MATHEMATICS, PHYSICS, AND COMPUTER SCIENCE
BLUE ASH COLLEGE

SUMMER RESEARCH OPPORTUNITIES FOR UNDERGRADUATE students

FOR APPLICATION YEAR: 2025

PROJECT TITLE: <u>Advancing Medical Diagnostics: AI-Powered 3D Body Key Point Detection for Unilateral Paralysis Assessment</u>

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Project Description

Project Overview: This cutting-edge research project harnesses the power of computer vision and artificial intelligence to develop an innovative diagnostic approach for detecting unilateral paralysis. By leveraging advanced 3D body key point detection techniques, the project aims to create a precise, non-invasive method for identifying neurological conditions such as stroke-induced paralysis or motor neuron diseases like ALS.

Research Objectives: The research will focus on:
• Developing a robust methodology for capturing and analyzing 3D body movement patterns
• Comparing AI-generated skeletal detection with real-time sensor data
• Validating the accuracy of computer vision techniques in medical diagnostics

Experimental Methodology: The student will:
• Design and implement data collection experiments using cutting-edge micro-computing platforms (Raspberry Pi or Arduino)
• Integrate IMU (Inertial Measurement Unit) sensors for precise movement tracking
• Develop sophisticated computer programs to analyze and interpret complex movement data
• Conduct comparative analysis between AI-detected body key points and sensor-generated position profiles

Technical Requirements: Ideal candidates will possess:
• Strong programming skills in Python, C, or C++
• Some knowledge of microcontroller systems and sensor technologies
• Passion for interdisciplinary research at the intersection of artificial intelligence and healthcare
• Curiosity about advanced medical diagnostic technologies

Mentorship and Support: The faculty mentor will provide:

- Comprehensive AI algorithm implementation
- Ongoing guidance for hardware-software integration
- Expert support in data interpretation and research methodology
- Collaborative environment for innovative technological exploration

Project Significance: This research represents a transformative approach to medical diagnostics, demonstrating the potential of AI and computer vision to:

- Provide objective, quantitative assessment of motor function
- Develop non-invasive diagnostic tools
- Bridge technological innovation with critical healthcare challenges

Learning Outcomes: Participants will gain:

- Advanced skills in AI and computer vision
- Insights into interdisciplinary research methodologies
- Potential for meaningful contributions to healthcare innovation