E-Valuer

(An Intelligent tool to assist in making smarter property related decisions)

Project-ID: 19-010

K.Thayalini

IT15156884

Bachelor of Science Special (honors) Degree in Information Technology

Department of Information Technology

Sri Lanka Institute of Information Technology

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System Requirement Specification

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Declaration

I declare that this is my own work and this Software Requirement Specification entitled Intelligent Tool to Assist in Making Smarter Property Related Decisions
, submitted to Sri Lanka Institute of Information Technology is a record of an original work done by me, under the guidance of our supervisor Mrs. M.P.A.W. Gamage. This document does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

Name	Student ID	Signature
K.Thayalini	IT15156884	

The above candidate is carrying out research for the undergraduate Dissertation under my supervision.

……. ……..

Signature of the supervisor: Date

(Mrs. M.P.A.W. Gamage)

……. ……..

Signature of the Co-supervisor: Date

(Mrs. Pasangi Rathnayke

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1. Introduction

Software requirements specification is the document which provides all of the information of the requirements of the system as expected by the end users and provides clarification of requirements for other stakeholders of the system. This is supposed to contain well detailed description of the functional and non-functional requirements of the proposed system, which will be used in the process of software development, quality assurance, and maintenance of the system.

1.1 Purpose

The purpose of the software requirement specification (SRS) is to present a detailed description of the project 'E-Value', a web application that predicts the current and future value of a land and factors influencing the same to provide the users with accurate computerized prediction system along with a detailed report of the land selected. The SRS document gives a detailed description on the functional and non-functional requirements that required by the user. This document will demonstrate what the main requirements are and interfaces that the system will have after the implementation and the interconnections. The SRS is the basic document to refer when developing the system and help to understand how developers are going to develop the proposed system. If the project requirements match with system requirements documents that is a successful project.

1.2 Scope of component

This document covers the requirements for release of E-Value a land value prediction system which will be assist the users in making smart property related decisions. Mention will be made throughout this document of selected probable features of future releases. The purpose of this is to guide developers in selecting a design that will be able to accommodate the full-scale application. It provides the clear overall design of the system which will provide the foundation for the development of the final end product.

• Functional requirements- specific functionalities, tasks or behaviors of the system

• Non-functional requirements - constraints, performance factors, etc...

The purpose of this component is to provide predicting the effect of future development projects on future commercial value. It's Forecasts of the future value of the land, as well as a report that indicates the effect of the development projects proposed in the area.

It contains effect of future development projects in determining the value of a particular land. The system will automatically find the current land value and compare with future development infrastructure facilities such as future apartments, hospital, railway station, bus stand, airport and schools and calculating the commercial value of the land.

1.3 Definitions, Acronyms and Abbreviations

- Abbreviations

Term	**Definitions**
SRS	Software Requirement Specification.
ROI	**Return of Investment**
RNN	**Recurrent Neural Networks**
Wi-Fi	Wireless fidelity.
ANN	**Artificial Neural Networks**
AI	**Artificial Intelligence**
RAM	Random access memory.

Table 1: Abbreviations

- Definition

Term	Description
SRS	A document which is described functional and non-functional requirement, user interaction that the software must provide.
User	Visually impaired citizen who interacts with system.
Concept comparison tool	Tool which is responsible for comparing the instances stored in ontologies and find out the news articles which are homogeneous among several instances stored in the dynamically changing ontology
Input	Input for the functional requirement.
Result	Most accurate news article provided by concept comparison tool.
Output	Final output of the function.
Concept	Concepts arise as abstractions or generalizations from experience or the result of a transformation of existing ideas.
Classes	Classes represent concepts which can be physical, specific or abstract or conceptual.
Relations	Relations are the associations between concepts.
Attributes	Attributes are properties which describes the features of the concepts.
Instances	Instances represent the elements of Ontology.

