

28.08.2025

## Group Assignment: Lumion Robots Ltd case

### 1 Group composition

You have been divided into groups of **4–5 students**, with members from different degree programs.

In this group assignment, your team will work on a given case, which is to develop a robotic lawnmower for **Lumion Robotics Ltd.**

**Collaboration between students from different degree programs** is needed.

- **AI and Data Analytics student** are responsible for collecting, processing, and analysing data. Their models generate insights and predictions that inform system behaviour.
- **Full-Stack Development student** will develop the backend and user-interface for the application. It should visualize real-time data and insights produced by the AI team, showing the current performance of Lumion's robotic lawnmowers.
- **Cyber Security student** will assess the security implications of the system. Their role is to ensure that all design and implementation decisions contribute to a robust and secure system for Lumion Robotics Ltd.
- **Robotics student** focus on the behaviour, control, and performance of the lawnmower hardware. They ensure that sensor data, movement logic, and system responses align with the insights provided by AI and meet the requirements of the software interface.

#### 1.1 Scheduling information

Some groups may include more than one student from the degree program if no student from some degree program is available for the group.

- The **groups** will be **drawn** in **mid-September**, when all participants have confirmed their participation in the course.
- The groups will be announced on the **Moodle** page, where the groups and their own return boxes for the group assignment will also be open.
  - hold a **planning meeting** in Teams during September.
  - Agree on how the group communicates.
- The project should be **returned** on early **December**. See exact schedule from the Moodle.

## 1.2 How to implement the project?

Let's take some instructions and tips for group assignment.

- The final document should be reviewed together at the end, i.e., if necessary, write an introduction and summary and glue the parts of the plan together.
- The total length of the document is approximately **20-25 pages**.
- Use also images, screenshots and charts in your document. Code listings in the appendix are not counted towards the document length.
- At the end, it is a good idea to **tie the parts of the document together** so that they are related to each other in some way. Someone in the group could take responsibility for this.

**Development** is an **optional part** of this project, but with the help of generative AI it is possible to **develop** a (restricted) **demo** about a feature of the lawnmower. First, however, you need to generate a dataset that can be used by the AI&DA and software solution.

- There is not much time to develop a plan (approx. **25-30 hours** per student), so keep the focus is on designing a solution for a robotic lawnmower.
- You can also define the subtask yourself using a "**research question**" that you define yourself.
- All important **source code** can be attached to the document by using attachments at the end of the document.

## 2 Robotic Lawnmower Task Specification

The group's task is to design and define a system built around a robotic lawnmower that collects, send, analyses and utilizes data.

The overall system includes

1. autonomous operation (robotics),
2. cybersecurity solutions,
3. artificial intelligence and/or data analytics and
4. a user-friendly application with backend (full-stack) that can be used to manage and monitor the operation of the lawnmower.

Student in the subject area in a group is responsible for his/her own area. However, the document should be put together in such a way that the output is uniform.

If a student from a degree program area is missing from the group, there is no need to write about this topic. If there are two members from a degree program, then you can write more extensively on this topic.

## 2.1 Secure development / cyber security in the project

**Lead:** Cyber security student

The cybersecurity part of the assignment will introduce the group to corporate security, ISMS and secure software development practises. The length of the cyber security section in the work should be roughly 4 - 5 pages and it should demonstrate understanding of cybersecurity governance and secure software development practices by applying them to the robotic lawnmower project.

**The cyber security section of the work should include following chapters or entities:**

### 1. Purpose and Scope

Explain why cybersecurity is important for this system and what the main objectives are.

**Deliverable:** Summarize the security goals for the project.

### 2. Governance & Compliance (Simplified)

Review ISMS and ISO 27001 principles at a high level.

Implement two elements in your report:

- **Risk Assessment & Treatment Plan:** Identify the most relevant security risks for this project, assess their likelihood and impact, and propose mitigation actions. Present this in a clear format (e.g., a table).
- **Short Information Security Policy:** Summarize the security objectives, responsibilities, and key principles for the company / project in a concise statement.

**Deliverables:**

- A risk assessment table (Risk | Likelihood | Impact | Mitigation).
- A short security policy (1-2 pages).

### 3. Secure Development Processes

Describe how security should be integrated into the software development lifecycle and delivery pipeline. Include concepts such as secure development practices, continuous security checks, and principles for protecting system components.

**Deliverable:** A short description of SSDLC, DevSecOps, and key principles (e.g., Zero Trust, OTA update security).

## 4. Tools for Secure Development

Prepare a table listing security tools that could be used in this fictional organization to support secure software development. For each tool, include:

- Tool name
- Category (e.g., code analysis, testing, monitoring)
- Type (open source or commercial)
- Purpose (what it helps achieve)

**Deliverable:** A tools table with at least 5 entries.

## 5. Minimum Security Controls

List the essential security measures that should be in place for this project. These should reflect your understanding of the most critical practices for ensuring security in development and operations.

