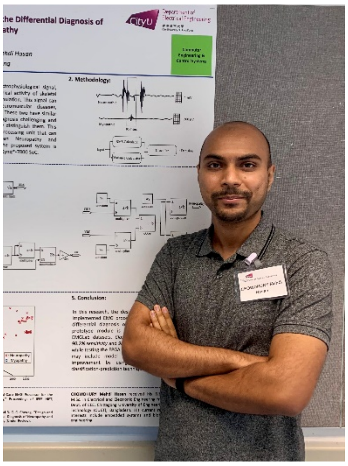
PhD Oral Defence

Date: **26 July 2021 (Monday)** **Time:** **4:00 pm**

Thesis Title

Reconfigurable Architectures for Electrophysiological Signal Processing



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Abstract

Electrophysiological signals are electrical activities measured from a living organism. In practice, these signals are frequently used to assess patients' health and to discover bio-physiological mysteries. As most biosignal processing units are multichannel systems with extensive datasets, conventional computation techniques often fail to offer immediate data processing. Reconfigurable architecture offers flexible software features with fast parallel computation using the FPGAs. This computation technique ensures "Hardware Acceleration" by designing application-specific circuits rather than using general-purpose processors to do signal processing. In this research, in-depth systematic analyses of four novel FPGA-based reconfigurable architectures are presented. In this works, time-critical and resource-intensive performance issues are addressed, and overall system efficiency improvement is also presented. The first work presents an original ECG compression algorithm with a high-frequency noise reduction protocol. An FPGA-based neuron activity extraction unit from the brain signal is described as the second work. The third work is about a first-of-its-kind system design for the differential diagnosis of two neuromuscular diseases- neuropathy and myopathy. The last work features a hardware optimized machine learning based Depth of Anesthesia (DOA) measurement framework for mice and its FPGA implementation. All of these research works are compared with state-of-the-art technologies to determine the viability and efficacy of the newly developed systems.