Table 2: Definition

1.4 Overview.

The document is intended to describe the requirements of developing a Predicting the effect of future development projects on future commercial value. It is a web application which is compatible to use with a desktop computer and a mobile device that help the users to get an accurate insight of the land they are going to buy. It contains impact of future advancement extends in deciding the estimation of a specific land. This suggests on the off chance that somebody is going to purchase a land, the framework will consequently locate the present land esteem and contrast and future advancement foundation offices, for example, future lofts, clinic, railroad station, transport stand, air terminal and schools and figuring the business estimation of the land

2 Overall Descriptions

It contains impact of future improvement extends in deciding the estimation of a specific land. This infers in the event that somebody is going to purchase a land, the framework will consequently locate the present land esteem and contrast and future advancement foundation offices, for example, future lofts, medical clinic, railroad station, transport stand, air terminal and schools and ascertaining the business estimation of the land. Esteem expectation is basically focusing on five significant framework offices. On the off chance that a client purchases a land, land esteem can increment or diminishing dependent on condition. There are some primary reasons that decreases the estimation of a land, for example, War, Flooding and so forth. Similarly the land esteem will be expanded if the zone where the land is found dependent on future advancement ventures. In the event that up and coming ventures are great, land esteem will increment. Each land esteem needs to anticipate with utilizing up and coming tasks or foundation is resolved to discover the land esteem.

2.1 Product Perspective

Existing solutions

The use of AI for residential value forecasting has been suggested in the literature from 1990s. [1]. Although Sri Lanka is lacking an automated land valuation system, many up and running, reliable solutions have been implemented in developed countries like New Zealand, England and Wales, USA etc. It is obvious with the well-structured digital data infrastructure of those countries, they can implement very accurate systems. Our intention is to identify the ways to use their underlying methodology in a suitable manner in Sri Lankan context.

3.QV.co.nz - QV homeguide

Quotable Value (QV) provides independent and authoritative information on any home in New Zealand on or off the market [2] QV.co.nz and their mobile App QV homeguide is known to be providing more accurate values of real estate property and key details to assist people to make instant decisions regarding property. QV with CoreLogic, a company which analyzes information assets and data to provide clients with analytics and customized data services provide a range of reports valuable to the user.

Features - QV homeguide app

- Online Value Estimation - Provides the likely selling price of a property during that particular time
- Sales activity - Sales activity specific property found on the app
- Suburb Demographics - Median price data, Demographic data, Current listings, and latest auction results [3]
- E-Value Report - Subjected to a fee complete valuation report of the property can be downloaded.

The component is useful since solving the problems in this study, it can be derived and produced a simple model of the influence of infrastructure development on the estimation of the land values, specifically described as follows:

1. A representative model can be identified for estimating the value of land in an area where the infrastructure development is dominant.

2. Can contribute positively to valuation of land in areas that are experiencing more dominant infrastructure development.

The study focuses on Colombo which experienced relatively high infrastructure development, which made it possible to become the study area in this study. It aims to determine the condition of the field and facilitate the preparation of observation strategies in the surrounding area which is expected to have a relatively large influence and the most appropriate analysis method to be developed in decision making in this study.

2.1.1 System interfaces

- The Application

The application must be hosted to be accessible by public. Users might access the system via desktop computer or a mobile device. Web application commonly use a combination of server-side script (ASP.net, python) and client-side script (C#, Angular 6) to develop the application. Accessible for a range of devices, Adaptable to increased workload are some benefits of using web application.

- Database Access

Proposed database is intended to store, retrieve, update and manipulate information to system which includes,

