جامعة أبوظبي
Abu Dhabi University

# CEN425/BME425: Internet of Things: Application & Networking

## Project: Smart Fall Detection and Emergency Response System for Elderly Patients
**(For Biomedical Students)**

**Deadline: February 14th at 11:59pm (Non-Extendable)**

**Project Description:**

Develop an IoT-based fall detection system for elderly patient monitoring. The system uses an MPU6050 accelerometer/gyroscope sensor connected to an Arduino to detect fall patterns (sudden acceleration followed by impact and stillness). When a potential fall is detected, the Raspberry Pi activates a camera to capture a snapshot and continues to monitor for continued movement. If no response is detected within a timeout period, an emergency alert is sent to caregivers via a PC dashboard. This project emphasizes sensor data processing, event-triggered camera activation, and real-time IoT communication.

**Design Constraints and Specifications:**

- Use MPU6050 sensor (accelerometer + gyroscope) connected to Arduino for continuous motion monitoring and fall pattern detection based on acceleration thresholds.
- LED indicators and buzzer provide local alerts when a fall is suspected, allowing the patient to cancel false alarms via a push button within a 30-second window.
- Raspberry Pi collects data from Arduino, processes fall events, and manages the camera module to capture snapshots when a fall is detected.
- Use Python/OpenCV on Raspberry Pi to capture images and detect motion to verify if the patient is moving after a suspected fall.
- Display real-time sensor data (acceleration, gyroscope readings), patient status, and captured snapshots on a local PC dashboard over the local network (TCP/IP or HTTP sockets).
- Demonstrate communication between Arduino node (edge) and Raspberry Pi (gateway) using Serial/I2C, and between Raspberry Pi and PC using Wi-Fi (TCP/IP or HTTP).

**Rules and Deliverables:**

- The project report should be in the ECBE overleaf template that you typically use for every ECBE department course for preparing project reports.
- The project report should include a state diagram, a hardware schematic diagram, the Bash script/ Python code, as well as the output screenshots, both in simulation and on hardware.
- Project demos should be uploaded as an unlisted video on YouTube. The link to the demo video should be submitted within (or alongside) the project report.
- You should only submit the PDF report and the link to your YouTube demo video (if it is not embedded within the project report) on Blackboard till the project deadline.
- The project can be done individually or in groups of a maximum of three students of the same major.