CSSE4011 Project Topics

You must select a project topic, that is listed. Each topic has specific hardware/software features. You will be required to develop a user scenario and project description based on the project topic. Use of Generative AI is permitted for idea generation.

Groups

Groups are restricted t o 3 members. Groups cannot do the same topic but are permitted to share equipment.

A) Camera Topics

Develop a user scenario and project using the ESP32-CAM module or Arducam. You will need to do independent research to determine a suitable topic. Use of Generative AI is permitted for idea generation. This topic limited to a maximum of 10 groups with one ESP32-CAM module, each.

Example topics

1) Localisation – place recognition (without camera) - using camera and use other sensors. Can use Bluetooth beacons.
2) Camera for detecting lecture theatres – use sensors to stabilise the camera image.

B) Data Muling

Develop a user scenario and project that uses Data Muling. You will need to do independent research to determine a suitable topic. Use of Generative AI is permitted for idea generation. The project must use at least 3 nodes.

Example topics

- air quality broadcasting – with wearable s sensor. Downloads information to other sensors. Consider energy usage for low power use. Base to capture the data.

C) Blockchain Topics

Develop a user scenario and project using block chain. You will need to do independent research to determine a suitable topic. Use of Generative AI is permitted for idea generation.

Example topics

- Blockchain for a localisation with trilateration (RSSI).
- Digital product passport using IOT for supply chain monitoring.

D) ADS-B Transponder

Develop a user scenario and project using the TV tuner USB SDR. The TV Tuner must plug into a Zephyr capable embedded board (e.g. nucleol496 with USB host) using USB. You will need to do independent research to determine a suitable topic. Use of Generative AI is permitted for idea generation.

Example topics

- Aircraft ADS-B Transponder tracking in selected Sky area using a Software Defined Radio.
- Marine Vehicle AIS Transponder tracking using a Software Defined Radio

E) Radio Controlled (RC) Stunt Car Topics

Develop a user scenario and project using an RC Stunt Car for traffic monitoring. You will need to do independent research to determine a suitable topic. Use of Generative AI is permitted for idea generation. This topic is limited to 5 groups.

Example topics

- Traffic simulation using cameras to monitor the location of the RC Stunt cars. Create a dashboard is used to show the road occupancy.
- Use a ZED camera to monitor the reaction time of a manually controlled RC car to positional cues within the 3m x 4m area. The M5 Core2 collects motion data, while Bluetooth iBeacons provide position updates to measure response accuracy. Evaluate driver reaction times in tight indoor spaces.
- Define a dynamic path in the 3m x 4m area using markers tracked by a ZED camera. The manually driven RC car, equipped with the M5 Core2, follows the path while Bluetooth Mesh nodes provide real-time position updates. Kalman filters help integrate data to provide feedback to the driver. Train drivers to manually follow complex paths with real-time position monitoring and feedback. Bluetooth Mesh nodes provide path updates, and M5 Core2 streams telemetry.

F) Embedded AI Board Topics

Develop a user scenario and project using the Nvidia Jetson Xavier (NX) board. You will have to use CUDA C++ programming with the Tensorrt framwork. You will need to do independent research to determine a suitable topic. Use of Generative AI is permitted for idea generation. This topic is limited to 5 groups.

Example topics

- Embedded and realtime classifcation of activity sensor data from an mmWave Radar.
- Activity monitoring with wearable sensors. Include additional visualisations and activity classification (e.g. star jumping recognition).

G) Prac Extension Topics

Develop a user scenario and project that extends one of the pracs (2 to 3). You will need to do independent research to determine a suitable topic. Use of Generative AI is permitted for idea generation.

Example topics

- Activity monitoring with wearable sensors. Include additional visualisations and activity classification (e.g. star jumping recognition).
- Room occupancy with TVOC sensor (C02) with mmwave radar (for short time). Should air flow be increased. Monitoring short-term occupancy in rooms
- Environmental sensing
- Over the air updates. Use of reliable File transfer and MCUBoot
- Use the M5Core2s to create a synchronised display that can show a graphics animation, using 9 m5Core2 displays. The array of m5Core2s displays should be synchronised, in such a way that it appears as a single display.