CS 542 - Machine Learning Final Challenge Assignment

1 Introduction

In this final challenge, you will be building your own machine learning solution to predict the price of an Airbnb rental given the dataset we have provided. To submit your solution, you will upload your code (see below for submission instructions).

We are expecting from all of you to make an initial submission with some model (a good one to start with can be Linear Regression). **Due date for initial submission is Nov 22, 5 pm EST.** You will get %10 of the score from a successful initial submission (your code runs without breaking, within a time frame of **10 minutes** and produces valid numbers, **no 'mse' limitation for initial submission**). **Final deadline for this assignment is Dec 2, 5 pm EST.**.

2 Problem and dataset description

Pricing a rental property such as an apartment or house on Airbnb is a difficult challenge. A model that accurately predicts the price can potentially help renters and hosts on the platform make better decisions. In this assignment, your task is to train a model that takes features of a listing as input and predicts the price.

We have provided you with a dataset collected from the Airbnb website for New York, which has a total of 39,981 entries, each with 764 features. The data is split into a training set and a test set. You may use the provided data as you wish in development. We will train your submitted code on the same provided training set, and will evaluate it on yet another, hidden, test set.

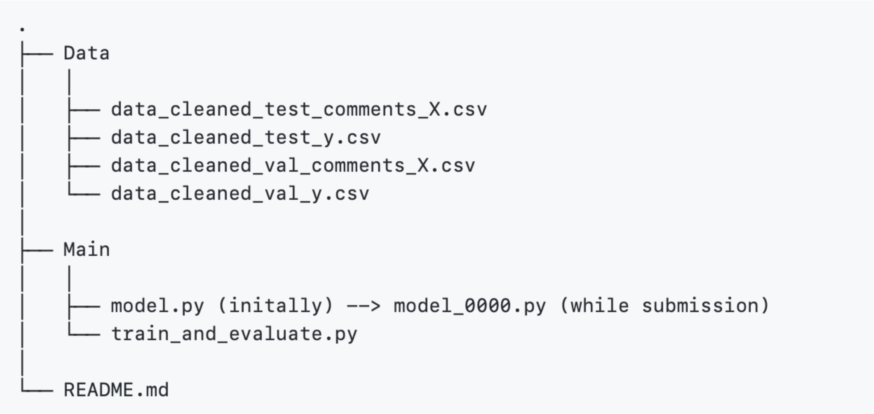
We have already done some minimal data cleaning for you, such as converting text fields into categorical values and getting rid of the NaN values. To convert text fields into categorical values, we used different strategies depending on the field. For example, sentiment analysis was applied to convert user reviews to numerical values ('comments' column). We added different columns for state names, '1' indicating the location of the property. Column names are included in the data files and are mostly descriptive.

Also in this data cleaning step, the price value that we are trying to predict is calculated by taking the log of original price. Hence, minimum value for our output price is around 2.302 and maximum value is around 11.488.

All input features have already been scaled to [0, 1].

3 Folder structure:

Please download the data from the class Drive folder under "/challenge/Data". Expected file structure for this project is shown in below:



```
.
├── Data
│   │
│   ├── data_cleaned_test_comments_X.csv
│   ├── data_cleaned_test_y.csv
│   ├── data_cleaned_val_comments_X.csv
│   └── data_cleaned_val_y.csv
│
├── Main
│   │
│   ├── model.py (initally) --> model_0000.py (while submission)
│   └── train_and_evaluate.py
│
└── README.md
```

4 Instructions to build your classifier:

1. Modify the 'model.py' file name and postfix it with last four digit of your BU ID. For example, if your ID is U12345678, change your 'model.py' file to 'model_5678.py'.
2. Update the 'ID_DICT' in 'model.py' file with your info.
3. Modify 'model.py' 'Model' class to the model you will be building (do NOT change the class name). For the model, you will implement three functions: 'preprocess', 'train', and 'predict'. The training and evaluation script is 'train_and_evaluate.py'. **Please no not make any changes** to the 'train_and_evaluate.py' file. Graders will be running these scripts automatically once you submit. The only thing you can change is the default BU ID in the argparser to make your debugging more convenient.
4. Test your model by running 'python train_and_evaluate.py –bu_id XXXX' with your ID number.

5 Instructions to submit:

When you submit, you just need to upload your 'model_XXXX.py' file (see Piazza for submission links). Before uploading, please **test your code first with the provided evaluation script** to make sure it runs correctly.

6 How is your code evaluated:

When we receive your submission, we will be running the 'train_and_evaluate.py' code on your model against our test set that is not released. Your score (we will use MSE as the primary metric) on the test set will be your performance measure. Your grade will depend on the following criteria:

1. The code runs without errors.
2. It follows rules (see below).
3. It is original code (implemented by you).
4. The code takes a reasonable time to complete.
5. The predicted MSE is reasonable.

7 What is allowed and not allowed?

You are meant to implement your own machine learning model. So you are **NOT** allowed to use the following packages (or any other similar libraries) in your submitted code:

```
text
pytorch
tensorflow
sklearn
keras
jax
...
```

You are allowed to learn the following white-listed libraries:

```
numpy
sklearn.preprocessing
...
```

You are **NOT** allowed to use additional datasets. This assignment is meant to challenge you to build a better model, not collect more training data.