Data Extraction and Introduction

```
Names = ["Manhattan"; ...
         "LaGuardia"; ...
         "JFK"];
 Lat1 = [40.7485;40.766;40.639];
 Lat2 = [40.7576;40.776;40.650];
 Lon1 = [-73.9955;-73.876;-73.793];
 Lon2 = [-73.9773;-73.861;-73.775];
pickupLocations = table(Names,Lat1,Lat2,Lon1,Lon2)
```

pickupLocations = 3×5 table

	Names	Lat1	Lat2	Lon1	Lon2
1	"Manhattan"	40.7485	40.7576	-73.9955	-73.9773
2	"LaGuardia"	40.7660	40.7760	-73.8760	-73.8610
3	"JFK"	40.6390	40.6500	-73.7930	-73.7750

For prediction of whole year 2016, the selection of all data files of 2015 are needed.

```
dataPath = fullfile(fileparts(which('yellow_tripdata_2015-01.csv')));
if isempty(dataPath)
    f = msgbox(["Taxi data not found on the MATLAB path." ; ...
        "Please select the location in the following dialog."])
    uiwait(f)
    dataPath = uigetdir([],"Select the folder containing the taxi data.")
end
ds = fileDatastore( fullfile(dataPath,"yellow*.csv"),"ReadFcn",@importTaxiData, ...
    "UniformRead",true);
```

The below code counts the pickups in the zones above over one hour intervals.

```
reset(ds);
numFiles = size(ds.Files,1);
fileNum = 0;
taxiPickups = table;

while hasdata(ds)
    % Read a file (month) of data
    data = read(ds);

    % Find taxi trips at the given locations
    data.Location = zeros(height(data),1);
    for i = 1:height(pickupLocations)
        isInBox = data.PickupLat >= pickupLocations.Lat1(i) & ...
            data.PickupLat <= pickupLocations.Lat2(i) & ...
            data.PickupLon >= pickupLocations.Lon1(i) & ...
            data.PickupLon <= pickupLocations.Lon2(i);
        data.Location(isInBox) = i;
    end
```

```
    % Remove non-labeled trips
    data(data.Location==0,:) = [];
    data.Location = categorical(data.Location,1:height(pickupLocations), ...
        pickupLocations.Names);

    % Shift the times to the start of each hour
    data.PickupTime = dateshift(data.PickupTime,"start","hour");

    % Sum the trips in each hour and clean up varible names
    result = groupsummary(data,["PickupTime" "Location"], ...
        "IncludeEmptyGroups",true);
    result = renamevars(result,"GroupCount","TripCount");

    % Put the result of the month just calculated  onto the overall table
    taxiPickups = [taxiPickups; result];

    % Update and display status
    fileNum = fileNum+1;
    disp("Finished file " + fileNum + " of " + numFiles);
end
```

```
Finished file 1 of 12
Finished file 2 of 12
Finished file 3 of 12
Finished file 4 of 12
Finished file 5 of 12
Finished file 6 of 12
Finished file 7 of 12
Finished file 8 of 12
Finished file 9 of 12
Finished file 10 of 12
Finished file 11 of 12
Finished file 12 of 12
```

```
save taxiPickupData taxiPickups pickupLocations
```

Data Exploration and Partitioning

To avoid having to run the script again if you continue working after clearing your workspace, the code below loads the saved data.

```
if ~isempty(which('-all','taxiPickupData.mat'))
    load taxiPickupData.mat
else
  error("The file taxiPickupData.mat is not found on the MATLAB path." + ...
      "  Add it to the path or run generateTaxiPickupTable.mlx " + ...
      "to generate it.")
end
```

Visualization and Analysis

As per this analysis Manhattan has the highest pickup location.

```
histogram(taxiPickups.TripCount)
boxplot(taxiPickups.TripCount,taxiPickups.Location)
```

Separate Test Data

```
tpicks = cvpartition(height(taxiPickups),"Holdout",0.2)
```

```
tpicks =
Hold-out cross validation partition
   NumObservations: 26217
       NumTestSets: 1
         TrainSize: 20974
          TestSize: 5243
```

```
taxitestidx = test(tpicks)
```

```
taxitestidx = 26217×1 logical array
   1
   0
   0
   0
   0
   0
   0
   0
   0
   0
     ⋮
```

```
taxitest = taxiPickups(taxitestidx,:);

taxitrainidx = training(tpicks)
```

```
taxitrainidx = 26217×1 logical array
   0
   1
   1
   1
   1
   1
   1
   1
   1
   1
     ⋮
```

```
taxitrain = taxiPickups(taxitrainidx,:);
```

