MARCH 27, 2021

FINAL PROJECT | ZILLOW

IS 6420 DATABASE THEORY & DESIGN

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Additional Submission Items

Presentation:

https://youtu.be/8UXMaFebFh8

Slide Deck:

https://drive.google.com/file/d/1iGF8BHpX-zSU9247Y6WUEdP0cfB0W1j3/view?usp=sharing

Full Size Models and Diagrams:

1. ER-Diagram
   https://drive.google.com/file/d/1keC09mvXPLS8_MLeDkR9ycqgIV5lT9XG/view?usp=sharing
2. Logical Model
   https://drive.google.com/file/d/13wm_4l1eOgng7lBCCgjtLwd9BfyPGfY3/view?usp=sharing
3. Physical Model
   https://drive.google.com/file/d/1tFEZkILV3qVZHzlC8LwTu_OaINisFBxy/view?usp=sharing
4. SQL Developer Implementation:
   https://drive.google.com/file/d/1arjpvaRM5CJgHd-nyDg-lmwUT6A7_j26/view?usp=sharing

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Executive Summary

Real estate is viewed as an industry that lags in innovation. The way customers find and buy houses seemingly hasn't changed through the decades, while behind the scenes, much has changed. The end-user is often restricted in options to purchase and search for homes in a hot market, creating the need to employ an expensive agent. The walls put up by the industry keep the status quo alive are large and very high, but Zillow sets out to change that.

Using technology to aggregate data from multiple sources and allowing end-users to browse databases themselves have revolutionized the search for homes since 2006. While agents are still needed and recommended due to legalities in buying a home, customers' ability to search through the database themselves makes the market more transparent overall.

Zillow's database has many functions; however, we focused merely on the aspect of buying houses. Keeping the scope manageable has been a challenge, but cutting away features that simply add more information instead of exciting relations to the model has allowed us to capture the essence of what Zillow is about, especially in its younger years.

The scope changed in every step of the process. We embraced an iterative approach to database design. While we ran into issues throughout the process up until we were implementing our design with SQL code, we adapted the design where needed and documented every significant change made along the way.

To achieve our final scope, we created the following tables in SQL: agent_tb, neighborhood, state_tb, user_tb, listing, listing_photos, listing_update, views_tb, similar_home, user_saved_searches, user_saved_listing, and populated them with extensive data.

Through this project, we captured the essence and complexity of Zillow's database's buy-side and learned a lot along the way. Starting with an extensive scope, shaving away features and options along the way allowed our final scope to zone in regarding recreating Zillow's key value offering. There are many opportunities to expand the database in the future, and doing so would give great practice with SQL

About Zillow

Introduction and History

Zillow is one of the leading real estate and rental marketplace apps today. Founded by Rich Barton and Lloyd Frink in 2006, Zillow is a medium dedicated to empowering consumers with data, inspiration, and knowledge around the place they hope to call home.

Zillow serves the entire lifecycle of owning and living in a home: buying, selling, renting, financing, remodeling, and more. All of this starts with Zillow's living database with more than 110 million U.S. homes which include: homes for sale, homes for rent, and homes not currently on the market. Zillow also helps estimate home and rental value through their "Zestimate home values." Zillow operates the most popular mobile real estate apps suite, with more than two dozen apps across all major platforms.

Zillow had over 39 million unique visitors in 2019, and over 12 functioning real estate applications are committed to connecting people to the home of their dreams.

Vision and Objectives

The vision of Zillow has been the same since its inception in 2006. Zillow's main objective is to place people in homes that they love. They make that point a possibility by showing different price points and estimates that give users the information they need to make an informed decision. As the world has gone increasingly digital, Zillow recognizes that creating a digital, user-friendly site would help consumers in the long run. They are allowing users to reach out to renters or sellers of homes cut out the long hours of researching the desired area.

Products and Services

Zillow provides a free service that allows users to view and list properties available to buy or rent online. Sellers, buyers, agents, and lenders can connect to a web interface. Zillow is supported by Mac, Windows, Linux, as well as all operating systems.

Transactional Databases Use

Zillow is able to utilize a transactional database in many ways. The primary use that we as a team saw was saving listings of a home to a user's account.

Users are provided with an opportunity to view and connect with potential real estate agents and options for buying, selling, or renting a property. Options are also available to post rental properties along with useful rental property management tools.

Approach

The team independently researched Zillow's website. Each team member explored every option of the website until we all understood all components associated with it. There are several dropdowns for users to choose from on the main page. Our focus was on home listings that were listed for sale. We then all set out to create a conceptual model, after which the best version was chosen to continue with. After completing the conceptual model, two team members focused on the project's quantitative side, creating models and writing code, while another focused on the qualitative side of the project and started writing and producing the write-up document. Eventually, the group came together again and cross-checked each other's work. Lastly, the PowerPoint was created, and the draft was rewritten to reflect any changes made since the original write-up.

Initial Scope

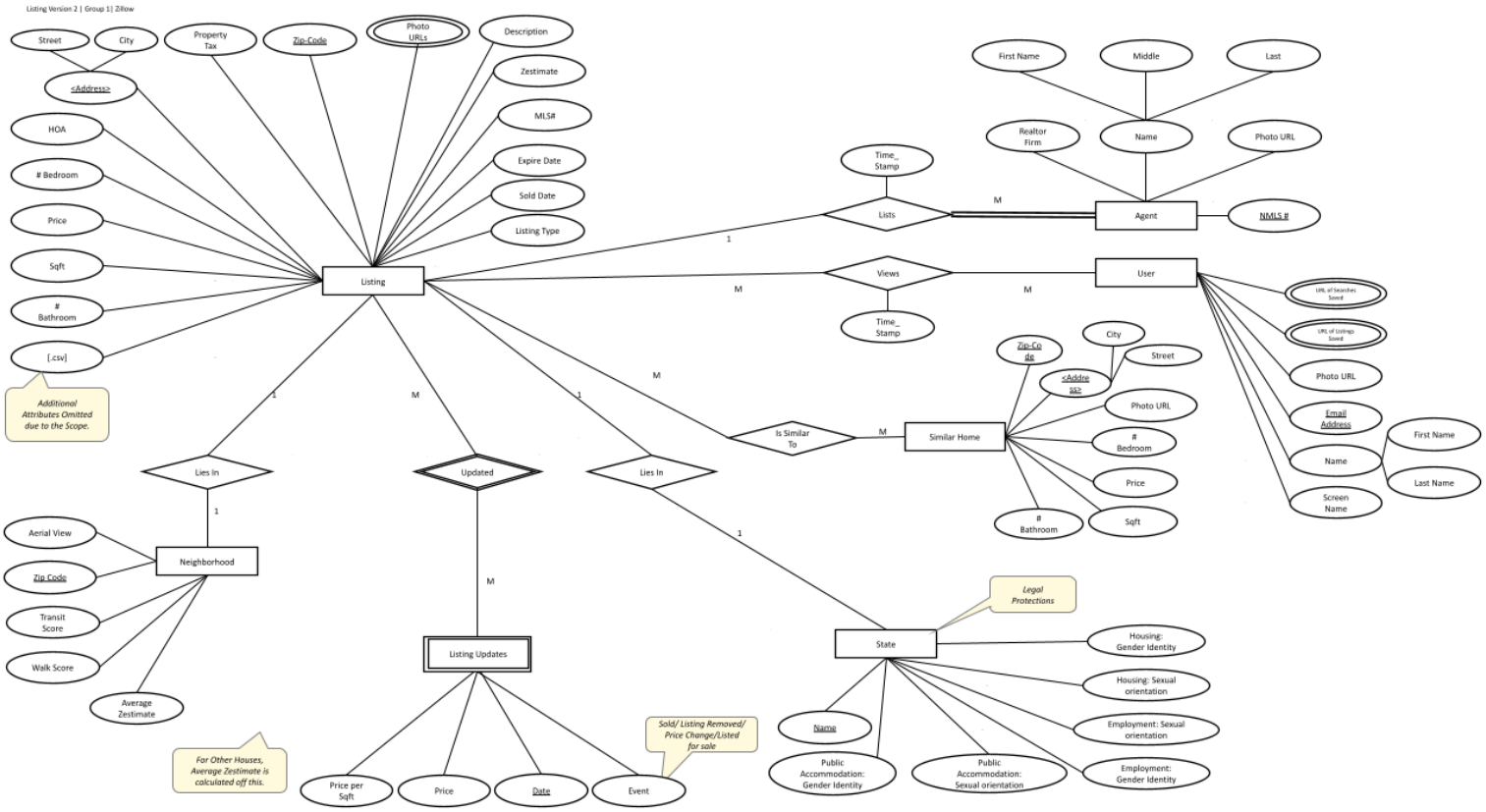
At the initial project stages, we decided to focus on sales listings on Zillow's platform as the scope for the project. It was determined the database must have the following requirements. Version one of the conceptual model can be seen in Appendix A.2.Users must be able to view listings.

- Users must be able to list homes for sale
- Users must be able to view relevant information to listings on one page.
- Similar homes to the current one shown need to be shown to the user.
- Agents must be able to create home listings.
- Users must be able to save listings.
- Users must be able to save search parameters.
- Zillow needs to be able to track which home listing has been viewed when by which user.
- Users need information on Schools
- Users need information on Taxes
- Users need information on lenders

To meet the requirements mentioned above, 14 tables would need to be created through the analysis of Zillow. The 14 tables are listed below.

- agent_tb
- neighborhood
- state_tb
- user_tb
- listing
- listing_photos
- listing_update
- views_tb
- similar_home
- user_saved_searches
- user_saved_listing
- Lender
- Schools
- Listing_Tax_Assestment

Conceptual Model



Conceptual Model Description

The above diagram (Appendix A) is version two of the created conceptual model. The listing table is the core of the database. In other words, the table where the data is aggregated and presented to the user. The main listing page is based on the listing table with extra information referenced in other tables.

The scope change between version 2 of the conceptual model and version 1 of the same model is evident with the scope updated to exclude lenders, schools, tax assessment, and users' ability to list homes.

Both users and agents are entities that represent people. Agents use both the Zillow platform and services like MLS (in Utah), from which Zillow gathers its data. If an agent creates a Zillow account and greenlights its listings to be published on the Zillow website, Zillow duplicates the MLS listings data and shows the house as available next to the contact details of the listing agent to contact. Agents can list multiple homes on Zillow via MLS, after which users can search and view listings and save their search query together with listings they find interesting. Version one of the conceptual models also allowed users to list homes. However, the ambiguity introduced in database actors' roles would be too complex to model at this point and has therefore been omitted.

The model shows two locational one-to-one relationships due to the real estate markets dealing in properties, each of which is unique products in terms of location. Listings can be updated at any time, as they are put or pulled from the market, which is done through the listing update

table. Even when listings are sold, the listing data is kept and republished when a house comes back on the market.

Listing data includes the current address, zip code, description, number of bedrooms and bathrooms, square footage, and many other data points applicable to any housing. A neighborhood table feeds into the listing table, giving additional information such as a transit score, walk score, average Zestimate, and an aerial view of the neighborhood. This data is fed to the users when they view a listing. The users can then save the listing or contact an agent through Zillow to schedule a showing. A table for State mandated legal protections for things like public accommodations, ADA accessibility, and sexual preferences allows users to filter listings to fit each of their highly individual needs. Listings are updated as agents input new prices through listing updates.

The updated scope after this step included

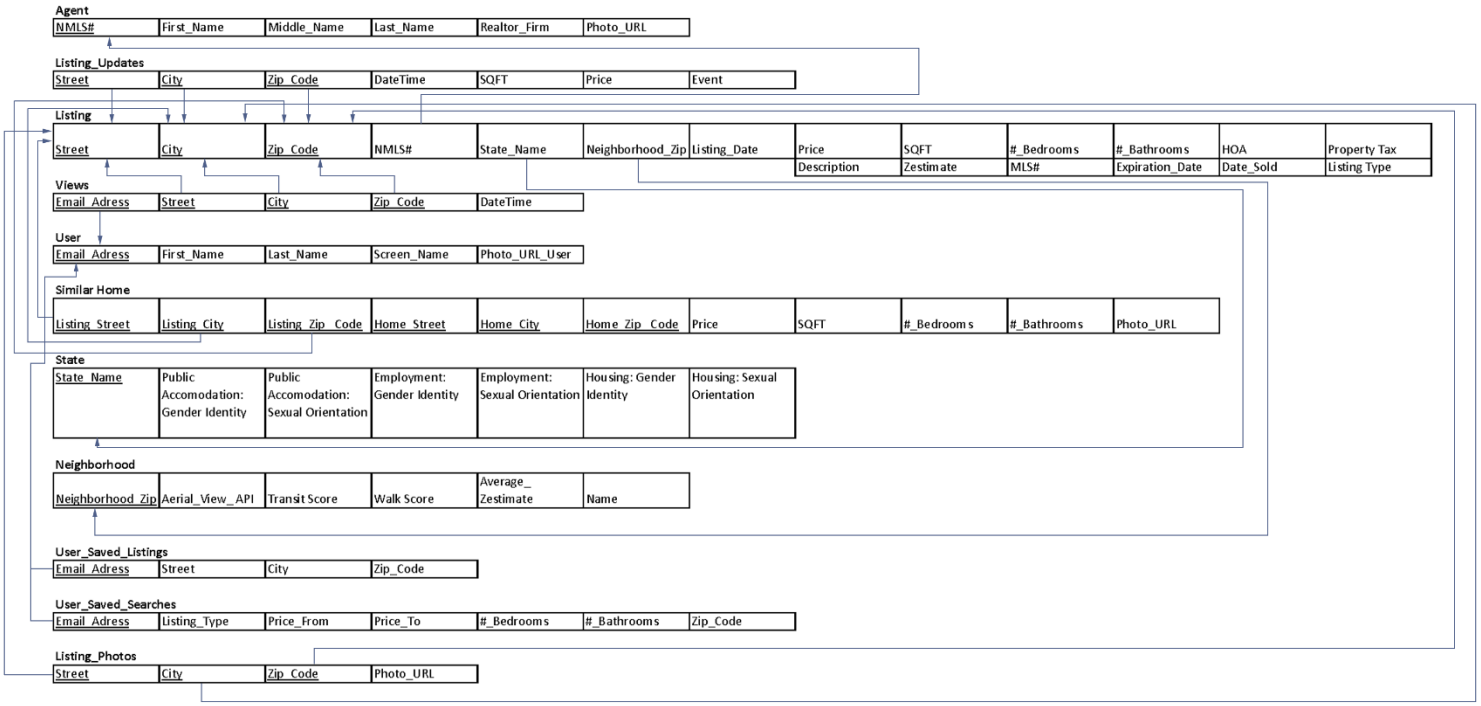
- Users must be able to view listings.
- Users must be able to view relevant information to listings on one page.
- Similar homes to the current one shown need to be shown to the user.
- Agents must be able to create home listings.
- Users must be able to save listings.
- Users must be able to save search parameters.
- Zillow needs to be able to track which home listing has been viewed when by which user.

And 11 tables would be needed to accomplish that namely;

- agent_tb
- neighborhood
- state_tb
- user_tb
- listing
- listing_photos
- listing_update
- views_tb
- similar_home
- user_saved_searches
- user_saved_listing

Logical Model

Zillow Logical Model | Version 3.0



Logical Model Description

The logical model (Appendix B) centers around the listing table. With origin points for the database being the Agent, User, State, and Neighborhood tables, all feeding data into the listing table with no dependencies on other tables.

