

Design and Development of Mobile and Web Applications

Team #2: cityTIPS



Final Project Report

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Executive Summary

cityTIPs is a trip itinerary planner application designed to aggregate information from popular rating websites such as Yelp, Eventbrite and Foursquare to help users plan their trips and give them suggestions on what all they can do on their trip. Currently, market factors suggest that there is a need for an aggregator of information across the web to provide consumers with the most consolidated list of popular tourist attractions. cityTIPs plans to acquire users through multiple online and print advertising channels, as well as through social media trends. Ultimately, we have created an application that will simplify trip planning by bringing all of the best recommendations together.

Introduction

Currently, there are various different sources of trip planning information for potential travelers to browse through. These sources include popular websites such as Yelp, which focuses on dining and food; Eventbrite, which focuses on special events; and Foursquare, which focuses on locational landmarks. The aforementioned websites all focus on one particular aspect of travel experiences such as food or landmarks, which forces users to search through all of the aforementioned websites when planning a trip.

The purpose of cityTIPs is to aggregate the information found on these websites on one page to simplify the process of trip planning by combining all of a traveler's preferred activities in one place. cityTIPs focuses on the experience of the trip for the traveler and displays only the highest-rated results from each information source. Using cityTIPs will allow travelers to dramatically reduce the time involved in planning a trip and spend more time enjoying their travel experiences.

Description of the Project

The origin of the name "cityTIPs" combines the word "city" with the word "tips" because the app's goal is to provide the best and most useful tips for a new location, likely a city. "TIP" also doubles as an acronym, short for "Trip Itinerary Planner", so the name of the app is stylistically reflected as "cityTIPs". cityTIPs will help users either plan optimal itinerary for their trips to a new city or explore the highest recommended activities around their area.

To get started with cityTIPs, a user can first choose to either login with a pre-existing account or register for a new account. To register for an account, new users must input personal information about themselves such as gender, birthdate, location, and a username/password combination. After registering, the user can then log in to use cityTIPs. The user will be directed to complete a search preference form after logging in. This form contains inputs such as desired location, food preferences, activity preferences, and event preferences. After the user submits the form, cityTIPs will populate a list of highly-rated and recommended activities from the Yelp,

Foursquare, and Eventbrite APIs based on the preferences that were inputted. The list includes relevant information about the activities such as links to purchase tickets, links to the company website, and dates. cityTIPs also uses the Google Maps APIs to display all of the events on a map of the area. Thus, travelers can not only use cityTIPs to plan itineraries for their trips but also to locate the most recommended attractions around the area they currently are in. Please see the Appendix for screenshots & a more detailed description of how the application is designed to be used.

Each user has a profile on cityTIPs that includes a history of past searches and preferences. In addition, the user profile also displays the personal information about the user that was submitted during initial user registration process. All of this data is stored in the backend of the app through MySQL database. The easy interface and clean aesthetic of cityTIPs is attributed to a Bootstrap template that allows optimization for both web and mobile devices. cityTIPs is convenient to use and adaptable to a specific user's preferences.

cityTIPs works best in iOS on the Safari browser. The tools and software that were used to develop cityTIPs include Python 3.4.3, PyCharm 5.0, Django 1.8.6, Bootstrap Framework, HTML/CSS for the front end, and MySQL Database. cityTIPs aggregates data from the Yelp, Eventbrite, Foursquare, and Google Maps APIs. In addition, Team #2 used GitHub to work collaboratively on the code to design cityTIPs. The github repository to our project is as follows: <https://github.com/contactaditya/WebandMobileApplicationDevelopment>.

Market Analysis

In 2014, U.S. residents logged 1.7 billion person-trips for leisure purposes. More than 3 out of 4 trips taken by Americans are taken for leisurely purposes. As well, travel is among the top 10 industries in 49 states and D.C. in terms of employment.¹ The domestic U.S. travel market is a huge industry with potential for further development.

The market for trip planning social networking sources has been increasing steadily as consumers become more and more digitalized. A 2012 study conducted by the U.S. Travel Association found that social media and mobile devices are being used increasingly often as sources for trip planning. In 2009, only 2% of travelers used social networking sources and only 1% used their mobile devices to assist in trip planning. By comparison, in 2012, an increase of 5% of travelers used social networking and 4% used their mobile devices in planning their travels.²

Although more travelers are using online trip planning services to plan their getaways, not all users have been pleased with the quality of services offered by the trip planning apps currently on the market. According to a study conducted in March 2015 by KAYAK.com, a popular trip

¹ https://www.ustravel.org/sites/default/files/page/2013/08/US_Travel_AnswerSheet.pdf

² <https://www.ustravel.org/news/press-kit/travel-facts-and-statistics>

booking website, the majority of travelers (86%) spend more time researching and planning rather than enjoying the experience of the trips themselves. 1 in 4 of the people surveyed said that they spent more time searching for holidays rather than enjoying them and 33% abandoned their holiday searches halfway due to online booking frustrations.³

Target Market

According to data from the U.S. Travel Association, leisure travelers are older than business travelers, with the average age of leisure travelers being 47.5 years old. Logically, this makes sense as people of this age have in general have the financial means to make leisurely travel plans. On the other hand, people of this age may still be working full-time jobs and taking care of their families. This means that they may have little time on their hands to scour the Internet to plan out their travel plans. cityTIPs plans to target the travel planning needs of this age group.

