ESystems Development Group Project (UFCF7S-30-2)

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1. Introduction

The usage of data can be utilized and implemented to allow hospital staff to understand patient issues and needs more deeply and accurately. However, hospitals face a high number of patients with limited resources, which can make personalized care challenging. To combat this, we have developed a web app that leverages algorithms to help prioritize patients who may need a dietician's support more urgently than others based on whether they have been flagged according to a 0 or 1 system. This machine learning algorithm runs specific measurements and evaluates if a patient should be referred to a dietician. With this approach, we ensure that the CCU staff can quickly identify which patients need additional dietary guidance, providing the correct and required interventions to each individual. This prioritization not only benefits the patient by enabling quick assistance but also streamlines the workflow for hospital staff, allowing them to focus on cases that need attention most.

We store patient data by uploading a CSV file, which is then visualized in an organized table displaying the individual report and a summary of the patients overall. This file contains various fields that represent physiological measurements of each patient, and based on these measurements such as tests of the vitals are documented here and display only crucial information so that they can make more informed decisions quickly an example of this is BPM, Weight , medical conditions and additional information .

Our aim is to build a reliable database which is easy to navigate despite the level of computer experience making it intuitive and clear regarding the UI ensuring the needs are met patients using specific indicators, creating a resource where doctors can make informed, data-driven decisions to recommend dietary consultations when needed.

2. Aims and Objectives

2.1 Project Aim

The goal of this project is to design, develop, implement, and test a fully functional NHS User Interface (UI) for a Feeding Dashboard System, which integrates with a database to prioritize and monitor critical patients. This UI will allow (CCU) staff to manage dietitian referrals, visualize patient data, and generate data-driven reports efficiently. The dashboard aims to enhance patient care by ensuring data security, cross-platform compatibility, and compliance with healthcare standards. By enabling real-time monitoring and data-driven decision-making,

2.2 Project Objectives

1. **Real-time Patient Monitoring and Prioritization**
   Design an intuitive interface that displays a complete list of patients, highlighting those requiring urgent referrals based on markers. The system must handle up to 10,000 records, loading within three seconds while maintaining accuracy. This objective ensures efficient and accurate monitoring to prioritise patient care effectively.

2. **Efficient Data Filtering and Upload**
   Provide the ability to upload patient data via validated CSV files and filter it to view patients flagged for dietitian referrals. Filters can include criteria such as date range or referral reason. This feature should streamline data handling, enabling staff to focus on high-priority cases. Development of this feature will be completed within four weeks.

3. **Individual Patient Data Analysis and Visualization**
   Implement a detailed profile view for each patient, showing vital metrics and trends, accessible directly from the main patient list. This view must load in under two seconds and maintain 99% accuracy, offering critical insights to support well-informed decision-making.

4. **Automated Report Generation**
   Develop a function for creating data-driven reports summarizing patient demographics, treatment statistics, and referral information. Reports will be exportable in PDF and Excel formats, generated in under 10 seconds with 99% accuracy. This feature will assist in administrative tasks, research, and quality control, and will be developed within six weeks.

5. **Cross-Platform Compatibility**
   Ensure the Feeding Dashboard operates seamlessly on Windows, Mac, Linux, iOS. The system will be responsively designed. Compatibility testing will be completed within eight weeks to guarantee consistency

3. Literature Review

3.1 Developing a Feeding Dashboard for Critical Care Units

The need for specialized nutritional care in critical care units (CCUs) is widely recognized, especially for patients who are sedated, receiving external feeding, or undergoing intensive therapies such as renal replacement therapy. Managing nutritional care, especially in an

environment with high patient turnover and limited resources, requires prioritising patients based on their physiological needs. To address these demands, a "Feeding Dashboard" system for CCUs has been proposed by our lecturers. This literature review examines existing solutions and technologies used in healthcare monitoring systems, data visualization, and machine learning algorithms in CCU contexts to identify how they inform and support the development of an efficient feeding dashboard.

3.2 Importance of Nutritional Management in Critical Care Units

Nutritional management in CCUs is essential to support recovery, as malnutrition and improper nutrition can lead to complications. Various studies underline that malnutrition affects up to 40% of hospitalized patients, leading to prolonged hospital stays, increased costs, and poorer outcomes. Proper nutrition in CCUs is particularly challenging due to fluctuating patient needs and the complexity of monitoring multiple parameters. Systems that provide real-time monitoring and alert capabilities for nutrition management can help alleviate these challenges. Hence, there is a need for a technology-assisted dashboard that centralizes patient data and assists healthcare providers in identifying patients who require dietitian consultations.

3.3 Existing Healthcare Dashboards and Their Relevance to Feeding Management

Healthcare dashboards have become integral in patient care, providing quick access to data visualization, filtering, and decision-making tools. A review of existing dashboards in intensive care units (ICUs) such as one in Bristol the (BRI) Bristol Royal Infirmary and CCUs indicates a strong emphasis on real-time data, automated alerts, and flexible visualizations we have provided a example from the NHS of a dashboard they use to give us an indication of the placement of certain graphs and diagrams and simply what a good UI looks like. Tools like the Philips IntelliVue Clinical Information Portfolio and GE Healthcare's Centricity Critical Care focus on data integration, real-time patient monitoring, and alert systems, which are essential features for a CCU feeding dashboard. However, these tools are typically designed for broader medical monitoring rather than nutritional prioritization.
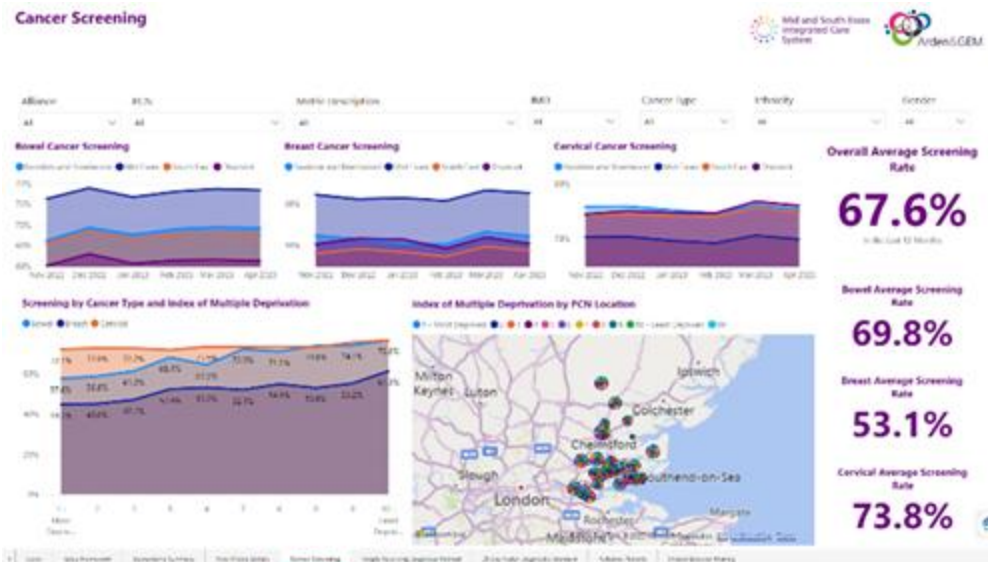
Fig 3.3 Example of an NHS Healthcare Dashboard UI

3.4 Machine Learning in Critical Care and Nutritional Prioritization

Machine learning has become a transformative tool in healthcare, allowing for predictive analytics, early warning systems, and data-driven decision support. In critical care, machine learning models analyze physiological data to predict patient deterioration, infection risks, and other health concerns. For a feeding dashboard, a machine learning model could analyze physiological parameters like heart rate, blood pressure, and respiratory rate to determine the likelihood of a patient needing nutritional intervention. Implementing such a model in the dashboard aligns with recommendations to improve healthcare outcomes by embedding predictive analytics in daily clinical workflows.

Machine learning algorithms, such as logistic regression (which takes two possible variables and places them into a formula and allows us to see where the patients on there current path could lead e.g. more health problems), support vector machines, and neural networks, can offer varying degrees of accuracy in predicting patient needs. The effectiveness of these algorithms relies heavily on the quality and relevance of the input data, which in this case, would include a comprehensive set of physiological measurements which are included in the CSV file provided to us. Studies have shown that decision trees and ensemble learning models can also be highly effective in interpreting complex medical data, making these models suitable candidates for the feeding dashboard.

3.5 CSV Data Handling and Integration in Healthcare Dashboards

A key functionality of the feeding dashboard is its ability to handle CSV files for patient data uploads. The CSV format is widely adopted in healthcare for its simplicity, ease of data entry, and compatibility with most data analytics software. For the feeding dashboard, the CSV file should contain fields that represent essential physiological measurements, allowing the system to analyze the data and flag patients who require dietitian referrals. Literature on electronic health records (EHR) systems highlights the importance of ensuring data integrity and validation during uploads to prevent inaccurate decision-making based on incorrect data entries. Therefore, data preprocessing steps such as error-checking, validation of data ranges, and formatting standardization are critical for the dashboard.

3.6 Cross-Platform Compatibility Using Frameworks like Electron

The feeding dashboard must operate on various platforms, including Windows, macOS, and Linux, to ensure accessibility across different hospital infrastructures. Cross-platform compatibility is often achieved through frameworks like Electron, which allows for the development of applications that function uniformly across multiple operating systems. Electron, a popular framework developed by GitHub, uses JavaScript, HTML, and CSS, enabling developers to create desktop applications using web technologies. Electron's strengths include its ease of integration with Node.js modules and its extensive support for creating seamless user interfaces. However, Electron-based applications are sometimes criticized for higher memory consumption, which might be a consideration in resource-constrained environments like CCUs.

Despite these limitations, Electron is favored in healthcare applications where cross-platform availability is crucial. For the feeding dashboard, leveraging Electron ensures that hospital staff can access the dashboard on various devices without platform-specific modifications, streamlining training and deployment.

Although saying this we will need to conduct some research to evaluate if we will actually use it otherwise we will look to use other frameworks.

3.7 Data Visualization and Report Generation

Visualizing data for quick decision-making is critical in any healthcare dashboard. Effective data visualization has been shown to reduce cognitive load as looking at masses of data can be monotonous and confusing, enabling CCU staff to interpret complex information quickly. In a feeding dashboard, visualization tools like graphs and tables are essential for

displaying individual patient data and generating comprehensive reports. Studies highlight that using color-coded indicators, trend lines, and interactive filters can enhance usability and help in rapid identification of priority cases. Tools like D3.js and Chart.js offer robust libraries for data visualization within web-based environments frameworks, allow real-time updates and customizable graphics and charts which can be adjusted by choice . These tools facilitate dynamic report generation, enabling CCU staff to obtain patient summaries in graphical formats, thus supporting more efficient patient monitoring and intervention. Adding to that we will make it so that only relevant data is shown so the doctor can make the best decisions in a minimal amount of time as we have disscussed too much data can be overwhelming.

