Technical Documentation

by

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An assignment submitted in partial fulfillment of the requirements
for the course CPTR490 - Information Science Advanced Project

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SECTION 1

1.1 Executive Summary

Virttour is a data intensive application where the final data product is continuous relevant recommendations to the user.

Users would be able to find houses with specific features or at a location or for a price. After spending some time on the website, the computer will analyze users' interest from the houses they view and provide continuous suggestions to them.

One benefit of Virttour is that you can access it any time that is convenient to you. This Virttour would save users time and money. Furthermore, considering the Covid pandemic, contactless action would be ideal [1]. Apart from that, we have realtors one zoom call away to assist you throughout the tour. Moreover, if the users have any questions, they can ask the chatbot on the webpage through speaking with your microphone or typing in the questions. After the tour if the searchers want to contact or schedule a meeting with the seller. Sellers can advertise their houses on the website. This website also has the feature for the new seller to estimate the prices of the house based on the information that they put in. Finally, there is a feature called the metaverse available on the website for the users to join and buy the digital land for the innovative future.

1.2 Problem Definition

Clear Identification and description of the problem being solved

The traditional way of doing open houses and tours is not working as well as they should for several reasons. Firstly, homebuyers are increasingly using the internet to a greater degree when searching for potential homes to buy [2]. Also, The Covid-19 pandemic led many realtors, homeowners, and homebuyers alike to suspend open houses to an extent. Open houses and tours incur a cost that, as previously established by the internet majority, may not be returning on the investment – doing an open house attracts a cost that, when compared with online purchases, does not prove to be a cost-effective measure of making a sale. The same can be said of the risks associated with doing an open house – the risks associated are not reasonable considering the low turnover rate [2]. Finally, scrolling through amateur-taken, professional-taken, or computer-generated (to the point of being edited to look better) pictures and videos may negatively affect users' willingness to make the acquisition.

1.3 Software Solution

Features - Brief Outline of features in bulleted list.

- The software will allow users to take a tour of listed spaces using an internet-enabled device.

- The software will be a place for potential buyers to gain information and compare listed items.
- The software will determine patterns of behaviors to help users find a match more quickly.
- The software will be enabled with a virtual assistant who will operate as a realtor would – hosting the tour, answering queries etc.
- The software will be able to explore smaller spaces (like corner walls and closets) the way a human would.

Similar Apps - Identification and Description of similar solutions that currently exist

Google streetview.

Street View, by Google Maps, is a virtual representation of our surroundings on Google Maps, consisting of millions of panoramic images. Street View's content comes from two sources - Google and contributors [2].

Virtual tour via video conferencing.

Here the realtor creates a video conference with potential buyers. The realtor would then tour the space (often aided by a small camera team) and interact with the patrons live.

▪ Innovation - Description of unique/creative/innovative features

This project will enable a virtual assistant who can interact with items alongside the user. Doing so will make the session closer to a real-life encounter compared to a slideshow session.

Also, there is a feature called the metaverse available on the website for the users to join and buy the digital land for the innovative future [3].

SECTION 2

2.1 Deliverables

Webpages:

A webpage for sellers, one for buyers and one for metaverse listings.

API's:

- The decentraland API is used to get meta-data on NFT parcels for sale and a link to enter the MetaVerse at that parcel.
- The Zoom API is used to create a zoom meeting so that several persons can explore a space at once but more importantly, so realtors/tech support can communicate with users at any time.

Chatbot:

The chatbot is powered using the chatterbot python module. The chatbot is implemented with AJAX in the chatbot.js that sends requests and responses to and from the chatbot1.py script. Voice input is enabled. The script uses voice recognition to send a request to the chat bot. That is to say, the user can speak into a mic then the audio turns into text then that text is sent to the chatbot.

Validations:

The site supports login, logout, and sign-up for its users. It also enables guest browsing but with limited features.

Automated ETL:

There is a script that generates the final data product. The recommendation model initially recommends all listings and features equally. As soon as one item starts to outperform the others, resources are shifted to recommend that item more often. There is still a provision to show the other items. The model just recommends them less. Altogether the apparently superior item is immediately acknowledged while minimizing inferior recommendations.

Note that showing the 'inferior' items gives the system an opportunity to see, and adjust, if an inferior item starts to do better [than the superior item].

There is a script that ingests user (click) activity into a database where that data will be incorporated (immediately) into the recommendation model.

Provided a relational database, a python script loads and cleans and otherwise prepares data for the recommendation model. Preprocessing is done here also.

There is a script that creates python list of preference data from the USER_PREF table of the database.

2.1.1 Functional requirements

User requirements

- A user will be able to search the repository of listings by location.
- A user will be able to upload a listing to the current repository of listings.
- A user will be able to take a virtual tour of a listing providing a tour is available.
- The users will be able to edit or remove their listings providing there is need.

System requirements

- The system will be able to suggest the price of a listing based on its features using the prices of existing listings and their respective features.
- The system will use linear regression to determine the influence of listings' features such as land space on listings' prices.
- The system will be able to keep track of registered users' interactions with specific listing features: price and location.
- Each listing on the system will be uniquely identified by separate 100-bit id numbers.
- Each user on the system will be uniquely identified by separate 100-bit id numbers.

