1 Popular Science Summary

With the inter-connectivity that comes with our new digital age, where smaller devices and faster network speeds make it possible to connect a wide range of devices into the so called Internet of Things (IoT), new challenges arise which have to be solved. Small wireless IoT sensor devices which contain limited hardware and run on battery power, create a challenge in providing maximum functionality while maintaining a long battery life for these devices. To reduce the power usage, minimizing the data sent from these devices is a vital part in this challenge, and compression of the data itself provides a possible solution.

Data compression is the act of reducing the size of data by changing its representation, in this case the data is values measured by the sensors of the devices. Compression methods involve a wide range of techniques, such as modifying values into smaller representations, finding patterns that repeat and replacing them with codes, and mathematical functions that modify signals, among others.

The idea behind reducing power usage by compression, stems from the fact that it may require less energy to compress and send the smaller amount of compressed data, than sending the unmodified larger data. This difference relies on how much smaller the data can be made, as well as how much energy is used for the computations. Therefore if the algorithms under-perform, they may instead require more energy than not modifying the data in the first place.

For compression algorithms to be able to operate on these devices, they have to adhere to the constraints set by the devices. Meaning they have to use a limited amount of memory, be fast and efficient, as well as compress the data sufficiently enough as to motivate the added computations. The most contradictory part of finding modern solutions to this problem, may be that combinations of classic methods reign supreme, while newer techniques mostly are too demanding. Most algorithms for this application therefore build on older methods, which are combined in new ways to form a sequential algorithm.

Of the five algorithms which were tested, it was found that they performed differently depending on the type of data the sensors collected. This shows the importance a motivated selection process, so that the proper algorithm is applied for the correct task.