Department of Electrical Engineering
香港城市大學
City University of Hong Kong

CityU Architecture Lab for Arithmetic and Security (CALAS) Seminar Series

Embedded Hardware for Real-Time Brain–Computer Interfaces

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Abstract:

Brain-Computer Interfaces (BCIs) enable direct communication between the brain and external devices, with promising applications in neuro-prosthetics, rehabilitation, assistive technology, and interactive entertainment. While much of the current research depends on high-performance computing systems for signal processing and decoding, practical deployment requires solutions that are portable, energy efficient, and capable of real-time operation. In today's talk, we will examine the essential role of embedded systems within BCI applications, focusing on how resource-constrained hardware platforms are utilized to acquire, preprocess, and interpret neural signals in real time. We will follow the complete signal pathway, starting from electrode-based acquisition and amplification, continuing through analog to digital conversion, and concluding with on-device feature extraction and lightweight classification. The discussion will emphasize practical challenges such as latency, energy usage, physical size limitations, and wireless communication. Several real-world examples of embedded BCI implementations will be reviewed, along with opportunities for system-level optimization and directions for future development.

Biography:

Mark Yu Hin Chan received his Bachelor's degree in Electronic and Communication Engineering from City University of Hong Kong in 2022, followed by a Master's degree in Computing from Cardiff University, UK. He is currently a Research Assistant in the Department of Electrical Engineering at City University of Hong Kong, under the supervision of Professor Ray C. C. Cheung. His research interests include embedded systems and edge computing.

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