The listing table aggregates most data and is the centerpiece of the logical model. A lot of available information on Zillow has been omitted since, with over 200 attributes collected, the modeling and data population section of this project would be too expansive. Instead, we focused on Zillow's database's complex relationships to create an interesting project scope without too much filler.

The most important keys in the final logical model were the addresses of listings, the state name, the user's email addresses, and the agent NMLS#. The NMLS# (Nationwide Multistate Licensing System) is a number attributed by a national agency to agents that operate in the United States platform.

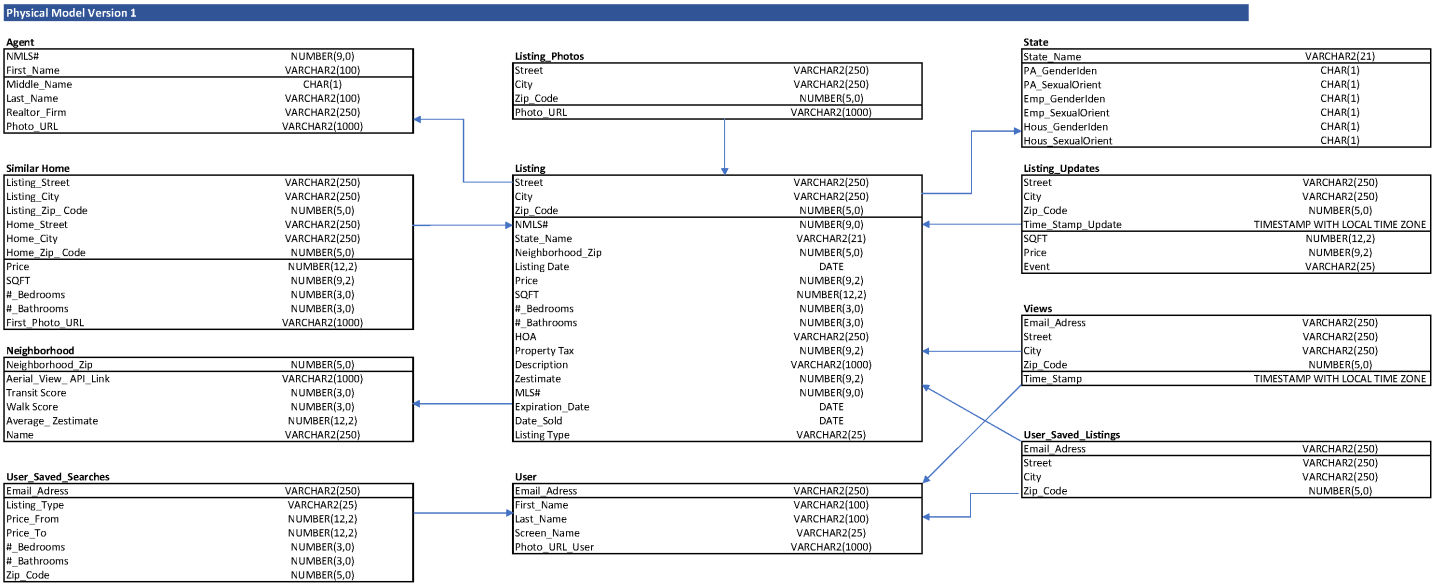
Only minor changes were made between the ER model and the logical model, mostly in attribute names. Note, however, the creation of three extra tables due to three multivalued attributes in the ER model.

- The creation of the views table that saves all user viewings of different listings based on the M: M view relationship between Users and Listings.
- The creation of the listing_updates table that covers both the M: M relationship between listing_updates, and listing and the weak entity type of listing_updates itself.

- The 1:M relationship between agents and listings has been included in the listing table as listing_date.

Both of the 1:1 relationships did not need additional attention as both the zip_code and state can serve as a foreign key to reference the relationship between tables.

Physical Model



Physical Model Description

The Physical model (Appendix C), as mentioned before, revolves around the listings table. Every table is either directly or indirectly related to the table. Attributes within the listings table include a street, city, zip code, NMLS# (Nationwide Multistate Licensing System) state, home details, whether there is an HOA, property tax history, listing description, Zestimates, MLS (Multi-Listing Service), type of listing, the expiration date of the listing, and the date the property was sold. The Zillow id attribute is the primary key for this table.

The agent table attributes are made up of NMLS#, the agent's name, the firm the agent works with, and a photo of the agent. The agent table is related because agents are the actors that list homes. The primary key in this table is the NMLS number.

The listing table is also related to the neighborhood table. As users search for listings, they can view information such as neighborhood name, walkability, transit friendliness, ariel views, and Zestimates. The neighborhood zip code was used as the primary key.

Listings are automatically updated as an event takes place. The primary keys in the listings table are street, city, and zip code. We chose to use a timestamp rather than the date function to track the event's time rather than the date only.

As users are searching for homes, they can see similar homes. We've included a table that contains homes Zillow deems similar based on the collected data. The similar homes table also provides pricing for those homes, the number of beds and baths, and a photograph.

Users can view the property photos, street, city, and zip code within the listing photos table. The listings photo table relates to the listings table, with the listing address as the primary key.

When users log into Zillow's website, they can create an account that includes screen names, email addresses, names and upload a photograph of themselves.

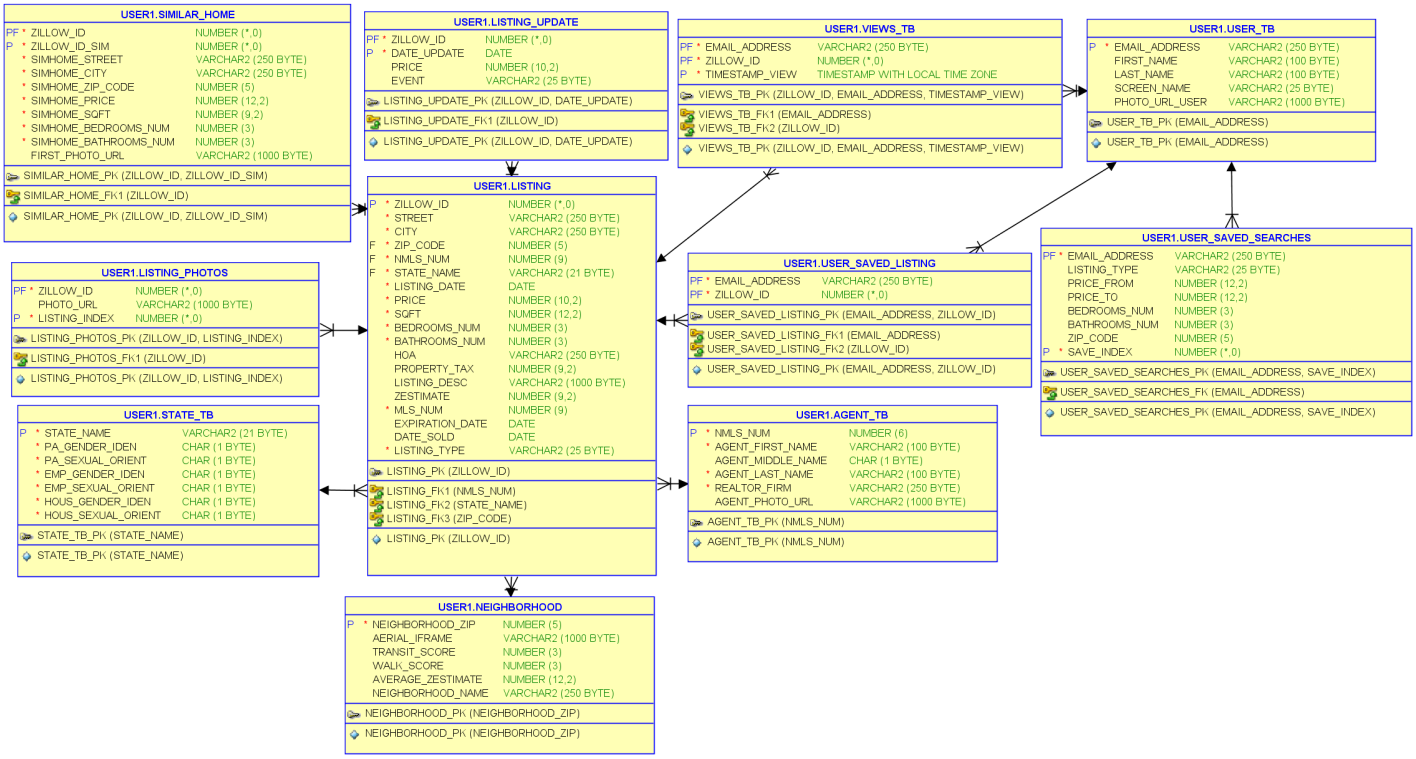
After a user is logged in, they can save induvial searches based on specific criteria and save induvial listings if a property meets the user's criteria. Each user is identified by using the email address as the primary key.

As each property is viewed, the data is tracked in the views table. The email address of the user, the address of the listing, and the timestamp are collected. The email address, street, city, and zip codes are used as the primary key.

In some states, there are legal regulations related to sexual and gender orientation. These are addressed in the state table using the state name as the primary key; other attributes are gender identity and sexual orientation.

SQL Implementation

SQL Implementation Description



The SQL implementation of the physical model caused us to run into several issues with how the model looked and how we wanted to use the database. These issues have been addressed, and the final product can be seen above or in Appendix D. Specific changes made will be explored in the coming paragraphs.

Most importantly, we decided to use an ID for every listing named Zillow_id. This id would replace the address as the primary key in the bulk of the tables. Using an ID kept tables more concise and would also decrease data redundancy. Additionally, an ID is easier to use by anyone accessing and using the database, as one number is more accessible to type than three differently formatted columns in address, city, and zip code.

Next, we created several index columns to supplement the existing primary keys of the tables; listing_photos and user_saved_searches. Both of these tables were set up so that every listing could only have one photo, identified by primary key Zillow_id. The same for user_saved_searches, with each user, only being able to save one search based on the primary key email_adress. By adding an index column to both of these tables, every listing and user could have multiple entries into these tables, allowing for multiple photos being saved per listing and multiple searches being saved per user.

Listing_update underwent the same treatment as listing_photos and user_saved_searches and got a date_update column added to the table. Date_update, together with Zillow_id, creates the primary key for the table listing_update and allows for multiple updates to occur per listing. However, we switched from saving a timestamp to merely a date, so only one listing update can be made per day currently in the dataset. Listing_update also lost the sqft column to limit data

redundancy. All Zillow displays are a price per sqft, calculated by pulling the sqft from the listing table. Supporting this decision is sqft being able to change like price would in the lifetime of a listing.

Also, user_views underwent the same treatment, and the timestamp per view was added per user as a primary key, as merely having the email_adress as a primary key would limit a database to save one view per user. It is essential to note the usage of TIMESTAMP WITH LOCAL TIME ZONE to allow for multiple views saved every minute of every day. A date data type would not be sufficient to capture the relatively fast viewing behavior of users browsing Zillow's website.

The last change is regarding the listings table in which the neighborhood_zip_code of every table was removed. The zip_code column in the listing table now refers to neighborhood.zip_code as a foreign key. Having both neighborhood_zip_code and zip_code would result in identical columns. This decision limits data redundancy.

Possible Improvements

One main issue that has not been implemented is firstly linking listing_update.price to listing.price. The problem here is that implementing this relationship goes beyond our current knowledge. Changing listing to be constrained and referring to listing_update would require the code to be rewritten so that CREATE listing_update is run before CREATE listing, and the primary key of listing is unique. Currently, the lack of a relationship between these two tables can result in a modification anomaly. We tried to rewrite the SQL statements, but we could not come to a solution, so we chose to omit this.

Another main issue regarding database functionality is that the similar home table's implementation is not entirely correct. Similar_homes should not be a table holding all the information it has currently. A similar homes table should look more like this.

```
CREATE TABLE similar_home (
    zillow_id INTEGER NOT NULL,
    zillow_id_sim INTEGER NOT NULL,
CONSTRAINT similar_home_pk PRIMARY KEY (zillow_id, zillow_id_sim),
CONSTRAINT similar_home_fk1
FOREIGN KEY (zillow_id) REFERENCES listing (zillow_id),
CONSTRAINT similar_home_fk1
FOREIGN KEY (zillow_id_sim) REFERENCES listing (zillow_id)
);
```

As shown above, the similar homes table should consist of two Zillow_ID's referring to each other. With every Zillow ID being a listing. We omitted this due to prior design choices and wanting to limit the amount of data population we had to do. If all the similar homes included in the data needed to have their own listing, the whole database would become even more extensive than it already is. The way similar_homes is currently set-causes data redundancy and the wasting of database resources due to duplicate data. In that, a complete listing is partly copied and saved again in the similar_homes table.

Some more minor improvement points would be not to save Zillow_id as an integer as integers drop leading zeroes. If leading zeros exist, the data type either needs to be adapted, or a convention must be adopted to eliminate leading zeros from occurring in ID's. In terms of data population listing.expiration_date, listing.date_sold, neighborhood.aerial_iframe are all entirely empty and NULL, and we should try to find the fitting data for it. While we did look, we couldn't

easily access it, and since all of these columns are nullable, we expected no difference in database behavior due to not populating them with data.

Database Population

We pulled data from 8 current Zillow listings, which can be found in this paper's references section. We picked the eight listings based on all of them pushing some boundary in terms of database functionality. Every table has been forced to its limit in some way to ensure that chosen data types and keys allow proper functionality of the database as envisioned.

- Going over each table starting with agent_tb, we ensured that at least one agent had multiple listings and at least one agent had a middle name. We also picked one agent based in Colorado to be able to cover at least two states.
- We ensured that at least one neighborhood had multiple listings associated with it for the neighborhood table, and null values occurred for transit score. Additionally, one neighborhood did not have a name and was also inserted into the table to ensure proper functionality.
- We made sure we included listings from at least two states, Utah and Colorado, for the state table.
- The user table was populated using mockeroo. As stated in the references section, we did this to ensure no non-public figures were referenced in our database.
- The listing table is filled in based on the eight found listings and includes NULLS for HOA, Zestimate, expiration date, and date sold. Additionally, we picked a few expensive listings to push the limit of price, sqft, bedrooms_num, and bathrooms_num. We found that the number we initially picked for price NUMBER(9,2) was too small, and we changed it to NUMBER(12,2)
- Listing_photos we populated with three random photos of every listing. While we did this, we found we needed listing_index and implemented it accordingly.
- The listing_update table is populated with a random number of entries per listing, with some listings having more than one update and some listings having none. While populating this table, we found we needed to include date_update in the primary key to allow for multiple entries per listing.
- The views table is populated the same way as the listing_update table. However, every user has at least one view; this, however, is not required. We decided to split the users in two and have three Colorado-based users, with the rest of the users based in Utah. While populating this table, we found the primary key needed the addition of timestamp_view to save multiple entries for every user.
- Similar_home is populated with every single similar home available for every listing. All listings have similar homes, except for listing 7 with Zillow_id 61470755, allowing us to check if no similar home connected to a listing was allowed.
- User_saved_searches follow the same split made in the views table, with users being assigned to one state regarding the zip_codes used in the searches. The data was randomized with Mockaroo. Populating this table showed us the need for the save_index column to allow one user to save multiple searches.
- User_saved_listings followed the same convention as user_saved_searches in terms of user's locations. Again the data was randomized with Mockaroo, with some users not

saving any listing and saving multiple. We found that including the Zillow_id into the primary key was needed to have multiple listings saved per user.

