

# Team PWA - Process Book

## Vacation Rental Pricing Helper

### Team PWA Members

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### Instructor and TA

Zona Kostic - Instructor

Gabe Korodi - TA

## Motivation

Property owners renting out their home or part of their property on a short-term basis (hosts) often have little experience in the real estate or hospitality industries and lack the ability to accurately predict the fair market value of their short-term rental. AirBnB offers a pricing estimator, but it can often be inaccurate.

The Vacation Rental Pricing Helper will provide hosts with a baseline prediction of the fair market value of their short-term rental based on location, property features, date, and any other predictors that the team finds to be meaningful. In addition, hosts will be provided with key data insights from listings data, alongside processed natural language insights. Armed with such information, hosts will be better prepared to accurately price their short-term rentals.

## Goal

Create a Progressive Web Application (PWA) for Airbnb property hosts (hosts) to determine their maximum potential rental price for the renter's length of stay.

## Background

Given the above, Andrew currently lists his property on the Maryland Eastern Shore on the Atlantic Ocean on the AirBnB platform while Joe previously listed his condo for rent at a mountain lake resort in Western MD. Using their experience with vacation rental pricing, they determined that this tool would help anyone, anywhere

in the United States set and realize their maximum rental price according to listings within a radius of 2 miles from their property.

The Vacation Rental Pricing Helper is a PWA app (app) and was designed and developed as a class project for the Harvard Extension School (HES) Course CSCI E-14a Building Interactive Web Applications for Data Analysis during the Fall 2021 semester.

## About the Vacation Rental Pricing Helper App

The [About](#) section of the Vacation Rental Pricing App contains a Table of Contents including an Overview of the app, screenshots of the app and how to use it. It also shows outputs in the form of responses to requests from the host(s). The Table of Contents is divided into several major sections. These are:

1. Vacation Rental Pricing Helper
2. App Features and Details
3. Modeling
4. Additional Considerations
5. App Code Structure

## Process Book

Our Process Book is based on the Process Documentation to design, develop and implement a product as shown in Asana.com's [Process Documentation](#). The steps used in our book also highlight the process workflow described in a later section.

As a method of continuous improvement to our product, I created an account in Asana for us to use. This will become increasingly important as we expand our operation and to begin to set up our business. While we are not tied to the Asana Issue Tracking system, we may use another issue tracking system such as Jira to create and track issues. The Asana system does provide a complete end to end environment for us to build and establish our policies, processes and procedures.

## Process Boundaries

Our Process Boundaries began with the formation of our team and with the initial meetings to determine the scope of our Final Project. Our process boundaries are:

1. Use the .csv data file acquired from Inside AirBnB site containing the July 2021 AirBnB rental pricing data.
2. Create the apps stack on Heroku using Flask, Jupyter Notebooks, PostgreSQL as the database to create a Minimum Viable Product (MVP)

3. Use our Machine Learning processes to develop our trends and pricing helper
4. Create a GitHub account and repository to store our design documents, code and configuration files
5. Continue to test and train our model while developing the apps MVP
6. Submit the Final Project on Dec 8, 2021
7. Once submitted and the class is complete, determine the next steps as a team as to whether to continue with enhancements and updated Inside AirBnB data from November 2021 to further prove our app and models
8. Publish articles about our Vacation Rental Pricing Helper in Medium, Towards Data Science and others
9. Continue working with Zona and Gabe as we investigate the possibility of creating a business and securing initial funding to create a nationwide prototype

## Inputs and Outputs

Our inputs and outputs will be using the Vacation Rental Pricing Helper apps User Interface.

### Inputs

Our interface will be web and mobile app compatible for property owners and hosts to enter their street address, city, state and zip code as well as select the type of rental they offer. These can consist of

1. An entire property - typically a home, condo or apartment
2. Private Room(s)
3. Shared Room(s)
4. Number of beds
5. Number of guests
6. Host response times

### Outputs

The Vacation Rental Pricing Apps output will provide the host the

1. Average rental price for properties in the Boston, MA area
2. The baseline rental price for their property based on
  - a. Location - Area of Boston
  - b. Transportation Options
    - i. Boston Area MTA subway lines and stations






- ii. Places of interest in Boston including a Map using Google Maps to provide directions and distances and the landmarks website link
- 3. Generated map of the Boston area showing the point of the address submitted
- 4. The map will be generated using data visualization software with each region shaded in different colors to distinguish each area
- 5. Host info showing the hosts
  - a. Room type
  - b. Address
  - c. Beds and guests
  - d. Overall review score
  - e. Typical response time

## Process Steps Taken

1. Meet with Zona and determine the type of PWA we would like to create.
2. Meet as a team and submit our Milestone 0 consisting of
  - a. Team number and name
  - b. Team Members
  - c. 3 times we are available to meet weekly
3. Upon approval of the Milestone, our team was introduced to Gaber Korodi, our TA who worked with us during the entire semester and guided us through many of the design and development decisions.
4. We determined that we would meet as a team every Monday during the semester at 3pm Eastern Time. While Zona, Gabe and Andrew live in the Eastern Time Zone, Joe lives in the Pacific Time Zone and Jing lives in the Hawaiian Time Zone. This time worked well for all.
5. We discovered that Airbnb rental pricing data was available for the Boston, MA area and this data was found on [Inside Airbnb/Boston](#). The data was captured for rental properties in the Boston area from July 2021.
6. Milestone 1 was due shortly after Milestone 0. For this Milestone we submitted 1-2 paragraphs of the requested items. These were:
  - a. Project Idea
  - b. What dataset/s we will be using
  - c. Who is our target audience
  - d. What kind of application do you have in mind to develop
7. Once the data was obtained in a .csv file format, we created the Machine Learning (ML) objective which was based on our Business Goals answering the question of "What If"
  - a. AirBnB hosts had a reliable service to estimate the short-term rental

value of their property?