O Store historical data relevant to predictions provided by values

O Retrieve data and feed the Artificial intelligence model

- GPS access

Acquire the current location

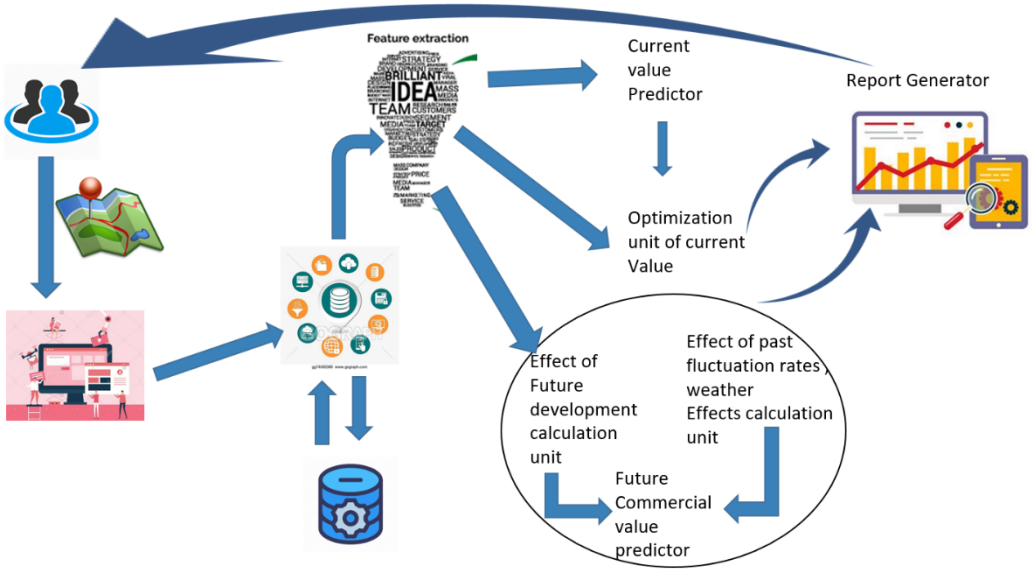


Figure 1: Architecture Diagram

2.1.2 User interfaces

Figure 2: homepage

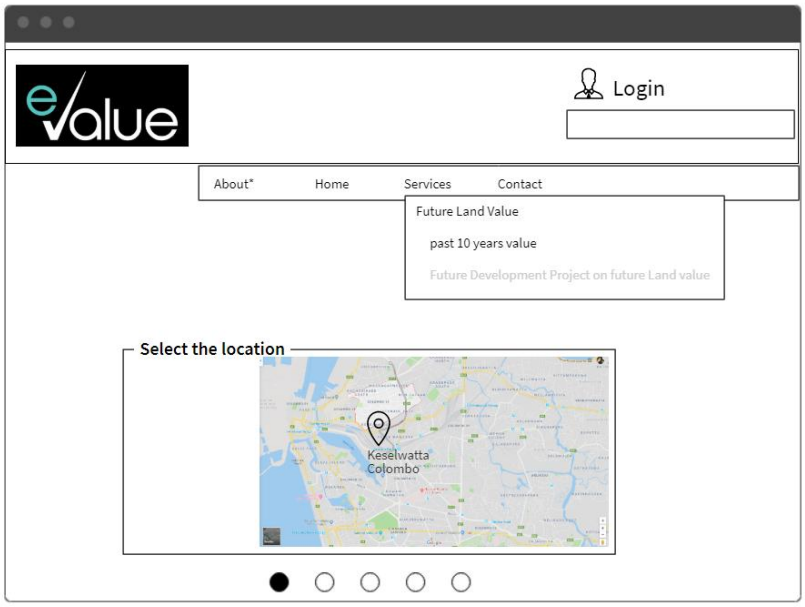


Figure 3: Select the location page

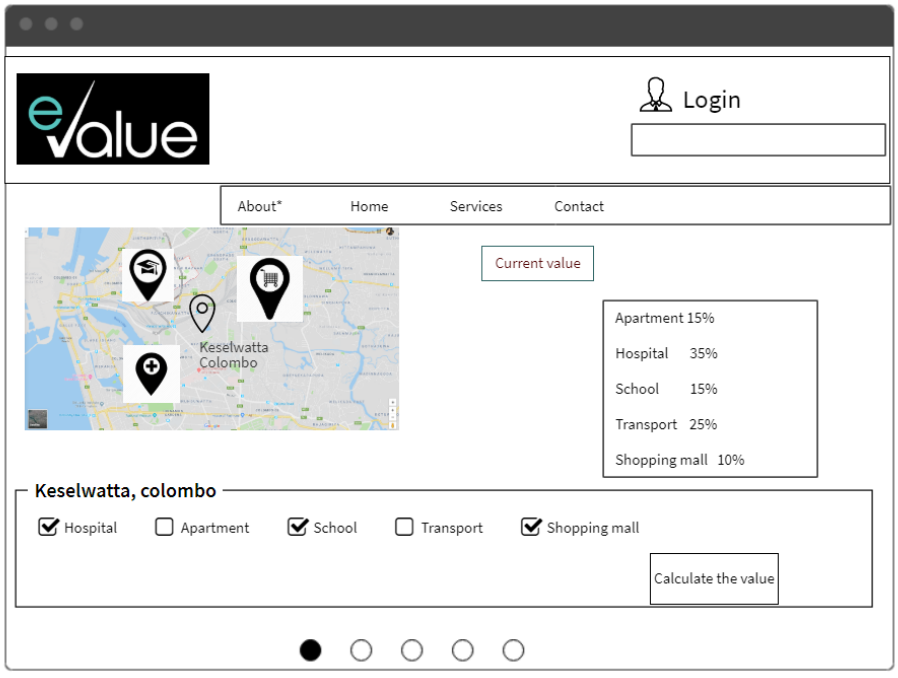


Figure 4: Future value prediction

2.1.3 Hardware interfaces

For clients we expect a smart mobile phone / tablet / laptop / desktop computer with minimum RAM of 2GB with web browser

For the developer end, we expect a computer with

- CPU: Quadcore Processor
- RAM: At least 8 GB
- Storage: 1 TB

2.1.4 Software interfaces

- Application Tool

We use Android studio for develop our mobile application

- Database

For create our application we use MongoDB.

- Anaconda Navigator

We use Anaconda Navigator as the application launcher. It allows us to launch applications and easily manage conda packages, environments and channels without the need to use command line commands.

- Jupyter

Jupyter is an IDE we have used to develop our machine learning models and it is powerful interactive development environment for the Python language with advanced editing, interactive testing, debugging and introspection features.

2.1.5 Communication interfaces

Internet connectivity is important, other than that this system does not use any communicational interfaces.

To create an internet connection between the client and server the device needs SIM card used for accessing the broad band network works using

- 3G standards like CDMA, HSPA
- 4G, 4G LTE, WCDMA are available with data transmission rate around 144 KB/per second and above.

2.1.6 Memory constraints

The application will not be needed internal or external memory space in device to install application since it is web hosted. But, it will need some memory space for cache data and other data. Hence, it is expected to use no more than 16 MB of Ram and 20 MB of external storage.

2.1.7 Operations

It contains effect of future development projects in determining the value of a particular land. This implies that if someone is going to buy a land, the system will automatically find the current land value and compare with future development infrastructure facilities such as future apartments, hospital, railway station, bus stand, airport and schools and calculating the commercial value of the land.

2.1.8 Site adaptation requirements

We think about that the substance showed under common risks to be redone as per the area since it is a huge factor which can give client an impression of the exactness of the framework initially.

