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Submission:

CNN Sensor Analytics with Hybrid-Float6 Quantization on Low-Power Embedded FPGAs.

September 21st, 2022

Dear associated editor,

We wish to submit our manuscript entitled, "CNN Sensor Analytics with Hybrid-Float6 Quantization on Low-Power Embedded FPGAs" for consideration as a research article in IEEE Access Journal.

In this paper, we present the Hybrid-Float6 (HF6) quantization and its dedicated hardware accelerator. We propose an optimized multiply-accumulate hardware by reducing the floating-point mantissa multiplication to a multiplexor-adder operation. To preserve model accuracy, we present a quantization-aware training method. We evaluate our approach in a tiny machine learning (TinyML) application with a convolutional neural network (CNN) for anomaly localization in structural health monitoring. The hardware/software co-design is integrated with TensorFlow Lite on the embedded FPGA.

The key contribution of our research is the concept of a hybrid floating-point quantization and its dedicated hardware design for high-quality and low-power CNN inference. Suitable for TinyML, this approach reduces latency, memory footprint, and power dissipation while preserving inference accuracy.

We believe our work is of substantial interest to many readers of IEEE Access Journal.

Thank you for your consideration.

Sincerely,
Yarib Nevarez