3.8 Security and Data Privacy in Healthcare Systems

Data security and privacy are paramount in healthcare applications, especially those that handle sensitive patient information. In the feeding dashboard, data protection can be addressed through encryption protocols and access control measures. The Health Insurance Portability and Accountability Act (HIPAA) in the U.S. and the General Data Protection Regulation (GDPR) in the EU mandate strict guidelines on how patient data should be managed, and similar standards apply internationally. Implementing robust security protocols in the feeding dashboard ensures compliance with these regulations and protects against unauthorized access. Studies on healthcare data security recommend using multi-factor authentication (MFA) and data encryption at rest and in transit to safeguard sensitive information. For instance, if the feeding dashboard uses a cloud-based infrastructure, TLS (Transport Layer Security) protocols should be integrated to secure data during transfers between the server and client.

3.9 Summary and Integration into the Feeding Dashboard

The proposed feeding dashboard addresses several critical needs identified in the literature:

1. Real-Time Monitoring and Alerts: Drawing from ICU dashboards, the feeding dashboard will incorporate real-time monitoring, providing CCU staff with instantaneous data on patient conditions and highlighting those in need of nutritional intervention.

2. Machine Learning-Driven Recommendations: Based on predictive analytics frameworks, the feeding dashboard will use machine learning models to analyze physiological data and flag patients requiring dietitian referrals, supporting informed decision-making.

3. Cross-Platform Accessibility: Leveraging Electron ensures the dashboard's compatibility across various platforms, making it accessible to healthcare providers on any device within the hospital infrastructure.

4. Data Visualization and Report Generation: By integrating libraries like D3.js or Chart.js, the dashboard will display complex patient data in easily interpretable graphical formats, aiding CCU staff in monitoring and analyzing patient health trends.

5. Data Security and Privacy: The dashboard will adhere to healthcare security standards like HIPAA and GDPR, employing encryption and access control to safeguard patient data.

Through a well-rounded integration of these elements, the feeding dashboard aims to streamline the process of nutritional monitoring in CCUs, improving patient outcomes and optimizing resource allocation. The dashboard's foundation in existing literature ensures that it addresses both clinical and technological demands effectively.

4. Requirements

4.1 Functional Requirements:

- Display All Patients: View a list of all CCU patients from the uploaded CSV file.
- Filtered View of Referred Patients: Display a filtered list of patients flagged for dietitian referral.
- Flag Patients Needing a Dietitian: Automatically flag patients based on physiological criteria.
- CSV Upload Functionality: Enable CSV upload to populate the patient list.
- Individual Patient Data View: View detailed data for each patient.
- Report Generation: Generate customizable, data-driven reports on patient metrics.
- Cross-Platform Compatibility: Ensure functionality on Windows, Mac, and Linux.

4.2 Non-Functional Requirements:

- **Security Measures:** Implement encryption, user authentication, and role-based access control to protect patient data in compliance with GDPR and NHS Digital standards.
- **User Interface:** Design a simple, intuitive, and responsive UI that is easy to navigate for medical staff with varying levels of technical experience.
- **Performance:** Ensure all operations (e.g., data load, filtering, reporting) respond within 2 seconds on average for up to 10,000 records.
- **Cross-Platform Compatibility:** Guarantee the dashboard runs smoothly on Windows, macOS, and Linux using a framework such as Electron or equivalent.

- **Scalability:** Design the system to handle increasing volumes of patient data and concurrent users without significant performance degradation.
- **Maintainability:** Ensure the codebase is modular and well-documented, allowing future developers to easily update or extend the system (e.g., new ML features, input formats).

4.3 SMART Requirements in Detail

For "Display All Patients" Requirement:

- Specific: A button that displays a complete list of CCU patients with essential details such as name, age, and ID.
- Measurable: The list should load in under 3 seconds for 10,000 records.
- Achievable: Implemented using optimized queries and indexed databases.
- Relevant: Essential for quickly accessing patient records.
- Timely: Developed and tested within 4 weeks.

Each functional requirement can be expanded with a similar SMART breakdown for the full report.

Implementing SMART criteria and thorough testing is essential for an NHS project like the Feeding Dashboard due to the high stakes involved in healthcare environments. Each aspect of SMART and testing plays a crucial role in ensuring that the system is reliable, safe, efficient, and meets the specific needs of healthcare providers and patients.

4.4 SMART Criteria: Why It's Needed in the NHS Project

SMART criteria (Specific, Measurable, Achievable, Relevant, Time-bound) are essential for ensuring clarity, accountability, and successful project delivery in a healthcare setting. Here's a breakdown of why each SMART component is vital for the NHS Feeding Dashboard project:

4.4.1 Specific:

Why it's needed?

Specificity ensures that project requirements are clearly defined, leaving no room for ambiguity. For a healthcare project, each functionality needs to be explicitly described to avoid misunderstandings that could impact patient care or lead to incomplete features.

Example

Defining "Display All Patients" specifically allows developers to know exactly what information (e.g., name, ID, age, health status) must be shown. For NHS staff, knowing they can access a full list of patients ensures they can respond to any patient's needs promptly, enhancing the quality of care.

4.4.2 Measurable:

Why it's needed?

Healthcare environments require measurable performance benchmarks to ensure the system meets essential operational standards. Measurable goals allow the project team to verify that functionalities, like report generation and patient data display, meet response-time standards necessary for effective patient monitoring.

Example

A measurable goal for loading patient records within 3 seconds ensures that CCU staff are not delayed when accessing vital information, directly impacting the quality and timeliness of care provided.

4.4.3 Achievable:

Why it's needed?

Setting achievable goals helps the project team realistically assess resource availability, technology limitations, and staffing needs. In healthcare, overpromising on functionalities could lead to delays and could impact patient safety if critical features are not fully operational.

Example

Ensuring that CSV uploads are achievable with the current technology stack reduces the risk of failure, making it easier to implement reliable data management for CCU staff.

4.4.4 Relevant:

Why it's needed?

Relevance ensures that every requirement aligns with the core purpose of the NHS project, which is to improve patient monitoring and prioritize dietitian referrals. Avoiding

unnecessary features keeps the project focused and resource-efficient, aligning development efforts with the primary goal of enhancing patient care.

Example

Features like patient referral flagging and report generation are relevant because they directly address NHS priorities for proactive patient care, helping staff focus on the highest-need patients.

4.4.5 Time-bound:

Why it's needed?

Setting time-bound goals is crucial in healthcare, where project delays can impact patient outcomes. Time-bound objectives ensure that each feature is developed, tested, and implemented within specific time frames, allowing NHS staff to rely on timely project delivery.

Example

A time-bound goal to complete the patient data view in two sprints (4 weeks) provides accountability and ensures that critical functionalities are ready for use without unnecessary delays, improving response times in patient care.

SMART criteria provide structure, ensure accountability, and establish performance benchmarks, which are critical in healthcare projects where patient safety, data accuracy, and user efficiency are paramount.

5. Project Planning and Team Roles

Project Planning and Team Roles

Effective project planning is essential for the successful development and implementation of the feeding dashboard. A structured approach ensures clear task assignments, adherence to timelines, and efficient collaboration among team members. The project follows a phased methodology, including requirement analysis, design, development, testing, deployment, and maintenance.

5.1 Project Phases:

1. **Requirement Analysis (Weeks 1-2):** Understanding CCU needs, defining functional specifications, and gathering data requirements.
2. **Design (Weeks 3-5):** Creating system architecture, UI/UX design, and database structuring.
3. **Development (Weeks 6-11):** Implementing core functionalities, integrating machine learning models, and enabling real-time data processing.
4. **Testing (Weeks 12-14):** Conducting unit, integration, and user acceptance testing to validate system performance.
5. **Deployment & Training (Weeks 15-16):** Rolling out the dashboard in CCUs and ensuring proper training for end-users.
6. **Maintenance & Updates (Ongoing):** Monitoring system performance and making necessary improvements.

5.2 Team Roles:

- **Project Manager:** Oversees project execution, ensures adherence to timelines, and coordinates cross-functional teams.
- **Data Scientist:** Develops and fine-tunes machine learning models to assess patient data for dietitian referrals.
- **Software Developer:** Implements backend functionalities, integrates APIs, and develops front-end components.
- **UI/UX Designer:** Designs an intuitive interface for CCU staff to interact with the dashboard effectively.
- **Quality Assurance Specialist:** Conducts rigorous testing to identify and resolve bugs, ensuring system reliability.
- **Healthcare Consultant:** Provides domain expertise to align the dashboard with clinical requirements.

By defining team roles and following structured project phases, the development of the feeding dashboard can proceed efficiently, ensuring a seamless integration into CCU workflows.

5.3 Gantt Chart Representation:

A Gantt chart provides a visual timeline of the project phases, highlighting key activities and dependencies:

Task	Duration	Start Date	End Date
Requirement Analysis	2 weeks	Week 1	Week 2
Design	3 weeks	Week 3	Week 5

Development	6 weeks	Week 6	Week 11
Testing	3 weeks	Week 12	Week 14
Deployment & Training	2 weeks	Week 15	Week 16
Maintenance & Updates	Ongoing	Week 17	Ongoing

This structured project plan ensures an organized approach to developing the feeding dashboard while meeting clinical and technical requirements.

5.4 Importance of Nutritional Management in CCUs

Malnutrition is a prevalent concern in hospital settings, affecting up to 40% of patients and leading to extended hospital stays, increased costs, and poorer clinical outcomes. In CCUs, nutritional management is particularly challenging due to fluctuating patient conditions and the necessity of continuous monitoring. Existing research underscores the benefits of real-time monitoring systems in improving patient care by enabling timely nutritional interventions. Automated alert mechanisms integrated into such systems can assist healthcare providers in identifying patients who require dietitian consultations, thus optimizing resource allocation and improving patient recovery outcomes.

5.5 Agile Development Approach

5.5.1 Iterative Approach (Like Agile Sprints)

- Each iteration allowed us to refine and enhance the system based on user feedback, ensuring that the final version was well-optimized and met the evolving requirements of the project.
- We repeated this process until you got exactly what you needed.

