus, it is often best to perform at least some of the analysis locally on the sensor device (edge processing). However, doing so requires processing power and memory capacity to be available on the device itself. Performing local analysis also drains the battery. Given these limitations, the type and quality of edge-processing analysis is constrained.

Researchers from Imperial College London have devised a method by which an optimised three-layer neural network is embedded on the device. By splitting training and classification in a patented process, the neural network has optimised static weights and connections thus freeing up RAM space on-chip. Energy is optimised by adopting efficient integer logic, going from 16-bit to 8-bit and using clock-less design.

Intellectual property information

Patent Application No. PCT/GB2018/053185, "Sensor device for classification of data".

Inventor information

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Benefits

- 3x energy saved vs standard implementations
- Uses only 40% RAM to achieve the same classification accuracy
- 22% better classification (with same memory footprint)

Applications

- Biometrics (e.g. smart watches, glasses, fitness trackers, healthcare, wearables, headsets, smart clothing, brain-computer interfaces).
- Audio and image recording.
- Environmental sensors (collecting environmental data such as temperature and pressure).

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