Neuromorphic Brain-Machine Interface System for Improving Attention

Participating faculty:
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Attention is the ability to actively process specific information in the environment while tuning out other details. We are investigating a non-invasive, neuroscience-based approach to enhance attention using neurofeedback. This proposal aims to develop a BMI that improves attention for both healthy individuals and those with attention-related challenges.
Our objectives include designing a front-end neuromorphic chip, creating hardware-optimized, machine learning-based decoder algorithms, and demonstrating these on an FPGA platform, with the ultimate goal of developing a fully integrated brain-computer interface (BCI) circuit. The system will decode and process brain signals, such as ElectroEncephaloGram (EEG) data, in real-time using signal processing and machine learning algorithms. The insights and technologies generated through this project could support attention-enhancement applications and lead to effective therapies for children and aging adults with attention disorders.

Over the course of the PhD, the student would get trained in various aspects related to Machine Learning/Deep Learning, Signal Processing, Computational Neuroscience, Neuromorphic Computing, FPGA Design, Analog Circuit Design etc.

Pre-requisites:
The ideal candidate should have a background in Digital Signal Processing, Linear Algebra, and FPGA design and be proficient in programming (Matlab/Python). The candidate should have an interest in understanding the Brain.