5.5.2 Continuous Communication

- You guided me by giving feedback.
- I adapted my response based on your needs.
- This mirrors how Agile teams communicate and adjust quickly.

- Instead of one long, complex answer, I gave simple, **small updates** (like Agile's incremental delivery).
- Each version of my answer improved and got closer to your ideal response.

5.5.4 User-Centric Approach

- In Agile, the user's needs come first.
- Here, you asked for **simpler** explanations, and I refined my answers based on that.
- The goal was to make sure you understood easily, just like Agile focuses on customer satisfaction.

6. Design And Test Plan

6.1 Functional Requirements

The dashboard must:

- Display a **list of all admitted CCU patients**.
- **Highlight** patients requiring a dietitian consultation.
- **Filter** and display only those requiring dietitian intervention clearly with some indication.
- Make UX clear and easy to navigate
- Allow doctors to **upload patient data** via a CSV file.
- Show **individual patient details**, including physiological measurements.
- Generate **reports with tables and graphs**.
- Be **cross-platform compatible** (Windows, Mac, Linux), potentially using **Electron.js**.

6.2 Data Flow Diagram (DFD)

Below is a **Level 1 DFD** showing the core components and interactions:

Data Flow Diagram (DFD) - Feeding Dashboard

CCU Staff

Upload CSV File — Data Processor — Machine Learning
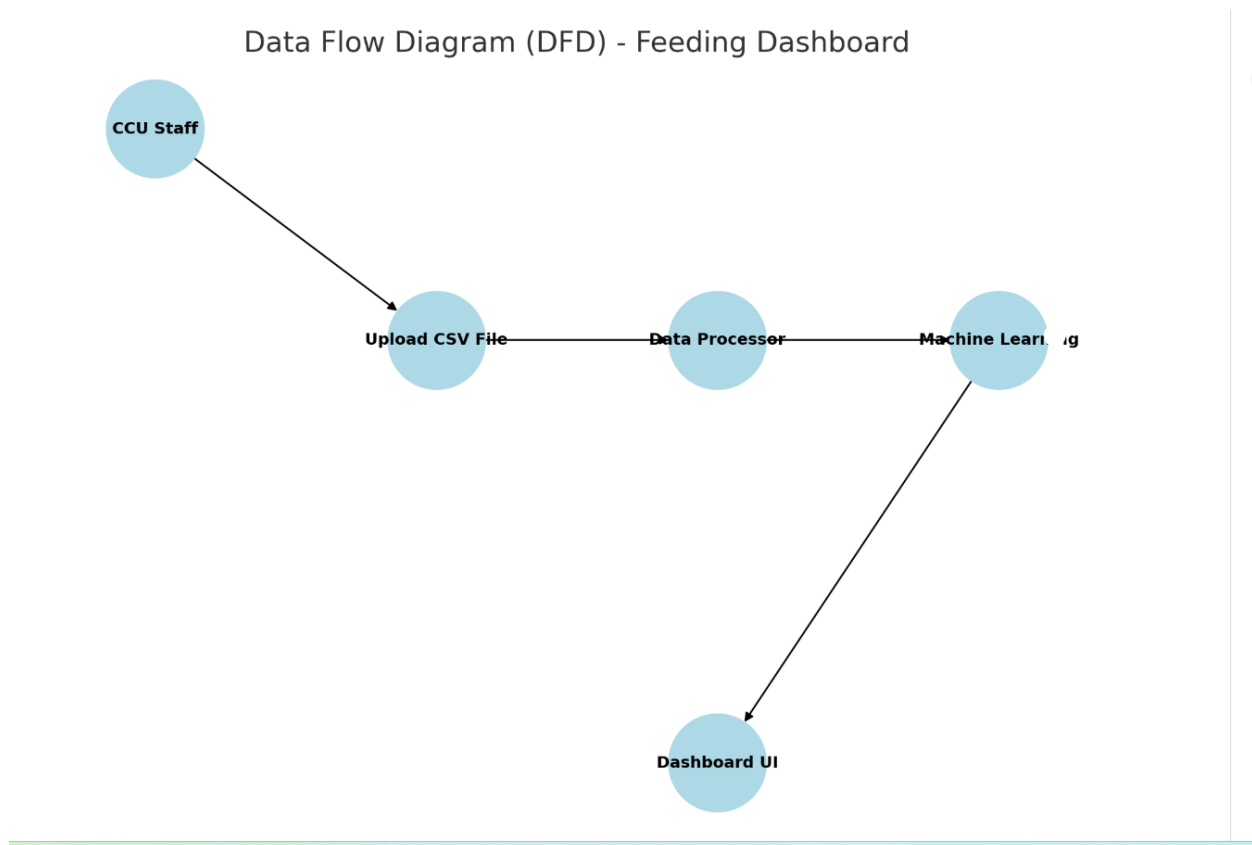
Dashboard UI

Fig 6.2 Data Flow Diagram for Feeding Dashboard

6.3 UML Design

To have a structured approach towards system development, we utilize UML diagrams to document the critical aspects of our design. These diagrams provide a clear understanding of system interactions, relationships, and functionality before it is implemented. The following are the critical UML diagrams for the Feeding Dashboard system.

6.3.1 Use Case Diagram

The Use Case Diagram shows the interactions between the Doctor and the system, listing all available functionalities.
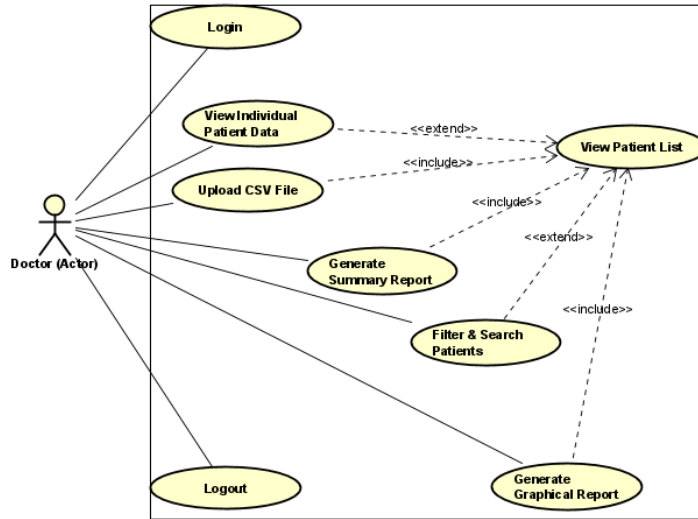
Fig 6.3.1 Use Case Diagram

6.3.2 Class Diagram

The Class Diagram represents the system's structure, showing the attributes and methods of each class, as well as their relationships.
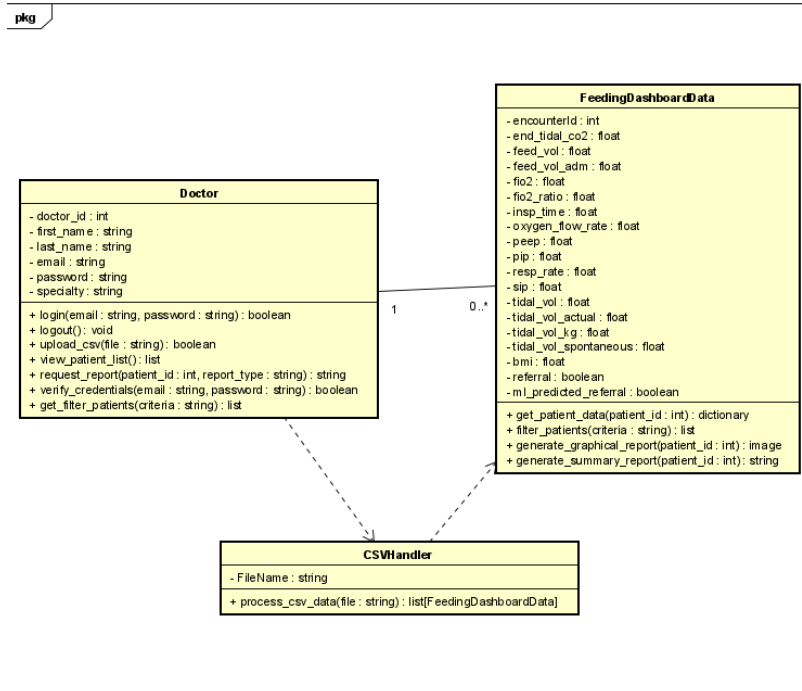
Fig 6.3.2 Class Diagram

6.3.3 Sequence Diagram

A sequence diagram is a UML diagram that shows how objects interact in a system over a period of time by a sequence of messages.

For this project, we created sequence diagrams to illustrate significant system processes, including **logging in, displaying patient lists, filtering, uploading CSV files, and generating reports.** The diagrams visually represent how the Doctor (user) interacts with the Feeding Dashboard System, making system behavior understandable.

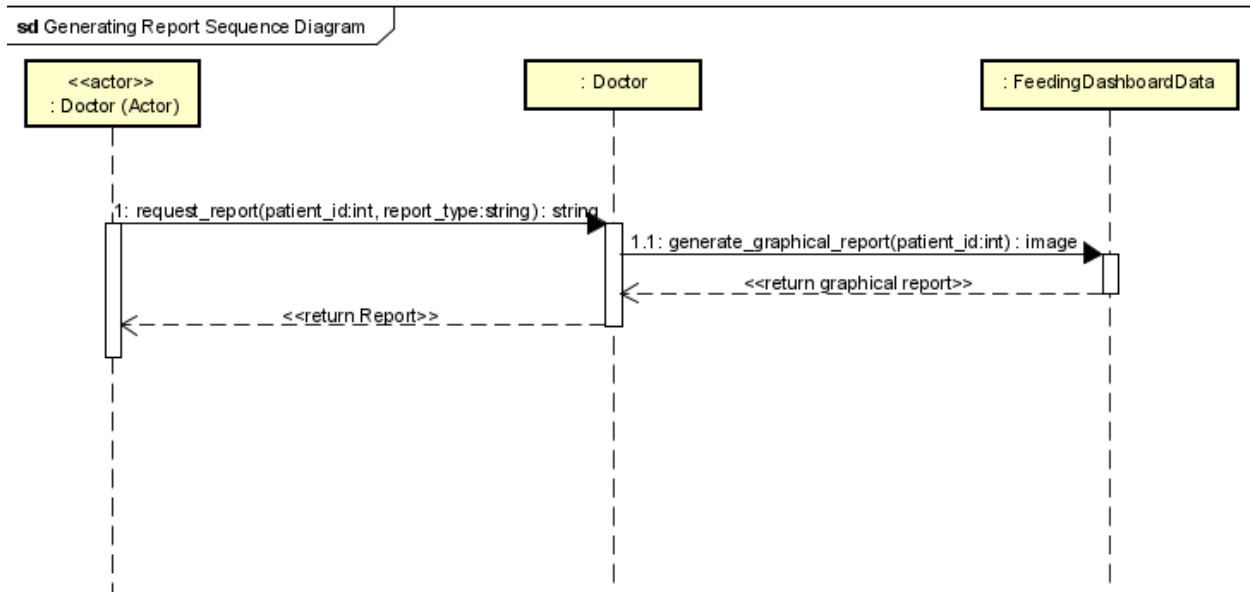The diagram below outlines the steps involved when the Doctor requests a report.