2.2 Product Functions

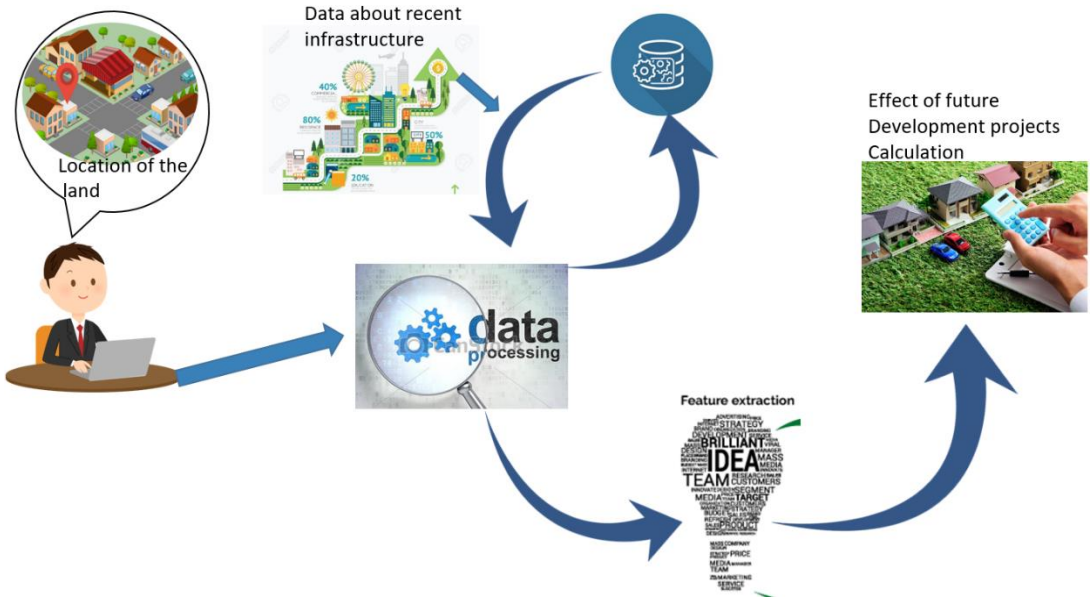
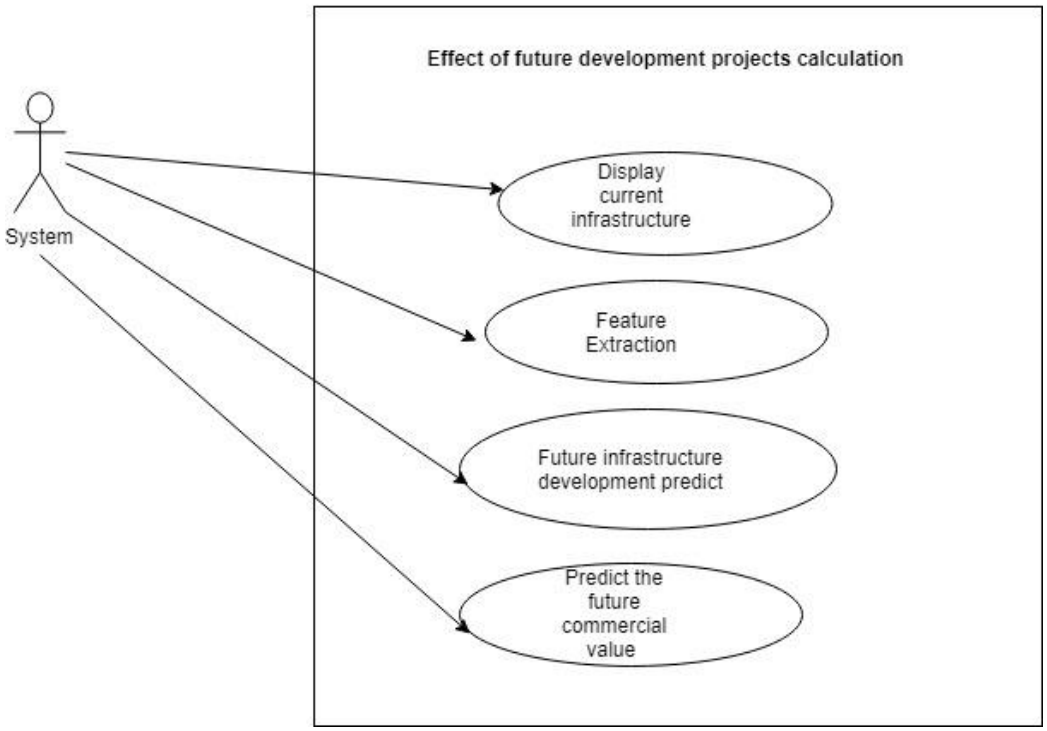


Figure 5: Product functions

- A customer will pick the location. Then our system will display the infrastructure of the framework.
- The feature extraction will happen. It contains school, hospital, transport, shopping mall, apartment details. It will collect these details from database.
- If the empty land is in a place, if the hospital comes around that area, if the school comes in that area, that land price will increase automatically. If that area is going to development side, that land price will increase.
- On the off chance that a client purchases a land, land esteem can increment or diminishing dependent on condition. There are some fundamental reasons that lessens the estimation of a land, for example, War, Flooding and so on. Similarly the land esteem will be expanded if the region where the land is found dependent on future improvement ventures. In the event that forthcoming tasks are great, land esteem will increment. Each land esteem needs to foresee with utilizing up and coming undertakings or foundation is resolved to discover the land esteem.



Use case name	Predicting possible natural hazards
Actor	User (Buyer/ Land sale owner)
Precondition	User must be logged in
Flow of events	1.User input the location of the land by manually searching for landmarks of Google map or locate me option to input current location 2. Get the information of the possible natural hazards details provided by the system 3. Download the report
Exceptions	If the user cannot log on to the application, user cannot see the predictions

Post Condition	-

2.3 User characteristics

Our application is mainly targeted for real-estate customers and owners of real estate companies. But any person can use this application. This intelligent tool can help people to identify the land they are willing to buy.

