

# Project Plan

## Product-based Capstone Project

**Team ID** : C241-PS261

**Team Member** :

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5. (CC) C001D4KX0180 – Dinda Regista Aprilia – Institut Pertanian Bogor - Active
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# Project Plan

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### Final Selected Themes:

Sustainable Futures: Nurturing harmony between humanity and the environment ▾

### Title of the Project:

LuminaSense

### Executive Summary/Abstract:

Our project proposes a Human Presence Monitoring System Using Cameras for Light Automation to tackle the urgent need for efficient indoor human presence monitoring, emphasizing sustainability and energy efficiency. By employing machine learning algorithms, it detects human presence from camera images captured by IoT devices like the ESP32Cam, triggering light automation accordingly. Our core aim is to harmonize humanity and the environment by promoting sustainable practices.

We've identified energy wastage indoors due to inefficient lighting control as a critical issue. Our solution aims to alleviate this by automatically adjusting lighting based on human occupancy, reducing unnecessary energy consumption.

Key research questions include effective application of machine learning for presence detection, optimal integration of IoT devices, cloud computing, and mobile development, and ensuring scalability, reliability, and security.

We strive to deliver a robust, user-friendly system fostering energy efficiency and sustainable living. Our commitment lies in offering a practical solution addressing current lighting automation inefficiencies. Through empathetic design and iterative development, we aim to empower individuals and organizations towards sustainable futures, nurturing harmony between humanity and the environment.

### How did your team come up with this project?

Our team identified the need for a sustainable solution to address energy wastage caused by inefficient lighting control systems in indoor environments. Through market research and discussions, we recognized the potential of integrating machine learning, cloud computing, and IoT technology to develop a Human Presence Monitoring System. This project aligns with our collective passion for promoting sustainability and leveraging innovative technologies to create positive environmental impacts.

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**Project Scope & Deliverables:**

**20 Mei - 20 Juni**

Project Scope			
No	Task	Person Responsible	Timeline
1	Perform requirement Engineering	ML, MD, and CC	20-21 May
2	Perform UI and UX design based on user requirements	MD	24-25 May
3	Application design	MD	21-24 May
4	Implementing application design	MD	30 May - 13 June
5	Testing application	MD	10 - 17 June
6	Define Cloud Architecture	CC	20-26 May
7	Create Entity Relationship Diagram (ERD)	CC	20-23 May
8	Estimate GCP Resource Billing	CC	27-29 May
9	API Documentation	CC	23 May-5 June
10	Architecture Implementation	CC	5 -13 June
11	Architecture Deployment	CC	9 - 13 June
12	Service Integration and Revise	CC	14-20 June
13	Define project scope and research available options (pre-trained model) for solution	ML	20-23 May
14	Data exploration	ML	24-26 May
15	Data processing and cleaning	ML	26-29 May
16	Select algorithm or pre-trained model	ML	29 May-2 June

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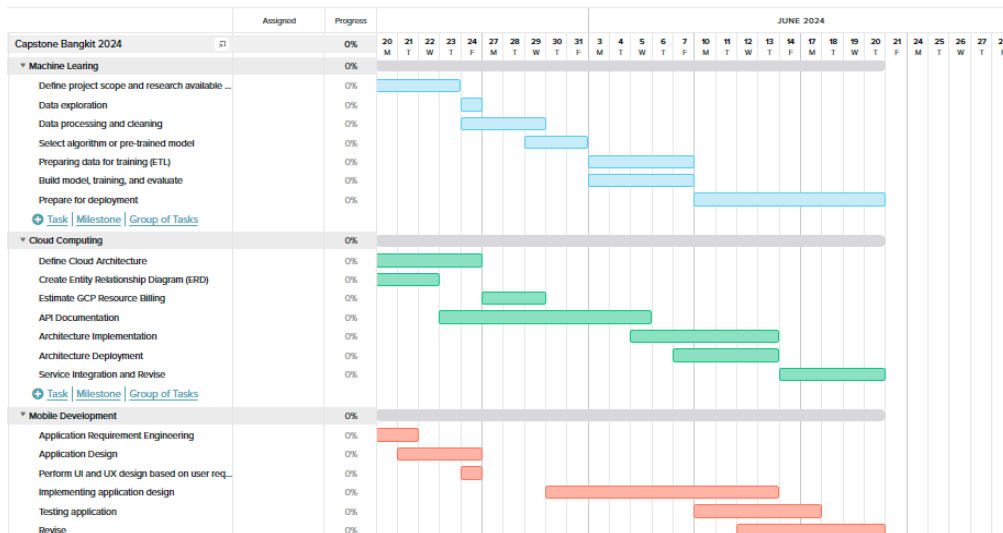
### Product-based Capstone Project