- Scope at Project Finalization

Features within the final scope

This project's priorities are that users must be able to view homes, and agents must be able to list homes for sales, with both user and agent connecting. Zillow needs to be able to collect data of listings viewed by users and to be able to save this data. Details of each property need to be able to be shown concisely, and tables need to reference each other properly to reduce data redundancy with, for example, listing and state. Users need to be able to search listings based on property features, location, and price and save these searches and any number of listings they find.

Neighborhoods need to be linked to listings where available and show relevant data effectively. The same goes for states.

We narrowed the project's scope based on feedback given by the professor to make the project more manageable.

Features Outside of the Scope

There are several features that Zillow has in place. Because of the limits of our scope for this project, we could not include them all at this time. Version one of the conceptual model, which includes some of the features mentioned below, can be found in Appendix A.2.Schools:

- Users can view which schools are nearby a particular listing. The name of the school, address details, and ratings are available.
- Tax Assessments: Information on the previous year's tax assessment is available to the user. Assessment information includes the year and its tax value.
- Lenders and Home loans: Zillow allows users to connect with lenders on their websites. The suggestions are made based on zip codes. The lender's first and last names are included as well as contact information and NMLS number. They also have a whole home loans section of their website set-up apart from listings.
- Users being able to list homes: Zillow allows users to list homes as well as agents.
- Rental Properties: Zillow also has the functionality to accommodate a rental transaction.
- Agent finder: Zillow has a whole separate section to connect users with agents.
- Additional data: Zillow collects over 200 attributes of every listing; this has been omitted due to time constraints.

Conclusion

Zillow provides a valuable service to its users. It enables users to search for housing in a convenient format. It was interesting to research the company and learn about all of the available features. We merely touched upon the tip of the iceberg regarding Zillow's offerings in terms of features; however, we think we captured Zillow's original value proposition sufficiently.

The real estate market Zillow is in is a tough nut to crack, with certain states having non-disclosure laws, monopolies on data being rampant, and professionals not willing to adopt new forms of doing business. The infrastructure Zillow has set-up seems solid and ready for future growth. When laws regarding data catch up with the potential data for the real estate industry, Zillow will be at the forefront of capturing this new development and growing to new heights. One move Zillow can take at this moment in time is to expand to different countries outside of North America, possibly with disclosure laws in place to allow further development of its infrastructure and better positioning for the future of data-driven real estate.

SQL: CREATE TABLE Statements

```
--------------------------------------------------------------------------------
-- execute the following statements to drop the tables
--------------------------------------------------------------------------------
DROP TABLE user_saved_listing;
DROP TABLE user_saved_searches;
DROP TABLE similar_home;
DROP TABLE views_tb;
DROP TABLE listing_update;
DROP TABLE listing_photos;
DROP TABLE listing;
DROP TABLE user_tb;
DROP TABLE state_tb;
DROP TABLE neighborhood;
DROP TABLE agent_tb;


--------------------------------------------------------------------------------
-- execute the following statements to create tables
--------------------------------------------------------------------------------

CREATE TABLE agent_tb (
       NMLS_num NUMBER(6,0) NOT NULL,
       agent_first_name VARCHAR2(100) NOT NULL,
       agent_middle_name CHAR(1),
       agent_last_name VARCHAR2(100) NOT NULL,
       realtor_firm VARCHAR2(250) NOT NULL,
       agent_photo_url VARCHAR2(1000),
CONSTRAINT agent_tb_pk PRIMARY KEY (NMLS_num)
);

CREATE TABLE neighborhood (
       neighborhood_zip NUMBER(5,0) NOT NULL,
       aerial_iframe VARCHAR2(1000),
       transit_score NUMBER(3,0),
       walk_score NUMBER(3,0),
       average_zestimate NUMBER(12,2),
       neighborhood_name VARCHAR2(250),
CONSTRAINT neighborhood_pk PRIMARY KEY (neighborhood_zip)
);

CREATE TABLE state_tb (
       state_name VARCHAR2(21) NOT NULL,
       pa_gender_iden CHAR(1) NOT NULL,
       pa_sexual_orient CHAR(1) NOT NULL,
       emp_gender_iden CHAR(1) NOT NULL,
       emp_sexual_orient CHAR(1) NOT NULL,
       hous_gender_iden CHAR(1) NOT NULL,
       hous_sexual_orient CHAR(1) NOT NULL,
CONSTRAINT state_tb_pk PRIMARY KEY (state_name)
);
```

```
CREATE TABLE user_tb (
	email_address VARCHAR2(250) NOT NULL,
	first_name VARCHAR2(100),
	last_name VARCHAR2(100),
	screen_name VARCHAR2(25),
	photo_url_user VARCHAR2(1000),
CONSTRAINT user_tb_pk PRIMARY KEY (email_address)
);

CREATE TABLE listing (
	zillow_id INTEGER NOT NULL,
	street VARCHAR2(250) NOT NULL,
	city VARCHAR2(250) NOT NULL,
	zip_code NUMBER(5,0) NOT NULL,
	NMLS_num NUMBER(9,0) NOT NULL,
	state_name VARCHAR2(21) NOT NULL,
	listing_date DATE NOT NULL,
	price NUMBER(10,2) NOT NULL,
	sqft NUMBER(12,2) NOT NULL,
	bedrooms_num NUMBER(3,0) NOT NULL,
	bathrooms_num NUMBER (3,0) NOT NULL,
	HOA VARCHAR2(250),
	property_tax NUMBER(9,2),
	listing_desc VARCHAR(1000),
	zestimate NUMBER (9,2),
	MLS_num NUMBER (9,0) NOT NULL,
	expiration_date DATE,
	date_sold DATE,
	listing_type VARCHAR2(25) NOT NULL,
CONSTRAINT listing_pk PRIMARY KEY (zillow_id),
CONSTRAINT listing_fk1 FOREIGN KEY (NMLS_num) REFERENCES agent_tb (NMLS_num),
CONSTRAINT listing_fk2 FOREIGN KEY (state_name) REFERENCES state_tb (state_name),
CONSTRAINT listing_fk3 FOREIGN KEY (zip_code) REFERENCES neighborhood
(neighborhood_zip)
);

CREATE TABLE listing_photos (
	zillow_id INTEGER NOT NULL,
	photo_url VARCHAR2(1000),
	listing_index INTEGER NOT NULL,
CONSTRAINT listing_photos_pk PRIMARY KEY (zillow_id, listing_index),
CONSTRAINT listing_photos_fk1 FOREIGN KEY (zillow_id) REFERENCES listing (zillow_id)
);


CREATE TABLE listing_update (
	zillow_id INTEGER NOT NULL,
	date_update DATE NOT NULL,
	price NUMBER(10,2),
	event varchar(25),
CONSTRAINT listing_update_pk PRIMARY KEY (zillow_id, date_update),
CONSTRAINT listing_update_fk1 FOREIGN KEY (zillow_id) REFERENCES listing (zillow_id)
);
```

```
CREATE TABLE views_tb (
       email_address VARCHAR2(250) NOT NULL,
       zillow_id INTEGER NOT NULL,
       timestamp_view TIMESTAMP WITH LOCAL TIME ZONE NOT NULL,
CONSTRAINT views_tb_pk PRIMARY KEY (zillow_id, email_address, timestamp_view),
CONSTRAINT views_tb_fk1 FOREIGN KEY (email_address) REFERENCES user_tb
(email_address),
CONSTRAINT views_tb_fk2 FOREIGN KEY (zillow_id) REFERENCES listing (zillow_id)
);

CREATE TABLE similar_home (
       zillow_id INTEGER NOT NULL,
       zillow_id_sim INTEGER NOT NULL,
       simhome_street VARCHAR2(250) NOT NULL,
       simhome_city VARCHAR2(250) NOT NULL,
       simhome_zip_code NUMBER(5,0) NOT NULL,
       simhome_price NUMBER(12,2) NOT NULL,
       simhome_sqft NUMBER (9,2) NOT NULL,
       simhome_bedrooms_num NUMBER (3,0) NOT NULL,
       simhome_bathrooms_num NUMBER (3,0) NOT NULL,
       first_photo_url VARCHAR2(1000),
CONSTRAINT similar_home_pk PRIMARY KEY (zillow_id, zillow_id_sim),
CONSTRAINT similar_home_fk1 FOREIGN KEY (zillow_id) REFERENCES listing (zillow_id)
);

CREATE TABLE user_saved_searches (
       email_address VARCHAR2(250) NOT NULL,
       listing_type VARCHAR2(25),
       price_from NUMBER(12,2),
       price_to NUMBER(12,2),
       bedrooms_num NUMBER(3,0),
       bathrooms_num NUMBER(3,0),
       zip_code NUMBER(5,0),
       save_index INTEGER NOT NULL,
CONSTRAINT user_saved_searches_pk PRIMARY KEY (email_address, save_index),
CONSTRAINT user_saved_searches_fk FOREIGN KEY (email_address) REFERENCES user_tb
(email_address)
);

CREATE TABLE user_saved_listing (
       email_address VARCHAR2(250) NOT NULL,
       zillow_id INTEGER NOT NULL,
CONSTRAINT user_saved_listing_pk PRIMARY KEY (email_address, zillow_id),
CONSTRAINT user_saved_listing_fk1 FOREIGN KEY (email_address) REFERENCES user_tb
(email_address),
CONSTRAINT user_saved_listing_fk2 FOREIGN KEY (zillow_id) REFERENCES listing
(zillow_id)
);
```

SQL: INSERT Statements

1. https://www.zillow.com/homedetails/374-S-1200-E-Salt-Lake-City-UT-84102/2072429152_zpid/
2. https://www.zillow.com/homedetails/558-S-Windsor-St-E-Salt-Lake-City-UT-84102/2073227522_zpid/
3. https://www.zillow.com/homedetails/350-N-Federal-Heights-Cir-Salt-Lake-City-UT-84103/145095302_zpid/
4. https://www.zillow.com/homedetails/55-W-South-Temple-St-701-Salt-Lake-City-UT-84101/2077063137_zpid/
5. https://www.zillow.com/homedetails/712-S-1000-E-Salt-Lake-City-UT-84102/2077681201_zpid/
6. https://www.zillow.com/homedetails/3103-S-1000-E-S-Salt-Lake-UT-84106/2119043326_zpid/
7. https://www.zillow.com/homedetails/2245-Blake-St-APT-M-Denver-CO-80205/61470755_zpid/
8. https://www.zillow.com/homedetails/1140-26th-St-Denver-CO-80205/2075168881_zpid/

```
-------------------------------------------------------------------------
-- execute the following statements to insert data
-------------------------------------------------------------------------
```

Agent Table

```
INSERT INTO agent_tb (NMLS_num, agent_first_name, agent_middle_name, agent_last_name,
realtor_firm, agent_photo_url)
VALUES (220892, 'Tracy', 'W', 'Burton', 'Coldwell Banker Realty',
'mortgageapi.zillow.com/getLenderProfileImage?lenderId=ZU105rqhtvat895_a57uh');
INSERT INTO agent_tb (NMLS_num, agent_first_name, agent_middle_name, agent_last_name,
realtor_firm, agent_photo_url)
VALUES (340314, 'Peter', NULL, 'Thomson', 'BlueMountain Realty',
'mortgageapi.zillow.com/getLenderProfileImage?lenderId=ZUzngaas7bd5op_7vqv3');
INSERT INTO agent_tb (NMLS_num, agent_first_name, agent_middle_name, agent_last_name,
realtor_firm, agent_photo_url)
VALUES (210683, 'Charles', NULL, 'Taylor', 'Tyler Parrish Windermere RE',
'https://mortgageapi.zillow.com/getLenderProfileImage?lenderId=ZUymqcks0usnpl_3jtqo');
INSERT INTO agent_tb (NMLS_num, agent_first_name, agent_middle_name, agent_last_name,
realtor_firm, agent_photo_url)
VALUES (258528, 'Christopher', NULL, 'Corroon', 'Axis Realty Group',
'https://mortgageapi.zillow.com/getLenderProfileImage?lenderId=ZUt5riwuahs5qh_32yx0');
INSERT INTO agent_tb (NMLS_num, agent_first_name, agent_middle_name, agent_last_name,
realtor_firm, agent_photo_url)
VALUES (293023, 'Michael', NULL, 'Elifritz', 'iPro Realty Network',
'https://mortgageapi.zillow.com/getLenderProfileImage?lenderId=ZU10684i1kthfd5_8fetp')
;
INSERT INTO agent_tb (NMLS_num, agent_first_name, agent_middle_name, agent_last_name,
realtor_firm, agent_photo_url)
VALUES (450615, 'Kathleen', NULL, 'Haas', 'THE RESOURCE GROUP LLC',
'https://mortgageapi.zillow.com/getLenderProfileImage?lenderId=ZU11yh42jsn2pl5_4u6i9')
;
```

Neighborhood Table

```
INSERT INTO neighborhood  (neighborhood_zip, aerial_iframe, transit_score, walk_score,
average_zestimate, neighborhood_name)
VALUES (84102, NULL, 59, 65, 472018.00, 'East Central');
INSERT INTO neighborhood  (neighborhood_zip, aerial_iframe, transit_score, walk_score,
average_zestimate, neighborhood_name)
VALUES (84103, NULL, 50, 6, 621506.00, 'Greater Avenues');
INSERT INTO neighborhood  (neighborhood_zip, aerial_iframe, transit_score, walk_score,
average_zestimate, neighborhood_name)
VALUES (84101, NULL, 68, 91, 387903.00, 'Downtown');
INSERT INTO neighborhood  (neighborhood_zip, aerial_iframe, transit_score, walk_score,
average_zestimate, neighborhood_name)
VALUES (84106, NULL, NULL, 72, 478920.00, '84106');
INSERT INTO neighborhood  (neighborhood_zip, aerial_iframe, transit_score, walk_score,
average_zestimate, neighborhood_name)
VALUES (80205, NULL, 86, 94, 553430.00, 'Five Points');
```

State Table

```
INSERT INTO state_tb (state_name, pa_gender_iden, pa_sexual_orient, emp_gender_iden,
emp_sexual_orient, hous_gender_iden, hous_sexual_orient)
VALUES ('Utah', 'Y', 'Y', 'Y', 'Y', 'N', 'N');
INSERT INTO state_tb (state_name, pa_gender_iden, pa_sexual_orient, emp_gender_iden,
emp_sexual_orient, hous_gender_iden, hous_sexual_orient)
VALUES ('Colorado', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y');
```

