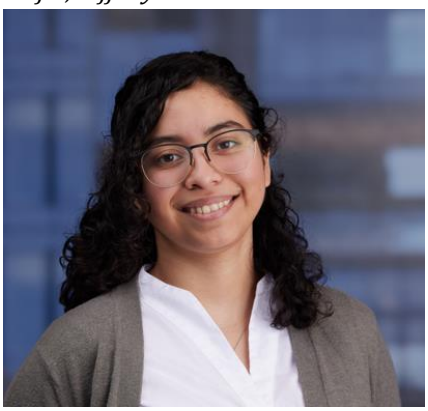
PROJECT AND TEAM INFORMATION

Project Title

(Try to choose a catchy title. Max 20 words).

TraceBAC

Student / Team Information

Team Name: *Team # on Canvas:*	*Group #7*
Team member 1	*Mejia, Tiffany – 26843836* 
Team member 2	*Naik, Om – 63925468* 

PROPOSAL DESCRIPTION (24 pts)

Motivation (2 pt)

(Describe the problem you want to solve and why it is important. Max 300 words).

Alcohol addiction and impaired driving pose significant public health and safety risks. Excessive alcohol consumption can impair judgment, coordination, and reaction time, increasing the likelihood of accidents and injuries, especially when driving. Current awareness tools, such as breathalyzers, only provide momentary feedback and often do not encourage self-monitoring over time. People struggling with alcohol dependence may not realize the extent to which their cognitive and physical abilities are impaired. Therefore, there is a need for an IoT-based system that continuously monitors the user's blood alcohol concentration (BAC) alongside physiological data like heart rate.

State of the Art / Current solution (2 pt)

(Describe how the problem is solved today (if it is). Max 200 words).

Currently, alcohol consumption monitoring is achieved primarily through personal breathalyzers and wearable fitness trackers. Personal breathalyzers, while effective, provide only a momentary snapshot of a person's BAC and are often used after impairment has already occurred. They also lack the ability to track trends over time or offer continuous feedback. Wearable devices, such as smartwatches or fitness bands, provide real-time data on heart rate and physical activity but do not integrate alcohol detection capabilities. Some experimental devices combine both alcohol and physiological monitoring, but these are often expensive and lack accessibility for the general public. Additionally, these systems may not provide seamless connectivity to cloud-based solutions, limiting their ability to analyze long-term trends in alcohol consumption patterns. Therefore, there is a gap for an affordable, integrated solution that provides real-time, continuous monitoring of alcohol impairment and physiological data, while being connected to a cloud-based system for data analysis and trend visualization.

Project Goals (4 pts)

(Describe the project general goals. Max 200 words).

The main goal of this project is to design and implement a smart, IoT-based system to help individuals track their alcohol consumption and its effects on their physical state. The system will use an Alcohol Gas Sensor MQ-3 to monitor BAC and an accelerometer to detect any physical imbalance. Additionally, it will monitor heart rate to provide a more comprehensive understanding of the user's physical state. The project aims to raise awareness of alcohol-induced impairment by continuously providing real-time feedback and long-term trend analysis through cloud-based data storage and visualization. The goal is to encourage responsible behavior, reduce the risks associated with alcohol consumption, and support long-term health improvements.

Project Approach (6 pts)

(Describe how do you plan to articulate and design a solution, architecture you would like to use and communication protocol (Wi-Fi, BLE, ...). Include initial milestones as well. Max 300 words).

This project will be built around a wearable device that combines an Alcohol Gas Sensor MQ-3, an accelerometer, and a heart rate sensor. The data from these sensors will be processed by a microcontroller (e.g., ESP32) with Bluetooth Low Energy (BLE) capabilities. The device will connect to a smartphone, which will transmit the data to a cloud server for real-time monitoring and trend analysis. BAC, heart rate, and movement data will be sent via Bluetooth to the smartphone, and then uploaded to the cloud for storage. The cloud system will analyze trends between BAC, heart rate, and movement over time, allowing users to observe how their alcohol consumption impacts their physical and physiological well-being on a daily basis. Initial milestones include (1) sensor integration and data acquisition, (2) cloud connection and data transmission setup, (3) development of a mobile app interface, and (4) analysis of data trends for user feedback. The system will use Wi-Fi or cellular networks for cloud communication when available. Data security will be ensured through encrypted transmission and storage.

Hardware Required (2 pt)

(The provisional/initial list and quantity of the required components for the proposed project)

Component/part	*Quantity*
ESP32	*1*
LED	*1*
Buzzer	*1*
Alcohol gas sensor MQ3	*1*
Accelerometer and Gyroscope (LSM6DSO) (Digital)	*1*
Button	*1*
Pulse Sensor	*1*

Project Outcome / Deliverables (4 pts)

(Describe what are the outcomes of the project and how you will conduct a short final video/zoom demo. Max 200 words).

The outcome of this project will be a fully functional IoT-based wearable device that monitors alcohol consumption and related physiological metrics. Users will be able to monitor their BAC, heart rate, and physical movement in real time through a mobile app, with data trends visualized on a cloud platform. The system will provide alerts when unsafe BAC levels are detected and offer long-term insights into how alcohol consumption impacts the user's physical condition. The project will culminate in a demonstration video that showcases the functionality of the system, including real-time monitoring, data transmission to the cloud, and trend analysis. This demo will be conducted over Zoom or shared as a video to demonstrate how the system operates in real-life scenarios. Additionally, a user manual and technical documentation will be provided, outlining system functionality, architecture, and usage instructions.

Video Presentation (4 pts)

Please include a link to a video presentation about your proposal; motivation, approach and expected outcomes (5 min max).

https://youtu.be/QvsLJVxPrp8