
CSE449

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Task 1

Section: 01

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Paper Name: The Effect of High Performance Computer on Deep Learning: A Face Expression Recognition Case

## 1. Summary

1.1 Motivation/purpose/aims/hypothesis
The paper seeks to explore the impact of high-performance computing (HPC) on deep learning, particularly focusing on a facial expression recognition (FER) use case. The authors posit that deep learning models, specifically Convolutional Neural Networks (CNN), can greatly benefit from advanced computational capabilities, and they aim to empirically demonstrate these benefits.

### 1.2 Contribution
The authors contribute by examining the effects of training CNNs on different computational setups: an ordinary computer, a high-performance computer with a CPU, the same with a GPU, and Google Colaboratory with GPU. Their results highlight the performance improvements, notably in training times and model accuracy, when using HPC systems and platforms.

### 1.3 Methodology
Using a dataset from Kaggle containing 35,887 grayscale images of facial expressions, the study evaluates the efficiency of four different CNN architectures. These architectures vary by layers and features but all share the same objective: recognizing facial expressions. Each CNN was trained using various computational platforms, and their performances, particularly model accuracy and training times, were then compared and contrasted.

### 1.4 Conclusion
The study found that HPC greatly enhances deep learning performance, especially in tasks that involve large datasets, such as FER. Training on a high-performance computer with a GPU yielded the best results in terms of efficiency and reduced training time. Furthermore, Google Colaboratory also proved to be a powerful and effective alternative for such tasks.

## 2. Limitations

### 2.1 First Limitation/Critique
The paper is largely focused on computational efficiency and model accuracy, but does not delve deeply into other metrics of model performance, such as precision, recall, or F1-score. This can provide a skewed perspective as accuracy alone isn't always the best metric for performance, especially in imbalanced datasets.

### 2.2 Second Limitation/Critique
The study uses a specific dataset from Kaggle, which may not represent the diversity and variations of facial expressions in real-world scenarios. Consequently, the generalizability of the results to other datasets or real-world applications remains uncertain.

## 3. Synthesis

The insights from this paper can be crucial for organizations or researchers aiming to leverage deep learning for complex tasks. As data continues to grow exponentially, the need for faster and more efficient

training will become paramount. HPC can be a game-changer in this regard, potentially revolutionizing industries from healthcare to finance. Moreover, with the rise of cloud platforms, like Google Colaboratory, HPC becomes accessible even to those without the infrastructure, broadening the horizon for deep learning applications. Looking forward, the integration of HPC in deep learning frameworks can pave the way for more advanced AI systems, capable of processing vast datasets in real-time, leading to breakthroughs in fields such as autonomous driving, real-time medical diagnosis, and more.