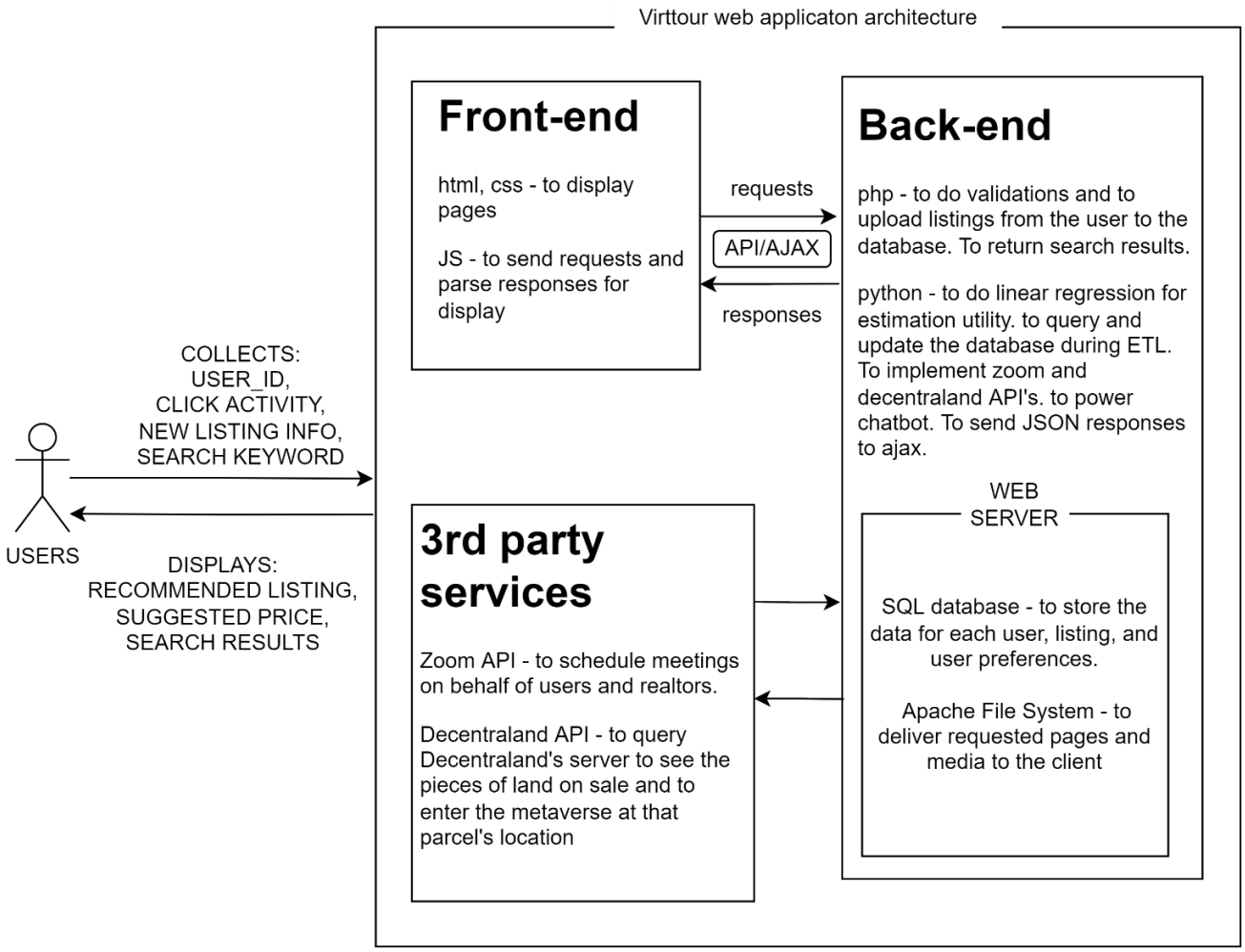
2.1.2 Non-functional requirements

- Hosting server must have at least 6GB ram available at any time for near-real-time ETL processing.
- The user must have at least 12GB of ram to smoothly tour a decentraland parcel [3].
- Users browsing as guests will be able to tour listings, but not allowed to advertise a listing for sale and will not have their personal preference saved.
- Users can virtually tour a listing at any time during the day.
- The system will return listing recommendations within 5 seconds of the initial call.