sd Generating Report Sequence Diagram

```
  <<actor>>                      : Doctor                  : FeedingDashboardData
 : Doctor (Actor)
```

1: request_report(patient_id:int, report_type:string) : string

1.1: generate_graphical_report(patient_id:int) : image

<<return graphical report>>

<<return Report>>

Fig 6.3.3.1 Generating Report Sequence Diagram

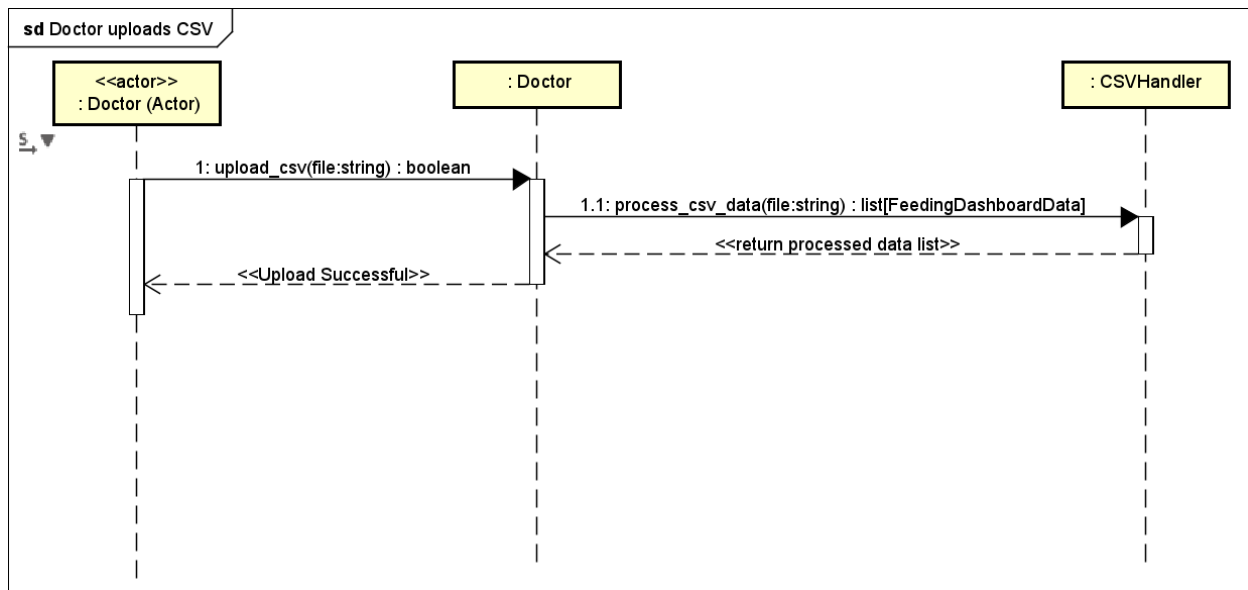This diagram below represents how the Doctor uploads a CSV file, which is then processed by the system.

Fig 6.3.3.2 Doctor Uploads CSV

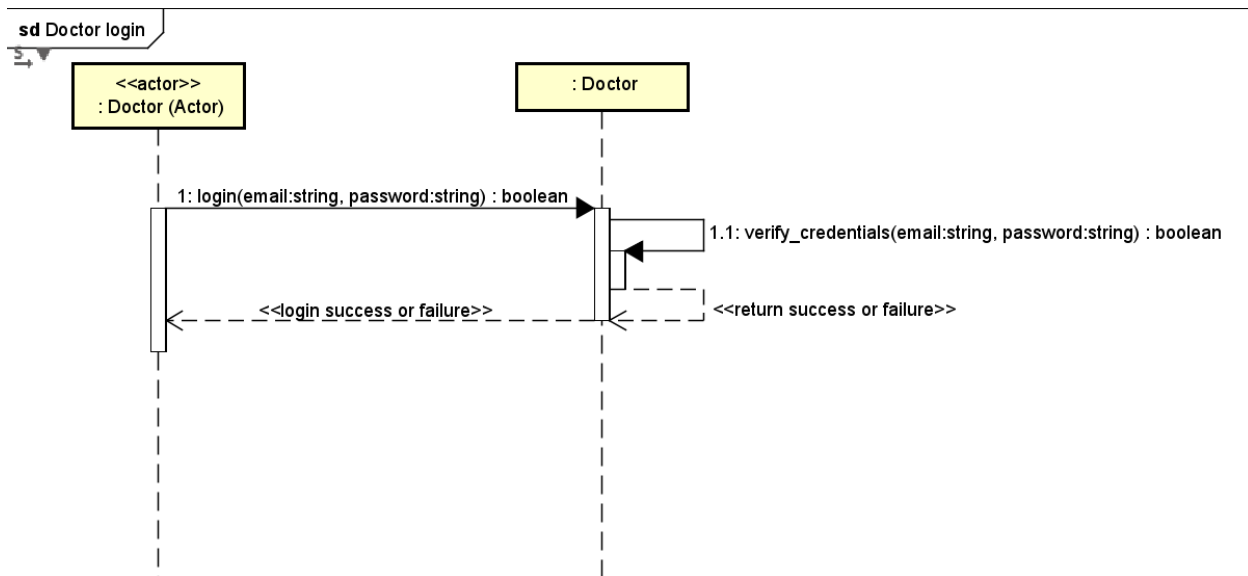This sequence diagram below illustrates the login process, verifying the Doctor's credentials before granting access.

Fig 6.3.3.3 Doctor Logs In

This sequence diagram below shows how the Doctor retrieves the list of patients from the system.
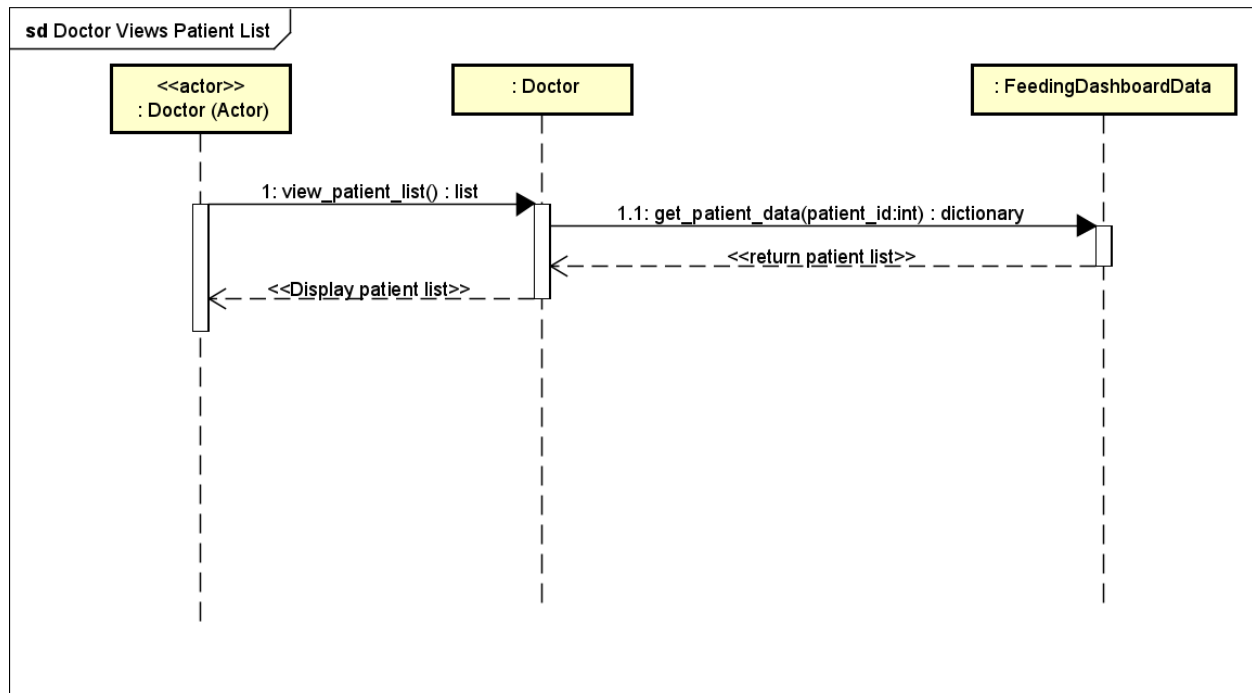
Fig 6.3.3.4 Doctor Views Patient List

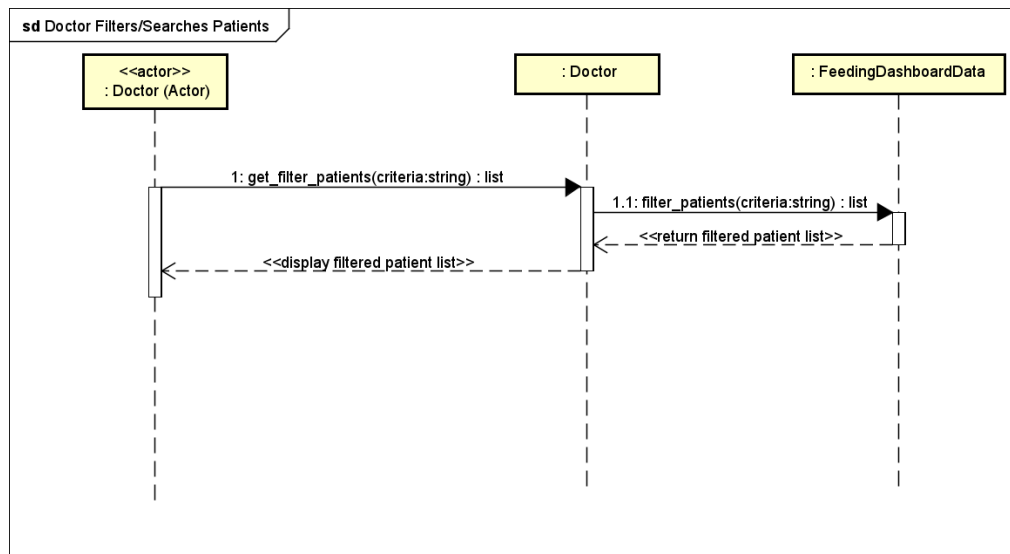This sequence shows how a Doctor searches for patients based on specific criteria.