Competitive Landscape

In the reviews and ratings category, cityTIP's current biggest competitor in the market is TripAdvisor. TripAdvisor's mission is to "enable travelers to plan and book the perfect trip".⁴ Similar to cityTIPs, TripAdvisor's database of trip information incorporates a wide variety of activities, ranging from food to landmarks. However, unlike cityTIPs, TripAdvisor's recommendations are based solely on TripAdvisor's internal data, which consists of user ratings on its site. cityTIPs differentiates itself from competitors because the data that is parsed comes from multiple sources. Thus, in comparison, cityTIPs provides a more well-rounded and cohesive list of search results.

User Acquisition

The cityTIPs app plans to reach both frequent and non-frequent travelers. First, to target more avid travelers, cityTIPs plans to advertise on well-known travel print resources such as *Travel* and *Travel + Leisure* magazine. Another method of targeting more frequent travelers is to place advertisements on travel booking websites such as KAYAK and Expedia. Travelers who make purchases on these sites are already making plans to travel to a particular destination and are likely to be in need of the services that cityTIPs provides to plan the specific activities on their trips.

In addition to advertisements targeted towards well-traveled customers, cityTIPs also plans to invest in paid search advertisements on search engines such as Google and Yahoo for keywords such as "{location} trip itinerary" or "trip planning". Advertising on search engines will allow us to target the less frequent travelers. As well, we hope to attract customers to the site

³ <http://www.traveller.com.au/australians-frustrated-at-time-spent-booking-travel-online-1m81sx>

⁴ http://www.tripadvisor.com/PressCenter-c6-About_Us.html

and increase their interest in traveling through the site's ease of use. As well, given the popularity of social media, cityTIPs also plans to acquire users through sponsored ads on platforms such as Facebook, Twitter, and Instagram. In particular, these social sites also encourages interactions with friends so that a greater number of people will hear of and test cityTIPs.

To promote the premium version of the app, we plan to implement a premium usage "trial period" for users to test the premium version. At the end of the trial period, users will have the option of paying to continue using the premium version of the app or being automatically downgraded to the free version again. Through this trial period, cityTIPs hopes to attract new users who pay for the premium services offered.

Financial Projections

Revenue Model

The application will be free to download with basic functionality, allowing users to complete the user preference form and review the results for their specific preferences. cityTIPs plans to implement a "freemium" revenue model by including additional services and functionalities to a premium version of the application. The premium version of the application will boast ad-free usage throughout the app, which will greatly appeal to customers who do not have patience for any extraneous search results. Additional services that cityTIPs looks to incorporate in the premium version of the app include additional filters such as coupons & deals in the user preference form, as well as a "Saved Searches" option for ease of access. The free version of the application will incorporate customized paid ads in the search results. Similar to the Yelp's interface, cityTIPs' search results page will block out a section or "Sponsored" posts, where ads that are relevant to the search will be displayed. In other words, companies and activities of the area will pay to have their search results displayed most prominently in the results page. This relevancy will be determined based on the user's account history and preferences. The "Sponsored" tag will be unobtrusive, to assist the paid ads in blending in with the remainder of the search results.

Projected Income Statement

There will be two versions of the cityTIPs offered: a free version and a premium version that includes extended features for an additional cost. Revenues for the application will come from downloads of the premium version of the service as well as payments from sponsored advertisers. Payouts include the cost of maintaining the database and servers in the backend as well as to marketing initiatives such as paid search ads.

Assumptions

Assumptions	Current Data
Total Number of Leisure Trips	1,700,000,000
Average Trips Taken Per Traveler	5
Total Travelers	340,000,000
Percentage of Travelers Testing cityTIPs	0.5%
Number Travelers using cityTIPs	1,700,000
Premium cityTIPs Travelers	5%
Cost per Premium App	\$ 1.99

As aforementioned, Americans took 1.7 billion leisure trips in the year 2014. According to Statista, each traveler on average makes 5 trips per year for a rough estimate of 340 million total travelers in the industry.⁵ We roughly estimate that around .5% of this traveling population will test the cityTIPs app. Of this .5%, 5% initially will download the premium version of the app for an additional

fee of \$1.99. This 5% estimate is an assumption made based off Spotify's revenue figures, another comparable freemium application. Currently 25% of Spotify's users are subscribed to their premium services.⁶ Thus, our 5% is a conservative estimate based on the fact that cityTIPs is a new application on the market.