User Table

```
INSERT INTO user_tb (email_address, first_name, last_name, screen_name,
photo_url_user)
VALUES ('ceslemont0@etsy.com', 'Charles', 'Eslemont', 'ceslemont0',
'https://photos.zillowstatic.com/h_i/ISvkb3cx783hla0000000000.jpg');
INSERT INTO user_tb (email_address, first_name, last_name, screen_name,
photo_url_user)
VALUES ('tbevens0@phoca.cz', 'Tammie', 'Bevens', 'tbevens0',
'https://photos.zillowstatic.com/h_i/ISvkb3cx783hla0000000001.jpg');
INSERT INTO user_tb (email_address, first_name, last_name, screen_name,
photo_url_user)
VALUES ('gyelland1@about.com', 'Ginelle', 'Yelland', 'gyelland1',
'https://photos.zillowstatic.com/h_i/ISvkb3cx783hla0000200000.jpg');
INSERT INTO user_tb (email_address, first_name, last_name, screen_name,
photo_url_user)
VALUES ('jcansdill2@epa.gov', 'Julianna', 'Cansdill', 'jcansdill2',
'https://photos.zillowstatic.com/h_i/ISvkb3cx783hla0030000000.jpg');
INSERT INTO user_tb (email_address, first_name, last_name, screen_name,
photo_url_user)
VALUES ('lcopozio3@deliciousdays.com', 'Loren', 'Copozio', 'lcopozio3',
'https://photos.zillowstatic.com/h_i/ISvkb3cx783hla0040000000.jpg');
INSERT INTO user_tb (email_address, first_name, last_name, screen_name,
photo_url_user)
VALUES ('jdawber4@thetimes.co.uk', 'Jim', 'Dawber', 'jdawber4',
'https://photos.zillowstatic.com/h_i/ISvkb3cx783hla0000000050.jpg');
INSERT INTO user_tb (email_address, first_name, last_name, screen_name,
photo_url_user)
VALUES ('ppedgrift5@instagram.com', 'Peggy', 'Pedgrift', 'ppedgrift5',
'https://photos.zillowstatic.com/h_i/ISvkb3cx783hla0060000000.jpg');
INSERT INTO user_tb (email_address, first_name, last_name, screen_name,
photo_url_user)
VALUES ('spalffrey6@buzzfeed.com', 'Sela', 'Palffrey', 'spalffrey6',
'https://photos.zillowstatic.com/h_i/ISvkb3cx783hla0000700000.jpg');
INSERT INTO user_tb (email_address, first_name, last_name, screen_name,
photo_url_user)
VALUES ('nbaldwin7@simplemachines.org', 'Natassia', 'Baldwin', 'nbaldwin7',
'https://photos.zillowstatic.com/h_i/ISvkb3cx783hla8000000000.jpg');
INSERT INTO user_tb (email_address, first_name, last_name, screen_name,
photo_url_user)
VALUES ('mpounsett8@usatoday.com', 'Mattie', 'Pounsett', 'mpounsett8',
'https://photos.zillowstatic.com/h_i/ISvkb3cx783hla0000090000.jpg');
INSERT INTO user_tb (email_address, first_name, last_name, screen_name,
photo_url_user)
VALUES ('amuzzlewhite9@com.com', 'Artair', 'Muzzlewhite', 'amuzzlewhite9',
'https://photos.zillowstatic.com/h_i/ISvkb3cx783hla01000000000.jpg');
```

Listing Table

```
INSERT INTO listing (zillow_id, street, city, zip_code, NMLS_num, state_name,
listing_date, price, sqft, bedrooms_num, bathrooms_num, hoa, property_tax,
listing_desc, zestimate, MLS_num, expiration_date, date_sold, listing_type)
VALUES (2072429152,'374 S 1200 E', 'Salt Lake City', 84102, 220892, 'Utah',
TO_DATE('2021-03-18', 'YYYY-MM-DD'),  574900.00, 2217.00, 3, 2, 'Has HOA fee: No',
355.00,
'Perfect original woodwork, Original lead glass light fixtures and sconces, Crown
moldings, Coved ceilings and immaculate Oak floors. Main floor bath has period tile
with newer granite counters. Kitchen was updated approximately 1998 w/Wolfe Range and
hood. Newer roof, furnace and A/C. ALL of this AND a 2 car garage with storage
above!',
NULL, 1730405,NULL, NULL, 'For Sale');

INSERT INTO listing (zillow_id, street, city, zip_code, NMLS_num, state_name,
listing_date, price, sqft, bedrooms_num, bathrooms_num, hoa, property_tax,
listing_desc, zestimate, MLS_num, expiration_date, date_sold, listing_type)
VALUES (2073227522,'558 S Windsor St E', 'Salt Lake City', 84102, 340314, 'Utah',
TO_DATE('2021-02-26', 'YYYY-MM-DD'),  414900.00, 1194.00, 3, 1, 'Has HOA fee: No',
256.00,
'Talk about an amazing location! This home has been updated with quartz countertops,
stainless steel appliances, tile, bathroom fixtures, carpet and so much more! Easy to
show and ready for you to move in ASAP!',
432939.00, 1726677,NULL, NULL, 'For Sale');

INSERT INTO listing (zillow_id, street, city, zip_code, NMLS_num, state_name,
listing_date, price, sqft, bedrooms_num, bathrooms_num, hoa, property_tax,
listing_desc, zestimate, MLS_num, expiration_date, date_sold, listing_type)
VALUES (145095302,'350 N Federal Heights Cir', 'Salt Lake City', 84103, 210683,
'Utah', TO_DATE('2021-03-11', 'YYYY-MM-DD'),  6750000.00, 14996, 3, 5, NULL, 4163.00,
'Welcome to 350 N Federal Heights Circle. A landmark Utah estate arrives on the
market, situated on almost eight acres in the foothills of Federal Heights. The home
has nearly 15,000 square feet and boasts unobstructed 270-degree views of the entire
Salt Lake Valley. An additional 3,300 square feet of terraces span the south of the
home and feature an outdoor pool capable of year-round use.',
6434882.00, 12100932,NULL, NULL, 'For Sale');

INSERT INTO listing (zillow_id, street, city, zip_code, NMLS_num, state_name,
listing_date, price, sqft, bedrooms_num, bathrooms_num, hoa, property_tax,
listing_desc, zestimate, MLS_num, expiration_date, date_sold, listing_type)
VALUES (2077063137,'55 W South Temple St 701', 'Salt Lake City', 84101, 258528,
'Utah', TO_DATE('2020-11-23', 'YYYY-MM-DD'),  1775000.00, 2027, 2, 3, 'HOA fee: $901
monthly', 1095.00,
'In the heart of the city and directly across from Temple Square, this luxury home
offers exceptional living with unbeatable views of the Salt Lake Citys historic Temple
grounds. Couple this with world-class shopping at City Creek Center, the citys best
dining and entertainment options (all right outside your door) and you have a home
that offers it all.',
1705638.00, 1714105,NULL, NULL, 'For Sale');

INSERT INTO listing (zillow_id, street, city, zip_code, NMLS_num, state_name,
listing_date, price, sqft, bedrooms_num, bathrooms_num, hoa, property_tax,
listing_desc, zestimate, MLS_num, expiration_date, date_sold, listing_type)
VALUES (2077681201,'712 S 1000 E', 'Salt Lake City', 84102, 220892, 'Utah',
TO_DATE('2020-09-29', 'YYYY-MM-DD'),  995000.00, 2343, 4, 4, 'HOA fee: $150 monthly',
614.00,
'Location- near the U of U, near downtown Salt Lake City. Perched on 10th East with
Incredible views. Walking distance from shopping and movies. Close to everything, but
yet in a peaceful and quite neighborhood. New contemporary construction inside and
out. Quality built with the latest in designer features. This is a true masterpiece.',
NULL, 1704218,NULL, NULL, 'For Sale');
```

```
INSERT INTO listing (zillow_id, street, city, zip_code, NMLS_num, state_name,
listing_date, price, sqft, bedrooms_num, bathrooms_num, hoa, property_tax,
listing_desc, zestimate, MLS_num, expiration_date, date_sold, listing_type)
VALUES (2119043326,'3103 S 1000 E', 'South Salt Lake City', 84106, 293023, 'Utah',
TO_DATE('2021-02-25', 'YYYY-MM-DD'),  995000.00, 4208, 6, 5, 'Has HOA fee: No',
614.00,
'Modern fully remodeled home located in the heart of Millcreek City. The home was
completely renovated in 2019 with full permits. Two new central air HVAC systems, new
roof, new skylights, new flooring, new drywall/paint, 2 brand new high end kitchens
with marble countertops and custom cabinets, 2 laundries, Luxury Vinyl Tile throughout
the living areas and marble tile in the bathrooms, new electrical and plumbing. Owner
is a licensed real estate agent in the state of Utah',
1100009.00, 1725040,NULL, NULL, 'For Sale');

INSERT INTO listing (zillow_id, street, city, zip_code, NMLS_num, state_name,
listing_date, price, sqft, bedrooms_num, bathrooms_num, hoa, property_tax,
listing_desc, zestimate, MLS_num, expiration_date, date_sold, listing_type)
VALUES (61470755,'2245 Blake St APT M', 'Denver', 80205, 450615, 'Colorado',
TO_DATE('2021-10-16', 'YYYY-MM-DD'),  18000000.00, 6903.50, 4, 7, 'HOA fee: $2,430
monthly', 7950.00,
'This exclusive residential loft is unlike anything else that currently exists in
Downtown Denver. The owners  spent years renovating both Penthouse units and a 3rd
adjacent unit to individually occupy the top two floors of the building which is
located next to Coors Field. If you desire a lot of open space, this is one of the
largest residential lofts in Downtown Denver at nearly 7000 square feet.',
1368037.00, 4180033,NULL, NULL, 'For Sale');

INSERT INTO listing (zillow_id, street, city, zip_code, NMLS_num, state_name,
listing_date, price, sqft, bedrooms_num, bathrooms_num, hoa, property_tax,
listing_desc, zestimate, MLS_num, expiration_date, date_sold, listing_type)
VALUES (2075168881,'1140 26th St', 'Denver', 80205, 450615, 'Colorado', TO_DATE('2021-
02-05', 'YYYY-MM-DD'),  999000.00, 2414.00, 3, 4, 'Has HOA fee: No', 441.00,
'Urban contemporary architecture has taken root in the heart of RiNo and around the
corner from Sustainability Park and Denver Central Market. This brand-new townhome
community centers around the urban experience boasting high walkability to the best of
RiNos vibrant culture, alongside giving you a stunning space to entertain.',
1032299.00, 3826320,NULL, NULL, 'For Sale');
```

Listing Photos

```
INSERT INTO listing_photos (zillow_id, photo_url, listing_index)
VALUES (2072429152,
'https://photos.zillowstatic.com/fp/a24017a2522803454c6e91056efa10f1-cc_ft_768.jpg',
1);
INSERT INTO listing_photos (zillow_id, photo_url, listing_index)
VALUES (2072429152,
'https://photos.zillowstatic.com/fp/ec9851314cd76ecb295b80a875f44668-cc_ft_384.jpg',
2);
INSERT INTO listing_photos (zillow_id, photo_url, listing_index)
VALUES (2072429152,
'https://photos.zillowstatic.com/fp/a24017a2522803454c6e91056efa10f1-cc_ft_768.jpg',
3);

INSERT INTO listing_photos (zillow_id, photo_url, listing_index)
VALUES (2073227522,
'https://photos.zillowstatic.com/fp/f81a814ee8879da7b02e64d8e4222e2a-cc_ft_768.jpg',
1);
INSERT INTO listing_photos (zillow_id, photo_url, listing_index)
VALUES (2073227522,
'https://photos.zillowstatic.com/fp/e758b8a62fbd08773c1dfeec03f8585f-cc_ft_384.jpg',
2);
INSERT INTO listing_photos (zillow_id, photo_url, listing_index)
VALUES (2073227522,
'https://photos.zillowstatic.com/fp/7b46ee25bd6bb4a54d277b440d83a62e-cc_ft_384.jpg',
3);

INSERT INTO listing_photos (zillow_id, photo_url, listing_index)
VALUES (145095302,
'https://photos.zillowstatic.com/fp/8a5009041d016ccaaa4d8b422b395ce4-cc_ft_768.jpg',
1);
INSERT INTO listing_photos (zillow_id, photo_url, listing_index)
VALUES (145095302,
'https://photos.zillowstatic.com/fp/4c458397a96b4033318a9e0bb7f5cd0d-cc_ft_384.jpg',
2);
INSERT INTO listing_photos (zillow_id, photo_url, listing_index)
VALUES (145095302,
'https://photos.zillowstatic.com/fp/4219fee49e6e5ef29ef29c7843e6e905-cc_ft_384.jpg',
3);

INSERT INTO listing_photos (zillow_id, photo_url, listing_index)
VALUES (2077063137,
'https://photos.zillowstatic.com/fp/b3731e8f1128ecb7bec981b6093b5082-cc_ft_768.jpg',
1);
INSERT INTO listing_photos (zillow_id, photo_url, listing_index)
VALUES (2077063137,
'https://photos.zillowstatic.com/fp/18314a98be8ceb1c3377c74a67008f3a-cc_ft_384.jpg',
2);
INSERT INTO listing_photos (zillow_id, photo_url, listing_index)
VALUES (2077063137,
'https://photos.zillowstatic.com/fp/714689eb0fff454a4e882bd278efdbd0-cc_ft_384.jpg',
3);

INSERT INTO listing_photos (zillow_id, photo_url, listing_index)
VALUES (2077681201,
'https://photos.zillowstatic.com/fp/772cc21fbc497459ce88817a729240dc-cc_ft_768.jpg',
1);
INSERT INTO listing_photos (zillow_id, photo_url, listing_index)
VALUES (2077681201,
'https://photos.zillowstatic.com/fp/ea254420a1e6b7b06ce502959e79393d-cc_ft_384.jpg',
2);
INSERT INTO listing_photos (zillow_id, photo_url, listing_index)
```

```
VALUES (2077681201,
'https://photos.zillowstatic.com/fp/ebf16cf9ce67e2d0fbabf972725ff99d-cc_ft_384.jpg',
3);

INSERT INTO listing_photos (zillow_id, photo_url, listing_index)
VALUES (2119043326,
'https://photos.zillowstatic.com/fp/cf3897b9cec237fdd14ba2b3a90d72e5-cc_ft_768.jpg',
1);
INSERT INTO listing_photos (zillow_id, photo_url, listing_index)
VALUES (2119043326,
'https://photos.zillowstatic.com/fp/4e1d1152d4504b54e09361e898d4e4a1-cc_ft_384.jpg',
2);
INSERT INTO listing_photos (zillow_id, photo_url, listing_index)
VALUES (2119043326,
'https://photos.zillowstatic.com/fp/06b6d34894c458a1415f8cb9e55abcea-cc_ft_384.jpg',
3);

INSERT INTO listing_photos (zillow_id, photo_url, listing_index)
VALUES (61470755,
'https://photos.zillowstatic.com/fp/2788ff77d06dd30af4d91d9a2d53dfc8-cc_ft_768.jpg',
1);
INSERT INTO listing_photos (zillow_id, photo_url, listing_index)
VALUES (61470755,
'https://photos.zillowstatic.com/fp/479429c6117fb477aa3850523e8d3180-cc_ft_384.jpg',
2);
INSERT INTO listing_photos (zillow_id, photo_url, listing_index)
VALUES (61470755,
'https://photos.zillowstatic.com/fp/cae8528b2c4d44901b2355a39b4e83b0-cc_ft_384.jpg',
3);

INSERT INTO listing_photos (zillow_id, photo_url, listing_index)
VALUES (2075168881,
'https://photos.zillowstatic.com/fp/f1450c0fba3039bd4e9d758e49f770d7-cc_ft_768.jpg',
1);
INSERT INTO listing_photos (zillow_id, photo_url, listing_index)
VALUES (2075168881,
'https://photos.zillowstatic.com/fp/f4e53f3a91f5a97a1a27fd26e3c34087-cc_ft_384.jpg',
2);
INSERT INTO listing_photos (zillow_id, photo_url, listing_index)
VALUES (2075168881,
'https://photos.zillowstatic.com/fp/57588578c69a3ab5ae64aadd9bb3254b-cc_ft_384.jpg',
3);
```

