بسم الله الرحمن الرحيم

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تم رفع هذه الرسالة بواسطة / سامية زكى يوسف

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

ملاحظات: لا يوجد

EMCA: EFFICIENT MULTISCALE CHANNEL ATTENTION MODULE FOR DEEP NEURAL NETWORKS

By

Eslam Mohamed Ali

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:

EMCA: Efficient Multiscale Channel Attention Module for Deep Neural Networks

Key Words:
Deep Learning; Machine Learning; Channel Attention Mechanisms; Convolution Neural Network; Classification

Summary:
In this thesis, we tackle the following question: can one consolidate multi-scale aggregation while learning channel attention more efficiently? To this end, we avail channel-wise attention over multiple feature scales, which empirically shows its aptitude to replace the limited local and uni-scale attention modules. Attention mechanisms have been explored with CNNs across the spatial and channel dimensions. However, all the existing methods devote attention to capturing local interactions from a uni-scale. Thus we propose EMCA, which is lightweight and can efficiently model the global context further; it is easily integrated into any feed-forward CNN architectures and trained in an end-to-end fashion. We validate our novel architecture through comprehensive experiments on image classification, object detection, and instance segmentation with different backbones.

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.

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List of Symbols and Abbreviations

Symbol	Description
x	Input feature map
R	Coverage region
S	Number of the stages
N_{ij}	The number of the blocks' output in the stage i j utilized into the channel attention block C_i
w	Neural network parameters or weights
Z	Learned channel scales
σ	sigmoid activation function
H	Height dimension of input feature map
W	Width dimension of input feature map
C	Channel dimension of input feature map
F(x)	Function models CNN block
v	Non-linear activation function

Abbreviation	Description
AI	Artificial Intelligence
AvgPool	Average Pooling Layer
C1D	1 Dimensional Convolutional layer
CA-module	Channel Attention module
Cat	Concatenation operation
CDA	Channel Dimension Alignment
CNN	Convolution Neural Network
Conv	Convolution layer
DCT	Discrete Cosine Transform
DNN	Deep Neural Network

EMCA	Efficient Multi-scale Channel Attention module
FC	Fully Connect layer
GPU	Graphics Processing Unit
LSTM	Long Short-Term Memory
MAB	Multi-scale Aggregation Block
MAxPool	Maximum Pooling Layer
MLP	Multi Layer Perceptron
SDA	Spatial Dimension Alignment

List of Publications

1. E. Mohamed, A. El-Sallab and M. Rashwan, “PKCAM: Previous Knowledge Channel Attention Module” in Proceedings of the Thirty-fifth Conference on Neural Information Processing Systems, ML4AD Workshop, 2021.