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Improving Medical Imaging Efficiency with AI Algorithms Running on Dedicated AI Chips

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Extended Abstract

The application of Artificial Intelligence (AI) in Medical imaging has been facing several challenges, including issues related to medical misdiagnoses and delays primarily caused by inaccurate data and a lack of interoperability, which hampers effective data sharing. The enormous volume of images generated daily can overwhelm traditional central processing units (CPUs), making it challenging to manage and analyze this data efficiently. Additionally, ensuring the quality and consistency of images used in clinical tests presents another obstacle. To address these issues, AI is being increasingly implemented in the field of medical imaging. AI technology enhances diagnostic accuracy and streamlines workflows by utilizing specialized AI chips to process medical images more effectively. These advanced algorithms can rapidly analyze images, detecting patterns and abnormalities that might be missed by human observers. As a result, AI enables earlier disease detection, improves diagnostic precision, and enhances treatment planning, among others, providing a significant advantage over conventional processing methods. In relatively recent years, machine learning (ML) and, more specifically, deep learning have emerged as a significant trend in medical imaging. However, deploying machine learning in this field necessitates fast and optimized hardware to handle the extensive data processing required by these models. CPUs have limitations in their computational processing, which makes them inadequate for effectively executing machine learning (ML) algorithms. Advancements in AI chip technology have enhanced the capabilities of these algorithms. Neural Network Accelerators (NNAs) and Neural Network Processors (NPUs) are specialized processors optimized to handle specific neural network capabilities at the hardware level. These technologies have shown promising applications in medical imaging. In this presentation, we will conduct a comparative analysis of CPUs and specialized AI chips, including Neural Processing Units (NPUs). We will highlight their differing performance capabilities in terms of speed and precision in medical imaging applications. Additionally, we will analyze the advantages of NPUs compared to CPUs and explore the hardware architecture of a System-on-a-Chip (SoC) that utilizes distributed multi-soft processors specifically for medical imaging. We will also discuss a hardware architecture implementation of reinforcement learning, which is highly sought after in the fields of AI and machine learning.