Breakdown of App Download Revenue

	2016	2017	2018	2019	2020
Target Market Growth Rate	2%	2%	2%	2%	2%
Percentage of Travelers Using cityTIPs	0.510%	0.520%	0.531%	0.541%	0.552%
Travelers Using cityTIPs	1,734,000	1,768,680	1,804,054	1,840,135	1,876,937
Premium Users Growth Rate	10%	10%	10%	10%	10%
Total Premium cityTIPs Travelers	95,370	104,907	115,398	126,937	139,631
Additional Premium Users	95,370	9,537	10,491	11,540	12,694
App Download Revenue	\$ 189,786.30	\$ 18,978.63	\$ 20,876.49	\$ 22,964.14	\$ 25,260.56

Breakdown of App Ad Revenue

	2016	2017	2018	2019	2020
Number of Ad Sponsors	100	125	156	195	244
Growth Rate for Ad Sponsors	25%	25%	25%	25%	25%
Average Yearly Cost per Ad	\$ 1,500.00	\$ 1,500.00	\$ 1,500.00	\$ 1,500.00	\$ 1,500.00
Total Ad Revenue	\$ 150,000.00	\$ 187,500.00	\$ 234,375.00	\$ 292,968.75	\$ 366,210.94

The estimate for the initial total number of ad sponsors is based off of the assumption that each state will have at least 2 local business or activities that would have an interest in advertising on cityTIPs.

⁵ <http://www.statista.com/statistics/185300/average-number-of-leisure-trips-in-the-us/>

⁶ <http://www.fastcompany.com/3040781/fast-feed/a-whopping-25-of-spotifys-60-million-active-users-are-paying-customers>

Gross Profit & Margin

	2016	2017	2018	2019	2020
Revenues					
App Download Revenue	\$ 189,786.30	\$ 18,978.63	\$ 20,876.49	\$ 22,964.14	\$ 25,260.56
Sponsored Ad Revenue	\$ 150,000.00	\$ 187,500.00	\$ 234,375.00	\$ 292,968.75	\$ 366,210.94
Total Revenues	\$ 339,786.30	\$ 206,478.63	\$ 255,251.49	\$ 315,932.89	\$ 391,471.49
Less: COGS - Servers & Hosting	\$ 100,000.00	\$ 25,000.00	\$ 25,000.00	\$ 25,000.00	\$ 25,000.00
Less: COGS - Potential API Cost	\$ 20,000.00	\$ 20,000.00	\$ 20,000.00	\$ 20,000.00	\$ 20,000.00
Total COGS	\$ 120,000.00	\$ 45,000.00	\$ 45,000.00	\$ 45,000.00	\$ 45,000.00
Gross Profit	\$ 219,786.30	\$ 161,478.63	\$ 210,251.49	\$ 270,932.89	\$ 346,471.49
Gross Margin	65%	78%	82%	86%	89%

The two main sources of COGS are the cost of hosting our app on the servers and the potential cost of gathering data from the APIs. Currently, because the application has not been published, we are able to access the data from the APIs. In the future, cityTIPs also will have to take into consideration the potential charges of using the data from APIs.

Net Income

Operating Expenses					
Salaries & Benefits	\$ 90,000.00	\$ 99,000.00	\$ 108,900.00	\$ 119,790.00	\$ 131,769.00
Rent & Utilities	\$ 25,000.00	\$ 25,000.00	\$ 25,000.00	\$ 25,000.00	\$ 25,000.00
Other Expenses - Marketing	\$ 30,000.00	\$ 33,000.00	\$ 36,300.00	\$ 39,930.00	\$ 43,923.00
Total Operating Expenses	\$ 145,000.00	\$ 157,000.00	\$ 170,200.00	\$ 184,720.00	\$ 200,692.00
Net Income Before Tax	\$ 74,786.30	\$ 4,478.63	\$ 40,051.49	\$ 86,212.89	\$ 145,779.49
Tax Rate	40%	40%	40%	40%	40%
Tax Expense	\$ 29,914.52	\$ 1,791.45	\$ 16,020.60	\$ 34,485.16	\$ 58,311.80
Net Income	\$ 44,871.78	\$ 2,687.18	\$ 24,030.90	\$ 51,727.74	\$ 87,467.70

Net income decreases in the years immediately following 2016 but begins to increase once again by 2020. This is because we believe that the initial launch of the application will draw a lot of attention towards downloads for the premium version of the app, especially given the trial test period for the premium version. After the initial launch of the app, however, the momentum for premium downloads is expected to decrease before picking up once again due to the popularity of the premium trial period. cityTIPs plans to increasing marketing expenses at a rate of 10% per year to maintain and support cityTIPs' spreading user base.

Problems Encountered

API Accessing Problems

TripAdvisor API is not open for developers to use freely and you can't use without requesting a special permission. The Eventbrite API has an hourly limit of allowing only certain number of searches in one hour and if we exceed the limit then it stops functioning and throws an error.