Models Training and Validation

```
taxitrain = providedPreprocessing(taxitrain)
```

```
taxitrain = 20974×7 table
                                                                                ...
```

	PickupTime	Location	TripCount	TimeOfDay	DayOfWeek	DayOfMonth
1	2015-01-01 ...	LaGuardia	2	0	Thursday	1
2	2015-01-01 ...	JFK	2	0	Thursday	1
3	2015-01-01 ...	Manhattan	10	1	Thursday	1
4	2015-01-01 ...	LaGuardia	0	1	Thursday	1
5	2015-01-01 ...	JFK	2	1	Thursday	1
6	2015-01-01 ...	Manhattan	14	2	Thursday	1
7	2015-01-01 ...	LaGuardia	0	2	Thursday	1
8	2015-01-01 ...	JFK	0	2	Thursday	1
9	2015-01-01 ...	Manhattan	9	3	Thursday	1
10	2015-01-01 ...	LaGuardia	0	3	Thursday	1
11	2015-01-01 ...	JFK	0	3	Thursday	1
12	2015-01-01 ...	LaGuardia	1	4	Thursday	1
13	2015-01-01 ...	JFK	0	4	Thursday	1
14	2015-01-01 ...	Manhattan	8	5	Thursday	1
15	2015-01-01 ...	LaGuardia	0	5	Thursday	1
16	2015-01-01 ...	JFK	1	5	Thursday	1
17	2015-01-01 ...	Manhattan	5	6	Thursday	1
18	2015-01-01 ...	JFK	2	6	Thursday	1
19	2015-01-01 ...	Manhattan	2	7	Thursday	1
20	2015-01-01 ...	LaGuardia	0	7	Thursday	1
21	2015-01-01 ...	JFK	2	7	Thursday	1
22	2015-01-01 ...	Manhattan	2	8	Thursday	1
23	2015-01-01 ...	LaGuardia	1	8	Thursday	1
24	2015-01-01 ...	JFK	0	8	Thursday	1
25	2015-01-01 ...	Manhattan	7	9	Thursday	1
26	2015-01-01 ...	LaGuardia	3	9	Thursday	1
27	2015-01-01 ...	Manhattan	15	10	Thursday	1
28	2015-01-01 ...	LaGuardia	4	10	Thursday	1
29	2015-01-01 ...	Manhattan	11	11	Thursday	1
30	2015-01-01 ...	LaGuardia	3	11	Thursday	1
31	2015-01-01 ...	JFK	2	11	Thursday	1
32	2015-01-01 ...	Manhattan	15	12	Thursday	1
33	2015-01-01 ...	LaGuardia	3	12	Thursday	1
34	2015-01-01 ...	JFK	4	12	Thursday	1

	PickupTime	Location	TripCount	TimeOfDay	DayOfWeek	DayOfMonth
35	2015-01-01 ...	Manhattan	18	13	Thursday	1
36	2015-01-01 ...	LaGuardia	8	13	Thursday	1
37	2015-01-01 ...	JFK	4	13	Thursday	1
38	2015-01-01 ...	Manhattan	15	14	Thursday	1
39	2015-01-01 ...	JFK	4	14	Thursday	1
40	2015-01-01 ...	Manhattan	21	15	Thursday	1
41	2015-01-01 ...	LaGuardia	2	15	Thursday	1
42	2015-01-01 ...	JFK	2	15	Thursday	1
43	2015-01-01 ...	Manhattan	16	16	Thursday	1
44	2015-01-01 ...	LaGuardia	7	16	Thursday	1
45	2015-01-01 ...	JFK	5	16	Thursday	1
46	2015-01-01 ...	Manhattan	23	17	Thursday	1
47	2015-01-01 ...	LaGuardia	8	17	Thursday	1
48	2015-01-01 ...	Manhattan	22	18	Thursday	1
49	2015-01-01 ...	LaGuardia	8	18	Thursday	1
50	2015-01-01 ...	JFK	1	19	Thursday	1
51	2015-01-01 ...	Manhattan	23	20	Thursday	1
52	2015-01-01 ...	Manhattan	15	21	Thursday	1
53	2015-01-01 ...	LaGuardia	4	21	Thursday	1
54	2015-01-01 ...	JFK	6	21	Thursday	1
55	2015-01-01 ...	LaGuardia	5	22	Thursday	1
56	2015-01-01 ...	Manhattan	10	23	Thursday	1
57	2015-01-01 ...	LaGuardia	5	23	Thursday	1
58	2015-01-02 ...	Manhattan	7	0	Friday	2
59	2015-01-02 ...	LaGuardia	2	0	Friday	2
60	2015-01-02 ...	Manhattan	2	1	Friday	2
61	2015-01-02 ...	JFK	1	1	Friday	2
62	2015-01-02 ...	Manhattan	2	2	Friday	2
63	2015-01-02 ...	LaGuardia	0	2	Friday	2
64	2015-01-02 ...	JFK	0	2	Friday	2
65	2015-01-02 ...	Manhattan	3	3	Friday	2
66	2015-01-02 ...	LaGuardia	0	3	Friday	2
67	2015-01-02 ...	JFK	0	3	Friday	2
68	2015-01-02 ...	Manhattan	3	4	Friday	2

