FURPS+

* Functional Requirements.
* Non-Functional Requirements.
* An application to manage the clinical analyses performed in its laboratories.
* Analysis of blood (**samples are collected**) are performed, as well as Covid 19 tests.
* The samples collected by the network of laboratories are then sent to the chemical laboratory located in the company's headquarters and the chemical analysis are performed there.
* The client arrives with a lab order prescribed by a doctor.
* a receptionist asks the client’s citizen card number, the lab order which contains the type of test and parameters to be measured and registers in the application the test to be performed to that client.
* In case of a new client, the receptionist registers the (new) client in the application. To register a client the receptionist needs the client’s citizen card number, National Healthcare Service (number, birth date, sex, Tax Identification number (TIF) phone number, e-mail and name.
* All the tests by the network of laboratories are registered locally by the medical lab technicians who collect the samples.
* The samples are sent daily to the chemical laboratory where the chemical analyses are performed and results obtained.
* The medical lab technician records the samples in the system, associating the samples with the client /test and identifying each sample with a barcode that is automatically generated using an external API.
* At the company's headquarters, the clinical chemistry technologist receives the samples (delivered by a courier) and performs the chemical analysis, recording the results in the software application.
* After completing the chemical analysis, the results of all chemical analyses are analyzed by a specialist doctor who makes a diagnosis and writes a report that afterwards will be delivered to the client.
* The application uses an external module that is responsible for doing an automatic validation using test reference values.
* After the specialist doctor has completed the diagnosis, the results of the clinical analyses and the report become available in the system and must be validated by the laboratory coordinator.
* Once the laboratory coordinator confirms that everything was done correctly the client receives a notification alerting that the results are already available in the central application and informing that he/she must access the application to view those results.
* The client receives the notification by SMS and e mail.
* At the same time the results are also available in the central application where the medical lab technicians who collect the samples, the clinical chemistry technologist, the specialist doctor and the laboratory coordinator can check them.
* To facilitate the access to the results, the application must allow ordering the clients by TIF and by name.
* The ordering algorithm to be used by the application must be defined through a configuration file.
* It is intended that the choice of the ordering algorithm is based on the algorithm complexity (mainly the execution time).
* Therefore, at least two sorting algorithms should be evaluated and documented in the application user manual (in the annexes) that must be delivered with the application.
* The company wants to decrease the number of tests waiting for its result.
* To evaluate this, it proceeds as following: for any interval of time, for example one week (6 working days with 12 working hours per day), the difference between the number of new tests and the number of results available to the client during each half an hour period is computed.
* A list with 144 integers is obtained, where a positive integer means that in such half an hour more test s were process ed than results were obtained, and a negative integer means the opposite.
* The implemented algorithm should be analyzed in terms of its worst-case time complexity, and it should be compared to a provided benchmark algorithm (must be defined through a configuration file).
* The complexity analysis must be accompanied by the observation of the execution time of the algorithms for inputs of variable size in order to observe the asymptotic behavior.
* The time complexity analysis of the algorithms should be properly documented in the application user manual (in the annexes) that must be delivered with the application.
* The NHS in England requires Many Labs to summarize and report Covid 19 data.
* The company needs to: identify the number of Covid 19 tests performed, identify all positive results to Covid 19 tests, report the total number of Covid 19 cases per day, per week and per month of the year, and send the forecasts for these same time horizons the number of Covid 19 cases for the following day, next week and next month).
* The company is also required to generate daily (automatic) reports with all the information demanded by the NHS and should send them to the NHS using their API.
* To make the predictions, the NHS contract defines that a linear regression algorithm should be used.
* The NHS required that both simple linear and multiple linear regression algorithms should be evaluated to select the best model.
* The accuracy of the prediction models should be analyzed and documented in the application user manual (in the that must be delivered with the application (The algorithm to be used by the application must be defined through a configuration file).
* The application must be developed in Java language using the IntelliJ IDE or Netbeans.
* The application graphical interface is to be developed in JavaFX 11.
* All those who wish to use the application must be authenticated with a password holding seven alphanumeric characters, including three capital letters and two digits.
* Only the specialist doctor is allowed to access all client data.
* The application must support the English language only.
* The development team must implement unit tests for all methods except methods that implement Input/Output operations. The unit tests should be implemented using the JUnit 4 framework. The JaCoCo plugin should be used to generate the coverage report.
* All the images/figures produced during the software development process should be recorded in SVG format.
* The application should use object serialization to ensure data persistence between two runs of the application.
* Each test is characterized by:
* An internal code.
* An NHS code.
* A description that identifies the sample collection method.
* The date and time when the samples were collected.
* The date and time of the chemical analysis.
* The date and time of the diagnosis made by the specialist doctor.
* The date and time when the laboratory coordinator validated the test.
* The test type (whether it is blood test or Covid test).
* Blood tests are frequently characterized by measuring several parameters which for presentation/reporting purposes are organized by categories.
* Covid tests are characterized by measuring a single parameter stating whether it is a positive or a negative result.
* The system should be developed having in mind the need to easily support other kinds of tests.