Listing Update

```
INSERT INTO listing_update (zillow_id, date_update, price, event)
VALUES (2073227522, TO_DATE('2021/03/17', 'YYYY-MM-DD'), 414900.00, 'Price Change');

INSERT INTO listing_update (zillow_id, date_update, price, event)
VALUES (145095302, TO_DATE('2016/12/02', 'YYYY-MM-DD'), NULL, 'Sold');
INSERT INTO listing_update (zillow_id, date_update, price, event)
VALUES (145095302, TO_DATE('2016/04/16', 'YYYY-MM-DD'), NULL, 'Sold');

INSERT INTO listing_update (zillow_id, date_update, price, event)
VALUES (2077681201, TO_DATE('2021/03/01', 'YYYY-MM-DD'), 995000.00, 'Price Change');

INSERT INTO listing_update (zillow_id, date_update, price, event)
VALUES (2119043326, TO_DATE('2012/05/25', 'YYYY-MM-DD'), 290000.00, 'Listing
Removed');
INSERT INTO listing_update (zillow_id, date_update, price, event)
VALUES (2119043326, TO_DATE('2012/07/26', 'YYYY-MM-DD'), 290000.00, 'Listing
Removed');
INSERT INTO listing_update (zillow_id, date_update, price, event)
VALUES (2119043326, TO_DATE('2018/10/31', 'YYYY-MM-DD'), NULL, 'Sold');

INSERT INTO listing_update (zillow_id, date_update, price, event)
VALUES (61470755, TO_DATE('2020/10/14', 'YYYY-MM-DD'), 18000.00, 'Listed for Sale');
INSERT INTO listing_update (zillow_id, date_update, price, event)
VALUES (61470755, TO_DATE('2012/11/20', 'YYYY-MM-DD'), 759000.00, 'Sold');
INSERT INTO listing_update (zillow_id, date_update, price, event)
VALUES (61470755, TO_DATE('2020-10-16', 'YYYY-MM-DD'), 18000000.00, 'Listed for
Sale');
INSERT INTO listing_update (zillow_id, date_update, price, event)
VALUES (61470755, TO_DATE('2020/10/15', 'YYYY-MM-DD'), 18000000.00, 'Price Change');

INSERT INTO listing_update (zillow_id, date_update, price, event)
VALUES (2075168881, TO_DATE('2020/03/04', 'YYYY-MM-DD'), 999000.00, 'Price Change');
INSERT INTO listing_update (zillow_id, date_update, price, event)
VALUES (2075168881, TO_DATE('2020/02/05', 'YYYY-MM-DD'), 959000.00, 'Listed for
Sale');
```

Views Table

--Utah

```
INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('ceslemont0@etsy.com',2072429152, TO_TIMESTAMP ('3/23/2020 9:22:00 AM',
'MM/DD/YYYY HH:MI:SS AM'));
INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('ceslemont0@etsy.com',2073227522, TO_TIMESTAMP ('3/23/2020 9:23:50 AM',
'MM/DD/YYYY HH:MI:SS AM'));
INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('ceslemont0@etsy.com',2077063137, TO_TIMESTAMP ('3/23/2020 9:25:25 AM',
'MM/DD/YYYY HH:MI:SS AM'));
INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('ceslemont0@etsy.com',2119043326, TO_TIMESTAMP ('3/23/2020 9:30:18 AM',
'MM/DD/YYYY HH:MI:SS AM'));

INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('tbevens0@phoca.cz',61470755, TO_TIMESTAMP ('3/20/2021 5:55:25 PM',
'MM/DD/YYYY HH:MI:SS AM'));

INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('gyelland1@about.com',2073227522, TO_TIMESTAMP ('3/22/2020 7:05:18 PM',
'MM/DD/YYYY HH:MI:SS AM'));
INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('gyelland1@about.com',145095302, TO_TIMESTAMP ('3/22/2020 7:05:18 PM',
'MM/DD/YYYY HH:MI:SS AM'));
INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('gyelland1@about.com',2077681201, TO_TIMESTAMP ('3/22/2020 7:05:18 PM',
'MM/DD/YYYY HH:MI:SS AM'));

INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('jcansdill2@epa.gov',2072429152, TO_TIMESTAMP ('3/20/2020 11:05:15 AM',
'MM/DD/YYYY HH:MI:SS AM'));
INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('jcansdill2@epa.gov',145095302, TO_TIMESTAMP ('3/20/2020 11:06:26 AM',
'MM/DD/YYYY HH:MI:SS AM'));
INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('jcansdill2@epa.gov',2077063137, TO_TIMESTAMP ('3/20/2020 11:08:48 AM',
'MM/DD/YYYY HH:MI:SS AM'));
INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('jcansdill2@epa.gov',2077681201, TO_TIMESTAMP ('3/20/2020 11:09:10 AM',
'MM/DD/YYYY HH:MI:SS AM'));
INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('jcansdill2@epa.gov',2119043326, TO_TIMESTAMP ('3/20/2020 11:10:10 AM',
'MM/DD/YYYY HH:MI:SS AM'));

INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('lcopozio3@deliciousdays.com',2073227522, TO_TIMESTAMP ('3/22/2020 10:05:29
AM', 'MM/DD/YYYY HH:MI:SS AM'));
INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('lcopozio3@deliciousdays.com',2077063137, TO_TIMESTAMP ('3/22/2020 10:06:58
AM', 'MM/DD/YYYY HH:MI:SS AM'));
INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('lcopozio3@deliciousdays.com',2119043326, TO_TIMESTAMP ('3/22/2020 10:09:31
AM', 'MM/DD/YYYY HH:MI:SS AM'));
INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('lcopozio3@deliciousdays.com',2119043326, TO_TIMESTAMP ('3/23/2020 11:10:12
PM', 'MM/DD/YYYY HH:MI:SS AM'));

INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('jdawber4@thetimes.co.uk',2073227522, TO_TIMESTAMP ('3/21/2020 9:25:30 AM',
'MM/DD/YYYY HH:MI:SS AM'));
```

```
INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('jdawber4@thetimes.co.uk',2072429152, TO_TIMESTAMP ('3/21/2020 9:30:25 AM',
'MM/DD/YYYY HH:MI:SS AM'));
INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('jdawber4@thetimes.co.uk',2072429152, TO_TIMESTAMP ('3/22/2020 7:13:05 PM',
'MM/DD/YYYY HH:MI:SS AM'));
INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('jdawber4@thetimes.co.uk',2072429152, TO_TIMESTAMP ('3/23/2020 6:00:15 PM',
'MM/DD/YYYY HH:MI:SS AM'));

INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('ppedgrift5@instagram.com',145095302, TO_TIMESTAMP ('3/20/2020 8:12:10 PM',
'MM/DD/YYYY HH:MI:SS AM'));
INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('ppedgrift5@instagram.com',2077681201, TO_TIMESTAMP ('3/20/2020 8:15:12 PM',
'MM/DD/YYYY HH:MI:SS AM'));
INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('ppedgrift5@instagram.com',2119043326, TO_TIMESTAMP ('3/20/2020 8:19:56 PM',
'MM/DD/YYYY HH:MI:SS AM'));

INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('spalffrey6@buzzfeed.com',145095302, TO_TIMESTAMP ('3/23/2020 3:15:45 PM',
'MM/DD/YYYY HH:MI:SS AM'));
INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('spalffrey6@buzzfeed.com',2077063137, TO_TIMESTAMP ('3/23/2020 3:18:25 PM',
'MM/DD/YYYY HH:MI:SS AM'));
INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('spalffrey6@buzzfeed.com',145095302, TO_TIMESTAMP ('3/23/2020 6:12:28 PM',
'MM/DD/YYYY HH:MI:SS AM'));

--Colorado
INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('nbaldwin7@simplemachines.org',61470755, TO_TIMESTAMP ('3/20/2020 6:17:28 PM',
'MM/DD/YYYY HH:MI:SS AM'));
INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('nbaldwin7@simplemachines.org',2075168881, TO_TIMESTAMP ('3/20/2020 6:21:28
PM', 'MM/DD/YYYY HH:MI:SS AM'));

INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('mpounsett8@usatoday.com',2075168881, TO_TIMESTAMP ('3/21/2020 9:45:58 PM',
'MM/DD/YYYY HH:MI:SS AM'));

INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('amuzzlewhite9@com.com',61470755, TO_TIMESTAMP ('3/20/2020 6:50:58 PM',
'MM/DD/YYYY HH:MI:SS AM'));
INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('amuzzlewhite9@com.com',61470755, TO_TIMESTAMP ('3/21/2020 7:45:23 AM',
'MM/DD/YYYY HH:MI:SS AM'));
INSERT INTO views_tb (email_address, zillow_id, timestamp_view)
VALUES ('amuzzlewhite9@com.com',61470755, TO_TIMESTAMP ('3/22/2020 9:12:14 PM',
'MM/DD/YYYY HH:MI:SS AM'));
```

Similar Homes

```
INSERT INTO similar_home (zillow_id, zillow_id_sim, simhome_street, simhome_city,
simhome_zip_code, simhome_price, simhome_sqft, simhome_bedrooms_num,
simhome_bathrooms_num, first_photo_url)
VALUES (2072429152, 2072438404, '129 W 400 N', 'Salt Lake City', 84103, 559900.00,
1878.00, 3, 3, 'https://photos.zillowstatic.com/fp/9f712eea4be949e5e54004be78294263-
cc_ft_768.jpg');
INSERT INTO similar_home (zillow_id, zillow_id_sim, simhome_street, simhome_city,
simhome_zip_code, simhome_price, simhome_sqft, simhome_bedrooms_num,
simhome_bathrooms_num, first_photo_url)
VALUES (2072429152, 2072477393, '1369 S 1500 E', 'Salt Lake City', 84105, 619500.00,
2590.00, 3, 2, 'https://photos.zillowstatic.com/fp/d1666692b0d162f33f61ee0cd6cc5a40-
cc_ft_768.jpg');

INSERT INTO similar_home (zillow_id, zillow_id_sim, simhome_street, simhome_city,
simhome_zip_code, simhome_price, simhome_sqft, simhome_bedrooms_num,
simhome_bathrooms_num, first_photo_url)
VALUES (2073227522, 12756132, '534 E Hawthorne Ave', 'Salt Lake City', 84102,
345000.00, 1036.00, 3, 1,
'https://photos.zillowstatic.com/fp/7cae4fe69f3985271b22733c23ec7bdc-cc_ft_768.jpg');
INSERT INTO similar_home (zillow_id, zillow_id_sim, simhome_street, simhome_city,
simhome_zip_code, simhome_price, simhome_sqft, simhome_bedrooms_num,
simhome_bathrooms_num, first_photo_url)
VALUES (2073227522, 2076612683, '522 E Hawthorne Ave', 'Salt Lake City', 84102,
345000.00, 1070.00, 3, 1,
'https://photos.zillowstatic.com/fp/d28e8710432e19e0c9bfc52b4b024806-cc_ft_768.jpg');

INSERT INTO similar_home (zillow_id, zillow_id_sim, simhome_street, simhome_city,
simhome_zip_code, simhome_price, simhome_sqft, simhome_bedrooms_num,
simhome_bathrooms_num, first_photo_url)
VALUES (145095302, 11895000, '999 N Grove Dr', 'Alpine', 84004, 3499000.00, 10399.00,
4, 6, 'https://photos.zillowstatic.com/fp/32517e8a44b45d01569e033b074692cd-
cc_ft_768.jpg');
INSERT INTO similar_home (zillow_id, zillow_id_sim, simhome_street, simhome_city,
simhome_zip_code, simhome_price, simhome_sqft, simhome_bedrooms_num,
simhome_bathrooms_num, first_photo_url)
VALUES (145095302, 12756132, '5678 E Twin Creek Rd S', 'Salt Lake City', 84108,
4900000.00, 12362.00, 6, 10,
'https://photos.zillowstatic.com/fp/eab8664c8ad2514a920a49a212be677b-cc_ft_768.jpg');

INSERT INTO similar_home (zillow_id, zillow_id_sim, simhome_street, simhome_city,
simhome_zip_code, simhome_price, simhome_sqft, simhome_bedrooms_num,
simhome_bathrooms_num, first_photo_url)
VALUES (2077063137, 2076597900, '99 W South Temple St S 307', 'Salt Lake City', 84101,
1095000.00, 1844.00, 2, 2,
'https://photos.zillowstatic.com/fp/1334764748afdc0d681b6fd41a5fb1e0-cc_ft_768.jpg');
INSERT INTO similar_home (zillow_id, zillow_id_sim, simhome_street, simhome_city,
simhome_zip_code, simhome_price, simhome_sqft, simhome_bedrooms_num,
simhome_bathrooms_num, first_photo_url)
VALUES (2077063137, 2076604697, '99 W South Temple St S 2703', 'Salt Lake City',
84101, 1999900.00, 2023.00, 2, 2,
'https://photos.zillowstatic.com/fp/d1dba74b89f24bfbee36bf789b1feb27-cc_ft_768.jpg');

INSERT INTO similar_home (zillow_id, zillow_id_sim, simhome_street, simhome_city,
simhome_zip_code, simhome_price, simhome_sqft, simhome_bedrooms_num,
simhome_bathrooms_num, first_photo_url)
VALUES (2077681201, 12759933, '1052 S Douglas St', 'Salt Lake City', 84105, 990000.00,
2500.00, 3, 4, 'https://photos.zillowstatic.com/fp/495132dbd3e17110685cbf667fca2803-
cc_ft_768.jpg');

--House 6
```

```
INSERT INTO similar_home (zillow_id, zillow_id_sim, simhome_street, simhome_city,
simhome_zip_code, simhome_price, simhome_sqft, simhome_bedrooms_num,
simhome_bathrooms_num, first_photo_url)
VALUES (2119043326, 2099267412, '746 E Empire Circle', 'Salt Lake City', 84106,
770000.00, 4032.00, 7, 3,
'https://photos.zillowstatic.com/fp/fe6d68c99adfec9b038a3ea7196d5108-cc_ft_768.jpg');
INSERT INTO similar_home (zillow_id, zillow_id_sim, simhome_street, simhome_city,
simhome_zip_code, simhome_price, simhome_sqft, simhome_bedrooms_num,
simhome_bathrooms_num, first_photo_url)
VALUES (2119043326, 2072359692, '2414 E 3750 S', 'Salt Lake City', 84109, 880000.00,
3906.00, 5, 3, 'https://photos.zillowstatic.com/fp/8d0636abbc69594e41f1ea3cb9efacc8-
cc_ft_768.jpg');

-- House 7 Has no Similar Homes

INSERT INTO similar_home (zillow_id, zillow_id_sim, simhome_street, simhome_city,
simhome_zip_code, simhome_price, simhome_sqft, simhome_bedrooms_num,
simhome_bathrooms_num, first_photo_url)
VALUES (2075168881, 88905734, '2403 E 28th Ave', 'Denver', 80205, 948000.00, 2951.00,
4, 4, 'https://photos.zillowstatic.com/fp/099d90cd80d1b982f6d659cdf4f401cf-
cc_ft_768.jpg');
INSERT INTO similar_home (zillow_id, zillow_id_sim, simhome_street, simhome_city,
simhome_zip_code, simhome_price, simhome_sqft, simhome_bedrooms_num,
simhome_bathrooms_num, first_photo_url)
VALUES (2075168881, 63786364, '2736 Curtis St', 'Denver', 80205, 947500.00, 2625.00,
3, 4, 'https://photos.zillowstatic.com/fp/a857d229d0a50cf899d5e081d5b1a7a7-
cc_ft_768.jpg');
```