SECTION 3

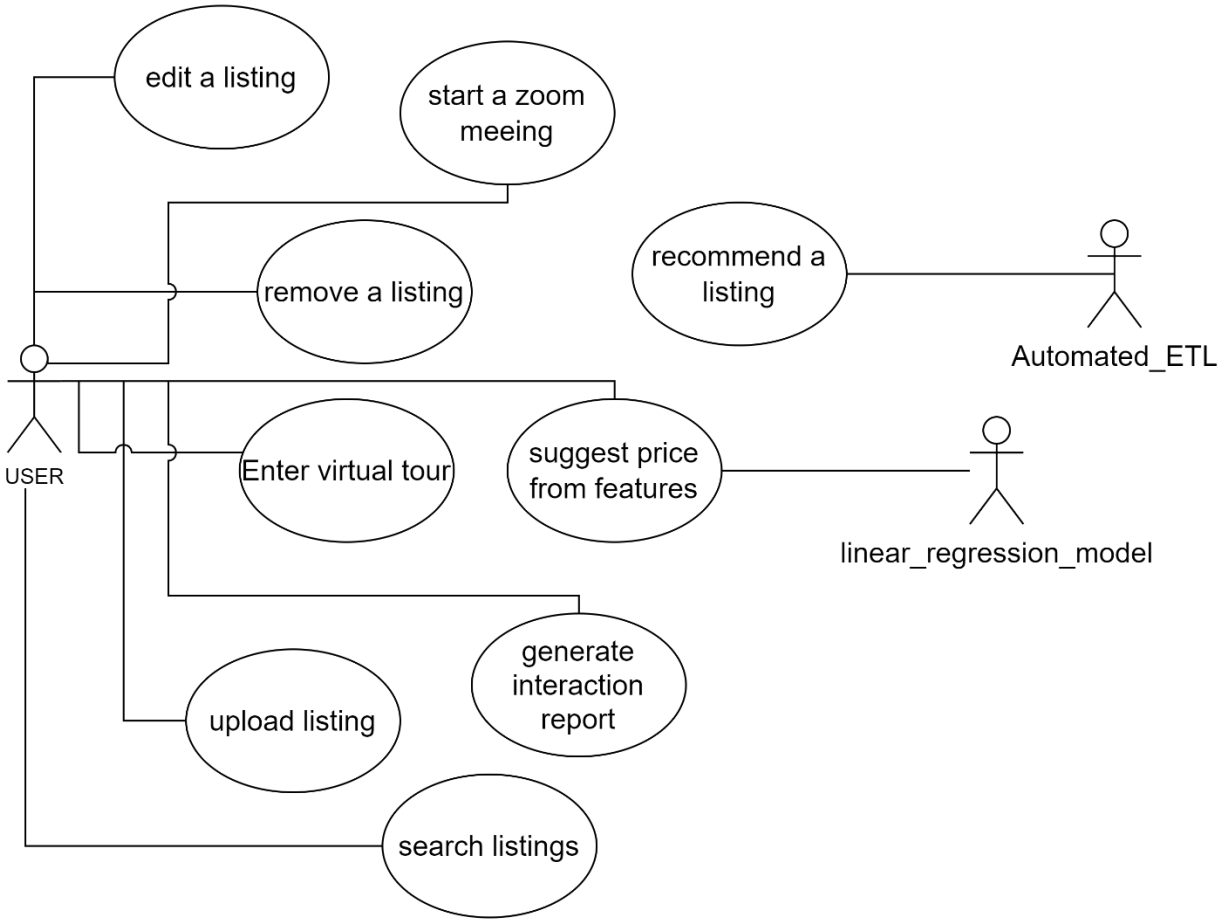
3.1 Technical Architecture & Environment

Diagram of overall System Architecture

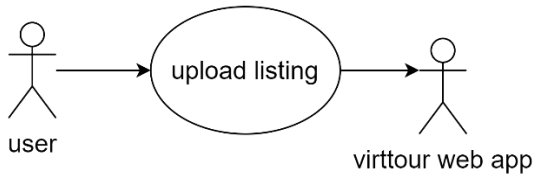


3.2 Design Elements

3.2.1 Use Cases

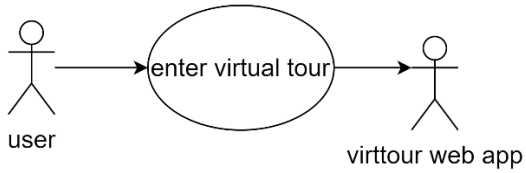


Use Case Descriptions

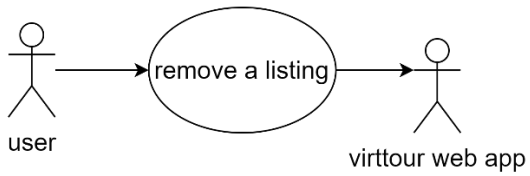


Virttour: upload listing	
Actors	User, virttour web app
Description	A user may upload a new listing to the web app's database.
Data	Features of the new listing: price, land space, living space, no. of bedrooms and bathrooms,

	images of the listing, building class (lowest cabin, highest mansion.
Stimulus	User command issued by user.
Response	Confirmation that listing database has been updated.
Comments	The features (price, location, land etc.) of the new listing cannot be null. The pictures can be used instead of a complete tour. The user must be a registered user in order to upload.

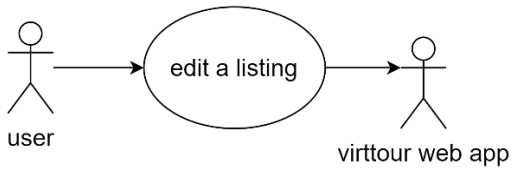


Virttour: enter virtual tour	
Actors	User, virttour web app
Description	1. For regular listings, A user may enter an immersive panoramic tour of a listing. 2. For decentraland listings, the user enters the metaverse at that parcel's location.
Data	1. For regular listings, A +1 sent to the interaction count of that listing, and a +1 to the location and price tags in that user's preference records in the database. 2. For decentraland listings, N/A.
Stimulus	User command issued by user.
Response	A html page served to the user.
Comments	If no virtual tour is the existing jpeg is served instead.

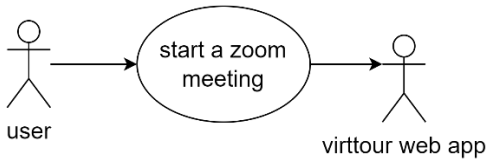


Virttour: remove a listing	
Actors	User, virttour web app
Description	A user may remove a listing from the database.
Data	All features of the listing
Stimulus	User command issued by user.

