شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

# بسم الله الرحمن الرحيم


HANAA ALY

# شبكة المعلومات الجامعية

# التوثيق الالكتروني والميكروفيلم

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# جامعة عين شمس

# التوثيق الإلكتروني والميكروفيلم

# قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

# يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

HANAA ALY


# HARDWARE ACCELERATION OF CONVOLUTIONAL NEURAL NETWORKS USING APPROXIMATE COMPUTING AND DYNAMIC PARTIAL RECONFIGURATION

By

Eman Youssef Ahmed Safina

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
**MASTER OF SCIENCE**
**in**
**Electronics and Communications Engineering**

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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**Title of Thesis:**

Hardware Acceleration of Convolutional Neural Networks using Approximate Computing and Dynamic Partial Reconfiguration.


**Key Words:**
Convolution Neural Network ; Approximate Computing ; Energy Efficiency ; Precision Scaling ; Dynamic Partial Reconfiguration.



**Summary:**
In this work, I have trained new four different convolutional neural networks (CNNs) to recognize four different datasets MNIST, Fashion MNIST, SVHN and CIFAR-10. Then, the CNNs are tested for recognition. The resulting trainable weights are approximated using precision scaling. The four networks are tested again while using this approximation. A new hardware architecture is proposed to recognize three datasets (MNIST- Fashion MNIST- SVHN) while using precision scaling approximation. This architecture is implemented on Xilinx XC7Z020 FPGA. The resulting power and energy consumed to recognize each image in each dataset is reported. The results show significant reduction in energy consumption while having minor loss in accuracy. This approximation is significant because CNN requires a lot of computation, and hence, consumes large power.

# Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

Name: Eman Youssef Ahmed Date: / / 2021

Signature:

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