API Fetching Speed

We enable our users to search via our app and guarantee them the most relevant result in a fast way, so getting the result in time becomes important. App like Pandora pays great attention on dealing with their reaction speed to user's response, especially to, when a user skips a song or switches to another station; if they can't make accurate and fast reaction they're losing customers. Even our application aims to ensure data at the fastest speed possible. The more checkbox on the user preference form page a user checks, the more API calls we need to make. Especially for Eventbrite API, imagine we get a curious user who is checking all 9 categories under event: a single call using Eventbrite API takes 2-3 seconds to finish, and 9 calls would take 0.5min, which might be too long and beyond a user's waiting time maximum. So API fetching problem needs to be solved immediately.

To solve this, we came up with a feasible solution: we will create a web crawler which will go external website (yelp.com, eventbrite.com, etc.) and grab information, then save it in our local database. The crawler works at the start of every day, after the database gets cleaned (erase all results of previous day), the grabbed information will be saved in the database, and will be used for that day; when a user searches, we query the database, and in this way it will be much faster than calling API.

Saving the information in database can speed user's search significantly, but problem occurs when we grab lots of information to presave: when there're too much data, even querying database can be slow. To solve this, an appropriate database design can minimize query time. Currently we don't have problem, but this can be a potential problem and needs to be solved to keep users' attention.

Database Connections

We had a lot of difficulty in connecting our bootstrap front end django application with a mysql database. To generate the database in mysql we first had to figure out which driver will be compatible with our version of Django and Python. We finally decided to use mysqlclient as it is the recommended choice as per the django documentation. We had to make changes in the settings.py file to make sure that Django understands that we are using MySQL database at the backend. Then we had to write the classes in models.py to generate the tables in the MySQL database. After that we had to use three commands to make sure that the database was generating properly. Since this is not properly mentioned step by step in the Django documentation. We had to figure out the steps ourselves. The three commands in the correct order are: syncdb, makemigrations and migrate. Once the database was getting generated properly we were able to store and extract information from the database easily.

Conversion to Mobile App

We weren't able to totally convert our web app into an mobile app, due to the frontend display problem. To display the page on mobile app, we need html page with Javascript code, and data sent from backend as a JSON object to display; at this point we only have pure html page at the front, and the data from backend isn't wrapped as a JSON. The workload of fixing all these are beyond the deadline, so we won't be able to fix it at this point, but we will continue to work on it afterwards.

To fix this, several things need to be done:

1. Wrap all dictionary objects in render() function in view.py as a JSON object.
 2. Edit html code in templates by adding Javascript code which are going to parse the JSON objects retrieved from backend
 3. Put all template paths to index.html page, and only display this page on the mobile phone.
- One thing to mention before closing this section: Django framework can be used for developing mobile app, such as Instagram uses Django as their backend. By creating an appropriate front end like Instagram using React (a JavaScript library for building user interface), our app can be displayed on a phone.

Lessons Learned

1. **Choose Your Stack carefully:** Choose appropriate backend and frontend before project starts: always choose technologies which complement each other well. Also it is always better to choose a stack of development which your team mates are familiar with.
2. **Choose Your Version carefully:** Choose appropriate version of a language to work on. Our group may have been better off by choosing Python 2.7. A new version may not be the best as it may not be steady and might easily report problems. As well, because the version is new and the user base may be smaller, there may be less references on sources such as stackoverflow when problems arise.
3. **Simple is better:** Make your application as simple to use as possible. Make sure that the learning curve involved in using the application is small so that you can attract a larger audience which may not be very tech friendly.
4. **Clear Communication:** It is important that every member of the development team has a clear understanding of the vision that is being developed and the ultimate goal. It also nice if every team member is given specific responsibilities so as to utilise each member's strengths in an effective manner.

Next Steps

In the future, cityTIPs looks to incorporate more APIs in the search results to provide an even more thorough aggregation of results. Other potential rating sites to explore include Zagat, OpenTable, Angie's List, and TripAdvisor. In addition, while cityTIPs currently focuses on populating just activity-related results, another possible area of expansion in the future is lodging and transportation. From here, cityTIPs can also include the added functionality of helping users book aspects of their trips such as air travel or hotels. For this, cityTIPs can look to incorporate data from booking websites such as KAYAK and Expedia.

cityTIPs also looks to make improvements in the future towards its recommender system for populating search results. One idea is that cityTIPs can look towards creating its own rating system for the search results generated and thus collect data on which results leave travelers most satisfied. Currently, cityTIPs' user registration and search functionalities enables the app to collect data about a user's personal information and store said data in the backend database. By analyzing a user's previous search history as well as the ratings on the cityTIPs site itself, cityTIPs can make better recommendations regarding activities that a user would prefer.