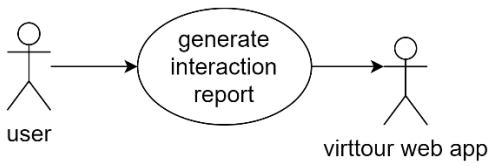
Response	The selected record is dropped from the database.
Comments	The user can only remove a listing if that user owns/ uploaded the listing



Virttour: edit a listing	
Actors	User, virttour web app
Description	A user may edit a listing in the database.
Data	Any features of the listing
Stimulus	User command issued by user.
Response	The selected record's features are updated in the database.
Comments	The user can only edit a listing if that user owns/ uploaded the listing



Virttour: start a zoom meeting	
Actors	User, virttour web app
Description	A user may request a zoom meeting to chat with a realtor or agent.
Data	Chatbot keyword: "Agent"
Stimulus	User command issued by user. Keyword: "Agent."
Response	A zoom meeting is scheduled and sent to the user.
Comments	There is no guarantee that an agent might join.

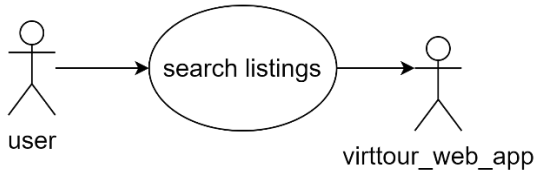


Virttour: generate interaction report	
Actors	User, virttour web app
Description	A user may see a report of his/her recorded interactions and preferences along with the number of times his/her listings were interacted with (providing one was uploaded).
Data	All features of the listing; all interaction counts.
Stimulus	User command issued by user.
Response	A page with all features of the listing; all interaction counts.
Comments	The report will have full historical records for each report.

Virttour: suggest price from features	
Actors	User, linear regression model
Description	A user may see an estimate of a house's price relative to the listings already in the database.
Data	As many features of the listing as possible.
Stimulus	User command issued by user.
Response	A cash amount.
Comments	The confidence of the estimation is based on the prices already in the database.

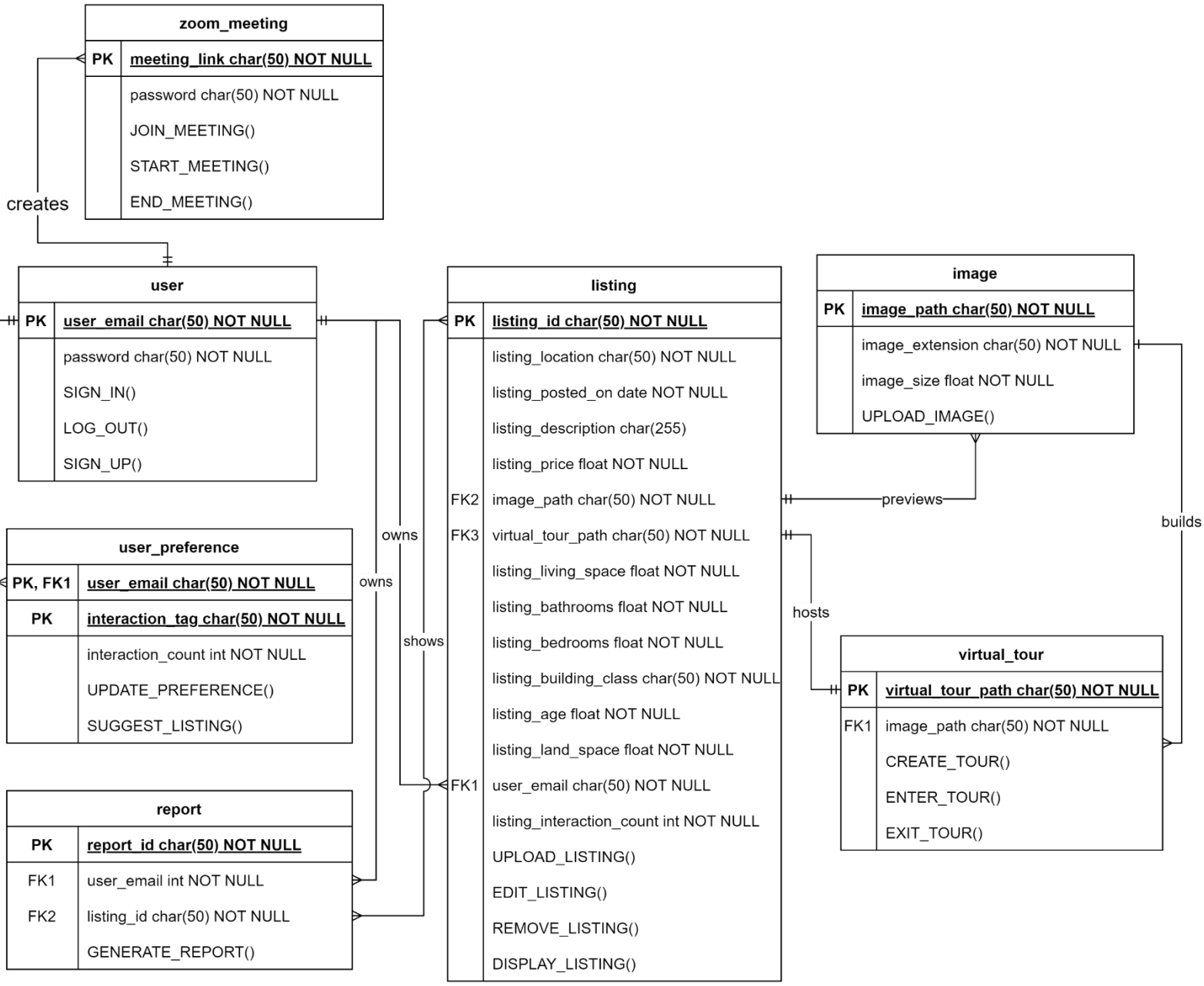
Virttour: recommend a listing	
Actors	Automated_ETL, virttour web app
Description	Python code is used to execute SQL queries. They work together to parse preference and listing data from the database. The python code then chooses what listing to send to the client side.
Data	All features of the listing.