	PickupTime	Location	TripCount	TimeOfDay	DayOfWeek	DayOfMonth
69	2015-01-02 ...	LaGuardia	0	4	Friday	2
70	2015-01-02 ...	JFK	0	4	Friday	2
71	2015-01-02 ...	Manhattan	2	5	Friday	2
72	2015-01-02 ...	LaGuardia	0	5	Friday	2
73	2015-01-02 ...	JFK	5	5	Friday	2
74	2015-01-02 ...	Manhattan	8	6	Friday	2
75	2015-01-02 ...	LaGuardia	0	6	Friday	2
76	2015-01-02 ...	JFK	6	6	Friday	2
77	2015-01-02 ...	Manhattan	8	7	Friday	2
78	2015-01-02 ...	LaGuardia	0	7	Friday	2
79	2015-01-02 ...	JFK	4	7	Friday	2
80	2015-01-02 ...	Manhattan	13	8	Friday	2
81	2015-01-02 ...	LaGuardia	2	8	Friday	2
82	2015-01-02 ...	JFK	0	8	Friday	2
83	2015-01-02 ...	Manhattan	12	9	Friday	2
84	2015-01-02 ...	LaGuardia	5	9	Friday	2
85	2015-01-02 ...	JFK	0	9	Friday	2
86	2015-01-02 ...	Manhattan	16	10	Friday	2
87	2015-01-02 ...	LaGuardia	2	10	Friday	2
88	2015-01-02 ...	Manhattan	17	11	Friday	2
89	2015-01-02 ...	LaGuardia	5	11	Friday	2
90	2015-01-02 ...	JFK	5	11	Friday	2
91	2015-01-02 ...	Manhattan	26	12	Friday	2
92	2015-01-02 ...	JFK	3	12	Friday	2
93	2015-01-02 ...	Manhattan	24	13	Friday	2
94	2015-01-02 ...	JFK	2	13	Friday	2
95	2015-01-02 ...	Manhattan	21	14	Friday	2
96	2015-01-02 ...	LaGuardia	5	14	Friday	2
97	2015-01-02 ...	JFK	7	14	Friday	2
98	2015-01-02 ...	Manhattan	21	15	Friday	2
99	2015-01-02 ...	LaGuardia	8	15	Friday	2
100	2015-01-02 ...	Manhattan	16	17	Friday	2

```
taxitrain = addTimeOfDay(taxitrain)
```

taxitrain = 20974×7 table

...

