Complex Engineering Problem: Design and Development of a Heart Health Management System

**Problem Statement:**

Developing an integrated heart health management system that combines predictive analytics, user-friendly interfaces, and wearable technology to empower users to monitor, assess, and improve their heart health.

**Tasks:**

**1. Product Conceptualization and Requirements Gathering:**

- Conduct market research and user surveys to identify user needs, preferences, and pain points related to heart health management.

- Define the key features and functionalities of the heart health management system, considering usability, accessibility, and affordability.

**2. Predictive Analytics and Risk Assessment:**

- Develop a predictive model using machine learning algorithms to assess users' heart disease risk based on health metrics such as blood pressure, cholesterol levels, and lifestyle factors.

- Incorporate feature engineering techniques to identify and prioritize relevant predictors of heart disease risk.

- Implement an interpretable model that provides users with actionable insights and personalized recommendations for heart health improvement.

**3. Product Design and User Interface Development:**

- Design an intuitive and user-friendly mobile application interface for users to input health data, view their heart health status, and access personalized recommendations.

- Create wireframes and mockups to visualize the user interface design and gather feedback from potential users for iteration.

- Ensure cross-platform compatibility and responsiveness for seamless user experience across devices.

**4. Wearable Technology Integration:**

- Develop wearable devices equipped with sensors to continuously monitor users' vital signs, activity levels, and sleep patterns.

- Implement data synchronization between wearable devices and the mobile application to provide real-time updates and insights to users.

- Optimize battery life, comfort, and wearability of the wearable devices to encourage long-term usage and adherence.

**5. Data Privacy and Security:**

- Implement robust data encryption and privacy measures to protect users' health data from unauthorized access or breaches.

- Comply with relevant data protection regulations and standards to ensure the confidentiality and integrity of users' personal health information.

**6. Testing and Validation:**

- Conduct rigorous testing of the heart health management system, including functionality testing, usability testing, and performance testing.

- Collaborate with healthcare professionals and domain experts to validate the accuracy and effectiveness of the predictive model and recommendations.

- Iterate on the design and functionality based on user feedback and testing results to improve the overall user experience and efficacy of the system.

**7. Deployment and User Adoption:**

- Develop a comprehensive deployment plan to launch the heart health management system to the target market.

- Provide user training and support materials to facilitate user onboarding and adoption of the system.

- Monitor user engagement, satisfaction, and health outcomes over time, and iterate on the product based on real-world usage data and feedback.

**Evaluation Rubrics and Deliverables**

* 1. **Write a report containing.**

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| **Deliverable** | **CLO** | **Marks** |
| Predictive Model Development and Justification | CLO1 | 10 |
| Heuristic Integration for Enhanced User Experience | CLO3 | 10 |
| Design and Development of User Interface | CLO2 | 10 |
| Wearable Technology Integration and Optimization | CLO2 | 10 |
| Data Privacy and Security Implementation | CLO3 | 10 |

**CEP mapping**

This assignment designed in a way to able students to solve the complex engineering problem. Following characteristics of complex engineering problem are targeted in this semester's project of Artificial Intelligence:

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| **WP-1[[1]](#footnote-1)**  Depth of Knowledge Required | | **WP-2**  Range of Conflicting Requirements | | **WP-3**  Depth of Analysis Required | **WP-5**  Extent of applicable codes |
| **CLO** | WA/PLO[[2]](#footnote-2) | Requirement | Justification | Explanation of how these heuristics contribute to improving the efficiency and effectiveness of the system. Assessment of selected heuristics' admissibility and impact on enhancing user experience. | The heuristic design is an AI technique which depends upon the problem and its selected search model. It is not covered in standard engineering practices |
| CLO-1  CLO-2  CLO-3 | PLO-1  PLO-8  PLO-4 | Overview of the predictive model architecture tailored for heart disease risk assessment. | Student should use machine learning algorithms and feature engineering techniques based on their relevance to heart health management. |

1. One or more WAs [↑](#footnote-ref-1)
2. Mapping of CLO to WA/PLO from First Day Handout [↑](#footnote-ref-2)