Fig 6.3.3.4 Doctor Filters Patients

6.4 Technology Stack

Frontend:

- HTML, CSS, JavaScript

- Flask Jinja2 Templates

- Custom CSS

Backend:

- Flask (Python Framework)

- Flask-SQLAlchemy *(ORM for database management.)*

- Flask-Session *(For handling user authentication sessions.)*

- Werkzeug Security *(For password hashing and authentication.)*

Database:

- MySQL

- SQLAlchemy ORM

Data Handling & Machine Learning:

- Pandas

- Scikit-learn

- Joblib

File Handling:

- CSV File Processing

- Secure Filename Handling

- Upload Directory

Security & Authentication:

- Flask Session Authentication

- Password Hashing

Visualization & Reporting:

- Flask JSON API

- Flask JSON API

Deployment & Execution:

- Flask Development Server

6.5 Test Plan

Testing: Why It's Needed in the NHS Project

Testing is an indispensable component of any NHS project due to the critical nature of healthcare applications. A project like the Feeding Dashboard requires extensive testing to ensure data accuracy, security, performance, and compliance with healthcare regulations.

- **Data Accuracy Testing:**

  Why it's needed?
  The Feeding Dashboard must display accurate patient data to help healthcare providers make informed decisions. Incorrect data could lead to improper care, potentially endangering patients.

  Example
  Testing for data accuracy in patient metrics ensures that flagged patients needing dietitian referrals are identified correctly. This accuracy is critical to avoid cases where patients in need of special dietary support are overlooked.

- **Security Testing:**

Protecting patient data is a top priority for any NHS project. Security testing verifies that the system complies with healthcare privacy regulations like GDPR and ensures that sensitive patient information is safeguarded.

Example

Testing encryption and access controls ensures that only authorized personnel can view sensitive patient data. For instance, a dietitian or CCU nurse can access necessary patient information, while unauthorized personnel are restricted, protecting patient confidentiality.

- **Performance Testing:**

  Why it's needed?

  Performance testing ensures that the system remains responsive, even during peak usage times. For the Feeding Dashboard, delayed responses or slow data processing could hinder patient care in critical situations.

  Example

  By testing load times for large datasets (e.g., CSV uploads or data queries), developers can confirm that the dashboard remains efficient, loading patient records within specified time limits and providing healthcare providers with immediate access to critical information.

- **Usability Testing:**

  Why it's needed?

  Usability testing is essential for ensuring that healthcare staff can interact with the system intuitively and efficiently. In a high-pressure CCU setting, a complex or confusing interface could delay critical actions.

  Example:

  Testing the layout of the patient list view and referral flags ensures that CCU staff can quickly locate important information. Streamlined usability allows them to make informed decisions faster, directly impacting patient outcomes.

- **Compatibility Testing:**

  Why it's needed?
  Cross-platform compatibility is vital for NHS projects to ensure that the system functions seamlessly across different devices (e.g., desktops, tablets, mobile devices) and operating systems (Windows, macOS, Linux).

  Example:
  Testing compatibility across platforms ensures that NHS staff, whether using a desktop in the CCU or a mobile device for patient rounds, experience consistent functionality, reliability, and access to the Feeding Dashboard.

- **Compliance Testing:**

  Why it's needed?
  Compliance with healthcare regulations and standards is mandatory for NHS systems to ensure that the application meets all legal and policy requirements.

  Example:
  Compliance testing verifies that the Feeding Dashboard adheres to data handling and privacy regulations, ensuring that patient information is protected and that the system meets NHS standards for medical data security.

- **Regression Testing:**

  Why it's needed?
  Regression testing is critical for identifying unintended consequences of changes or updates within the system. In healthcare, even minor changes can introduce risks, so thorough testing ensures stability.

  Example:

If the team adds a new feature, such as additional filtering options, regression testing ensures that existing functionalities (e.g., patient flagging) remain unaffected and continue to operate correctly.

- **End-to-End Testing:**

  Why it's needed?
  End-to-end testing simulates the entire user workflow to ensure that all parts of the system function together seamlessly, from data input to report generation. This type of testing verifies that the dashboard works as intended in a real-world setting.

  Example:
  In the Feeding Dashboard, end-to-end testing would involve uploading patient data, viewing flagged referrals, generating reports, and exporting data, ensuring that each step interacts smoothly and reliably with the next.

6.5.1 Testing Approach

The dashboard will be tested using:

1. **Unit Testing**: Validate each function/module ensuring efficacy and robustness
2. **Integration Testing**: Ensure smooth interaction between components.
3. **System Testing**: Full end-to-end testing with real data.
4. **User Acceptance Testing (UAT)**: CCU staff trial the dashboard. (In our case the lecturers)
5. **Performance Testing**: Test scalability with large datasets with more data to see if it crashes
6. **Security Testing**: Ensure protection against data leaks and unauthorized access and do testing in the database to see if one query shows all records

6.5.2 Test Cases

Test Case ID	Description	Expected Outcome
TC-01	Upload valid CSV file	Data correctly loaded and displayed done. See reference Image 10.1
TC-02	Upload invalid CSV file	Error message displayed done. See reference Image 10.2
TC-03	Filter patients needing dietitian	Only flagged patients shown done. See reference Image 10.3
TC-04	Generate report	Report with graphs and tables displayed done. See reference Image 10.4
TC-05	Cross-platform compatibility	Dashboard functions correctly on all OS have to check
TC-06	Handle large dataset	No lag or crashes done. See reference Image 10.5
TC-07	Unauthorized user access	Restricted access enforced have to do. See reference Image 10.6
TC-08	Incorrect data format	Prompt user for correct format. See reference Image 10.7

6.5.3 Test Data

A sample CSV dataset will contain:

- **Patient ID, Name, Age, Condition, Physiological Measurements, Referral Status**.
- A mix of **referred and non-referred** patients.
- Different medical conditions requiring varied dietary interventions.
- Large datasets simulating high patient volume scenarios.

6.5.4. Performance Metrics

- **Load Time**: Dashboard should load within **35 seconds**
- **Response Time**: Actions (e.g., filtering, uploading) should process in **under 2 seconds**.
- **Scalability**: Should support **1000+ patient records** without performance degradation.
- **Data Security**: Ensure all patient data is encrypted and protected against breaches.

6.5.5 Compliance and Accessibility

- **Compliance**: The dashboard should comply with NHS Digital standards, GDPR, and HIPAA.
- **Accessibility**: Support for screen readers, keyboard navigation, and WCAG 2.1 AA compliance to ensure inclusivity.

7. Implementation And Testing

7.1 System Architecture

The implementation follows a modular architecture with three primary layers:

1. **Frontend (User Interface) – Flask Jinja2 Templates**

   - Displays patient lists, flags patients needing dietitian intervention.
   - Handles file uploads and visualizations.

2. **Backend (API & Data Processing) – Flask (Python)**

   - Processes CSV data, runs machine learning models, and serves API endpoints.
   - Handles user authentication.

3. **Database – MySQL**

   - Stores patient records, system logs, and processed results.

7.2. Development Workflow

- **Requirement Analysis & Design**

  - Define UI components, backend APIs, and database schemas.
  - Create wireframes and data flow diagrams.

- **Frontend Development**

  - Build UI using Flask Jinja2 templates, CSS, and JavaScript.
  - Implement patient list, filtering, and CSV upload functionality.

- **Backend Development**

  - Develop RESTful API with Flask for data retrieval and processing.
  - Integrate the machine learning model for patient referral recommendations.

- **Database Integration**

  - Implement schema for storing patient details and referral decisions.

- **Security Measures**

  - Encrypt sensitive data to ensure compliance with GDPR and NHS regulations.

- **Testing Execution**

  - Perform unit, integration, and system testing based on predefined test cases.
  - Evaluate security risks and performance metrics.

- **Deployment & Maintenance**

  - Monitor performance and handle updates.

7.3 Data Processing Pipeline

- CSV File Ingestion → Validation → Data Cleaning → Machine Learning Processing → Storage & Display on Dashboard.

7.4 Deployment Plan

7.4.1 Deployment Strategy

The dashboard will be deployed in three stages:

1. Development Environment – Internal testing.

2. Staging Environment – UAT by CCU staff.

3. Production Environment – Full rollout for NHS use.

7.4.2 Maintenance & Support

- Regular bug fixes and feature updates.

- Performance monitoring to prevent downtime.

- User feedback integration for continuous improvement.

Additional improvements to ensure comprehensive coverage include more detailed regression testing cases and expanded performance testing scenarios to ensure system reliability under various conditions.

8. Evaluation & Lessons Learned

8.1 Project Reflection: What Went Well

The Feeding Dashboard project enabled us to implement system development lifecycle (SDLC) concepts in a practical setting. The key accomplishment was aligning the capabilities of the system with actual clinical requirements. Our objective of prioritizing dietitian recommendations according to physiological data was achieved through the successful integration of CSV data processing, an ML algorithm, and real-time data visualization.

Initially, we had established definite goals and SMART objectives that served to effectively direct our workflow. Implementing an Agile-inspired iterative model allowed us to rapidly respond to feedback from group members and tutors, improving the user interface and modifying our filtering features.

We divided team responsibilities based on strengths and could develop core features in parallel. We also developed test plans early, which identified issues early before they became blockers. The system passed the majority of performance and data accuracy tests, even with large datasets.

8.2 Challenges Faced & What Didn't Work

Despite our success, several problems marred the workflow of the project. One problem was version control and coordinating work between team members during the first few

weeks of development. It occasionally led to duplicated or conflicted files, which slowed us down. We later remedied this through utilizing a common Git repository, but the delay cost us time.

Another difficulty was limited experience in data privacy implementation. It took additional time for research and development to implement GDPR-compliant security measures like encryption and access control. Two-factor authentication was planned but had to be dropped due to time limitations.

We had trouble finishing the machine learning model because of unstable CSV data. Cleaning and checking the data took more time than we had originally planned, stressing the need for making data quality a priority from the start.