Stimulus	Time or automatically called by user scrolling.
Response	A JSON with all features of the listing.
Comments	This is the final data product – a recommendation.



Virttour: search listings	
Actors	User, virttour web app
Description	A user may search the repository of listings by a single feature – location.
Data	Search keyword – a location
Stimulus	User command issued by user.
Response	A page with listings that match the requested location.
Comments	This is a basic search.

3.2.2 UML Class Diagram



3.2.3 Data Dictionary

Users table

Field name	Data type	Description	Example	Prompt/default	Required
id	Int (10)	an id like the email, but is an int and autoincremented to for ease of access and to know number of users	1	Auto incremented	Yes
email	text	the email of the user	info@virttour.com	No default	Yes
password	Text	The user's password	123.PassWord	No default	Yes

Listings table

Field name	Data type	description	example	Required
Id	Int	Unique id	34	Y
Listing_location	Text	Parish/town level location of the listing in Jamaica	Lucea	Y
Date_posted	Date	Date uploaded	30/12/22	Y
listing_description	Text	Any additional details	A house on a hill overlooking the sea	Y
Listing_price	Float	Price	1223435.90	Y
Listing_image	Text	A path to the image uploaded alongside the features	http://localhost/vtour/images/tour1.jpg	Y
Listing_tour	Text	A path to the tour once the tour is available	http://localhost/vtour/tour.html	Y
Living_space	Float	Acres of finished living space i.e., acres of indoors	0.9	Y
Land_space	Float	Acres of unoccupied land i.e., acres of outdoors	2	Y
No_of_bedrooms	Float	Number of bedrooms	3	Y
No_of_bathrooms	Float	Number of bathrooms	2.5	Y
Building_class	Int	Int from 1-10 with 10 being the most luxurious/commercial type	6	Y

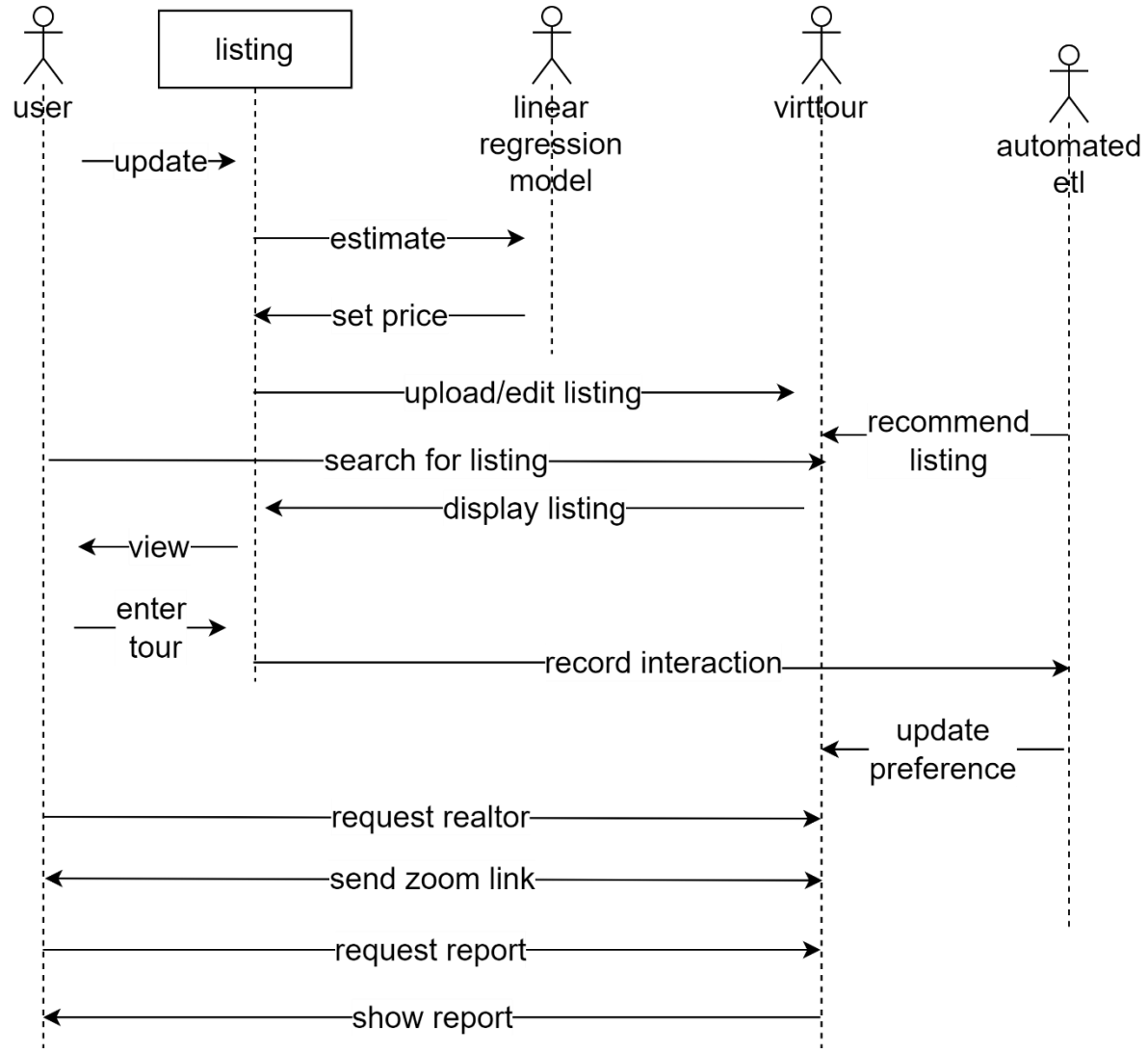
age	Float	Years since built or renovated	12	Y
Posted_by	Text	User that uploaded the listing. A record from the user table	info@virttour.com	Y
Listings_interaction	Int	How many times this listing was toured	2	Y

