

Moving Masters

CS 411 Project Stage 1: Project Description

Team Members:

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Project Summary:

The project is an app that helps people evaluate the livability of different areas across the United States, based on key socioeconomic factors and user input. On our website, users can input their preferences—such as priorities on housing affordability, job opportunities, population trends, or GDP growth—and the app will generate personalized recommendations of suitable regions. By combining interactive visualizations, search filters, and regional analytics, the app makes navigating complex relocation data both intuitive and engaging. The goal of the project is to simplify the complex relocation process and provide users with an intuitive and interactive experience.

Description:

Our project aims to determine the most appealing zip code for a user based on their preferences through a web application. Living in urban areas throughout the United States has become increasingly unaffordable for the majority of young people without a stable career. Effective pricing out of places where people have lived their whole lives can lead to feelings of bitterness and societal discontent, but this does not have to be the case. Many areas in the United States are more affordable and have great amenities, but people just don't know about them. Our project utilizes a dataset to identify the top five best zip codes for each user.

All users are unique, so it is essential to cater to different zip codes from other users.

When the website is first entered, you will be greeted with a list of the top five generically good zip codes, or zip codes that have the highest possible rating in all categories. Ideally, these zip codes would be highlighted on a map of the United States; however, due to the loss of a group member, this addition may not be possible. The top five worst zip codes would also be listed and highlighted on the map, if applicable, to show areas that a user should avoid. The user would have the opportunity to log in to an existing account with a username and password, or create a new account if the username does not already exist. While the user is logged in, they can favorite any zip codes that appeal to them, which stores the zip code and associated information in their Favorites tab. The user can also create custom zip code searches, where they rate each search attribute from 1 to 5, with 1 being the least important and 5 being the most important. These ratings weigh certain factors according to the user's preference and then return the top 5 zip codes based on this weighting.

Technically Challenging Features:

There are many options for creative components to enhance the functionality of our application; however, we may be limited in implementation due to the loss of a group member. One functional creative component could be increasing the number of data sets used by our website. This would give the user more options in picking their perfect zip code. In a previous paragraph, we mentioned how it might be possible to add a map on the front page that allows users to visualize the best zip codes, as well as compare them to major cities. This map could be expanded to show all zip codes in the United States with a color rating ranging from very bad(1) to very good(5), with an associated color from red to green. Clicking on a zip code would then return the number, rating, and all metrics used to determine said rating. This will likely be too difficult for a group of three to accomplish, and it is also challenging for a user to distinguish between zip codes, as there are over 40,000.

The number of additional creative components is severely limited by the fact that we now have only three members in our group, but we will try to add as much as possible. It may be possible to add a visual map and additional search modifiers, but we need to start working on the project before this is clarified. As price is also an important deciding factor, we could also add a search feature that allows you to specify a price range for the zip code, thereby limiting the zip codes to only those within that price range. This would be a feasible addition to the project, while also significantly enhancing its functionality. Finally, we could add a password-changing option for individuals who have forgotten their password. During account setup, they would have to include the answer to two different security questions. The user could then click forget password during sign-in and input the answers to the security questions to change the password for the associated username.

Usefulness:

Our application will help individuals determine when and where to relocate based on their priorities. Moving to a new city or state is a considerable investment and lifestyle change. By providing users with a clear and concise overview of each area, our application enables them to make informed decisions through an intuitive, user-friendly interface. Simple features include searching for zip codes based on amenity preferences or price, display of best zip codes on the home page, account creation to save preferred zip codes, and the ability to change a password if forgotten. More complex functionality includes an interactive map on the home page that either displays the best and worst zip codes or all zip codes with a rating.

Our application idea is viable because numerous similar websites already exist. <https://www.nextburb.com/us/il/chicago/best-zip-codes-to-live/> is a website that provides the best zip codes to live in based on a specific city. It provides some vital information like commute time to a city, median home value, income per capita, and population data but does not provide much amenity information depending on the location, lacks the ability to sort by preferential factors, appears to lack the ability to favorite preferential zip codes, and does not include a map. <https://www.niche.com/places-to-live/search/best-zip-codes-for-families/m/chicago-metro-area/> ranks each zip code by a variety of factors, including a map with the zip code, the ability to favorite the zip code for future lookup, and the ability to filter results based on specific factors. This website's filtering capabilities are somewhat limited, only allowing sorting by cost with no option to select a particular range or rank the local public schools. This website would be closer to what we hope our final project to look like, but with more filtering options, more hard data information instead of just a basic grade, and the ability to check the whole country instead of just one city.

Realness:

To fully understand how appealing a zip code is requires a variety of data from numerous different sources. We have identified several potentially useful datasets to utilize in our project, including the county-to-zip code converter, GDP per county, industry per zip code datasets, and average annual housing price change.

The county-to-zip code converter and GDP per county datasets are used to determine whether the GDP of a group of zip codes is increasing or decreasing, which can be used to infer the approximate economic growth or decline in an area. These files are in the XLS format. The GDP per county has a cardinality of 3221 with a degree of 10. The county-to-zip code converter has a cardinality of 44,396 with a degree of 11. The GDP per county dataset is sourced from the data.census.gov webpage, while the United States Postal Service provides the county-to-zip code converter at https://postalpro.usps.com/ZIP_Locale_Detail.

Our industry-per-zip-code dataset is essential for understanding the types of businesses in a zip code, which allows us to see available amenities in an area, as well as the types of employment opportunities. This data can be vital for a variety of reasons, including: selecting areas with an abundance of a particular job type, seeking out relevant amenities, or avoiding over or under-industrialized areas. This data set is formatted in csv and has a cardinality of 456709 and a degree of 12. This data is sourced from data.census.gov.

