

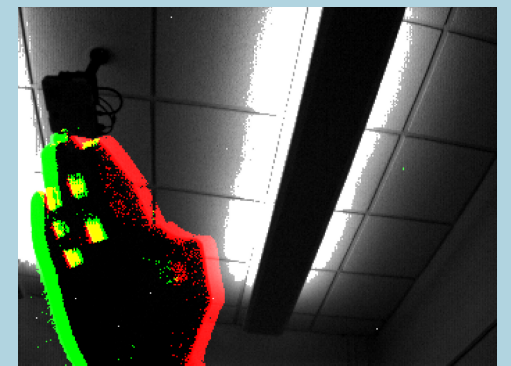
***Abdelrahman AboEitta***  
***Class of 2023***



## **Honors Thesis**

**April 6 @ 12pm, Parmly 405**  
**(pizza lunch included)**

## **"Hyperdimensional Computing for Gesture Recognition using a Dynamic Vision Sensor"**



Artificial Intelligence (AI) has experienced rapid growth in recent years and is receiving unprecedented attention due to the impressive results achieved in various domains, including computer vision, natural language processing, and many others. Two of the key technologies that enabled these groundbreaking results were (1) Convolutional Neural Networks (CNNs), designed for image and video processing, and (2) Backpropagation, an algorithm for training AI models. Despite their remarkable capabilities, these technologies face criticism for several reasons. First, CNNs are limited in their applicability to numerous real-world problems, primarily due to their high computational requirements. Furthermore, backpropagation is criticized for being biologically implausible, as it fails to represent how the human brain works.

To address the limitations mentioned above, this thesis introduces a novel neuromorphic approach that exploits two biologically-inspired technologies: (1) Dynamic Vision Sensor (DVS) and (2) Hyperdimensional Computing (HDC). By integrating technologies inspired by the human brain, the primary goal of this research is to develop more efficient and adaptable AI systems that can handle various real-world problems, overcoming the constraints faced by CNNs and backpropagation.

To demonstrate the effectiveness of this approach, I propose an AI classifier for recognizing simple hand gestures, which was built using HDC technology and trained using data captured by a DVS. Despite its simplicity, the AI model serves as a compelling proof-of-concept, showcasing the potential of combining brain-inspired technologies (DVS and HDC) to achieve substantial gains in efficiency and performance, paving the way for the next generation of efficient AI technologies.