User preference table

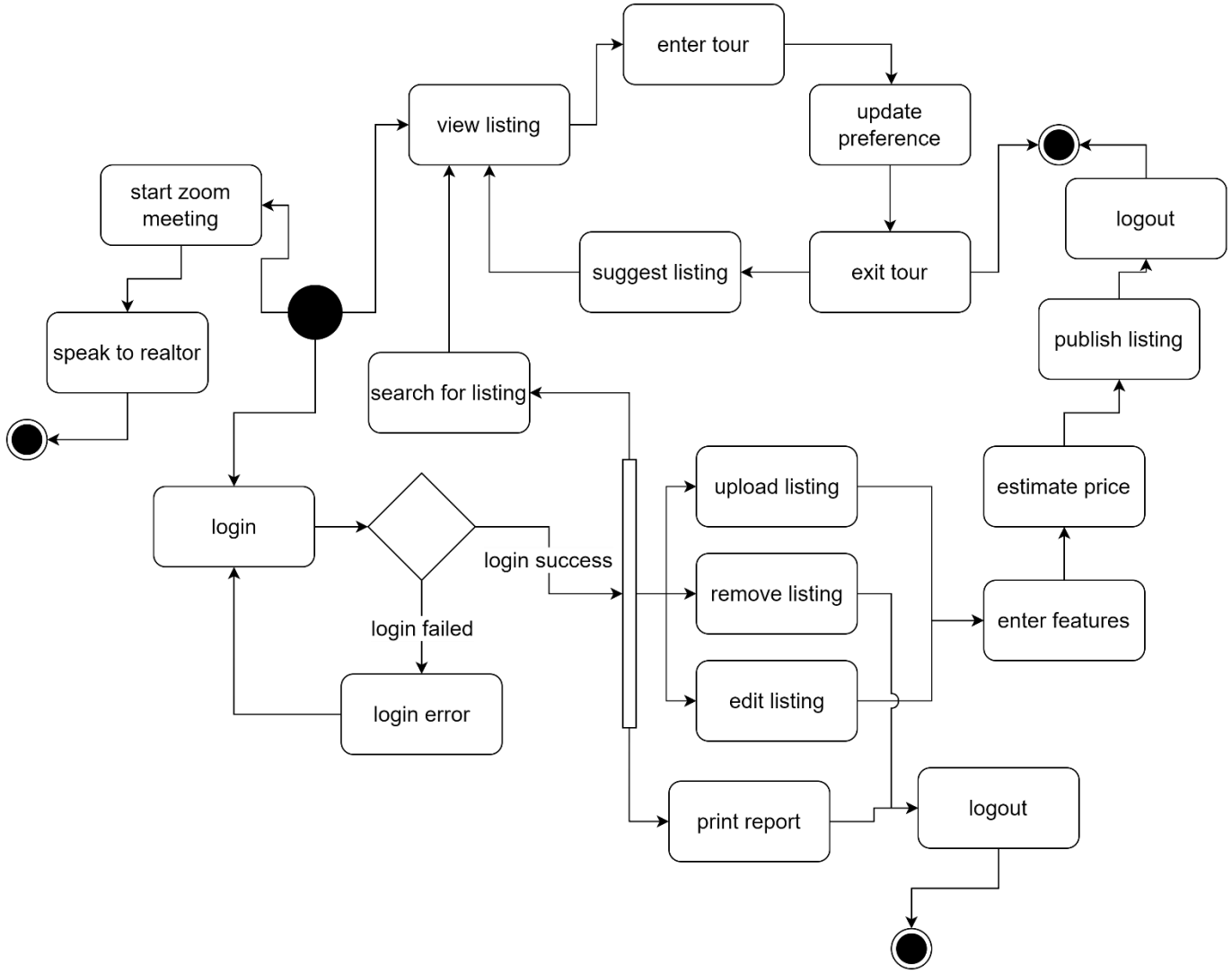
Field name	Data type	description	example	
username	text	User that we will track. A record from the user table	tyreek@gmail.com	
Price_0	Int	A tag that represents a truth from a listing e.g., the price between a floor and a max. this tag represents the price of the listing if it is between 0 and 1 million. The data is the number of times the user interacted with this tag.	2	
Price_1	Int	A tag that represents a truth from a listing e.g., the price between a floor and a max. this tag represents the price of the listing if it is between 1 and 2 million. The data is the number of times the user interacted with this tag.	2	
Price_n	Int	A tag that represents a truth from a listing e.g., the price between a floor and a max. this tag represents the price of the listing if it is between x and y. The data is the number of times the user interacted with this tag.	4	
Location_1	Int	A tag that represents a truth from a listing e.g., the location. This tag represents Lucea. The data is the number of times the user interacted with this tag. The data is the number of times the user interacted with this tag.	2	
Location_2	Int	A tag that represents a truth from a listing e.g., the location. This tag represents Kingston. The data is the number of times the user interacted with this tag. The data is the number of times the user interacted with this tag.	3	
Location_n	Int	A tag that represents a truth from a listing e.g., the location. This tag represents x…. The data is the number of times the user interacted with this tag. The data is the number of times the user interacted with this tag.	5	

3.2.4 Supporting diagrams

• Sequence diagram



• Activity/workflow diagram



SECTION 4

4.1 Minimum PC & Mobile Device Systems Requirements

The typical 12GB ram, 256GB HDD will be sufficient to use the product and all its features.