17	Preparing data for training (ETL)	ML	3-9 June
18	Build model, training, and evaluate	ML	3-9 June
19	Prepare for deployment	ML	10-20 June

Deliverables			
No	Name	Role	Data Available
1	UI/UX design	MD	29 May
2	API documentations	CC	5 June
3	ML models	ML	3 June
4	Android application	MD	13 June

### Project Schedule:

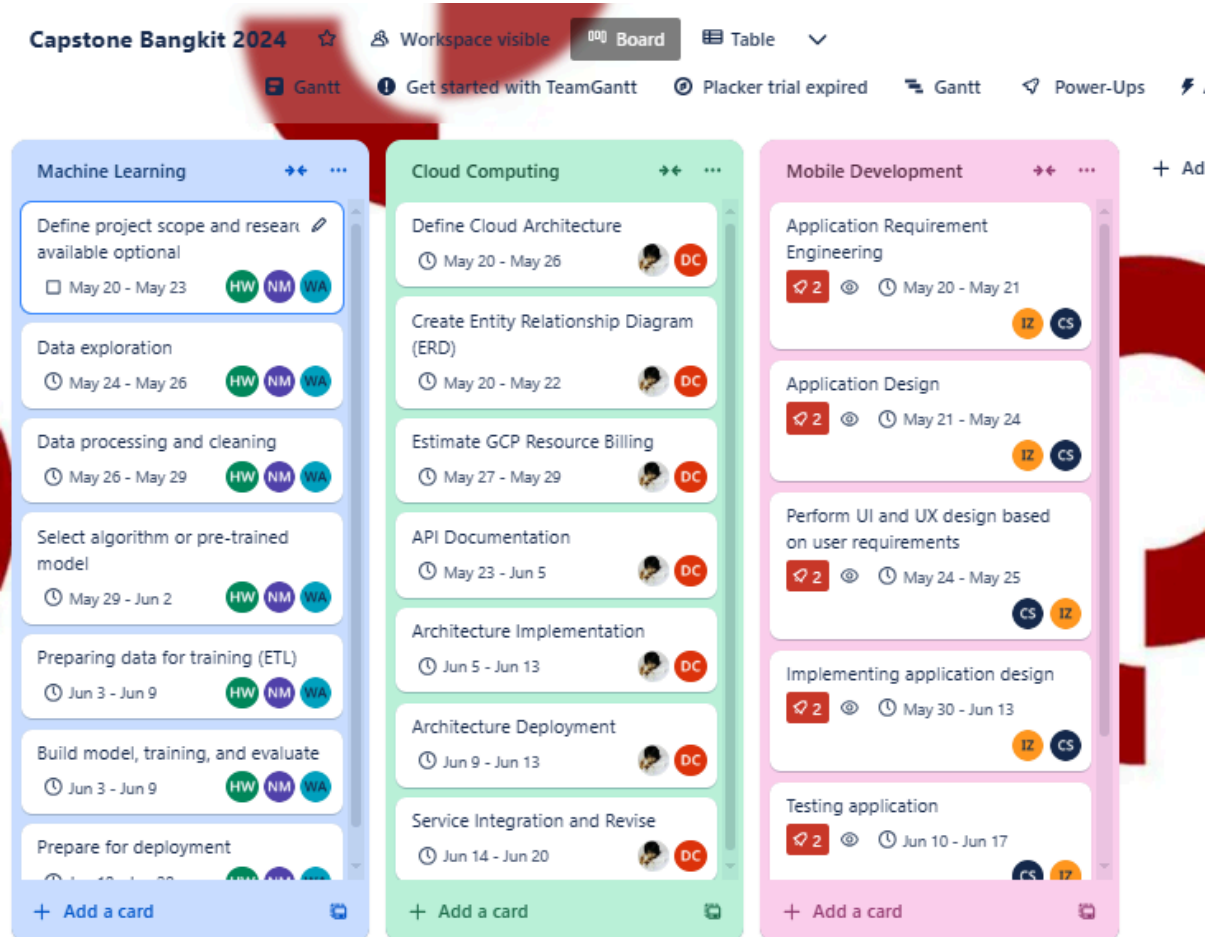
20 Mei - 20 Juni



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## Product-based Capstone Project

