The University of Hong Kong

Department of Computer Science

Final Year Project

Home and Roommate Finder
Detailed Project Plan

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I. Project Background

With an increasing number of non-local students being admitted to universities in Hong Kong every year, there has been a rising demand for housing among non-local university students. However, seeking appropriate accommodation is a challenge faced by non-local university students. On-campus housing is a popular option for students due to its proximity to university campuses and comparatively cheaper rents than off-campus housing. Nevertheless, the quota for on-campus housing is limited, and their supply is below the demand [1], resulting in students needing to search for off-campus accommodation otherwise. Moreover, Hong Kong is consistently ranked as the most unaffordable housing market in the world. The city was ranked as the least affordable housing market in 2023 [2]. The monthly rent was also ranked third highest globally [3]. The housing shortage and high housing prices create a challenging environment for students to search for homes in Hong Kong.

Furthermore, there are existing sources such as online listing platforms (e.g*., 28Hse.com, Hong Kong Property*), social media (e.g., *Facebook*), and advertisements. However, there are limitations to the current existing sources. Firstly, the limitation of the existing sources is that they are generally designed to cater to a broad demographic. Therefore, students may be recommended housing beyond their financial and practical needs when searching. Moreover, the existing resources often lack verification, recommending students with unreliable, misleading, or fraudulent listings [4]. Lastly, the process of finding listings online is difficult and inefficient, as students will have to look for listings from multiple sources and compare them.

To address the challenges that students face, this project proposes an application specifically tailored for students to conveniently find housing in Hong Kong. With the use of Machine Learning (ML) and Large Language Models (LLM), the application plans to perform smart housing recommendations based on their preferences, inform students with possible misinformation or fraudulent activities. In addition to house recommendations, the application plans to include a feature that allows students to find roommates for apartment sharing.

II. PROJECT OBJECTIVE

The objective of this project is to develop an efficient platform tailored to help students studying in Hong Kong find suitable housing and roommates. The below mentioned points are the features that are planned to be included in the application to achieve the objective.

1. Personalized Housing Recommendation

The platform plans to ease the home search process by providing personalized housing recommendations. Instead of students navigating through multiple property websites, they will enter specific preferences directly into the platform. These preferences may include factors like rental price range, housing size, preferred type of housing (e.g., shared or studio apartments), and proximity to public transportation or university campuses. Based on this input, the system will analyze the data and offer a personalized list of housing that match the student's needs.

The platform will make personalized recommendations with each user interaction. As students use the system more, it learns their preferences and refines future recommendations accordingly. Moreover, the ML technique will evaluate factors such as market rent trends to ensure the listings are not only relevant but also adequately priced to better inform the students when checking the listing.

2. Roommate Finder

The platform will support students in finding compatible roommates. This feature will provide two methods on finding roommates: users can either search for housing with roommates based on preferences or initiate a group matching system called "Start a Party."

The "Start a Party" option enables students to group with other users to rent a shared space. If a user finds a larger housing that requires multiple tenants, they can initiate a party, inviting others to join and live together. This helps students find shared accommodations more easily and provide a way to connect with others.

For the roommate matching feature, students are asked to enter preferences of preferred roommates, including rent contributions, lifestyle habits such as sleep schedules or smoking, and shared interests. Based on these inputs and future user patterns, the application will suggest shared apartment listings that were initiated by other students and fit best with the student's housing and roommate criteria.

III. Project Methodology

The application utilizes ML, clustering techniques, and price prediction models to better provide information to students by delivering personalized and verified housing recommendations.

1. Data Collection

Data collection is needed to construct dataset for the recommendation engine. The primary sources for housing data will include online property listing platforms such as *28Hse.com* and *Hong Kong Property* where housing listings are available. A web crawler will be used to extract data from these sources, collecting information such as rental prices, property sizes and location details. The data collected will be used as the dataset throughout the project.

Moreover, the application will employ a serverless architecture that uses cloud-based instances to handle continuous updates from these sources. Additionally, the data will be further processed using LLM to clean and organize the data. This clean and processed data will be used for modeling purposes.

2. Recommendation Engine Development

The recommendation engine filters and suggests housing listings based on user preferences and interactions. Users will input their housing preferences, such as price range, location, and housing type. As they interact with the system (e.g., by liking or rejecting listings), the engine will learn from these interactions to refine future recommendations. This process is supported by ML algorithms (e.g., *K-Means, K-Nearest Neighbors*) that use both user inputs and user usage patterns to optimize recommendations over time.

Furthermore, to support the recommendation engine, the clustering model, which will be used for selecting relevant cluster of housing data which is most similar to user, will be trained and developed by existing housing data. This will help shortlist the data that are relevant to users' needs which can reduce the workload of recommendation engine as well as enhance the performance of recommendation.

3. Price Prediction Model Development

The price prediction model will be trained and deployed using previously collected housing data. The model will be used alongside recommendation engine which helps predict accurate market prices for housing listings and flags potential fraudulent listings. The model will make use of Convolutional Neural Network (CNN) with several customized features. It will continuously analyze housing data, comparing historical pricing trends with current market listings to generate accurate rent predictions. If a listing appears to deviate suspiciously from typical market trends (e.g., a significantly low rental price in a prime area), the system will label it as a potential scam, informing users of possible risks.

4. Recommendation and Roommate Matching

The roommate matching feature allows users to either find existing shared accommodations or create new groups via "Start a Party" feature. For this feature, a ranking algorithm will be developed using LLM to sort roommate candidates based on compatibility. The LLM-based engine will utilize the user input, such as living preferences, sleep schedules, smoking habits, and shared interests. It will recommend suitable roommates based on the data input.

5. Platform Development

The frontend will be developed for the user interface of the application, and it will be developed using either *Flutter* or *React* (including *React Native*) for cross-platform compatibility. Both frameworks offer smooth and native-like experiences across mobile and web with customizable widgets, making it ideal for consistent design across platforms.

The backend requires ML model integration and supporting user requests. *Python* will be used to develop the backend, considering the available AI/ML libraries in the language (e.g*., Scikit-learn, TensorFlow, PyTorch*) and the frameworks (e.g., *Django, FastAPI*) to support ML integration and API handling. Moreover, database management system will be set up for storing data needed in the application, respectively for testing and production, and integrate it with the backend.

To provide scalability, automated management, and efficient resource utilization, the application will be deployed in cloud infrastructure (e.g., *Amazon Web Services*, *Microsoft Azure*, *Google Cloud Platform*). Cloud infrastructure supports ML model training, along with CI/CD pipelines for testing, building, and deployment.

IV. Timeline and Milestones

Period	Milestone / Deliverable
October 1, 2024	Phase 1 Deliverables • Complete detailed project plan • Set up project web page
October, 2024	• Collect housing data for model development • Set up cloud infrastructure • Design system architecture and database
October – December, 2024	• Develop prototype with core features, including frontend UI, and API handling • Train machine learning models
January 13-17, 2025	• First presentation
January 26, 2025	Phase 2 Deliverables • Preliminary implementation • Detailed interim report
January – April, 2024	• Optimize models and application features • Perform testing and fix issues • Finalize all application features
April 21, 2025	Phase 3 Deliverables • Finalized tested implementation • Final report
April 22-26, 2025	• Final presentation
April 30, 2025	Project exhibition • 3-min video

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