Software Requirements Specification

for

FATIGUE RISK CHAIN MODEL.

Prepared by
Group - 14

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1. Introduction

1.1 Purpose

The purpose of the project is to create a fatigue detection model that can predict fatigue in people before it occurs to prevent accidents based on recorded body vitals.

1.2 Intended Audience and Reading Suggestions

The document contains the list of each requirement, both functional and non-functional, and the different viewpoints on the product. It has every feature that has to be included in the final product which are to be reviewed by the teachers.

1.3 Scope of the project

The project is a machine learning model that can generate user risk profiles based on the physiological indicators . The model generates a risk profile for each user within a dataset which helps

1.4 Stakeholders

The Stakeholders of the project includes the target group , the development team and project managers

1.5 System Requirements

Operating System - Linux/Windows/MacOS
RAM - Minimum of 16GB required
CPU Processor - Above Intel Core i7
Storage - Minimum of 1TB HDD

2. Overall Description

2.1 Product Perspective

As implied by its name, the proposed model is designed to identify the level of fatigue experienced by an individual at an early stage, thereby preventing any unexpected incidents or stressful events in later stages of life. This model is primarily geared towards employers operating in multinational corporations, where the working conditions are often highly demanding, and can consequently result in accidents or personal health complications in the later phases of life.

The model achieves this by analyzing various factors, such as heart rate and blood pressure of individual persons, thereby enabling early detection of fatigue and prevention of accidents that may occur subsequently.

2.2 Product Features

Key features include:

1) Risk Profile Generation
2) Risk Level Classification

2.3 User Classes and Characteristics

Different users are identified on the basis of the review process of the document. It is listed as follows:

1. Reviewer
    a. The mini-project is an academic undertaking which is to be evaluated according to the guidelines.

2. End Users
    a.Manager
    b.Employers

3. Developers

    i. Fayiz Umar
    ii. Gautham Jayakrishnan
    iii. Joel James
    iv. Suhana Jabin

2.5 Design and Implementation Constraints

- Model constraints
    - Overfitting and underfitting can be an issue.
    - Training must be done efficiently to provide the accurate results
    - Subjectivity of fatigue
    - Threshold parameter for each user

- Tool specifications
    Functional
        - Jupyter Notebook
        - Numpy
        - Pandas
        - Sci-kit Learn
        - Matplotlib

- Design convention
  - Readable text
  - Fast and efficient

- Programming standards
  - Maintainable code
  - Consistent coding conventions
  - Documentation
  - Error handling

- Language requirements: Python

3. System Features

3.1 Monitoring and Analyzing the health conditions.

Monitoring and Analyzing the health conditions are crucial aspects as it involves accessing and interacting with sensitive medical data of employees and performing statistical analysis on it . These two processes work together to predict the fatigue risk and develop a score system for each employee.Analyzing the parameters such as sleep hours , blood parameters , stress levels help in comparative statistical analysis which increases the accuracy of the model.

3.2 Monitor Fatigue information and identify trends.

Fatigue related information can be initiated through the fatigue related incident reports from the company. Information can also be obtained through voluntary reports of fatigue, and also through the internal audit reports. Through all these sources, information is collected and common factors are identified and they are considered as independent variables. Machine Learning Model learns patterns from the dataset and fits accordingly.

3.3 Generating a Risk profile for workers.

As the model is to notify the authorities when workers are at verge of fatigue, A risk profile is generated for each employee along with grading system, Profile consists of all the parameters that play a significant role in fatigue risk chain and based on these hazards scoring for each individual is created so that how a person is close to fatigue can be identified.

3.4 Assess new workers/employees.

As new workers are appointed, their health parameters must be identified and monitored, based on the analysis risk profile is also created for the new employees.

3.5 Keep higher management and workforce fully informed.

End Users include the manager of the company where based on monitoring and analysis of the heath parameters the model fits correctly and after performing statistical analysis the model will be able to find patterns and trends on the data , with which it can predict when an employee will fall into fatigue and how exposed is the employee towards fatigue.This information is timely informed to the higher authorities so that necessary actions can be taken inorder to safeguard his life and maintain safety in workplace.

4. Other Nonfunctional Requirements

4.1 Data Security

The security of health data is essential to protect privacy and confidentiality of patient information. Since medical data is sensitive, it needs to be protected from attack internally as well as externally.

4.2 Accuracy and Performance

Accuracy - The model can correctly predict the outcomes or classification of data inputs. It can be found out by dividing the number of predictions by total number of predictions made.

Performance - Performance is used to evaluate how well a machine learning model can achieve its intended task, such as predicting outcomes or identifying patterns in data.

4.3 Reliability

Reliability: The ability to understand and interpret the model's output is important for ensuring its reliability. ML models should be designed to be transparent and explainable, allowing users to understand how the model arrived at its predictions or classifications.The quality and relevance of the data used to train the model is critical to its reliability. It is important to ensure that the data is accurate, comprehensive, and representative of the problem domain.

5 References

https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=age+and+heartrate&oq=age+and+heartra#d=gs_qabs&t=1681271311472&u=%23p%3D0rn7StCACsUJ
https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=heart+rate+and+gender&oq=heartrate+and+gender#d=gs_qabs&t=1681271620717&u=%23p%3DQoN6rgcxkXoJ
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https://arxiv.org/pdf/2108.04022.pdf
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