Customer service provides forecasts of the future value of the land, as well as a report that indicates the effect of the development projects proposed in the area.

This proposed system would be of great help in making better property decisions, which is a huge investment and a very important decision in everyone's life.

2.4 Constraints

1. The application is to be developed for the Colombo district at its initial stage. The scalability of the same to other districts of Sri Lanka is dependent on th3e availability of data.

2. Internet connectivity is needed to use the application

3. Data collected from professional values should be stored securely

4. System should be able to handle data traffic properly

2.5 Assumptions and Dependencies

- Wi-Fi or mobile data available in the device used all the time with sufficient bandwidth.
- Stakeholders have knowledge on using our application and familiar with English language.

- Data and information will be limited to Colombo district at this release

2.6 Apportioning of requirements

The necessities portrayed in segments 1 and 2 of this archive are alluded to as essential particulars; those in segment 3 are alluded to as prerequisites (or useful) details. If a necessity is expressed inside both essential and utilitarian particulars, the application will be worked from useful determination since it is progressively definite.

3 Specific Requirements

3.1 External interface requirement

3.1.1 User Interfaces

Previous section presents information oriented to the customer/user while section 3 is oriented to the developer.

It contains both content and format as follows:

- Name of item
- Description of purpose
- Source of input or destination of output
- Valid range, accuracy and/or tolerance
- Units of measure
- Timing
- Relationships to other inputs/outputs
- Screen formats/organization
- Window formats/organization

- Data formats

Login page

This page is the identification and authentication level of the developing mobile application. Here have to consider very sophisticated technology to login the page to identify which user is login and he can have rights to login the web application. This page has two fields which are username and password. Those fields should be match with database particular user column upon authentication or otherwise should display proper message to alert the user. If a user attempt to login is failed for three times that user should to wait some time to login next time.

Main page

After a successful user login that user will be see the main page with our main input screen in order to input the location, the sole input we expect from the user to give the predictions. In the main page mainly a client oriented one where client does not need to wander through the application to get to the main functionality. Also, the administrator can access all features in the web application. These user interfaces might be subjected to changes depending on the customer requirements and developer concerns.

View predictions and natural hazards components

Once the user input location, the above-mentioned components would appear in the same main page enabling section navigation. There should be an option to download the reports if user needed. Content of the report would be a collection of all the outputs of the systems arranged as expected by the client.

Login page for values

This page is the identification and authentication level of the developing mobile application. Here have to consider very sophisticated technology to login the page to identify that user is using a valid valuer login and he can have rights to login the web application. This page has two fields

which are username and password. Those fields should be match with database particular user column upon authentication or otherwise should display proper message to alert the user. If a user attempt to login is failed for three times that user should to wait some time to login next time.

Insert new values

Once the logged in as a value, the above-mentioned link would appear in the same main page. There should be an option to view previous data provided by the user.

View user profile

Once the logged in as a value, the above-mentioned link would appear in the same main page. User would be able to view and download complete report of the data fed to the system as the first step.

3.1.2 Hardware Interfaces

We don't use any hardware components. We are doing web application. We won't use hardware equipment. We are using cloud based tools like cloud storage, RAM and etc.

For the developer end, we expect a computer with

- CPU: Quadcore Processor
- RAM: At least 8 GB
- Storage: 1 TB

3.1.3 Software Interfaces

Developer End:

- Python (Numpy, Pandas, Matplotlib, scikit-learn)
- Anaconda distribution,

- Angular 6
- Google API
- Elastic search (Optional)

3.1.4 Communication Interfaces

Internet connectivity is important, other than that this system does not use any communicational interfaces.