	PickupTime	Location	TripCount	TimeOfDay	DayOfWeek	DayOfMonth
1	2015-01-01 ...	LaGuardia	2	0	Thursday	1
2	2015-01-01 ...	JFK	2	0	Thursday	1
3	2015-01-01 ...	Manhattan	10	1	Thursday	1
4	2015-01-01 ...	LaGuardia	0	1	Thursday	1
5	2015-01-01 ...	JFK	2	1	Thursday	1
6	2015-01-01 ...	Manhattan	14	2	Thursday	1
7	2015-01-01 ...	LaGuardia	0	2	Thursday	1
8	2015-01-01 ...	JFK	0	2	Thursday	1
9	2015-01-01 ...	Manhattan	9	3	Thursday	1
10	2015-01-01 ...	LaGuardia	0	3	Thursday	1
11	2015-01-01 ...	JFK	0	3	Thursday	1
12	2015-01-01 ...	LaGuardia	1	4	Thursday	1
13	2015-01-01 ...	JFK	0	4	Thursday	1
14	2015-01-01 ...	Manhattan	8	5	Thursday	1
15	2015-01-01 ...	LaGuardia	0	5	Thursday	1
16	2015-01-01 ...	JFK	1	5	Thursday	1
17	2015-01-01 ...	Manhattan	5	6	Thursday	1
18	2015-01-01 ...	JFK	2	6	Thursday	1
19	2015-01-01 ...	Manhattan	2	7	Thursday	1
20	2015-01-01 ...	LaGuardia	0	7	Thursday	1
21	2015-01-01 ...	JFK	2	7	Thursday	1
22	2015-01-01 ...	Manhattan	2	8	Thursday	1
23	2015-01-01 ...	LaGuardia	1	8	Thursday	1
24	2015-01-01 ...	JFK	0	8	Thursday	1
25	2015-01-01 ...	Manhattan	7	9	Thursday	1
26	2015-01-01 ...	LaGuardia	3	9	Thursday	1
27	2015-01-01 ...	Manhattan	15	10	Thursday	1
28	2015-01-01 ...	LaGuardia	4	10	Thursday	1
29	2015-01-01 ...	Manhattan	11	11	Thursday	1
30	2015-01-01 ...	LaGuardia	3	11	Thursday	1
31	2015-01-01 ...	JFK	2	11	Thursday	1

	PickupTime	Location	TripCount	TimeOfDay	DayOfWeek	DayOfMonth
32	2015-01-01 ...	Manhattan	15	12	Thursday	1
33	2015-01-01 ...	LaGuardia	3	12	Thursday	1
34	2015-01-01 ...	JFK	4	12	Thursday	1
35	2015-01-01 ...	Manhattan	18	13	Thursday	1
36	2015-01-01 ...	LaGuardia	8	13	Thursday	1
37	2015-01-01 ...	JFK	4	13	Thursday	1
38	2015-01-01 ...	Manhattan	15	14	Thursday	1
39	2015-01-01 ...	JFK	4	14	Thursday	1
40	2015-01-01 ...	Manhattan	21	15	Thursday	1
41	2015-01-01 ...	LaGuardia	2	15	Thursday	1
42	2015-01-01 ...	JFK	2	15	Thursday	1
43	2015-01-01 ...	Manhattan	16	16	Thursday	1
44	2015-01-01 ...	LaGuardia	7	16	Thursday	1
45	2015-01-01 ...	JFK	5	16	Thursday	1
46	2015-01-01 ...	Manhattan	23	17	Thursday	1
47	2015-01-01 ...	LaGuardia	8	17	Thursday	1
48	2015-01-01 ...	Manhattan	22	18	Thursday	1
49	2015-01-01 ...	LaGuardia	8	18	Thursday	1
50	2015-01-01 ...	JFK	1	19	Thursday	1
51	2015-01-01 ...	Manhattan	23	20	Thursday	1
52	2015-01-01 ...	Manhattan	15	21	Thursday	1
53	2015-01-01 ...	LaGuardia	4	21	Thursday	1
54	2015-01-01 ...	JFK	6	21	Thursday	1
55	2015-01-01 ...	LaGuardia	5	22	Thursday	1
56	2015-01-01 ...	Manhattan	10	23	Thursday	1
57	2015-01-01 ...	LaGuardia	5	23	Thursday	1
58	2015-01-02 ...	Manhattan	7	0	Friday	2
59	2015-01-02 ...	LaGuardia	2	0	Friday	2
60	2015-01-02 ...	Manhattan	2	1	Friday	2
61	2015-01-02 ...	JFK	1	1	Friday	2
62	2015-01-02 ...	Manhattan	2	2	Friday	2
63	2015-01-02 ...	LaGuardia	0	2	Friday	2
64	2015-01-02 ...	JFK	0	2	Friday	2
65	2015-01-02 ...	Manhattan	3	3	Friday	2

