There are several legal, social, ethical, and professional considerations that need to be accounted for in the development of this dashboard, ensuring it aligns with best practices and regulations while addressing potential risks.

Legal Issues:

Whilst designing an internal system for company use, it is still important to comply with data privacy laws, such as the General Data Protection Regulation (GDPR) in the EU, ensuring that even minimal user data, like hashed passwords, is stored in a way that protects user privacy. Sensitive information should only be stored if explicitly necessary, and data should be retained for the minimum time required. Additionally, when using third-party libraries or software components (e.g., for the API or visualisations), it's crucial to adhere to licensing requirements and ensure proper attribution, particularly when using open-source tools. Ownership of the machine learning model and sensor data should also be clearly defined, establishing who owns the collected sensor data and what rights users or employees have in terms of accessing or distributing it.

Social Issues:

To ensure accessibility and inclusivity, the dashboard must comply with WCAG (Web Content Accessibility Guidelines), as it will be used by approximately 20 users with no/limited technological background. This requires intuitive navigation, and accessible help pages to facilitate ease of use. A responsive design will ensure the application works seamlessly across various devices, although reliable internet access is essential for optimal performance. Transparency and accountability are critical, ensuring operators, managers, and users can trust the visualisations and data presented, with clear and accurate traffic light systems and anomaly detection to avoid misleading decisions. While the automation and AI-driven insights may reduce the need for manual monitoring, this is a long-term consideration for the company, and falls outside the scope of our project.

Ethical Issues:

Ethical considerations for this system revolve around ensuring that the pre-trained machine learning model is free from bias, especially in how data points are flagged as anomalous. While our project is focused on integrating the model as per the client’s specifications, the company must prioritise validating future models with diverse datasets to mitigate any potential bias. For example, historical data used to train the model might reflect periods when anomalies were more or less common, which could lead to the model being biased toward detecting anomalies. Developing, training, and optimising these models to ensure they are unbiased and validated with varied datasets can be costly. This may involve acquiring additional data or hiring data scientists to fine-tune and validate the models, which could increase operational costs. However, by investing in this process, the company can enhance the model’s accuracy and reliability, ensuring it performs well across different conditions.

Ethical concerns could also arise if synthetic data does not adequately reflect real-world conditions, potentially undermining the system's decision-making reliability. Moreover, along with ensuring reliability, the system must prioritise the security of personal data. Personal information, such as login credentials, must be securely stored and used solely for authentication. Future enhancements could include investments in advanced security protocols, such as two-factor or multi-factor authentication systems, as well as securing cloud storage solutions. However, these measures could lead to additional operational expenses and infrastructure costs. To maintain transparency and respect user autonomy, users should be clearly informed about the data being collected—such as email and password—and how it will be used. The company should also consider offering users the ability to manage their data preferences and request account deletion in the future. Additionally, a data collection transparency disclosure should be prominently displayed on the website, ensuring users fully understand the platform’s data practices and their rights regarding account deletion.

Finally, while not the direct focus of our project, the system should be developed with energy consumption in mind. This approach ensures that the system contributes to ethical and environmentally responsible practices. Moreover, by implementing energy-efficient measures, the system will help reduce overall energy consumption and support the sustainable use of resources, ultimately leading to a lower environmental footprint over time. For example, the use of an AI-powered backend system could require increased computational resources, potentially increasing energy consumption and the environmental footprint. As the company aims to improve platform performance and scalability, it’s important to consider this added energy demand. To mitigate such impacts, the company might explore solutions like energy-efficient hardware, optimising AI models for better performance, or offsetting emissions through sustainability programs.

Professional Issues:

Quality assurance and testing are critical in this project, especially with real-time data updates and the integration of machine learning models. Professionals must thoroughly test and validate the application to prevent bugs or incorrect results. Additionally, continuous monitoring and maintenance will be necessary to ensure the dashboard remains reliable and accurate as the number of sensors and data points grows. Transparency in the machine learning models is equally important, as users need to trust the system's decisions. The anomaly detection process should be explainable rather than a black-box solution, and clear documentation about model training and limitations will be essential to maintain professional ethics. Furthermore, the system must be adaptable, allowing for the easy addition of new sensors and functionality without excessive difficulty. It should also be designed with scalability in mind, ensuring it can grow seamlessly without compromising performance or security.

Below is a table summarising potential risks associated with the project and possible solutions to mitigate these risks within the scope of our work.

|  |  |
| --- | --- |
| Potential risks | Possible solutions |
| Unauthorised Access | Secure passwords with hashing algorithms, potentially implementing 2FA authentication for admin users |
| Non-working UI on some devices | Ensure responsive design with testing across different screen sizes and devices that will be used in the workplace |
| System downtime | If the local server implementation fails, consider using a reliable cloud server as an alternative. Ensure that redundancy and backup mechanisms are in place to maintain system reliability and prevent data loss. |
| User misinterpreting the data that is shown | Provide training and documentation which explains the data that is being visualised |