All modern browsers are supported. While it is not advisable, Internet explorer can also be used. With internet explorer however, some html elements may not function as they were designed to.

Besides having JavaScript enabled in the web browser, there are no special software needs. All the product feeds to users are basic types: html, mp4, jpeg.

From a hosting standpoint, the requirements are simple. To host the web application, a web server is unavoidable. This webserver could be cloud or a local server.

From a user standpoint, the user simply needs an internet enabled device that has browsing capabilities. I.e., a computer or other mobile device with a web browser installed and a stable internet connection is the only requirement.

References

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Appendix

Imported python modules

- sys — System-specific parameters and functions

  This module provides access to some variables used or maintained by the interpreter and to functions that interact strongly with the interpreter [1].

  a. sys.path A list of strings that specifies the search path for modules.

- Os – This module provides a portable way of using operating system dependent functionality [1].

  0. os.environ – A mapping object where keys and values are strings that represent the process environment.

- urllib.parse - This module defines a standard interface to break Uniform Resource Locator (URL) strings up in components (addressing scheme, network location, path etc.), to combine the components back into a URL string, and to convert a "relative URL" to an absolute URL given a "base URL." [1].

  1. unquote_plus – Replace %xx escapes with their single-character equivalent and replace plus signs with spaces, as required for unquoting HTML form values.

- ChatterBot is a Python library that makes it easy to generate automated responses to a user's input [2]. ChatterBot is a machine-learning based conversational dialog engine build in Python which makes it possible to generate responses based on collections of known conversations. The language independent design of ChatterBot allows it to be trained to speak any language [3].

- email. The email package is a library for managing email messages. The central component of the package is an "object model" that represents email messages [1].

- JWT. python-jwt is a JSON Web Token (JWT) implementation in Python [3]. JSON Web Token (JWT) is an open standard (RFC 7519) that defines a compact and self-contained way for securely transmitting information between parties as a JSON object [4].

- Requests – Requests allows you to send HTTP/1.1 requests extremely easily [3]. There is no need to manually add query strings to your URLs, or to form-encode your POST data. Keep-alive and HTTP connection pooling are 100% automatic, thanks to urllib3 [5].

- JSON (JavaScript Object Notation), specified by RFC 7159 (which obsoletes RFC 4627) and by ECMA-404, is a lightweight data interchange format inspired by JavaScript object literal syntax [1].

- The datetime module supplies classes for manipulating dates and times. While date and time arithmetic is supported, the focus of the implementation is on efficient attribute extraction for output formatting and manipulation [1].
- Random. This module implements pseudo-random number generators for various distributions [1].
- mysql. connector. MySQL driver written in Python which does not depend on MySQL C client libraries and implements the DB API v2.0 specification (PEP-249) [3].

Frontend frameworks

- Bootstrap. Quickly design and customize responsive mobile-first sites with Bootstrap, the world's most popular front-end open-source toolkit, featuring Sass variables and mixins, responsive grid system, extensive prebuilt components, and powerful JavaScript plugins [6].