Trello



Link Trello:

<https://trello.com/invite/b/Gm1klC6L/ATTIf6d02c81a30e9d371c8c3e2083b60efc53AB65D4/capstone-bangkit-2024>

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Based on your team's knowledge, what tools/IDE/Library and resources that your team will use to solve the problem?

Machine Learning	Description
Kaggle	Platform for finding datasets. The main dataset for training model, we will use the Human Detection Dataset on CCTV footage. <a href="https://www.kaggle.com/datasets/constantinwerner/human-detection-dataset/data">https://www.kaggle.com/datasets/constantinwerner/human-detection-dataset/data</a>
MobileNetV2	A Convolutional Neural Network Architecture for efficient performance on mobile
TensorFlow Lite	Machine learning library for device
Google Colab	Platform for writing and executing Python code in web browser

Mobile Development	Description
Android Studio	Official IDE for Android app development
Retrofit	Library for HTTP client on Android
Room	Library for SQLite database on Android
Glide	Library for loading and displaying images on Android
Jetpack Compose	Modern toolkit for building user interfaces on Android

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Cloud Computing	Description
GCP (Google Cloud Platform)	To manage applications in a powerful and secure cloud environment provided by Google.
VS Code	Develop, modify, and maintain code for projects on the GCP platform
Postman	For testing, managing, and investigating APIs
App Engine/Cloud Run	To deploy and run applications on Google Cloud Platform
Node.js (Hapi.js)	Creating APIs, managing routes, handling HTTP requests

#### Based on your knowledge and explorations, what will your team need support for?

Mentors provide invaluable guidance in ML, cloud, mobile. Access human presence datasets for ML training. Expert assistance in ML model refinement. GCP credits support cloud infrastructure needs. Detailed guidance in designing cloud architecture. Assistance in native Android app dev for live camera feeds and light control, ensuring seamless user experience.

#### Based on your knowledge and explorations, tell us the Machine Learning Part of your Capstone!

In our Capstone project's Machine Learning segment, we developed a customized CNN model using TensorFlow to detect human presence from camera images. We fine-tuned the model with transfer learning using MobileNet SSD v2, adjusting parameters for optimal performance. Evaluation focused on metrics like precision and recall. Webcam samples validated the model's performance.

#### Based on your knowledge and explorations, tell us the Mobile Development Part of your capstone?

In our Capstone's Mobile Development segment, we utilized Android Studio and Kotlin to create a robust Android app. We prioritized a user-friendly experience, enabling access to live camera feeds from ESP32Cam with real-time human presence detection, enhancing utility and relevance for users.

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**Based on your knowledge and explorations, tell us the Cloud/Web/Frontend/Backend Part of your capstone?**

We utilize Google Cloud Platform (GCP) as our primary infrastructure, employing Visual Studio Code for programming and Postman for API testing. To deploy our Backend and ML models, we implement serverless approaches such as App Engine or Cloud Run. Additionally, we utilize the Hapi.js framework, based on Node.js, for building the application's Backend.

**Based on your team's planning, is there any identifiable potential Risk or Issue related to your project?**

Potential risks for our project include data security breaches, hardware failures, and scalability issues. We'll regularly assess risks, implement security measures, and have contingency plans in place. Transparent team communication will help us identify and resolve issues promptly.

**Any other notes/remarks we should consider on your team's application**

In developing our product, we emphasize excellence in ease of use and intuitive functionality. With carefully designed interfaces and seamless navigation, users can quickly and easily adapt to our product without requiring specialized training. Additionally, we ensure that our product provides effective and practical solutions to meet users' everyday needs, thus delivering significant added value to their daily use.