**Fine-Tuning Llama2 Inference: A Comparative Exploration of**

**Language Implementations for Optimal Efficiency**

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ABSTRACT

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This paper conducts a comparative investigation to maximize the effectiveness of Llama2 inference, a critical task in machine learning and natural language processing (NLP). Various programming languages and frameworks, including TensorFlow, PyTorch, Python, Mojo, C++, and Java, are examined, assessing their speed, memory consumption, and ease of implementation through extensive testing and benchmarking. The advantages and disadvantages of each strategy are noted, with suggested optimization methods considering parallel processing and hardware utilization. Additionally, the performance of the Mojo SDK, a novel framework designed for LLM inference on Apple Silicon, is investigated, comparing it against established implementations in C, C++, Rust, Zig, Go, and Julia. Through comprehensive benchmarking on an Apple M1 Max, Mojo SDK's competitive performance and its advantages in ease of use and Python compatibility are demonstrated, suggesting it is a compelling alternative for LLM inference on Apple Silicon. Implications for the future of LLM deployment on resource-limited hardware and potential avenues for further research are discussed.

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KEYWORDS

Large Language Model (LLM), Inference, Llama2, Mojo, Rust, NLP

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1 Introduction

The updated template, user manuals, samples, and required fonts, all are available at the URL <https://www.acm.org/publications/proceedings-template>. It contains said information for all three versions of MS Word (Windows and 2 versions of Mac). There are also separate links to the user guide, which can be referred to by the user. This URL also contains some useful video links, which describe how to add the template, structure the paper, and generate the layout, in different clips. **Display Formula with Number**

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Figure 1: Figure Caption and Image above the caption [In draft mode, Image will not appear on the screen]

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1.1 Heading Level 2

In the below paragraph, it is explained how alt-txt value is placed in **MS Word 2010**. To add alternative text to a picture in Word 2010, follow these steps:

1. In a Word 2010 document, insert a picture.
2. Right click on the inserted picture and select the **Format Picture** option.
3. Select the **Alt Txt** option from the left-side panel options.
4. In the "Title:" and "Description:" text boxes, type the text you want to represent the picture, and then click "Close".

Below are steps to place alt-txt value in **MS Word 2013/2016**. To add alternative text to a picture in Word 2013/2016, follow these steps:

1. In a Word 2013/2016 document, insert a picture.
2. Right click on the inserted picture and select the **Format Picture** option.
3. In the settings at the right side of the window, click on the "Layout & Properties" icon (3rd option).
4. Expand **Alt Txt** option.
5. In the "Title:" and "Description:" text boxes, type the text you want to represent the picture, and then click "Close".

*1.1.1 Heading Level 3.* Insert paragraph text here. Insert paragraph text here. Insert paragraph text here. Insert paragraph text here. Insert paragraph text here. Insert paragraph text here. Insert paragraph text here. Insert paragraph text here. Insert paragraph text here. Insert paragraph text here. Insert paragraph text here.

*1.1.1.1 Heading Level 4.*Insert paragraph text here. Insert paragraph text here. Insert paragraph text here. Insert paragraph text here. Insert paragraph text here. Insert paragraph text here. Insert paragraph text here. Insert paragraph text here. Insert paragraph text here. Insert paragraph text here. Insert paragraph text here. Research findings are presented in Table 1.

**Table 1. Table captions should be placed above the table**

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