User Saved Searches

Utah

```
INSERT INTO user_saved_searches (email_address, listing_type, price_from, price_to,
bedrooms_num, bathrooms_num, zip_code, save_index)
VALUES ('jcansdill2@epa.gov', 'For Sale', 425388.85, NULL, 6, 7, NULL, 1);
INSERT INTO user_saved_searches (email_address, listing_type, price_from, price_to,
bedrooms_num, bathrooms_num, zip_code, save_index)
VALUES ('tbevens0@phoca.cz', 'For Sale', 686193.17, 834230.04, 6, NULL, '84103', 1);
INSERT INTO user_saved_searches (email_address, listing_type, price_from, price_to,
bedrooms_num, bathrooms_num, zip_code, save_index)
VALUES ('ceslemont0@etsy.com', 'For Sale', 586750.42, 1128977.08, 11, 11, '84106',1);
INSERT INTO user_saved_searches (email_address, listing_type, price_from, price_to,
bedrooms_num, bathrooms_num, zip_code, save_index)
VALUES ('jdawber4@thetimes.co.uk', 'For Sale', 159766.32, 1701469.0, 11, 6, NULL, 1);
INSERT INTO user_saved_searches (email_address, listing_type, price_from, price_to,
bedrooms_num, bathrooms_num, zip_code, save_index)
VALUES ('spalffrey6@buzzfeed.com', 'For Sale', 270138.39, 169490.94, 7, NULL, NULL,
1);
INSERT INTO user_saved_searches (email_address, listing_type, price_from, price_to,
bedrooms_num, bathrooms_num, zip_code, save_index)
VALUES ('gyelland1@about.com', 'For Sale', 999307.9, 1092838.02, 9, NULL, '84102', 1);
INSERT INTO user_saved_searches (email_address, listing_type, price_from, price_to,
bedrooms_num, bathrooms_num, zip_code, save_index)
VALUES ('jdawber4@thetimes.co.uk', 'For Sale', 870063.05, 1015049.69, 6, 5, '84102',
2);
INSERT INTO user_saved_searches (email_address, listing_type, price_from, price_to,
bedrooms_num, bathrooms_num, zip_code, save_index)
VALUES ('ppedgrift5@instagram.com', 'For Sale', 686396.18, 1133572.84, 9, NULL,
'84106', 1);
```

Colorado

```
INSERT INTO user_saved_searches (email_address, listing_type, price_from, price_to,
bedrooms_num, bathrooms_num, zip_code, save_index)
VALUES ('nbaldwin7@simplemachines.org', 'For Sale', 445146.15, 1638509.07, 15, 13,
80205, 1);
INSERT INTO user_saved_searches (email_address, listing_type, price_from, price_to,
bedrooms_num, bathrooms_num, zip_code, save_index)
VALUES ('mpounsett8@usatoday.com', 'For Sale', 451828.34, NULL, 11, 8, 80205, 1);
INSERT INTO user_saved_searches (email_address, listing_type, price_from, price_to,
bedrooms_num, bathrooms_num, zip_code, save_index)
VALUES ('amuzzlewhite9@com.com', 'For Sale', 983783.6, NULL, 6, NULL, 80205, 1);
INSERT INTO user_saved_searches (email_address, listing_type, price_from, price_to,
bedrooms_num, bathrooms_num, zip_code, save_index)
VALUES ('nbaldwin7@simplemachines.org', 'For Sale', 400000.00, 750000.07, 1, 12,
80205, 2);
```

User Saved Listings

--Utah

```
INSERT INTO user_saved_listing (email_address, zillow_id)
VALUES ('lcopozio3@deliciousdays.com', 2072429152);
INSERT INTO user_saved_listing (email_address, zillow_id)
VALUES ('spalffrey6@buzzfeed.com', 145095302);
INSERT INTO user_saved_listing (email_address, zillow_id)
VALUES ('jdawber4@thetimes.co.uk', 145095302);
INSERT INTO user_saved_listing (email_address, zillow_id)
VALUES ('gyelland1@about.com', 2072429152);
INSERT INTO user_saved_listing (email_address, zillow_id)
VALUES ('ppedgrift5@instagram.com', 2077063137);
INSERT INTO user_saved_listing (email_address, zillow_id)
VALUES ('tbevens0@phoca.cz', 2072429152);
INSERT INTO user_saved_listing (email_address, zillow_id)
VALUES ('jcansdill2@epa.gov', 2119043326);
INSERT INTO user_saved_listing (email_address, zillow_id)
VALUES ('ceslemont0@etsy.com', 2119043326);
INSERT INTO user_saved_listing (email_address, zillow_id)
VALUES ('gyelland1@about.com', 2119043326);
INSERT INTO user_saved_listing (email_address, zillow_id)
VALUES ('gyelland1@about.com', 145095302);
INSERT INTO user_saved_listing (email_address, zillow_id)
VALUES ('spalffrey6@buzzfeed.com', 2073227522);
INSERT INTO user_saved_listing (email_address, zillow_id)
VALUES ('jcansdill2@epa.gov', 2073227522);
INSERT INTO user_saved_listing (email_address, zillow_id)
VALUES ('ppedgrift5@instagram.com', 2077681201);
INSERT INTO user_saved_listing (email_address, zillow_id)
VALUES ('ppedgrift5@instagram.com', 145095302);
```

--Colorado

```
INSERT INTO user_saved_listing (email_address, zillow_id)
VALUES ('amuzzlewhite9@com.com', 61470755);
INSERT INTO user_saved_listing (email_address, zillow_id)
VALUES ('mpounsett8@usatoday.com', 61470755);
INSERT INTO user_saved_listing (email_address, zillow_id)
VALUES ('amuzzlewhite9@com.com', 2075168881);
INSERT INTO user_saved_listing (email_address, zillow_id)
VALUES ('nbaldwin7@simplemachines.org', 61470755);
```

References

All information for the project was obtained on Zillow.com.

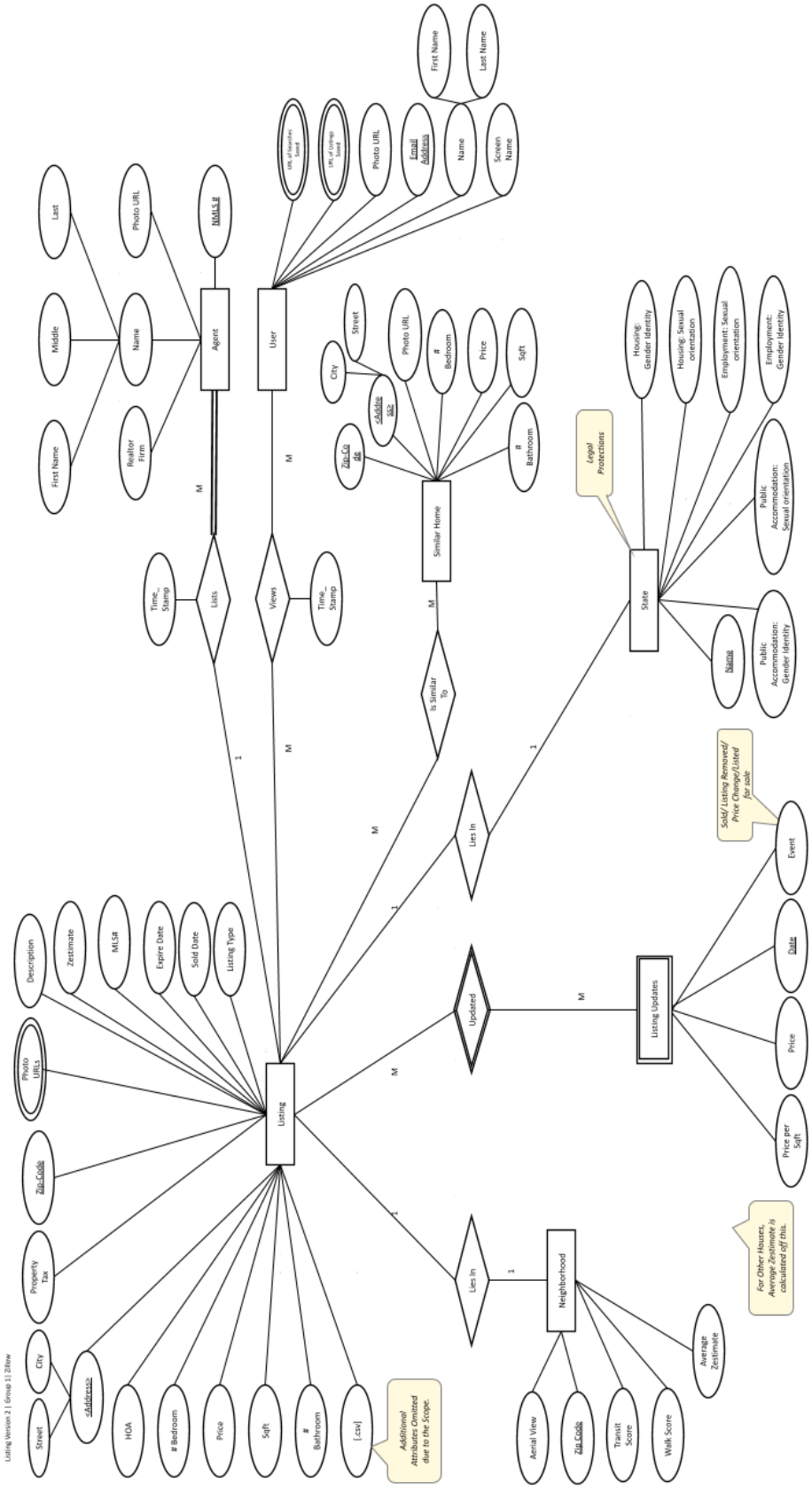
The specific listings used in database population are:

1. https://www.zillow.com/homedetails/374-S-1200-E-Salt-Lake-City-UT-84102/2072429152_zpid/
2. https://www.zillow.com/homedetails/558-S-Windsor-St-E-Salt-Lake-City-UT-84102/2073227522_zpid/
3. https://www.zillow.com/homedetails/350-N-Federal-Heights-Cir-Salt-Lake-City-UT-84103/145095302_zpid/
4. https://www.zillow.com/homedetails/55-W-South-Temple-St-701-Salt-Lake-City-UT-84101/2077063137_zpid/
5. https://www.zillow.com/homedetails/712-S-1000-E-Salt-Lake-City-UT-84102/2077681201_zpid/
6. https://www.zillow.com/homedetails/3103-S-1000-E-S-Salt-Lake-UT-84106/2119043326_zpid/
7. https://www.zillow.com/homedetails/2245-Blake-St-APT-M-Denver-CO-80205/61470755_zpid/
8. https://www.zillow.com/homedetails/1140-26th-St-Denver-CO-80205/2075168881_zpid/

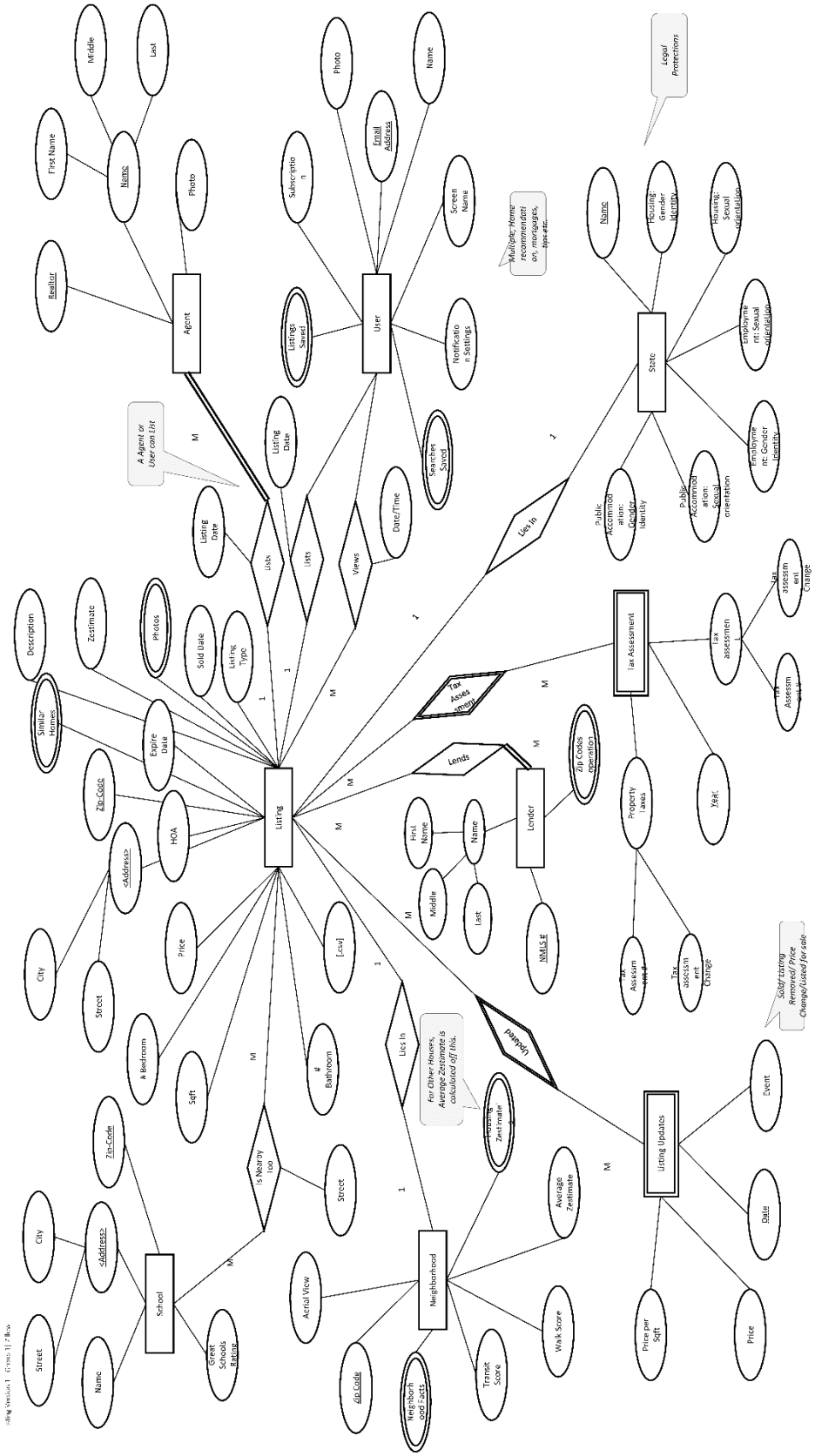
For mock user data Mockaroo was used, to omit any references to non-public figures in populating the dataset. To be precise, first_name, last_name, email_adress, and screen_name in the user table were generated with this tool. The tool was also used to scramble the email_adress list for usage in user_views, user_saved_listing and user_saved_searches

