Review of “CNN Sensor Analytics with Hybrid-Float6 Quantization on Low-Power Embedded FPGAs.” By YARIB NEVAREZ, ANDREAS BEERING, AMIR NAJAFI, ARDALAN NAJAFI, WANLI YU, YIZHI CHEN, KARL-LUDWIG KRIEGER, ALBERTO GARCIA-ORTIZ.

Summary

The authors propose a novel Hybrid-Float6 (HF6) quantization scheme for the weights of a CNN. They implement HF6 in the MAC of a CNN. Additionally, they present a QAT method to improve classification accuracy. Finally, they evaluate the performance of their HF6 and QAT scheme on a Xilinx XC7 series FPGA that includes a Zynq-7000 Arm processor. They show a peak power efficiency of 5.7GFLOPS/s/W and acceleration of 48.3 times.

Comments to the Authors

This work is promising and requires some updates, clarifications, alterations and additional results as follows:

- Line numbers are missing from pages 11, 12, and 15.
- Page 6: column 2, Figure 5: You show the output as 32-bit floats. However, Figures 6 and 7 show 64-bit outputs. Is this a typo in Figure 5?
- Page 11, column 1, Figure 12: The CNN regression model proposed has very few layers. It would be interesting to see your proposal implemented in a more SOTA CNN, such as Yolo V7.
- Page 11, column 1, around line 50: 10 epochs and such small sample sizes, while possibly stretching your proposed model, are insignificant to a more SOTA model.
- Page 11, column 2, around line 55: "imput". Spell and grammar check the document.
- Page 11, column 2, around line 45: How long did Hybrid Log 6-bit QAT take?
- Page 13, column 2, Figure 15: For ease of reading, please label your axes.
- Page 15, column 1, Figure 17: The figure appears to have an Error distribution and two versions of the Loss Distance Histogram. Is this intentional?