To create an internet connection between the client and server the device needs SIM card used for accessing the broad band network works using

- 3G standards like CDMA, HSPA
- 4G, 4G LTE, WCDMA are available with data transmission rate around 144 KB/per second and above

3.2 Classes/Objects

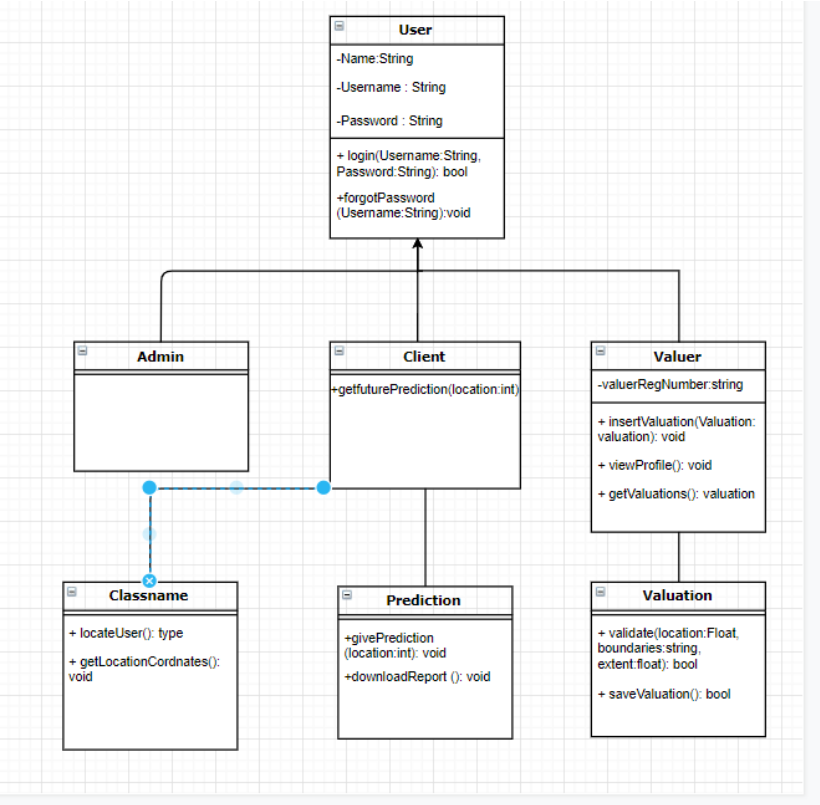


Figure 6: class diagram

3.3 Performance requirements

This is used client-server architecture. Therefore, one or more than one person can use this application at the same time. System initially aimed to work with more concurrent users.

Performance requirements define acceptable response times for system functionality.

It takes no more than two seconds for the user interface screens to load.

Login information will be verified within five seconds.

Consultations should return results within five seconds.

The system consumes very little primary memory.

3.4 Design constraints

Successful procedures can assist engineers with measuring how well structure objectives are being met and manage practical modules. The frameworks configuration ought to adjust the effectiveness, information investigate and money saving advantage tradeoffs. As a large portion of the clients are crippled it is important to have basic interfaces which can be utilized with no earlier PC ability. Because of the assorted foundation, PC memory, server execution and distinctive processor speed, time taken to yield may shift.

3.5 Software system attributes

3.5.1 Reliability

Unwavering quality of a framework implies the capacity to play out its ordinary tasks with less number of disappointments over a given time in a given situation. The unwavering quality of this capacity doesn't crash or come up short with the exception of PC gadget equipment disappointment, for example, battery issues, mouthpiece or earphone or speaker issues or system issues happens.

3.5.2 Availability

Accessibility of a framework implies framework is running the large portion of time in working condition at a predetermined time and that framework ought to have the option to convey the mentioned administrations in the meantime. After client mentioned something from framework, it must accessible with less number of frameworks down time or less number of framework disappointment. In the event that client has web availability and PC gadget, this capacity will dependably be accessible at whatever point client needs to get news result.

3.5.3 Security

Security is significant element for online based application since every one of the subtleties which are given to clients ought to be substantial and precise. Client demands are done by means of web. In this way, there is a high security to defeated dangers by actualizing key trade and encryption strategies into the web application.

3.5.4 Maintainability

Inside this present capacity's code is remarked wherever it is essential, particularly in complex code fragments. This will be useful to developer for future keeps up or alteration.

3.6 Other Requirements

3.6.1 User-friendliness

The graphical UIs of soil investigation work enrapture the client's fascination in play out the exercises utilizing this framework.

3.6.2 Simplicity

All the UIs' are planned basic way to utilize the framework with no disarray for outwardly weakened and different clients.

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