Appendix

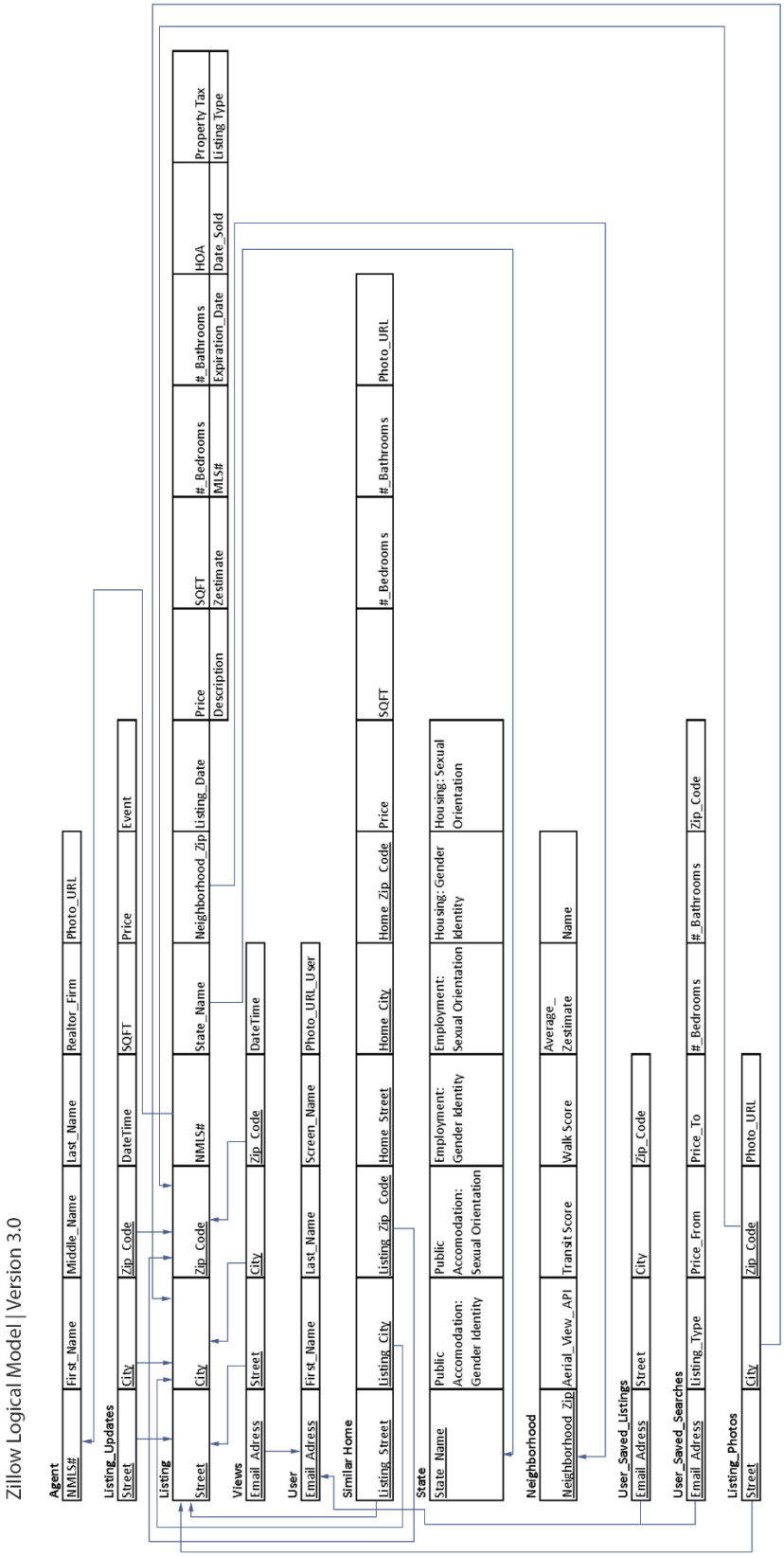
Appendix A: ER Model



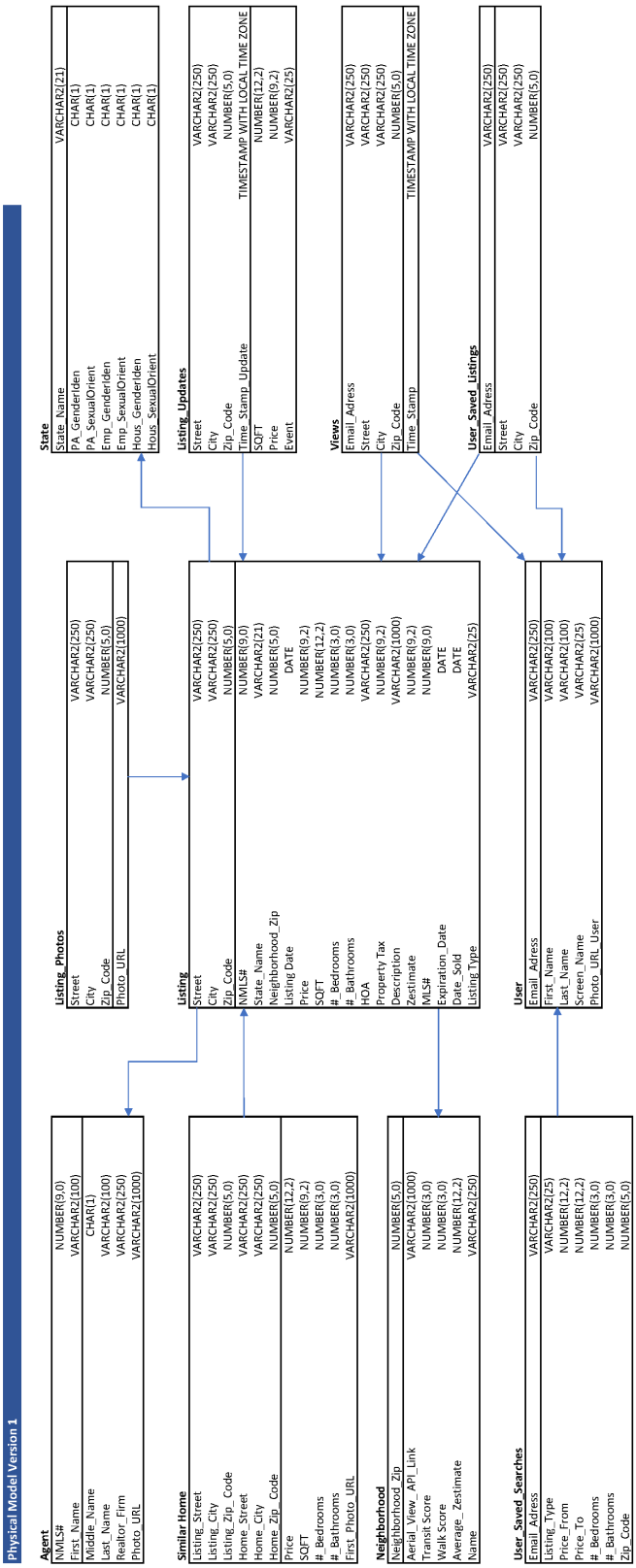
Appendix A.2: ER Model version 1



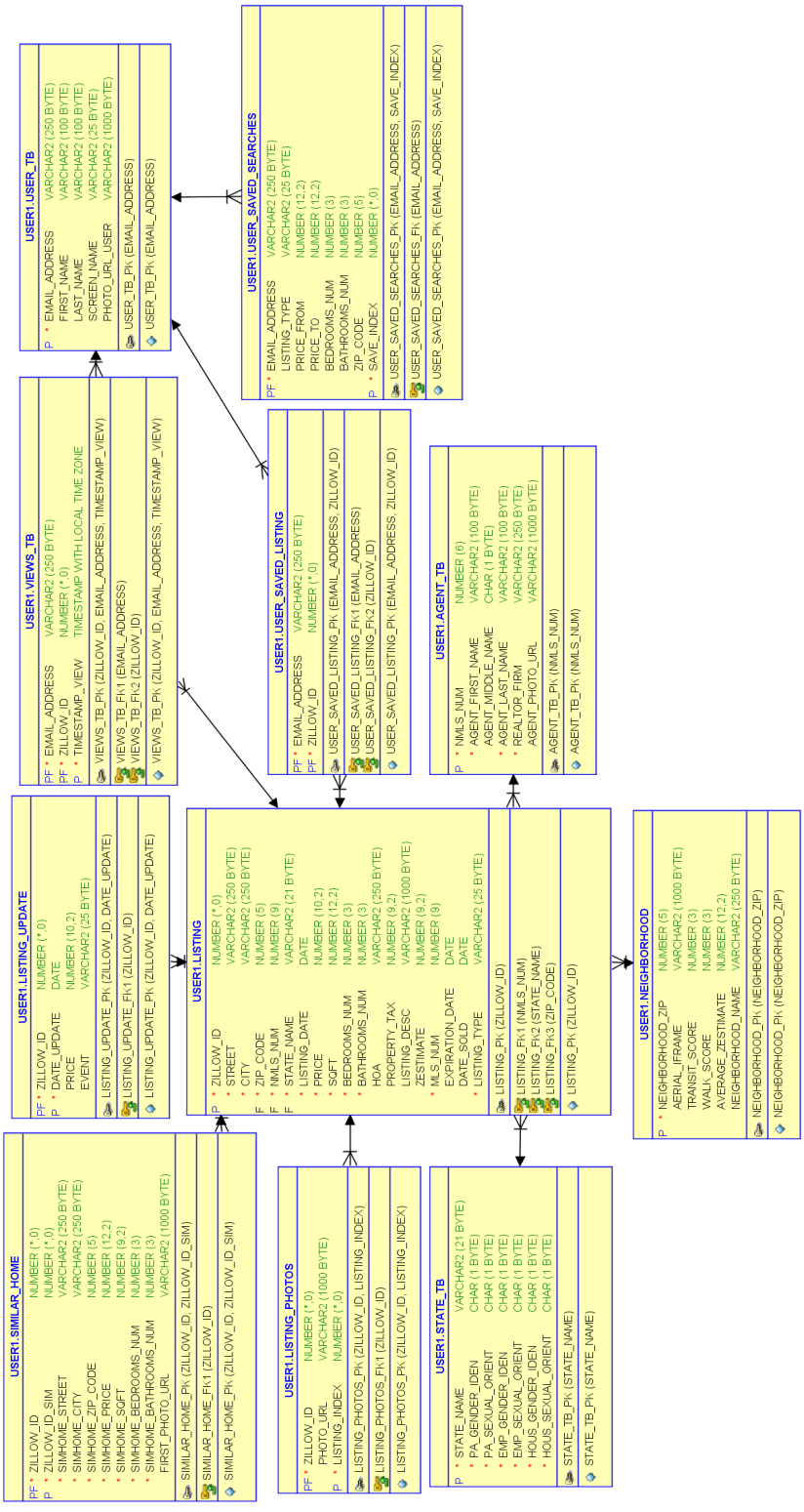
Appendix B: Logical Model



Appendix C: Physical Model



Appendix D: SQL Implementation



Appendix E: Populated Tables

Agent_tb

NMLS_NUM	AGENT_FIRST_NAME	AGENT_MIDDLE_NAME	AGENT_LAST_NAME	REALTOR_FIRM
220892	Tracy	W	Burton	Coldwell Banker Realty
340314	Peter		Thomson	BlueMountain Realty
210683	Charles		Taylor	Tyler Parrish Windermere RE
258528	Christopher		Corroon	Axis Realty Group
293023	Michael		Elifritz	iPro Realty Network
450615	Kathleen		Haas	THE RESOURCE GROUP LLC

AGENT_PHOTO_URL
mortgageapi.zillow.com/getLenderProfileImage?lenderId=ZU105rqhtvat895_a57uh
mortgageapi.zillow.com/getLenderProfileImage?lenderId=ZUzngaas7bd5op_7vqv3
https://mortgageapi.zillow.com/getLenderProfileImage?lenderId=ZUymqcks0usnpl_3jtqo
https://mortgageapi.zillow.com/getLenderProfileImage?lenderId=ZUt5riwuahs5qh_32yx0
https://mortgageapi.zillow.com/getLenderProfileImage?lenderId=ZU10684i1kthfd5_8fetp
https://mortgageapi.zillow.com/getLenderProfileImage?lenderId=ZU11yh42jsn2pl5_4u6i9

Neighborhood

NEIGHBORHOOD_ZIP	AERIAL_IFRAME	TRANSIT_SCORE	WALK_SCORE	AVERAGE_ZESTIMATE	NEIGHBORHOOD_NAME
84102		59	65	472018	East Central
84103		50	6	621506	Greater Avenues
84101		68	91	387903	Downtown
84106			72	478920	84106
80205		86	94	553430	Five Points

State_tb

STATE_NAME	PA_GENDER_IDEN	PA_SEXUAL_ORIENT	EMP_GENDER_IDEN	EMP_SEXUAL_ORIENT	HOUS_GENDER_IDEN	HOUS_SEXUAL_ORIENT
Utah	Y	Y	Y	Y	N	N
Colorado	Y	Y	Y	Y	Y	Y

User_tb

EMAIL_ADDRESS	FIRST_NAME	LAST_NAME	SCREEN_NAME
ceslemont0@etsy.com	Charles	Eslemont	ceslemont0
tbevens0@phoca.cz	Tammie	Bevens	tbevens0
gyelland1@about.com	Ginelle	Yelland	gyelland1
jcansdill2@epa.gov	Julianna	Cansdill	jcansdill2
lcopozio3@deliciousdays.com	Loren	Copozio	lcopozio3
jdawber4@thetimes.co.uk	Jim	Dawber	jdawber4
ppedgrift5@instagram.com	Peggy	Pedgrift	ppedgrift5
spalffrey6@buzzfeed.com	Sela	Palffrey	spalffrey6
nbaldwin7@simplemachines.org	Natassia	Baldwin	nbaldwin7
mpounsett8@usatoday.com	Mattie	Pounsett	mpounsett8
amuzzlewhite9@com.com	Artair	Muzzlewhite	amuzzlewhite9

PHOTO_URL_USER
https://photos.zillowstatic.com/h_i/ISvkb3cx783hla0000000000.jpg
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Listing

ZILLOW_ID	STREET	CITY	ZIP_CODE	NMLS_NUM	STATE_NAME	LISTING_DATE
2072429152	374 S 1200 E	Salt Lake City	84102	220892	Utah	3/18/2021
2073227522	558 S Windsor St E	Salt Lake City	84102	340314	Utah	2/26/2021
145095302	350 N Federal Heights Ci	Salt Lake City	84103	210683	Utah	3/11/2021
2077063137	55 W South Temple St 701	Salt Lake City	84101	258528	Utah	11/23/2020
2077681201	712 S 1000 E	Salt Lake City	84102	220892	Utah	9/29/2020
2119043326	3103 S 1000 E	South Salt Lake City	84106	293023	Utah	2/25/2021
61470755	2245 Blake St APT M	Denver	80205	450615	Colorado	10/16/2021
2075168881	1140 26th St	Denver	80205	450615	Colorado	2/5/2021