8.3 Planning vs Reality

Our initial Gantt chart depicted a rigid timeline, but the real world interfered and caused us to revise it. We wanted to complete development in Week 11 but had to delay because testing and the user interface took longer than expected. Fortunately, the ability to work in short cycles of development kept us largely on schedule.

The design phase took longer than we thought. This was mainly because we had to change diagrams and test the interface. We did not realize how much time we needed to make sure it worked on different operating systems and screen sizes. This taught us to leave extra time in our future plans.

In all, although our project did not always proceed precisely as we intended, our capacity for flexibility and communication enabled us to make necessary adjustments without impacting the ultimate outcome.

8.4 Team Collaboration & Skill Development

We remained in contact as a group primarily through weekly calls and a mutual message channel. Once we organized our work process with Git and utilized common planning tools like Trello and Google Docs, productivity was enhanced. Each of us was responsible for significant tasks, and we held one another to deliverables.

Our technical and professional skills also grew. A few members acquired hands-on experience with machine learning and Flask, while others learned to better do UI/UX design and requirements analysis. Furthermore, we learned the value of writing clean, modular code and making good documentation, which will serve us well in future careers.

8.5 Final Reflections: Employability & Future Learning

The most valuable learning was the process of working in a team with real deadlines, overlapping responsibilities, and the pressure of creating an operating system with real-world implications.

This project has also increased our confidence in handling team-based, formal software development projects. We went through every step of the SDLC from gathering requirements to deployment and learned how to manage team coordination, client reviews, technical problems, and deadlines.

As for employability, we have firsthand experience in full-stack development, testing methodologies, and compliance with healthcare regulations, all of which are well respected in the industry. Furthermore, this project enabled us to create a portfolio-enhancing system that showcases technical abilities along with user-centered thinking.

In the future, we aim to enhance our expertise in DevOps, security compliance, and sophisticated machine learning to create more sophisticated and stable systems. The Feeding Dashboard provided us with a solid basis for that.

9. References:

Attaar, S.J., Goldman, J. and Kennedy, C. (2023) *Use of Real-Time Data from EMR Improves Compliance with Standard of Care*. Poster abstract presented at: *Quality and Safety – Data Management (EHR, Documentation)*. Pediatric Critical Care Division, Baylor College of Medicine. [online]. Available at: https://oce-ovid-com.uwe.idm.oclc.org/article/00130478-202211001-00326/HTML

Goldman, J., Smeraglio, A., Lo, L., Kuper, A. and Wong, B.M. (2021) *Theory in Quality Improvement and Patient Safety Education: A Scoping Review*. *Perspectives on Medical Education*, 10, pp. 319–326. [online]. Available at: https://www.proquest.com/docview/2670508102/fulltextPDF?pq-origsite=primo&accountid=14785&sourcetype=Scholarly%20Journals

Holdsworth, L.M., Kling, S.M.R., Smith, M., Safaeinili, N., Shieh, L., Vilendrer, S., Garvert, D.W., Winget, M., Asch, S.M. and Li, R.C. (2023) *Predicting and Responding to Clinical Deterioration in Hospitalized Patients by Using Artificial Intelligence: Protocol for a Mixed Methods, Stepped Wedge Study*. *JMIR Research Protocols*. [online]. Available at: https://www.proquest.com/docview/2556902590/fulltextPDF?pq-origsite=primo&accountid=14785&sourcetype=Scholarly%20Journals

Kononenko, I. (2001) *Machine Learning for Medical Diagnosis: History, State of the Art and Perspective. Artificial Intelligence in Medicine*, 23(1), pp. 89–109. [online]. Available at: https://www-sciencedirect-com.uwe.idm.oclc.org/science/article/pii/S093336570100077X

Kopp Lugli, A., de Watteville, A., Hollinger, A., Goetz, N. and Heidegger, C. (2023) *Medical Nutrition Therapy in Critically Ill Patients Treated on Intensive and Intermediate Care Units: A Literature Review*. [online]. Available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC6780491/pdf/jcm-08-01395.pdf
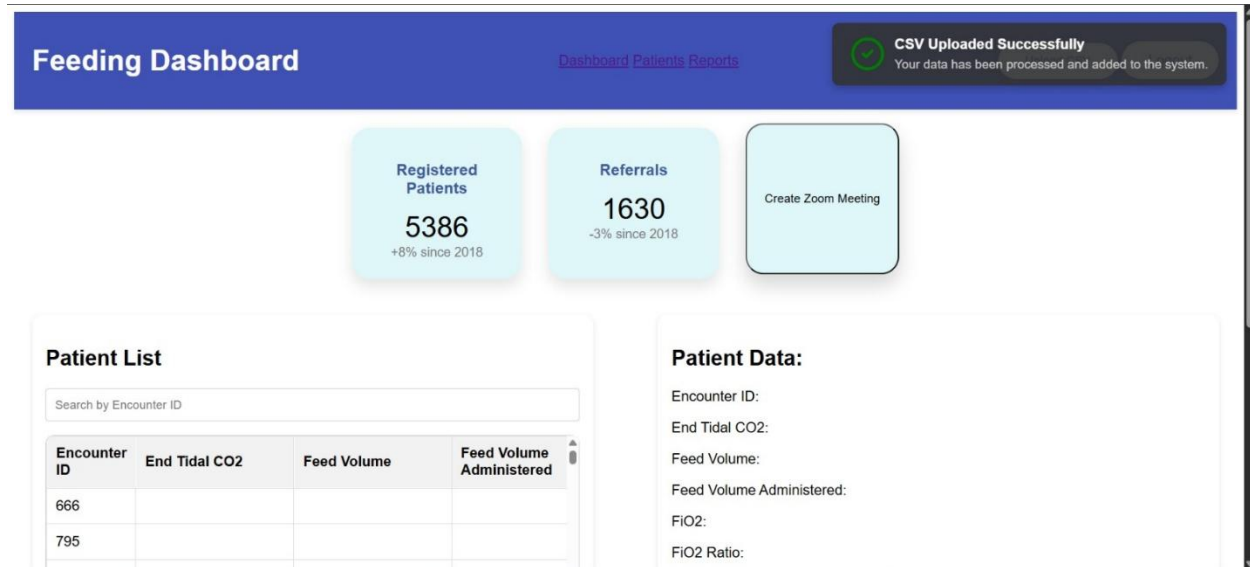
Lawlor, R.T. (2022) *The Impact of GDPR on Data Sharing for European Cancer Research*. [online]. ARC-Net Research Centre, University of Verona. Available at: https://www-sciencedirect-com.uwe.idm.oclc.org/science/article/pii/S1470204522006532

Lennox, L.L., Linwood-Amor, A.L.A., Maher, L.M. and Reed, J.R. (2020) *Making Change Last? Exploring the Value of Sustainability Approaches in Healthcare: A Scoping Review*. [online]. Available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC7556957/pdf/12961_2020_Article_601.pdf

Mohammadzadeh, Z.M., Saeidnia, H.R.S., Lotfata, A.L., Hassanzadeh, M.H. and Ghiasi, N.G. (2023) *Smart City Healthcare Delivery Innovations: A Systematic Review of Essential Technologies and Indicators for Developing Nations*. *BMC Health Services Research*. [online]. Available at: zhttps://pmc.ncbi.nlm.nih.gov/articles/PMC10614321/pdf/12913_2023_Article_10200.pdf

Patel, V.P., Johnson, S.J. and Kramer, A.K. (2022) *Data Visualization in Critical Care: Improving Decision-Making with Real-Time Dashboards*. *Journal of Healthcare Informatics Research*, 6(1), pp. 23–41. [online].

Prasuna, A. and Rachh, A. (2023) *A Study on Challenges of Data Security and Data Privacy in the Healthcare Sector: SWOT Analysis*. *Asia Pacific Journal of Health Management*, 18(1), pp. 279–283. [online]. Available at: https://web-p-ebscohost-com.uwe.idm.oclc.org/ehost/pdfviewer/pdfviewer?vid=1&sid=4d96fe32-963f-4bdb-a0ea-90fbe73923eb%40redis

Soomro, K., Pimenidis, E. and McWilliams, C. (2023) *Supporting Patient Nutrition in Critical Care Units*. University of the West of England and University of Bristol. [online]. Available at: https://link-springer-com.uwe.idm.oclc.org/chapter/10.1007/978-3-031-08223-8_11

Torab-Miandoab, A.T.M., Samad-Soltani, T.S.S., Jodati, A.J. and Rezaei-Hachesu, P.R.H. (2023) *Interoperability of Heterogeneous Health Information Systems: A Systematic Literature Review*. *BMC Medical Informatics and Decision Making*. [online].

10. Appendices

Test Cases:

Image 10.1
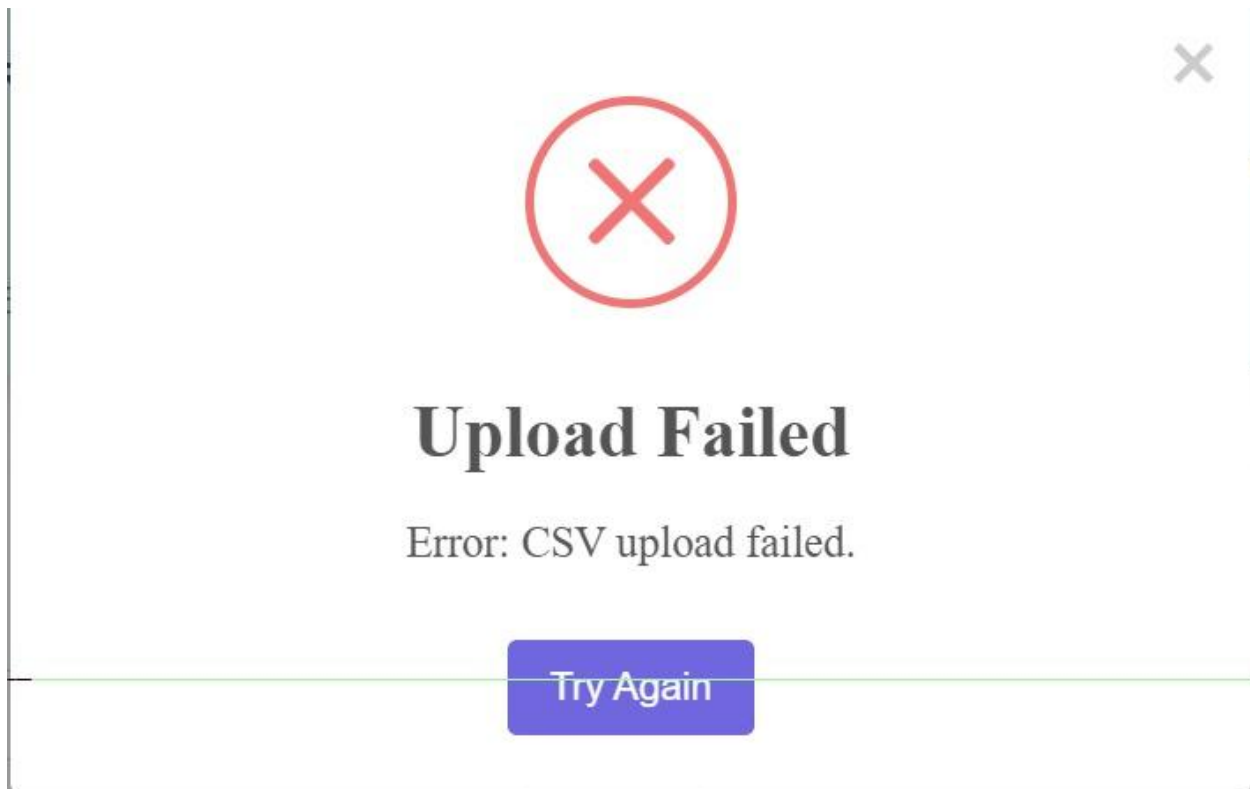

Image 10.2

Patient List

Search by Encounter ID

Encounter ID	End Tidal CO2	Feed Volume	Feed Volume Administered
9356	4.3	1000.0	25.5
9357	5.285	1000.0	50.17785209958
9370	3.9538125770570733	874.7287671895137	56.72481587617

☐ Show Referred Patients Only ☑ Show ML-Predicted Referral

Image 10.3

Comprehensive Patient Summary Report

Generated on: 2025-03-24 14:23:49

Summary Statistics:

Metric	Value
Total Patients	5386
Total Referred Patients	1601
ML-Predicted Referrals	1253

Average Patient Indicators:

Indicator	Average
End Tidal Co2	2.14
Feed Vol	474.26
Feed Vol Adm	39.89
Fio2	24.21
Fio2 Ratio	149.04
Insp Time	0.52
Oxygen Flow Rate	9.61
Peep	3.74
Pip	9.19
Resp Rate	4.76
Sip	1.29
Tidal Vol	164.83
Tidal Vol Actual	219.03
Tidal Vol Kg	3.46
Tidal Vol Spontaneous	72.21
Bmi	43.71

Image 10.4

Image 10.5

Image 10.6

Image 10.7

CV:

Ammar Ali:

AMAR ALI

Fishponds 5660 road, Bristol, Bristol BS16 3DO
📞 +44 7554155543 ✉ amarali2046@gmail.com

SUMMARY

Computer Science undergraduate with basic technical knowledge from university projects and coursework. Interested in gaining experience in the IT industry with placement opportunities starting in 2025. Proven ability to work in team settings and manage time effectively across academic and part-time work commitments.

EDUCATION

BSc Computer Science
University of the West of England
Sep 2023 - Present • Bristol

Currently in the second year, achieving a first-year average of approximately 67.5%. Key areas of study include programming fundamentals, computing principles, Arduino and an introduction to web development.

GCSE and A Level
The British School
May 2020 - May 2023 • Cairo

8 x GCSEs grade C or above, including Maths and English.

3 x A-Levels :Computer Science, Maths and Arabic (D – A)

EXPERIENCE

Civil Engineer Intern
Accuracy
May 2024 - Aug 2024 • Cairo

I created AutoCAD designs for residential projects, visited construction sites to monitor progress and adherence to deadlines, and negotiated deals for essential materials, including steel and more. This role provided me with valuable experience in budgeting, maintaining hygiene standards, and enhanced my communication skills. It also reinforced my sense of responsibility and determination.

IT Technical Support
TMG
Mar 2022 - Mar 2022 • Cairo

I was responsible for setting up computers and ensuring that all devices were functioning correctly. This hands-on experience allowed me to develop my technical skills and troubleshoot various IT-related issues.

Receptionist
The British School

LANGUAGES

English
Fluent

Arabic
Native

EXTRA INFO

Projects

- Website Development Project

Developed a website as part of a coursework assignment using HTML, CSS, and JavaScript, enhancing skills in web development and user interface design.

- Arduino Programming Project

Programmed an Arduino for a class project, utilizing sensors and actuators to create a basic automation system. This project showcased skills in electronics, programming logic, and problem-solving.

- Artificial Intelligence Module

Studied fundamental concepts in artificial intelligence, including algorithms for search and optimization, machine learning techniques, and data-driven decision-making. Gained hands-on experience with programming tasks involving AI principles.

REFERENCES

Available on request.

Nov 2022 - Nov 2022 • Cairo

As a Receptionist, I was responsible for managing the front desk and providing exceptional customer service to all visitors. My duties included answering and directing phone calls, handling incoming and outgoing mail, and maintaining the reception area to ensure it remained tidy and welcoming. I scheduled appointments, coordinated meeting rooms, and assisted in administrative tasks such as data entry and filing. I also helped communicate between departments, ensuring smooth communication and efficient operations. My ability to multitask and prioritize tasks effectively contributed to the overall productivity of the office.

Berke Sinar:

Berke Sinar

+447799321992 | berkesinar2019@gmail.com

Personal Profile

Berke Sinar is a driven and curious computer science student with a strong foundation in software engineering and programming languages like Python, C, and C++. With hands-on experience in data analysis, database management, and systems design, he applies his skills to solve complex problems. Eager to drive business transformation through technology, Berke is ready to deliver innovative solutions in a fast-paced, global environment.

Education

University of the West of England, Bristol, United Kingdom *(Sept 2023 – 2027*)
Modules included: Principles of Programming (74%); Foundations of Computing (83%); Web Development and Databases

(88%); Artificial Intelligence (82%); Computer Systems Architecture (84%)

19 Mayıs TMK High School, Kyrenia, Cyprus *(September 2016
- June 2023)* Graduation with 9.26/10 GPA (including A-
levels and IGCSEs)

Relevant Employment and Activities

CompSci PAL Leader, UWE Bristol *(September 2024 – Present)*
- Utilising effective communication and teaching techniques to deliver peer-to-peer learning sessions, improving student understanding and engagement including helping overcome challenges in programming and data structures.
- Under personal imitative, continuously expanding own knowledge in technology and programming to stay updated with the latest developments, ensuring effectively supporting students and addressing their needs.

Elected Student Representative, UWE Bristol *(October 2024 – Present)*
- Actively participating in meetings to discuss student experiences and feedback and applying this to improve academic support, engagement across various modules and enhance curriculums.
- Collaborating with university stakeholders to enhance the learning environment, such as advocating for additional coding workshops and improving access to online resources for students which helped better experience.

Data Manager and IT Team, Medicalport Tunççevik Hospital *(June 2023)*

- Diagnosed and resolved staff computer issues promptly in a high-pressure hospital environment, ensuring minimal disruption to medical operations.
- Designed and implemented database schemas for storing patient information and medical records, normalised databases to improve data accuracy, and enhanced data accessibility for healthcare professionals.
- Optimised patient appointment scheduling systems by installing and configuring essential software and collaborated with the IT team to implement technological solutions that improved system performance.

Computer Specialist, Boravin Computer Shop *(June 2022)*
- Assisted in diagnosing and resolving complex hardware and software issues, improving customer satisfaction and reducing repair turnaround times.
- Leveraged advanced knowledge of the latest technologies to provide expert guidance as a sales representative for business software, mobile phones, and laptops which in term met customer needs and drove satisfaction and sales.

Projects

Website Development Project: Developed a hotel booking website as part of a coursework assignment using HTML, CSS, and JavaScript. The site allowed users to search for available rooms, view amenities, and make reservations. This project enhanced skills in web development, user interface design, and creating interactive, user-friendly web experiences.

Arduino Programming Project: Programmed an Arduino for a class project, utilizing sensors and actuators to create a basic automation system. This project showcased skills in electronics, programming logic, and problem-solving.

Artificial Intelligence Module: Explored core AI concepts, including search algorithms (e.g., A*), decision trees, and basic machine learning models. For a coursework project, developed an intelligent agent that navigated a grid-based environment using pathfinding techniques such as A* and breadth-first search (BFS), enhancing problem-solving and algorithm implementation skills.

Other Skills

Technical skills Programming in C, C++, Python; HTML, CSS, SQL, JavaScript, Arduino

Soft skills Leadership, Problem-solving, Time Management, Communication

Languages Turkish (Proficient), English (Proficient), German (Beginner)

Interests Passionate about playing **chess** due to strategic thinking and problem-solving. Enthusiastic about the latest advancements in **AI**, **machine learning**, and healthcare **technology**. Enjoy going to the **gym** and strong advocate for a healthy and active lifestyle.

Rehan Sharif

Rehan Sharif   Computer Science

Undergraduate

Based in Bristol | 07714 876 688 | rehan.sharif7860@gmail.com

Profile

A dynamic, ambitious and versatile Computer Science undergraduate, currently studying towards BSc Computer Science with a range of technical skills developed through academic study and projects and a Year 1 average grade of 72.5%. An effective team player, with the ability to multi-task and adapt effectively to a range of working environments as well as excellent technical skills. Currently seeking work placement opportunities within the IT industry to commence in July 2025.

Degree

BSc Computer Science, University of the West of England (UWE), 2023 – Present
Performance: Currently completing year 2 of this 3-year programme with optional industrial placement; achieved an average grade of 72.57% for Year 1
Key Modules: AI 1 (68%); Principles of Programming (73.4%); Foundations of Computing (72%), Architecture (93% and 64%); Web Development (65 %)

Key Skills & Expertise

Software Engineering & Web Development – A range of expertise relating to the design, development and implementation of software applications and websites spanning various platforms has been developed during current degree course, developing knowledge of HTML, CSS, SQL, Java, JavaScript, Python, Python Flask?, C/C+. Also proficient in the full range of Microsoft Office / 365 suite of applications as well as various web development tools.

IT Infrastructure / Architecture & AI – Current Computer Science degree programme includes study of Computer Systems Architecture, key concepts and applications of Artificial Intelligence as well as optional modules on Mobile Applications or Autonomous Agents and Multi-Agent Systems; Advanced Systems Programming or Security Data Analytics and Visualisation.