**Deliverable:** 4–5 bullet points summarizing minimum controls.

### Important for the whole cybersecurity section:

Do not copy examples from lecture slides or templates directly. Use your own reasoning and research to select risks, write the policy, and choose tools.

Your choices should make sense for this specific project context (robotics, IoT, cloud, and application development).

## 2.2 For Data Analytics and Artificial Intelligence Student

**Lead:** AI/DA student

For AI/DA student: Choose at least three of the tasks below to include in the robotic lawnmower implementation plan.

### Building data analytics and visualization

Tasks about Data Analytics:

- How do you build data analytics and visualization based on measurement data?
- How would you define the EDA (Exploratory Data Analysis) process and choose the tools you would use to implement the EDA analysis.
- How could generative AI tools be utilized in data analysis.

## **Development of machine learning models**

Tasks about Machine Learning:

- What kind of machine learning (ML) models could be built from the data collected from the robotic lawnmower?
- How could the training and validation of the ML models be implemented?
- What tools, libraries and platforms would you use to build these models?

## **More specific information**

- Choose at least three of the tasks above, which you will implement as one member of the project team.
- Although the implementation is not part of the task, and it is not evaluated in this project work, some kind of draft of the EDA implementation can be made. In this case, you can (or you should) use a Generative AI tool as a help.

## **Some hints**

- Building Data Analytics starts from collecting raw data from sensors, then cleaning data with automated (Python) scripts and storing it in a defined format. Then it's possible to continue with EDA process.
- You can use Generative AI Tools like GPT-4, Copilot or ChatGPT. These "AI Assistant tools" can assist in generating data, generating insights, automating parts of the EDA process, and helping visualize the data.

## **2.3 For Full Stack Software Development Student**

**Lead:** Full Stack Software Development Student

For Full Stack student: Choose at least three of the tasks below to include in the robotic lawnmower implementation plan.

## **Full-stack application development**

## Tasks for developing Full-Stack App:

- How would you go about building a Full-Stack application that visualizes valid measurement data collected by a robotic lawnmower and offers a user interface for management?
- How would you implement a backend API that receives real-time data from the lawnmower?
- How would you implement the user interface for the web browser with supporting features like charts and live data visualizations?
- How would you implement the user interface for a mobile device with similar features, and how will the responsiveness and user experience of the application be ensured?

## Testing the application

### Tasks for testing Full-Stack App:

- How is application testing carried out? Describe the stages of testing and the tools you would use (e.g. unit testing, integration testing).
- Which frameworks and tools would you choose to build the application?
- How could you use AI tools to build a rapid prototype of the application?

## More specific information

- Choose at least three of the tasks above, which you will implement as one member of the project team.
- Although the implementation is not part of the task, and is not evaluated in this project work, some kind of draft and even a demo of the implementation can be made. In this case, you can (or you should) use a Generative AI tool as a help.

## Some hints

- Architecture Overview of Full-Stack application consists of a backend to handle data processing and an API for communication with the lawnmower and a frontend for data visualization and control.
- Testing stages can be Unit testing, integration testing and finally End-to-End testing.
- You can use Generative AI Tools like GPT-4, Copilot or ChatGPT. These "AI Assistant tools" can assist you to develop rapid AI-Powered prototyping to auto-generating code snippets, iterate quickly on prototypes, create User interface prototypes and create automated tests.

## 2.4 For Robotics Student

### **Lead: Robotics student**

Choose at least two of the topics below and investigate on the following topics and explain how they relate to the subject of Modern Management of IT and keep main focus on robotics lawnmower implementation plan. You can focus on robots itself or the production process of robots.

#### **Data from Robots:**

- Investigate what kind of data can typically be obtained from robots, such as sensor data (e.g., temperature, pressure, motion, and location).
- Analyse how this data can be utilized to optimize production processes.

#### **Interfaces and Integration with Other Systems:**

- Explore how robots can be integrated with other systems in a production facility, such as ERP (Enterprise Resource Planning) and CRM (Customer Relationship Management).
- Identify the interfaces and protocols used for data transfer and integration.

#### **Robot Control and IoT Data Collection:**

- Compare wired and wireless solutions (WiFi, Private LTE, Private 5G, RedCap, LPWAN (LoRaWAN, SigFox, Mioty), ecc...) for robot control and IoT data collection.
- Analyse the advantages and disadvantages of each solution in different production environments.

#### **Robot Safety:**

- Study the principles and practices of robot safety.
- Identify the risks associated with the use of robots and how these risks can be managed and minimized.