- b. Better still... What if we could give them advice to improve the rental value of their properties?
8. Created our repository in GitHub [Vacation Rental Pricing Helper](#) for Milestone 3 which we provided the following.
  - a. Provide the GitHub repo to share the project files among team members
  - b. Include our instructors as collaborators
  - c. Upload the Project Plan to the repo
9. We began committing our code and design documents on a regular basis as we followed our process steps described in the Process Flowchart section below. For additional information on these documents, please see these files in the repository which explain in detail how our app was developed along with the configuration files for the app. The repo also shows the commits and branches as the Vacation Rental Pricing app was created.
  - a. [Project Plan.md](#)
  - b. [ReadMe.md](#)
  - c. [Vacation Rental Pricing Helper.md](#)
10. Once our goals were established, we began building the Machine Learning (ML) models and quickly produced visualizations showing
  - a. Locations in the Boston area and the average pricing of each location
  - b. Trends observed were
    - i. Property Type
    - ii. Host reviews
    - iii. Rental Prices
    - iv. Location to items of interest
    - v. Host response time to the renter
    - vi. Superhost vs. Host
11. Milestone 4 was created and presented to the entire class on Thursday October 14, 2021. Our presentation consisted of
  - a. Google Slide Presentation consisting of our
    - i. Motivation
    - ii. Business Goals
    - iii. Solution showing snippets of our data visualizations
    - iv. Design Strategy
    - v. Progress completed and steps to complete
  - b. Demonstration of our app showing the trends identified above.
12. We received positive and constructive feedback from classmates, TA's and Zona.
13. Feedback was incorporated into our modeling and app design
  - a. Further modeling, testing, refining our testing
  - b. Creation of our Stack as shown in the figure below

User Interface	 HTML/CSS, JS, & D3.JS
Application	 Python & Flask
ML Model	 Jupyter Notebooks
Database	 PostgreSQL
Networking	 Heroku

c.

## Project Stakeholders

**Andrew Fabrizio** - User Interface development using HTML, CSS and JS, Flask creation and preparation, Docker configuration files, current AirBnB property owner and host of a rental property on the Maryland Eastern Shore facing the Atlantic Ocean.

**Joe Pursel** - Project Leader using his many years of experience managing his own vacation rental property as well as Federal and Commercial contracts providing Information Technology goods and services. Joe also created the presentations for the Milestone 1 as well as attended every class lecture and provided lecture notes to both Andrew and Jing. Joe's business acumen provided key guidance in the creation and implementation of the goals and business strategy not only for the class Final Project but to further the work of the team to the potential creation of a business deploying the Vacation Rental Pricing Helper as a prototype and securing funding for the business.

**Jing Yu** - Performed Machine Learning Modeling, PostgreSQL database creation and database loading, User Interface development using HTML, CSS and JS.

# Process Flowchart

Visualizing our process provides clarity in an easy to understand way showing the Inputs, Steps and Outputs. As each step is complete, the process proceeds to the next step. Our process workflow is shown in the table below.

Inputs	Steps	Outputs
Project Plan	Task Creation	Dependencies
Business Objectives	Task Prioritization	Project Timeline
Communication Tools	Task Reminder	Automated Notifications
Design and Copy	Task Implementation	Deliverables
Leadership Feedback	Task Review	Deliverable Approval
Live Staging	Task Testing	Final Analysis
Readiness Reviews	Task Deployment	Support and Maintenance

Source - Asana.com

## Process Flow Exceptions

With the process workflow established, there will come times when not every task will be completed with all of the items shown in the table above. It may be that some tasks may not be required based on the complexity of the work.

We followed this process flow during class as we designed and developed the Vacation Rental Pricing Helper app. While not every task was accomplished in the order above, all of the steps, input and outputs were realized in a tangible way. Using this structure helped us keep our project on track while meeting and exceeding the class requirements for a functional PWA submitted on December 8, 2021.

## Process Testing

We tested the process workflow many times during our class project and we feel we have refined the process to enable us to continue our development of enhancements and improvements incorporating updated Inside AirBnB Rental Pricing Data for Boston as well as continue our development using input for

additional cities such as New York, Chicago, Atlanta, Miami, Los Angeles and San Francisco and their surrounding areas.

## Credits

We thank our Instructor Zona Kostc and TA Gabe Korodi as well as the other class TA's and classmates for their valuable feedback during our Milestone presentations and the development of our app.

We also want to thank the Harvard Extension School for providing each member of our team with the support and information necessary for us to complete this class and continue our knowledge in the Web Interfaces and Computer Science Graduate Certificate Programs.