Presently, social media and user interaction are also extremely important in the development and usage of new services/products. In a 2014 MarketWatch article, investors noted that the popularity of ratings websites were declining in favor of social network recommendations. Users were more trusting of the recommendations from their family and friends on Facebook than the Yelp reviews of strangers.⁷ Following this trend, cityTIPs hopes in the future to incorporate more social aspects such as user profiles, friends, and the aforementioned public rating system. One particular feature that could be implemented is an collaborative group trip-planning interface that would allow users to select activities and plan trips together with their friends. In addition, cityTIPs plans to work on incorporating log in through social media such as Facebook, Twitter and Google+.

⁷ <http://www.marketwatch.com/story/millennials-are-leaving-yelp-and-angies-list-2014-10-23>

Conclusion

We hope that through this project we have been able to provide a good solution to a problem that is faced by many travelers who are looking to plan their trip in such a way so that they can go and enjoy the place that they are visiting. Most of the travelers are really anxious of missing out on great experiences because of lack of knowledge about their favourite activities that are happening in the city that they are planning to visit. Using this application will allow people to easily figure out which places are trending in the city, which places are serving their favourite food, or which places are hosting their favourite music artists. Travelers can also click on the image of an event to directly buy tickets for that event. This ensures that they do not miss the event even if they come to know about the event last minute. In addition, showing all the places of interest on a Google map enables the user to visualize the locations of the activities. All of these factors combined will lead to a more well planned trip, which will hopefully in turn make the user feel more satisfied and ultimately more happy.

Appendix

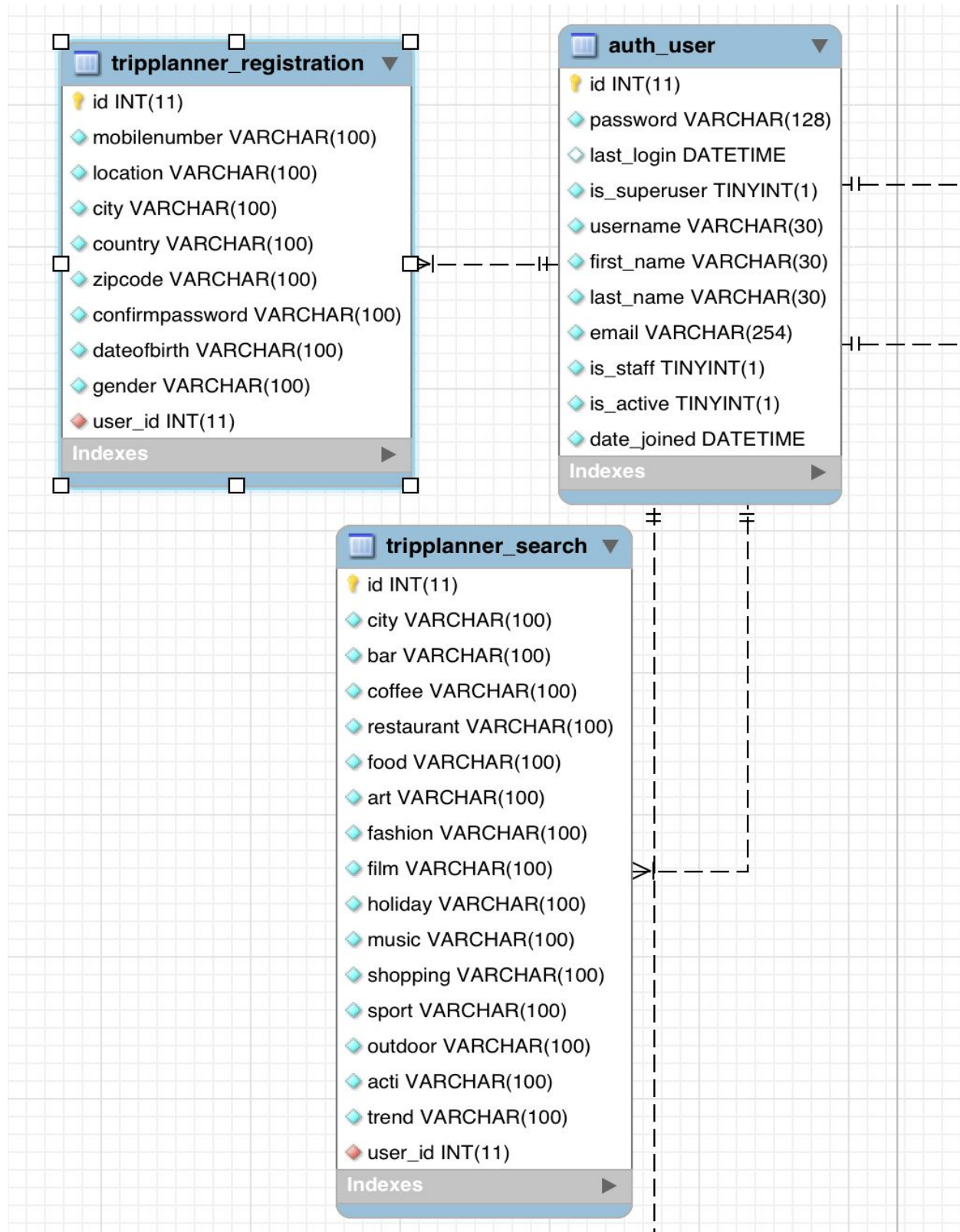
Code

Please see our GitHub repository:

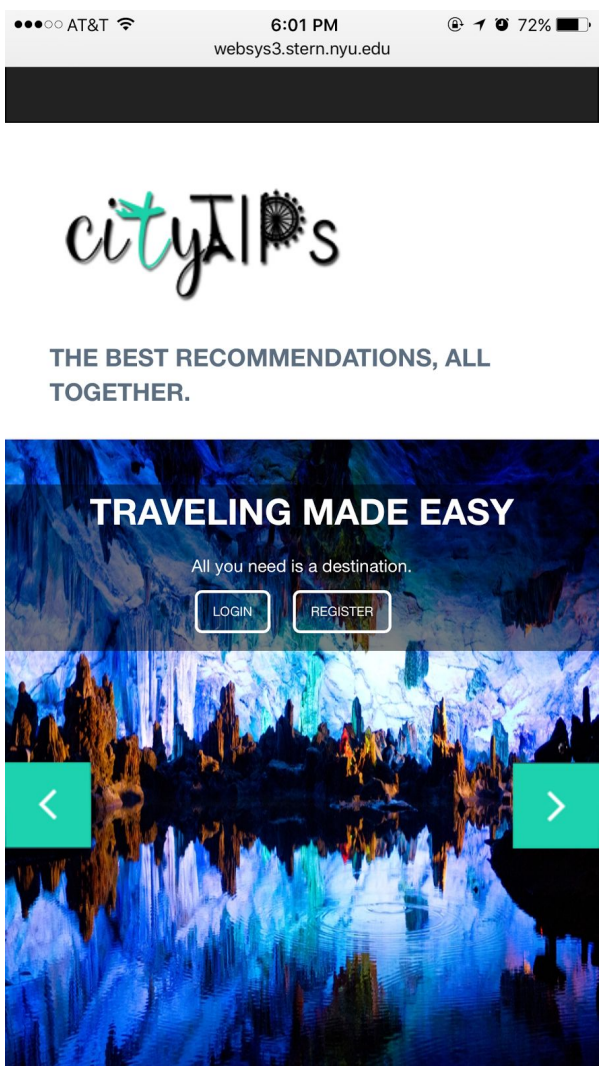
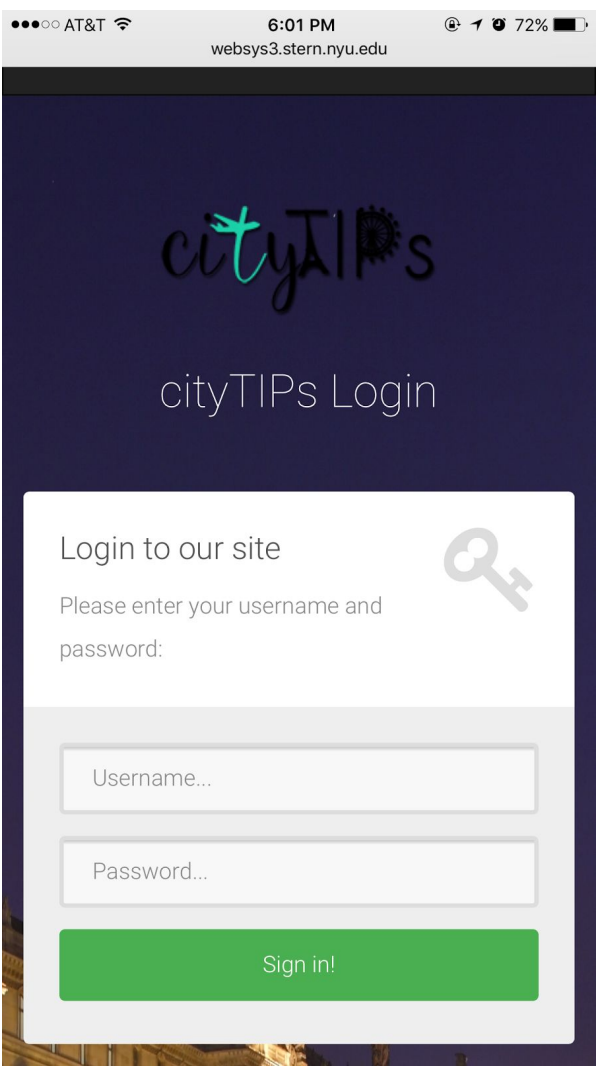
<https://github.com/contactaditya/WebandMobileApplicationDevelopment> or the Stern Websys3 folder where we posted the code for our entire application:


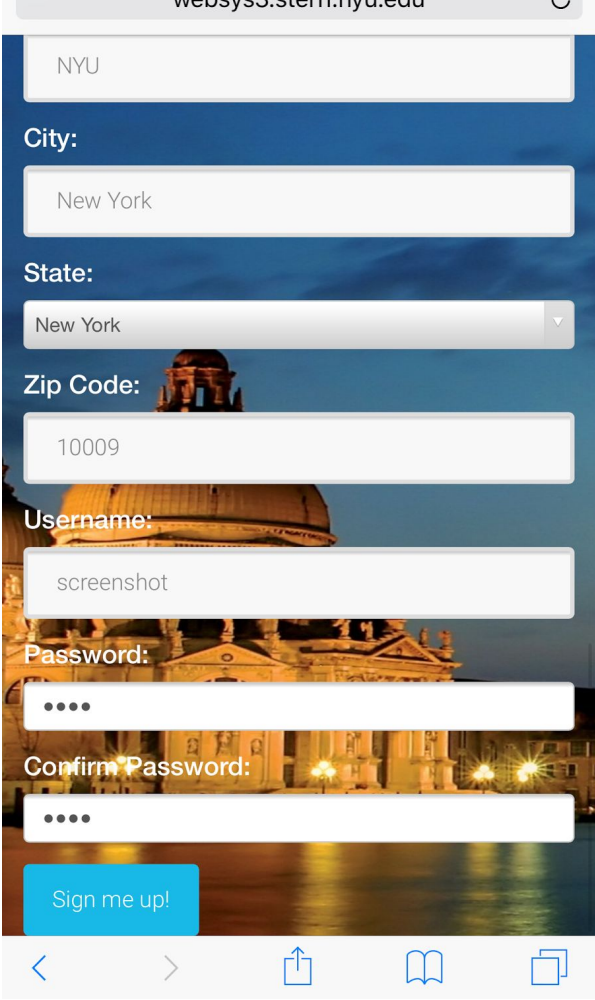
<http://websys3.stern.nyu.edu/websysF15GB/websysF15GB2/WebandMobileApplicationDevelopment/> for a detailed breakdown of the code that was used.

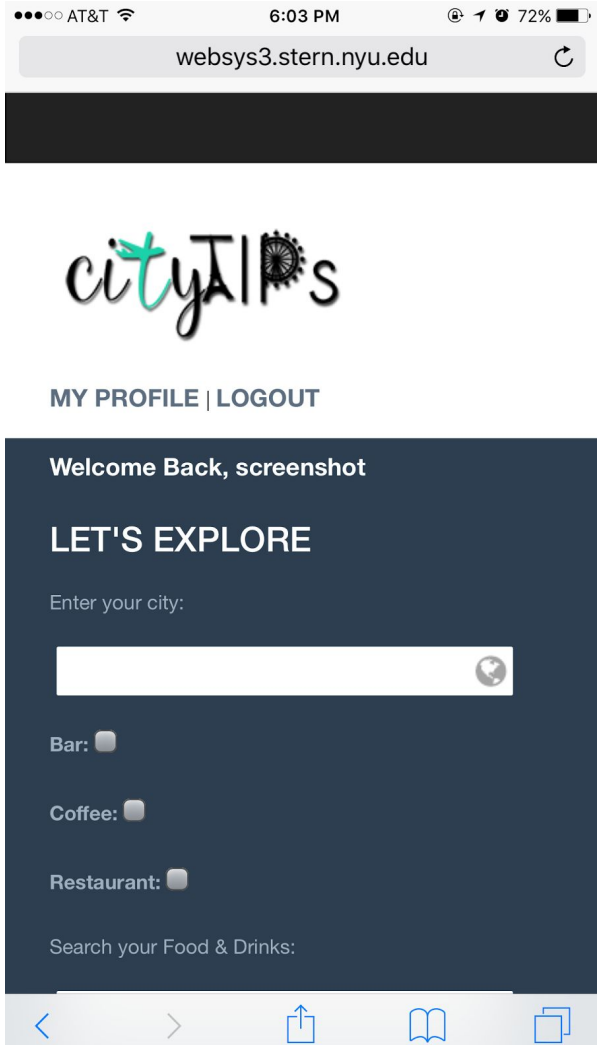
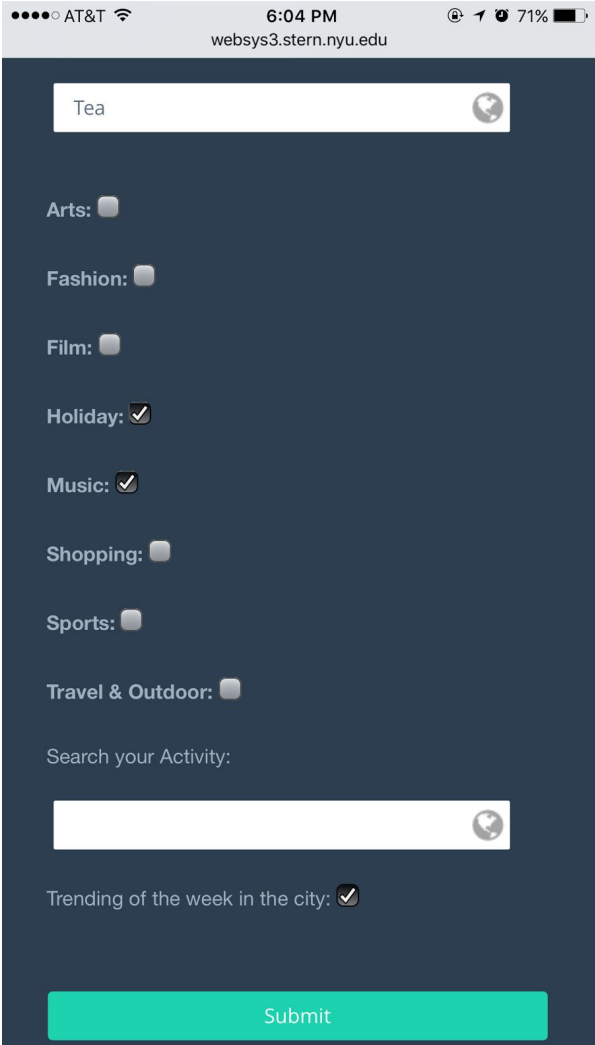
Table Design & ER Diagrams