	PickupTime	Location	TripCount	TimeOfDay	DayOfWeek	DayOfMonth
66	2015-01-02 ...	LaGuardia	0	3	Friday	2
67	2015-01-02 ...	JFK	0	3	Friday	2
68	2015-01-02 ...	Manhattan	3	4	Friday	2
69	2015-01-02 ...	LaGuardia	0	4	Friday	2
70	2015-01-02 ...	JFK	0	4	Friday	2
71	2015-01-02 ...	Manhattan	2	5	Friday	2
72	2015-01-02 ...	LaGuardia	0	5	Friday	2
73	2015-01-02 ...	JFK	5	5	Friday	2
74	2015-01-02 ...	Manhattan	8	6	Friday	2
75	2015-01-02 ...	LaGuardia	0	6	Friday	2
76	2015-01-02 ...	JFK	6	6	Friday	2
77	2015-01-02 ...	Manhattan	8	7	Friday	2
78	2015-01-02 ...	LaGuardia	0	7	Friday	2
79	2015-01-02 ...	JFK	4	7	Friday	2
80	2015-01-02 ...	Manhattan	13	8	Friday	2
81	2015-01-02 ...	LaGuardia	2	8	Friday	2
82	2015-01-02 ...	JFK	0	8	Friday	2
83	2015-01-02 ...	Manhattan	12	9	Friday	2
84	2015-01-02 ...	LaGuardia	5	9	Friday	2
85	2015-01-02 ...	JFK	0	9	Friday	2
86	2015-01-02 ...	Manhattan	16	10	Friday	2
87	2015-01-02 ...	LaGuardia	2	10	Friday	2
88	2015-01-02 ...	Manhattan	17	11	Friday	2
89	2015-01-02 ...	LaGuardia	5	11	Friday	2
90	2015-01-02 ...	JFK	5	11	Friday	2
91	2015-01-02 ...	Manhattan	26	12	Friday	2
92	2015-01-02 ...	JFK	3	12	Friday	2
93	2015-01-02 ...	Manhattan	24	13	Friday	2
94	2015-01-02 ...	JFK	2	13	Friday	2
95	2015-01-02 ...	Manhattan	21	14	Friday	2
96	2015-01-02 ...	LaGuardia	5	14	Friday	2
97	2015-01-02 ...	JFK	7	14	Friday	2
98	2015-01-02 ...	Manhattan	21	15	Friday	2
99	2015-01-02 ...	LaGuardia	8	15	Friday	2

	PickupTime	Location	TripCount	TimeOfDay	DayOfWeek	DayOfMonth
100	2015-01-02 ...	Manhattan	16	17	Friday	2

⋮

```
taxitrain = addDayOfWeek(taxitrain)
```

taxitrain = 20974×7 table

...

	PickupTime	Location	TripCount	TimeOfDay	DayOfWeek	DayOfMonth
1	2015-01-01 ...	LaGuardia	2	0	Thursday	1
2	2015-01-01 ...	JFK	2	0	Thursday	1
3	2015-01-01 ...	Manhattan	10	1	Thursday	1
4	2015-01-01 ...	LaGuardia	0	1	Thursday	1
5	2015-01-01 ...	JFK	2	1	Thursday	1
6	2015-01-01 ...	Manhattan	14	2	Thursday	1
7	2015-01-01 ...	LaGuardia	0	2	Thursday	1
8	2015-01-01 ...	JFK	0	2	Thursday	1
9	2015-01-01 ...	Manhattan	9	3	Thursday	1
10	2015-01-01 ...	LaGuardia	0	3	Thursday	1
11	2015-01-01 ...	JFK	0	3	Thursday	1
12	2015-01-01 ...	LaGuardia	1	4	Thursday	1
13	2015-01-01 ...	JFK	0	4	Thursday	1
14	2015-01-01 ...	Manhattan	8	5	Thursday	1
15	2015-01-01 ...	LaGuardia	0	5	Thursday	1
16	2015-01-01 ...	JFK	1	5	Thursday	1
17	2015-01-01 ...	Manhattan	5	6	Thursday	1
18	2015-01-01 ...	JFK	2	6	Thursday	1
19	2015-01-01 ...	Manhattan	2	7	Thursday	1
20	2015-01-01 ...	LaGuardia	0	7	Thursday	1
21	2015-01-01 ...	JFK	2	7	Thursday	1
22	2015-01-01 ...	Manhattan	2	8	Thursday	1
23	2015-01-01 ...	LaGuardia	1	8	Thursday	1
24	2015-01-01 ...	JFK	0	8	Thursday	1
25	2015-01-01 ...	Manhattan	7	9	Thursday	1
26	2015-01-01 ...	LaGuardia	3	9	Thursday	1
27	2015-01-01 ...	Manhattan	15	10	Thursday	1
28	2015-01-01 ...	LaGuardia	4	10	Thursday	1