Last but not least, we have found a House Value Index (HPI) dataset published by the U.S. Federal Housing (<https://www.fhfa.gov/data/hpi/datasets>), which contains HPIs for

each Zip Code from around 2000 to 2024. This dataset captures not only their calculated HPI but also the annual changes that could be valuable to analyze.

Functionality Description:

Our website is a data-driven platform that empowers users to assess the livability of various U.S. regions based on key socioeconomic indicators. It serves individuals such as renters, homeowners, real estate agents, or prospective investors by helping them make informed decisions about relocation, property investment, or listings. The core of the application lies in its interactive tools, customizable analytics, and regional insights.

User Interactions & Features

1. Region Search Tool

Users can search for a region through a search bar, upon which the site displays a detailed profile of that region. This includes statistics such as:

- Median housing prices
- GDP and GDP growth rate
- Population size and growth trends
- Job growth rate

2. Smart Filters for Data Exploration

Users can apply dynamic filters to explore regions that match their personal criteria. For example:

- Filter regions by a desired housing price range
- Search for ZIP codes with positive population or job growth
- View only areas with top-tier GDP growth

The results update in both a **map-based visualization** and a **sortable table**, ensuring a seamless data exploration experience.

3. Interactive U.S. Map

The website features a U.S. map where ZIP-code-level regions are color-coded based on their livability scores (e.g., green for high, red for low).

- Hovering over a region displays a brief overview of the key stats. Clicking a region brings up a more detailed dashboard.
- Users can zoom and pan to focus on areas of interest.

4. Customizable Quality of Life Score Tool

To personalize the experience, users can adjust weightings for various livability factors such as:

- GDP
- Housing affordability
- Population growth
- Job availability

Based on these inputs, the site recalculates livability scores in real time, updating visualizations and rankings accordingly.

5. Top 5 ZIP Code Table

A dedicated section highlights the five highest-scoring ZIP codes based on either default or user-customized weights.

- Users can click on each entry to view deeper statistics and trends.
- Table columns are sortable by any metric, allowing for comparative analysis.

Advanced Role-Based Features

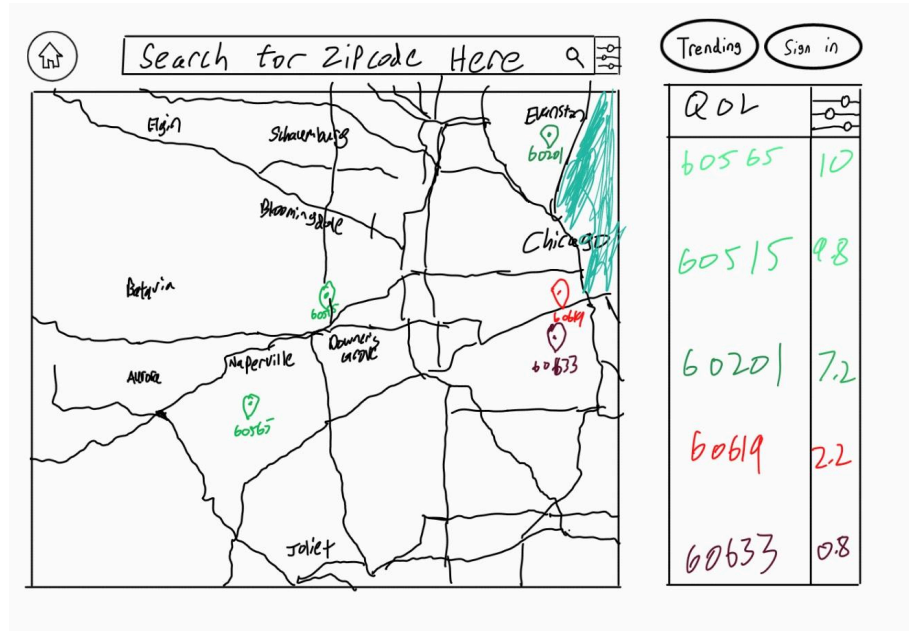
To enhance personalization and access control, we envision a **role-based access system**, allowing different user types to unlock specialized tools:

- **Renters & Buyers:** Use the quality-of-life calculator to evaluate potential moving destinations.
- **Leasing Agents:** Identify emerging “hot” ZIP codes that renters frequently search for.
- **Homeowners:** Gain insights into how attractive their ZIP code is and monitor trends that affect property value.

User Manual:

- Type in the location and choose the filter
- Quickly interact with the Quality of Life Score Tool
- Retrieve the result from the table or see it from the map visualization.

A low-fidelity UI mockup:



Project work distribution:

To ensure a smooth and efficient development process, our team of three has divided the project responsibilities based on our individual strengths and areas of interest. Each member contributes to both the core functionality and overall quality of the application.

[Tony Liu] – Front-End Development & User Experience

- Designs and implements the user interface
- Builds key features such as the search bar, interactive filters, livability score customization, and user dashboard

- Integrates the interactive U.S. map and ensures a responsive, intuitive user experience across devices

[Nicholas Chan] – Back-End Development & Data Processing

- Develops server-side infrastructure using Node.js
- Creates API endpoints for search queries, filters, and scoring logic
- Sources and preprocesses datasets (e.g., GDP, housing prices, industry breakdowns) from Census Bureau, BEA, etc.
- Maintains the database and manages data joins across ZIPs, counties, and regions

[John Driscoll] – Recommender System, Analytics & Deployment

- Implements the livability score engine and builds the recommendation system based on user-defined preferences and product tags
- Integrates functionality for comparing similar regions
- Handles testing, deployment (e.g. AWS), and project documentation
- Ensures the scalability and maintainability of the system

We maintain consistent team communication through weekly meetings, shared task boards, and code reviews to ensure progress remains aligned with our project goals and timeline.