PRICE	SQFT	HOA	BATHROOMS_NUM	BEDROOMS_NU
574900	2217	Has HOA fee: No	2	3
414900	1194	Has HOA fee: No	1	3
6750000	14996		5	3
1775000	2027	HOA fee: $901 monthly	3	2
995000	2343	HOA fee: $150 monthly	4	4
995000	4208	Has HOA fee: No	5	6
18000000	6903.5	HOA fee: $2,430 monthly	7	4
999000	2414	Has HOA fee: No	4	3

PROPERTY_TAX	ZESTIMATE	MLS_NUM	EXPIRATION_DATE	DATE_SOLD	LISTING_TYPE
355		1730405			For Sale
256	432939	1726677			For Sale
4163	6434882	12100932			For Sale
1095	1705638	1714105			For Sale
614		1704218			For Sale
614	1100009	1725040			For Sale
7950	1368037	4180033			For Sale
441	1032299	3826320			For Sale

LISTING_DESC
Perfect original woodwork, Original lead glass light fixtures and sconces, Crown moldings, Coved ceilings and immacu
Talk about an amazing location! This home has been updated with quartz countertops, stainless steel appliances, tile
Welcome to 350 N Federal Heights Circle. A landmark Utah estate arrives on the market, situated on almost eight acre
In the heart of the city and directly across from Temple Square, this luxury home offers exceptional living with unb
Location- near the U of U, near downtown Salt Lake City. Perched on 10th East with Incredible views. Walking distanc
Modern fully remodeled home located in the heart of Millcreek City. The home was completely renovated in 2019 with f
This exclusive residential loft is unlike anything else that currently exists in Downtown Denver. The owners spent
Urban contemporary architecture has taken root in the heart of RiNo and around the corner from Sustainability Park a

Listing_Photos

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2072429152	https://photos.zillowstatic.com/fp/ec9851314cd76ecb295b80a875f44668-cc_ft_384.jpg	2
2072429152	https://photos.zillowstatic.com/fp/a24017a2522803454c6e91056efa10f1-cc_ft_768.jpg	3
2073227522	https://photos.zillowstatic.com/fp/f81a814ee8879da7b02e64d8e4222e2a-cc_ft_768.jpg	1
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2073227522	https://photos.zillowstatic.com/fp/7b46ee25bd6bb4a54d277b440d83a62e-cc_ft_384.jpg	3
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145095302	https://photos.zillowstatic.com/fp/4c458397a96b4033318a9e0bb7f5cd0d-cc_ft_384.jpg	2
145095302	https://photos.zillowstatic.com/fp/4219fee49e6e5ef29ef29c7843e6e905-cc_ft_384.jpg	3
2077063137	https://photos.zillowstatic.com/fp/b3731e8f1128ecb7bec981b6093b5082-cc_ft_768.jpg	1
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2077681201	https://photos.zillowstatic.com/fp/ebf16cf9ce67e2d0fbabf972725ff99d-cc_ft_384.jpg	3
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2075168881	https://photos.zillowstatic.com/fp/57588578c69a3ab5ae64aadd9bb3254b-cc_ft_384.jpg	3

Listing_Update

ZILLOW_ID	DATE_UPDATE	PRICE	EVENT
2073227522	44272	414900	Price Change
145095302	42706		Sold
145095302	42476		Sold
2077681201	44256	995000	Price Change
2119043326	41054	290000	Listing Removed
2119043326	41116	290000	Listing Removed
2119043326	43404		Sold
61470755	44118	18000	Listed for Sale
61470755	41233	759000	Sold
61470755	44120	18000000	Listed for Sale
61470755	44119	18000000	Price Change
2075168881	43894	999000	Price Change
2075168881	43866	959000	Listed for Sale

Views_tb

EMAIL_ADDRESS	ZILLOW_ID	TIMESTAMP_VIEW
amuzzlewhite9@com.com	61470755	20-MAR-20 06.50.58.000000000 PM
amuzzlewhite9@com.com	61470755	21-MAR-20 07.45.23.000000000 AM
amuzzlewhite9@com.com	61470755	22-MAR-20 09.12.14.000000000 PM
nbaldwin7@simplemachines.org	61470755	20-MAR-20 06.17.28.000000000 PM
tbevens0@phoca.cz	61470755	20-MAR-21 05.55.25.000000000 PM
gyelland1@about.com	145095302	22-MAR-20 07.05.18.000000000 PM
jcansdill2@epa.gov	145095302	20-MAR-20 11.06.26.000000000 AM
ppedgrift5@instagram.com	145095302	20-MAR-20 08.12.10.000000000 PM
spalffrey6@buzzfeed.com	145095302	23-MAR-20 03.15.45.000000000 PM
spalffrey6@buzzfeed.com	145095302	23-MAR-20 06.12.28.000000000 PM
ceslemont0@etsy.com	2072429152	23-MAR-20 09.22.00.000000000 AM
jcansdill2@epa.gov	2072429152	20-MAR-20 11.05.15.000000000 AM
jdawber4@thetimes.co.uk	2072429152	21-MAR-20 09.30.25.000000000 AM
jdawber4@thetimes.co.uk	2072429152	22-MAR-20 07.13.05.000000000 PM
jdawber4@thetimes.co.uk	2072429152	23-MAR-20 06.00.15.000000000 PM
ceslemont0@etsy.com	2073227522	23-MAR-20 09.23.50.000000000 AM
gyelland1@about.com	2073227522	22-MAR-20 07.05.18.000000000 PM
jdawber4@thetimes.co.uk	2073227522	21-MAR-20 09.25.30.000000000 AM
lcopozio3@deliciousdays.com	2073227522	22-MAR-20 10.05.29.000000000 AM
mpounsett8@usatoday.com	2075168881	21-MAR-20 09.45.58.000000000 PM
nbaldwin7@simplemachines.org	2075168881	20-MAR-20 06.21.28.000000000 PM
ceslemont0@etsy.com	2077063137	23-MAR-20 09.25.25.000000000 AM
jcansdill2@epa.gov	2077063137	20-MAR-20 11.08.48.000000000 AM
lcopozio3@deliciousdays.com	2077063137	22-MAR-20 10.06.58.000000000 AM
spalffrey6@buzzfeed.com	2077063137	23-MAR-20 03.18.25.000000000 PM
gyelland1@about.com	2077681201	22-MAR-20 07.05.18.000000000 PM
jcansdill2@epa.gov	2077681201	20-MAR-20 11.09.10.000000000 AM
ppedgrift5@instagram.com	2077681201	20-MAR-20 08.15.12.000000000 PM
ceslemont0@etsy.com	2119043326	23-MAR-20 09.30.18.000000000 AM
jcansdill2@epa.gov	2119043326	20-MAR-20 11.10.10.000000000 AM
lcopozio3@deliciousdays.com	2119043326	22-MAR-20 10.09.31.000000000 AM
lcopozio3@deliciousdays.com	2119043326	23-MAR-20 11.10.12.000000000 PM
ppedgrift5@instagram.com	2119043326	20-MAR-20 08.19.56.000000000 PM

Similar_home

ZILLOW_ID	ZILLOW_ID_SIM	SIMHOME_STREET	SIMHOME_CITY	SIMHOME_ZIP_CODE
2072429152	2072438404	129 W 400 N	Salt Lake City	84103
2072429152	2072477393	1369 S 1500 E	Salt Lake City	84105
2073227522	12756132	534 E Hawthorne Ave	Salt Lake City	84102
2073227522	2076612683	522 E Hawthorne Ave	Salt Lake City	84102
145095302	11895000	999 N Grove Dr	Alpine	84004
145095302	12756132	5678 E Twin Creek Rd S	Salt Lake City	84108
2077063137	2076597900	99 W South Temple St S 307	Salt Lake City	84101
2077063137	2076604697	99 W South Temple St S 2703	Salt Lake City	84101
2077681201	12759933	1052 S Douglas St	Salt Lake City	84105
2119043326	2099267412	746 E Empire Circle	Salt Lake City	84106
2119043326	2072359692	2414 E 3750 S	Salt Lake City	84109
2075168881	88905734	2403 E 28th Ave	Denver	80205
2075168881	63786364	2736 Curtis St	Denver	80205

SIMHOME_PRICE	SIMHOME_SQFT	SIMHOME_BEDROOMS_NUM	SIMHOME_BATHROOMS_NUM
559900	1878	3	3
619500	2590	3	2
345000	1036	3	1
345000	1070	3	1
3499000	10399	4	6
4900000	12362	6	10
1095000	1844	2	2
1999900	2023	2	2
990000	2500	3	4
770000	4032	7	3
880000	3906	5	3
948000	2951	4	4
947500	2625	3	4

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User_saved_searches

EMAIL_ADDRESS	LISTING_TYPE	PRICE_FROM	PRICE_TO	BEDROOMS_NUM	BATHROOMS_NUM	ZIP_CODE	SAVE INDEX
jcansdill2@epa.gov	For Sale	425388.85		6	7		1
tbevens0@phoca.cz	For Sale	686193.17	834230.04	6		84103	1
ceslemont0@etsy.com	For Sale	586750.42	1128977.08	11	11	84106	1
jdawber4@thetimes.co.uk	For Sale	159766.32	1701469	11	6		1
spalffrey6@buzzfeed.com	For Sale	270138.39	169490.94	7			1
gyelland1@about.com	For Sale	999307.9	1092838.02	9		84102	1
jdawber4@thetimes.co.uk	For Sale	870063.05	1015049.69	6	5	84102	2
ppedgrift5@instagram.com	For Sale	686396.18	1133572.84	9		84106	1
nbaldwin7@simplemachines.org	For Sale	445146.15	1638509.07	15	13	80205	1
mpounsett8@usatoday.com	For Sale	451828.34		11	8	80205	1
amuzzlewhite9@com.com	For Sale	983783.6		6		80205	1
nbaldwin7@simplemachines.org	For Sale	400000	750000.07	1	12	80205	2

User_saved_listing

EMAIL_ADDRESS	ZILLOW_ID
amuzzlewhite9@com.com	61470755
amuzzlewhite9@com.com	2075168881
ceslemont0@etsy.com	2119043326
gyelland1@about.com	145095302
gyelland1@about.com	2072429152
gyelland1@about.com	2119043326
jcansdill2@epa.gov	2073227522
jcansdill2@epa.gov	2119043326
jdawber4@thetimes.co.uk	145095302
lcopozio3@deliciousdays.com	2072429152
mpounsett8@usatoday.com	61470755
nbaldwin7@simplemachines.org	61470755
ppedgrift5@instagram.com	145095302
ppedgrift5@instagram.com	2077063137
ppedgrift5@instagram.com	2077681201
spalffrey6@buzzfeed.com	145095302
spalffrey6@buzzfeed.com	2073227522
tbevens0@phoca.cz	2072429152

Appendix F: Contribution Table

Willem van der Schans

Name:	Willem van der Schans	
Date	Time Spent	Notes
2.18.21	1.5	Zoom Meeting 1: Brainstorming project ideas
2.22.21	2	Conceptual Model draft
2.26.21	2	Zoom Meeting 2: Conceptual Model work
3.11.21	1.5	Logical Model draft
3.10.21	1	Logical Model
3.11.21	2	Logical Model
3.11.21	1.5	ER Model Revisions.
3.11.21	1	Zoom Meeting 3: Discussion of models, planning next week's work
3.16.21	2	Physical Model Start
3.17.21	2	Physical Model Research and Mock Code testing
3.18.21	3	Finalizing Physical model and Update Logical and ER model according to new insights.
3.18.21	1.5	Zoom Meeting 4: Discuss next steps
3.22.21	4	Create Schema
3.22/23.21	6	Data Population and Schema Checks
3.23.21	1.5	Formatting and Implementing code into document
3.23.21	1.5	Zoom Meeting 5: Discuss Write-Up and SQL Coding
3.24/25.21	6	Rewriting Draft, adding content, formatting.
3.25.21	1.5	Zoom Meeting 6: PPT Update
3.25.21	1.5	Zoom Meeting 6: Further PPT Updates
3.26.21	5	Spell check and further formatting final document
3.27.21	2	practice/presentation recording
Total	**50 Hours**	
Individual	**39.5 Hours**	

Cathy Brown

Name:	Cathy Brown	
Date	Time Spent	Notes
2.18.21	1.5	Zoom Meeting 1: Brainstorming project ideas
2.22.21	2	Conceptual Model draft
2.24.21	3	Conceptual Model draft
2.26.21	2	Zoom Meeting 2: Conceptual Model work
3.8.21	2.5	Write up of DB features
3.11.21	1	Zoom Meeting 3: Discussion of models, planning next week's work
3.18.21	6	Rough draft and formatting of report
3.18.21	1.5	Zoom Meeting 4: Discuss next steps
3.20.21	1.5	Draft 2 report, physical model write up
3.21.21	2	Draft 2 report, physical model write up
3.23.21	1.5	Zoom Meeting 5: Discuss Write-Up and SQL Coding
3.24.21	1.5	Draft 3
3.25.21	1	Review of draft
3.25.21	1.5	Zoom Meeting 6: PPT Update
3.25.21	1.5	Zoom Meeting 6: Further PPT Updates
3.26.21	1	speaker notes for ppt.
Total	**31 Hours**	
Individual	**20.5 Hours**	

Trevor Finstead

Name:	Trevor Finstead	
Date	Time Spent	Notes
2.18.21	1.5	Zoom Meeting 1: Brainstorming project ideas
2.22.21	2	Conceptual Model draft
2.26.21	2	Zoom Meeting 2: Conceptual Model work
3.10.21	3	Conceptual Model update
3.11.21	1.5	Logical Model draft
3.11.21	1	Zoom Meeting 3: Discussion of models, planning next week's work
3.18.21	6	PPT setup
3.18.21	1.5	Zoom Meeting 4: Discuss next steps
3.21.21	2	Create Tables
3.23.21	1.5	Zoom Meeting 5: Discuss Write-Up and SQL Coding
3.24.21	2	PPT update
3.24.21	0.5	Draft 3 minor update - obsolete
3.25.21	2	Review of draft
3.25.21	1.5	Zoom Meeting 6: PPT Update
3.25.21	1.5	Zoom Meeting 6: Further PPT Updates
3.25.21	1.5	Rest of PPT and Zoom meeting
3.27.21	2	practice/presentation recording
Total	**33 Hours**	
Individual	**22.5 Hours**	

Jonathan Tracy

Name:	Jonathan Tracy	
Date	Time Spent	Notes
2.18.21	1.5	Zoom Meeting 1: Brainstorming project ideas
2.26.21	2	Zoom Meeting 2: Conceptual Model work
3.11.21	3	Executive Summary and Summary of Zillow
3.11.21	1	Zoom Meeting 3: Discussion of models, planning next week's work
3.16.21	0.5	Write up Summary Edits
3.23.21	0.5	Logical Model and ERD Model Write Up
3.23.21	0.5	Logical Model and ERD Write Up Edits
3.25.21	2.5	Paper Formatting and Phrasing
3.25.21	1.5	Zoom Meeting 6: PPT Update
3.27.21	2	practice/presentation recording
Total	**15 Hours**	
Individual	**9 Hours**	