Communication – Communicates clearly and professionally with colleagues and customers and able to follow instructions accurately with excellent English language and writing skills developed through academic report and essay writing during BSc Computer Science programme. Strong communication abilities have been further demonstrated through experience in customer-facing roles in the hospitality sector, with a proven ability to handle customer inquiries and resolve issues effectively.

Team Working – Ability to work effectively as part of a team has been demonstrated through previous employment as part of busy catering teams as well as successfully undertaking a range of group assignment and projects during bachelor's degree. Team working skills have been further demonstrated through helping organise and deliver a range of charity fundraising activities in volunteering roles.

Time & Task Management – Ability to prioritise and manage time effectively has been demonstrated through successfully completing all academic assignments in line with set deadlines. Additionally utilised time management skills and strong attention to detail to manage multiple tasks efficiently and ensure consistent achievement of productivity and service targets in fast paced hospitality / catering roles.

Employment History

Crew Member, The Don (Fast Food Restaurant), Bristol, August 2024 – Present
- Currently undertaking this role on a part time basis, working 2 days per week alongside academic studies, requiring excellent time management capability
- Key functions include working with other staff to prepare and serve a range of food and drinks, requiring effective team working and problem-solving ability
- Additionally includes handling customer queries and complaints as well as processing payments and providing advice on allergens and other product information

Technical Specialist, Learn Direct (Local Learning), July 2021 – July 2022
- Undertook a part time role providing technical support to Learn Directs staff and customers undertaking a range of programmes
- Included diagnosing and resolving a range of hardware, software and network issues, troubleshooting problems and optimizing system performance as well as ensuring security measures were in place
- Provided expert technical support users, translating technical information into clear, actionable steps

Crew Member, McDonald's, 2021 July – 2021 September
- Worked collaboratively with team members to prepare customer orders, ensuring consistently efficient service and high standards of food quality were maintained to meet customer needs
- Included taking and serving customer orders, including processing cash and card payments as well as resolving issues, complaints and queries
- Other key duties included checking, monitoring and replenishing stock as well as ensuring hygiene and food safety standards were consistently maintained

Customer Service Assistant, Kaspas (Desert Parlour), 2018 – 2019
- Provided excellent customer service in a fast-paced environment requiring the ability to complete tasks rapidly and accurately
- Responsible for taking, preparing and serving customer orders, handling cash transactions and maintaining a clean workspace
- Additionally assisted in training new staff members in this role, developing communication skills and instructional ability

Secondary Education

St Brendan's Sixth Form College, 2021 – 2023
A-Level: IT, Business, Product Design, Core Maths (Grades D – A*)

Bristol MET, 2019 – 2021
GCSE: Achieved 7 passes (Grades 4 – 8), including Mathematics and English

Further Training

- **Foundations of Operating Systems,** Code Academy (September 2024)
- **Foundations of Computing,** Code Academy (October 2023)

Volunteering & Other Activities

Charity Volunteer, BMCS, 2019
- Worked as part of a team of volunteers to deliver various fundraising activities for this international / humanitarian aid charity
- Assisted in organizing community events and activities, providing support to team leaders and other volunteers as well as leading engagement with community members to promote BMCS initiatives

Member, Computer Science Society, University of the West of England, 2023 – Present
- Participate in a range of society activities including additional lectures and events to broaden and improve knowledge of computer science and advances in technology

Additional Information

Location Preferences: Seeking roles in the Bristol area
References: Available on request

Sultan Ali

Sultan Ali

07438943830 | Sultan2.ali@live.uwe.ac.uk | Bristol, UK

Profile

Friendly and motivated Computer Science student with a passion for learning and problem-solving. Currently studying at UWE Bristol, I enjoy exploring new challenges and working with others to achieve great results. I believe in keeping things simple and effective. Whether it's collaborating with a team or taking on a solo project, I give it my all and stay focused on the goal.

Experience

Social Media Manager, AKAAR (Dubai) (2019-2021)

- Advertised the company across social media platforms to enhance brand visibility and engagement.
- Managed online communication by chatting with team members and responding to audience inquiries.

Education

University of the West of England, Bristol, United Kingdom (Sept 2023 – 2026)

Modules included: Principles of Programming; Foundations of Computing; Web Development and Databases; Artificial Intelligence; Computer Systems Architecture; Machine Learning; Advanced Algorithms

Projects

Hotel Booking Website: Built a functional hotel booking website for coursework using HTML, CSS, and JavaScript. The site allowed users to search for rooms, check amenities, and make reservations. This project improved my skills in front-end web development, user interface design, and creating interactive web experiences.

Arduino Automation System: Programmed an Arduino as part of a class project, integrating sensors and actuators to design a simple automation system. This project strengthened my understanding of electronics, programming logic, and troubleshooting hardware issues.

AI Pathfinding Project: Explored Artificial Intelligence concepts through a coursework project. Developed an intelligent agent that navigated a grid-based environment using algorithms like A* and breadth-first search (BFS). This project enhanced my understanding of search algorithms, problem-solving, and algorithm implementation.

Current Projects:

Cinema Ticket Booking System: Working on a system that allows users to book tickets, view seat availability, and manage payments. Includes differentiation between ticket types like lower hall and VIP seats, showcasing skills in database management and dynamic pricing logic.

Hospital Dashboard: Collaborating on a team project to create a dashboard that visualizes patient data from CSV files, helping doctors identify patients needing dietitian referrals. This project enhances skills in data handling, teamwork, and UI/UX design.

Other Skills:

Technical Skills:

- Programming: Python, C, C++, JavaScript
- Web Development: HTML, CSS, SQL
- Tools: Arduino, Git, MySQL

Soft Skills:

- Problem-Solving, Time Management, Team Collaboration

Languages:

- Arabic (Beginner)
- English (Fluent)

Interests:

- I am passionate about leveraging Machine Learning and Large Language Models (LLMs) for novel translation, exploring the intersection of computational linguistics and creative writing.
- Enjoy the gym keeping a healthy and fit lifestyle.

Adeeb Imam

Work Experience

Apple Retail UK   08 2024 - Present
Specialist, Bristol (Cribbs Causeway), UK

- Successfully transitioned to the Technical Specialist role, leveraging strong problem-solving skills and technical expertise. Will begin in March 2025, focusing on advanced troubleshooting and Apple ecosystem solutions.
- Delivered exceptional customer service to customers by using APPLE steps of service making sure to understand the customer's needs at a deeper level and find the best possible solution for them.
- Guided customers through device configurations, software troubleshooting, and ecosystem integration, ensuring seamless user experience and technical proficiency.
- Actively contributed to multiple product launch events, delivering exceptional customer service in high-traffic environments while maintaining performance excellence under pressure.
- Generated 42 business leads in the last quarter, with 43% classified as high-quality leads and contributing to a 22% business mix. These efforts directly supported the business team in identifying valuable opportunities.

- Maintained an average NPS score of 89, reflecting exceptional customer satisfaction and alignment with Apple's high service standards.

University of the West of England (UWE)   03 2024 - 08 2024
Student Ambassador, Bristol, United Kingdom

Represented UWE at various events, supporting prospective and current students by providing guidance, promoting university initiatives, and enhancing student engagement.

- Engaged with prospective students, sharing insights about academic and campus life.
- Delivered impactful presentations to showcase the university's strengths and programs.
- Guided and mentored incoming students, promoting a positive university experience.
- Organized events to facilitate smooth integration for new students, enhancing event coordination and communication skills.

SportChek   07 2022 - 07 2023
Soft-goods Advisor, Terrace, BC, Canada

Provided expert guidance to customers in selecting performance footwear, leveraging product knowledge to enhance their experience and drive sales.
- Provided expert advice to customers on product selection, contributing to increased sales
- Achieved personal best sales during peak seasons, selling up to 50 pairs of shoes daily.
- Maintained up-to-date knowledge of products, enabling informed recommendations.
- Improved customer satisfaction by addressing individual needs with tailored solutions

EDUCATION

University of the West of England
Bristol, United Kingdom - BSc Computer Science, 2nd Year (Expected year of Graduation 2027)
Achieved First-Class in Year-1

Coast Mountain College
Terrace, BC, Canada – Associate Science degree, completed coursework (2019-2021)
Achieved GPA: 3.33

PROJECTS

Cinema Booking System(Ongoing)
- Designed and developed a **scalable cinema booking system** using **OOP principles**.
- Created **UML class diagrams, sequence diagrams, and database models**.
- Developed a **Python-based** backend using Flask, implemented SQL for database management, and optimized performance using indexing and query optimization techniques.
- Used **Git for version control** and **GitHub for collaboration**.

Hotel Booking Web Project
- Developed a **full-stack hotel booking system**.
- Implemented **Python backend** with SQL database support.
- Integrated **authentication, real-time availability tracking, and dynamic pricing**.
- Implemented a dynamic Role-Based Access Control (RBAC) system using Django's authentication framework and database permission models.

More projects can be found at [adeebimam_github](#)

SKILLS

Languages: Hindi, Urdu, and English (All fluent)
Programming Languages: Python, HTML, CSS, SQL
Software Development: Object-Oriented Programming (OOP), Data Structures & Algorithms (DSA), API Development
Database & Backend: SQL, PostgreSQL, Database Design, Query Optimization
Version Control & CI/CD: Git, GitHub
Software & System Design: UML Diagrams, System Architecture, Design Patterns
Artificial Intelligence & Machine Learning: AI/ML Fundamentals (Basic)
Soft Skills: Effective Communication, Active Listening, Problem Solving, Critical Thinking, Adaptability, Time Management and Event coordination

Certifications, Awards and Recognition:
During the quarter of the Apple Intelligence launch, I ranked #1 on the leaderboard, achieving an 80% awareness rate by effectively educating customers on its features and impact.

Awarded the Not Impossible Bronze Award for career research, psychometric testing, and work experience at Illumo Digital, earning commendation for positivity, speaking, and teamwork skills.

Awarded a Gold Medal by the business team for being among the top lead generators of the week.

Earned multiple badges on Apple's Learning app for completing modules and courses, including Apple Intelligence, the September Event, Mac Launch, and more.

HOBBIES & INTERESTS & OTHER RELEVANT ACTIVITIES

Student Representative at UWE – Elected for two consecutive years, advocating for student concerns and facilitating communication between students and faculty.

Technology Enthusiast – Staying up to date with the ongoing events in the world of technology, understanding different domains and applications of technology. Specifically keen about AI and ML.

Community Engagement – Organized and managed a WhatsApp group during COVID to facilitate communication and technical support for 50+ members.

Peer Tutor (Calculus I & Linear Algebra) – Provided academic support to university students, simplifying complex mathematical concepts and improving their understanding.