

tinyML Energy Harvesting Systems

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Background: tinyML is a promising research area concerned with running machine learning models on ultra-low power devices, typically in the range of milliwatts or below. The state of the art of tinyML involves training machine learning models on larger computers (e.g., a laptop computer), and subsequently applying optimizations and deploying the models on ultra-low power devices. tinyML has interesting use cases in rural areas where a working network connection cannot always be guaranteed or where a network is undesirable due to latency or privacy concerns.

Energy Harvesting Systems are systems that harvest energy from their environment. A simple example of this is a system that is powered using an attached solar panel. More complex and interesting systems also exist where e.g., the push of a button powers a system that responds to the push.

Project Description: The promise of tinyML is often that ultra-low power devices can be powered by a small battery for an extended period of time. But what if we do not even need a battery to power the device? Ultra-low power devices by definition consume very low power, which should enable them to be powered by the energy in its surrounding environment. Solar-powered tinyML has been thought of before, but some more interesting and unique energy harvesting systems could be constructed. E.g., vibration powered predictive maintenance.

Recommended Background Knowledge: Embedded Systems, Machine Learning, C++ & Python.