API's

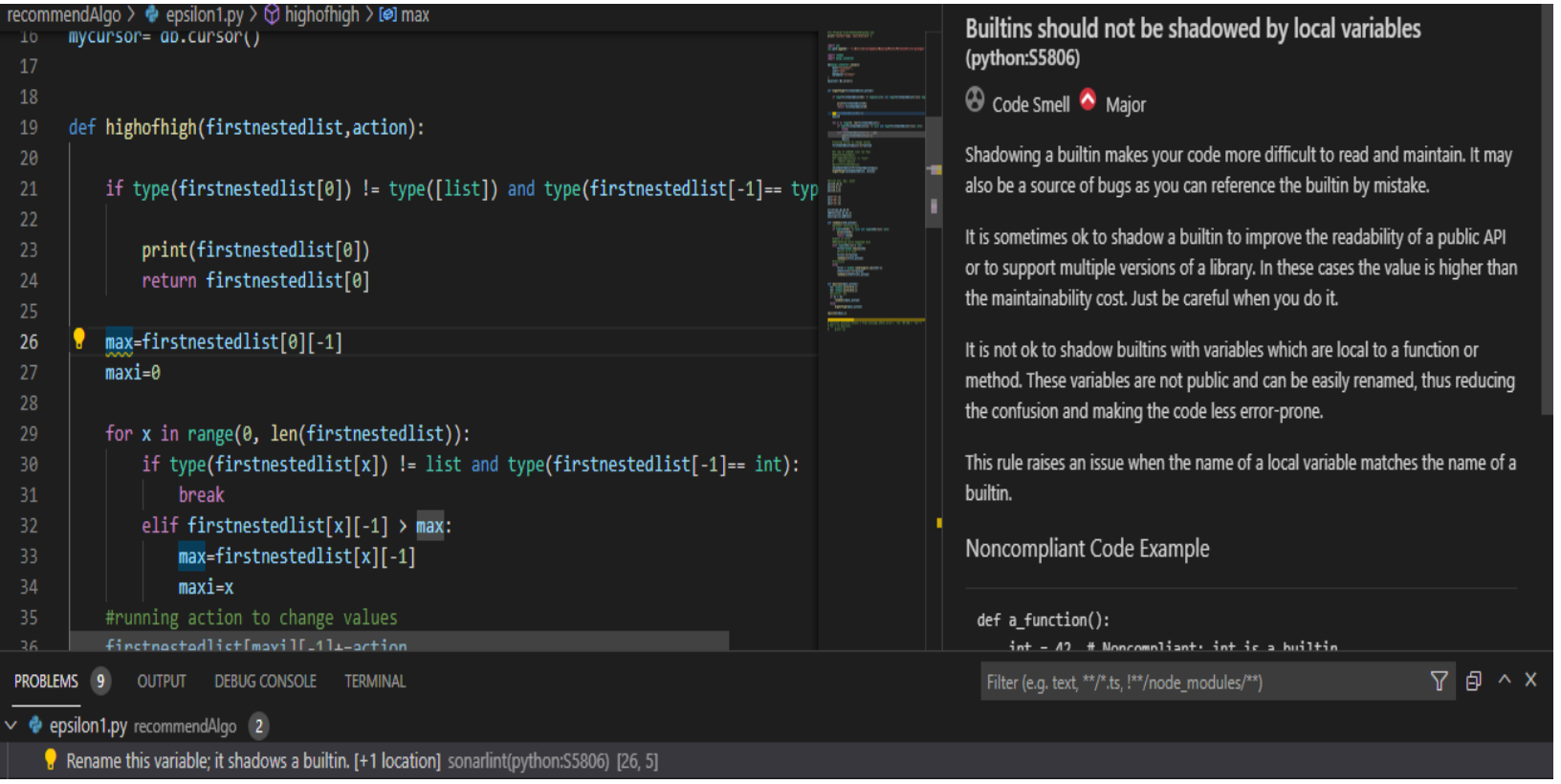
1. Zoom. Use JWT Build an app that supports server-to-server integration with Zoom services without a need for user authorization [7].
2. Decentraland. There are several v1 endpoints without a v2 counterpart, but the corresponding data can still be found via a query to Decentraland's subgraph on The Graph. [8]

Static Code Analysis & Code Security Report

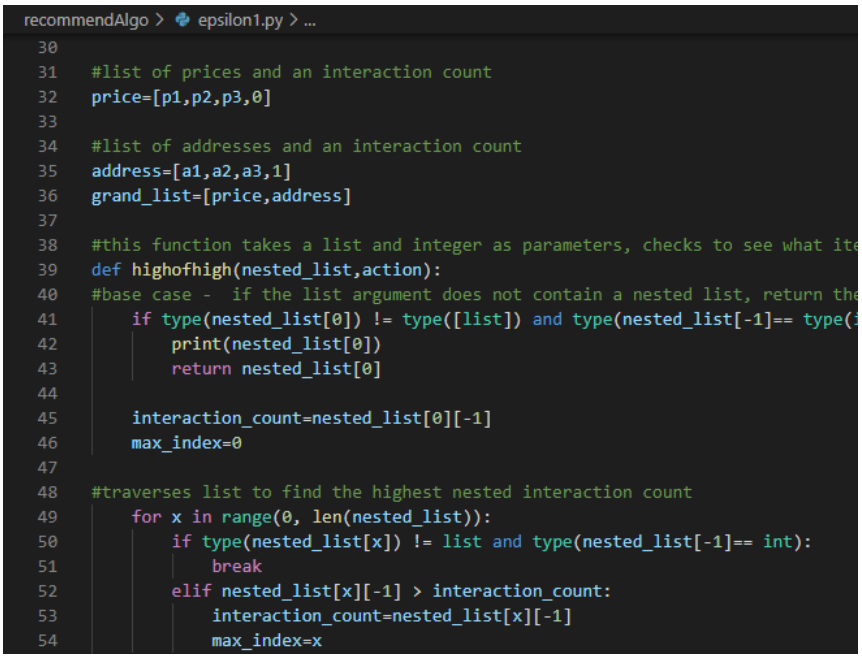
SonarLint is a Free and Open-Source IDE extension that identifies and helps you fix quality and security issues as you code [9]. Like a spell checker, SonarLint squiggles flaws and provides real-time feedback and clear remediation guidance to deliver clean code from the get-go [10].

Sample: The Picture below show code on left, specific SMELLS description on right.

Problematic code:



Compliant code.



Honor code Document/Presentation

I, Tyreek ALEXANDER, pledge on my honor that this is my honest work, and I did not cheat, and I did not receive any unauthorized assistance; neither did I assist anyone to cheat nor share with anyone, nor give unauthorized assistance to any person in completing this examination, assignment, assessment, or work submitted to Northern Caribbean University.

I acknowledge that the regulations on any form of cheating are strictly enforced and that engaging in any activity deemed as cheating or an attempt to cheat may result in very serious penalties, including failing grades, or dismissal from the University. I will endeavor to avoid such activities and guide my actions accordingly.

Choosing to continue with this assessment is an indication that I have read, understood, and consented to complete and submit this assessment.

Student Signature: T. ALEXANDER Date: April 18, 2022