Screenshots & User Instructions Walk-Through

	
<p>cityTIPs Main Page</p> <ul style="list-style-type: none">• Returning users can choose either to login from here or register for a new account• New users can register for a new account	<p>cityTIPs Login Page</p> <ul style="list-style-type: none">• Returning users enter their username & password then press “Sign in!”

	
<p>cityTIPs Registration Form</p> <ul style="list-style-type: none">This is the page users will first see when attempting to create a new account.	<p>cityTIPs Registration Form</p> <ul style="list-style-type: none">Users fill in the contents of the form and then press “Sign me up!” in order to create a new account.

	
<p>cityTIPS Preference Form</p> <ul style="list-style-type: none">After either logging in or creating a new account, users will be directed straight to fill out a Preference form.	<p>cityTIPS Preference Form</p> <ul style="list-style-type: none">After selecting their preferences on the form, users can click the button to “Submit” their preferences.

6:04 PM
websys3.stern.nyu.edu

cityTIPs

MY PROFILE | LOGOUT

Search result

FOOD&DRINKS

Foodie name	Type	Status(Click on status to see website)	Addr
Abraço	coffee	OPEN	86 Village
Brooklyn Roasting Company	coffee	OPEN	St, DU

cityTIPs Preference Form Results

- After submitting the preference form, cityTIPs will use the submitted preferences to crawl through the aforementioned APIs and populate a list of recommended activities in the inputted location.

6:04 PM
websys3.stern.nyu.edu

		NY 10121, United States
Grand Central Terminal	http://www.grandcentralterminal.com	87 E 42nd St (btwn Vanderbilt & Park Ave), New York, NY 10017, United States
Port Authority Bus Terminal	http://www.panynj.gov/bus-terminals/port-authority-bus-terminal.html	625 8th Ave (btwn W 40th St), New York, NY 10018, United States

Google Map of New York City showing location pins.

cityTIPs Preference Form Results

- At the bottom of the list of activities, cityTIPs also creates a visual representation of the search results using the Google Maps API.

A screenshot of a mobile web browser showing the cityTIPs user profile page. The browser's address bar displays 'websys3.stern.nyu.edu'. The page features the cityTIPs logo at the top, followed by links for 'REFILL A PREFERENCE FORM' and 'LOGOUT'. Below this is a dark blue header with the text 'screenshot's Information & Historical Searches'. The main content area, titled 'MY INFORMATION', contains a table with the following data: USERNAME: screenshot, FIRST NAME: Screen, LAST NAME: Shot, and EMAIL: screenshot@stern.nyu.edu. The bottom of the screen shows a mobile navigation bar with icons for back, forward, home, and tabs.

cityTIPs User Profile

- Each user also has an user profile that contains the personal information that was inputted during registration.

A screenshot of a mobile web browser showing the cityTIPs user profile page. The browser's address bar displays 'websys3.stern.nyu.edu'. The page features the cityTIPs logo at the top, followed by links for 'REFILL A PREFERENCE FORM' and 'LOGOUT'. Below this is a dark blue header with the text 'screenshot's Information & Historical Searches'. The main content area, titled 'MY INFORMATION', contains a table with the following data: CITY: New York, STATE: NY, ZIP: 10009, GENDER: FEMALE, and DOB: 09/04/1994. Below this is a section titled 'MY SEARCHES' which contains a table with the following data: CITY: NYC, BAR: (empty), COFFEE: (checked), and RESTAURANT: (empty). The bottom of the screen shows a mobile navigation bar with icons for back, forward, home, and tabs.

cityTIPs User Profile

- In addition to the user's personal information, the user profile also contains the user's search history, which is stored in cityTIPs backend database.