

The concept of requirement can be defined in various ways, however, the IEEE - Institute of Electrical and Electronics Engineers - presents its definition proposed by the standard (IEEE, 2017), as being:

1. A condition or capability that a user needs to solve a problem or to achieve a goal.
2. A condition or a capability that must be verified or possessed by a system or a system component, to satisfy a contract, standard, specification, or other formally imposed documents.
3. The set of all requirements that form the basis for the subsequent development of a software program or its components.

On the other hand, a requirement can be defined as a characteristic of the system or a description of something that the system can accomplish to achieve its goals (Pfleeger, 2001).

Requirements can be functional or non-functional. Functional requirements, as the name implies, describe the functionality of the system by specifying the actions that the system must perform. They are statements of services that the system should provide, how the system should react to certain inputs, and how the system should behave in specific situations (Sommerville, 2007).

Non-functional requirements, on the other hand, are restrictions on the services or functionality offered by the system. They may include constraints of time, the development process, or standards (Sommerville, 2007).

Some examples of the functional requirements we have defined are the following:

FR.01 - The AI system must be able to track and record the movements of the user with high accuracy and precision using 6-axis sensors;

FR.02 - The AI system must be able to collect and process large amounts of human movement data from the sensors;

FR.03 - The AI system must be able to pre-process and clean the incoming data to ensure that it is of high quality and can be used for training and prediction purposes;

FR.04 - The AI system must use deep neural networks to predict human movements in general, based on the dataset collected from the sensors;

FR.05 - The AI system must be able to train the deep neural network using the collected dataset and update the network parameters based on the training results;

FR.06 - The AI system must be able to adjust the network structure to better predict the personal intent of a real-world user;

FR.07 - The AI system must be able to predict the user's movement intention in the future time interval;

FR.08 - The AI system must be able to provide near-real-time responses to the user's movement intention;

FR.09 - The AI system must be able to adapt and improve its prediction accuracy over time, based on the feedback received from the user's movements;

FR.10 - The AI system must be able to handle missing or incomplete data and still provide accurate predictions;

FR.11 - The AI system must be able to handle noisy data and outliers and still provide accurate predictions;

FR.12 - The AI system must be able to handle variations in user movement patterns and still provide accurate predictions;

FR.13 - The AI system must be able to handle changes in the environment and still provide accurate predictions;

FR.14 - The AI system must be able to handle multiple users and still provide accurate predictions for each individual user;

FR.15 - The AI system must be able to handle different types of movements, such as walking, running, and jumping;

FR.16 - The AI system must be able to handle different types of terrain and surface conditions, such as flat, inclined, and uneven surfaces;

FR.17 - The AI system must be able to handle different types of sensors, such as accelerometers and gyroscopes, and integrate their data seamlessly;

FR.18 - The AI system must be able to provide visualizations and feedback to the user, such as graphs and charts of their movement patterns and progress;

FR.19 - The AI system must be able to handle multiple languages and cultural contexts and be culturally sensitive and appropriate;

FR.20 - The AI system must be able to ensure the privacy and security of the user's personal data and movements and comply with relevant data protection and privacy laws and regulations.

Some examples of the non-functional requirements we have defined are listed below:

NFR.01 - The AI component should be reliable and provide accurate predictions with a high degree of confidence.

NFR.02 - The AI component should be scalable to accommodate an increasing number of users and data over time.

NFR.03 - The AI component should be fast and provide near-real-time predictions to ensure that users receive timely assistance.

NFR.04 - The AI component should be secure and ensure the confidentiality and privacy of the user's data.

NFR.05 - The AI component should be user-friendly and easy to use for both the caregivers and the users.

NFR.06 - The AI component should be interoperable and able to communicate with other systems, such as the data acquisition system and the dashboard.

NFR.07 - The AI component should be easy to maintain and update over time, with minimal downtime.

NFR.08 - The AI component should be adaptable to different users' needs and preferences.

NFR.09 - The AI component should be robust to handle noisy and incomplete sensor data, unexpected movements, and other adverse conditions.

NFR.10 - The AI component should be accurate in predicting user movements to avoid false positives and false negatives.

NFR.11 - The AI component should provide explanations for its predictions to increase transparency and build trust with users and caregivers.

NFR.12 - The AI component should adhere to ethical principles, such as ensuring that the predictions do not discriminate against certain groups or perpetuate harmful stereotypes.

NFR.13 - The AI component should be accessible to people with disabilities and meet accessibility standards.

NFR.14 - The AI component should be compatible with different hardware and software platforms to support its deployment in various settings.

NFR.15 - The AI component should be energy-efficient to prolong the battery life of the sensor devices.

NFR.16 - The AI component should comply with relevant regulations and standards, such as data protection regulations and ethical guidelines for AI.

NFR.17 - The AI component should be modular, allowing for the easy integration of new AI algorithms or models in the future.

NFR.18 - The AI component should be thoroughly tested for performance to ensure that it meets its specified response times and other performance metrics.

NFR.19 - The AI component should handle errors gracefully and provide meaningful error messages to users and caregivers when something goes wrong.

NFR.20 - The AI component should log and monitor its operations to facilitate debugging, performance analysis, and compliance reporting.