	PickupTime	Location	TripCount	TimeOfDay	DayOfWeek	DayOfMonth
29	2015-01-01 ...	Manhattan	11	11	Thursday	1
30	2015-01-01 ...	LaGuardia	3	11	Thursday	1
31	2015-01-01 ...	JFK	2	11	Thursday	1
32	2015-01-01 ...	Manhattan	15	12	Thursday	1
33	2015-01-01 ...	LaGuardia	3	12	Thursday	1
34	2015-01-01 ...	JFK	4	12	Thursday	1
35	2015-01-01 ...	Manhattan	18	13	Thursday	1
36	2015-01-01 ...	LaGuardia	8	13	Thursday	1
37	2015-01-01 ...	JFK	4	13	Thursday	1
38	2015-01-01 ...	Manhattan	15	14	Thursday	1
39	2015-01-01 ...	JFK	4	14	Thursday	1
40	2015-01-01 ...	Manhattan	21	15	Thursday	1
41	2015-01-01 ...	LaGuardia	2	15	Thursday	1
42	2015-01-01 ...	JFK	2	15	Thursday	1
43	2015-01-01 ...	Manhattan	16	16	Thursday	1
44	2015-01-01 ...	LaGuardia	7	16	Thursday	1
45	2015-01-01 ...	JFK	5	16	Thursday	1
46	2015-01-01 ...	Manhattan	23	17	Thursday	1
47	2015-01-01 ...	LaGuardia	8	17	Thursday	1
48	2015-01-01 ...	Manhattan	22	18	Thursday	1
49	2015-01-01 ...	LaGuardia	8	18	Thursday	1
50	2015-01-01 ...	JFK	1	19	Thursday	1
51	2015-01-01 ...	Manhattan	23	20	Thursday	1
52	2015-01-01 ...	Manhattan	15	21	Thursday	1
53	2015-01-01 ...	LaGuardia	4	21	Thursday	1
54	2015-01-01 ...	JFK	6	21	Thursday	1
55	2015-01-01 ...	LaGuardia	5	22	Thursday	1
56	2015-01-01 ...	Manhattan	10	23	Thursday	1
57	2015-01-01 ...	LaGuardia	5	23	Thursday	1
58	2015-01-02 ...	Manhattan	7	0	Friday	2
59	2015-01-02 ...	LaGuardia	2	0	Friday	2
60	2015-01-02 ...	Manhattan	2	1	Friday	2
61	2015-01-02 ...	JFK	1	1	Friday	2
62	2015-01-02 ...	Manhattan	2	2	Friday	2

	PickupTime	Location	TripCount	TimeOfDay	DayOfWeek	DayOfMonth
63	2015-01-02 ...	LaGuardia	0	2	Friday	2
64	2015-01-02 ...	JFK	0	2	Friday	2
65	2015-01-02 ...	Manhattan	3	3	Friday	2
66	2015-01-02 ...	LaGuardia	0	3	Friday	2
67	2015-01-02 ...	JFK	0	3	Friday	2
68	2015-01-02 ...	Manhattan	3	4	Friday	2
69	2015-01-02 ...	LaGuardia	0	4	Friday	2
70	2015-01-02 ...	JFK	0	4	Friday	2
71	2015-01-02 ...	Manhattan	2	5	Friday	2
72	2015-01-02 ...	LaGuardia	0	5	Friday	2
73	2015-01-02 ...	JFK	5	5	Friday	2
74	2015-01-02 ...	Manhattan	8	6	Friday	2
75	2015-01-02 ...	LaGuardia	0	6	Friday	2
76	2015-01-02 ...	JFK	6	6	Friday	2
77	2015-01-02 ...	Manhattan	8	7	Friday	2
78	2015-01-02 ...	LaGuardia	0	7	Friday	2
79	2015-01-02 ...	JFK	4	7	Friday	2
80	2015-01-02 ...	Manhattan	13	8	Friday	2
81	2015-01-02 ...	LaGuardia	2	8	Friday	2
82	2015-01-02 ...	JFK	0	8	Friday	2
83	2015-01-02 ...	Manhattan	12	9	Friday	2
84	2015-01-02 ...	LaGuardia	5	9	Friday	2
85	2015-01-02 ...	JFK	0	9	Friday	2
86	2015-01-02 ...	Manhattan	16	10	Friday	2
87	2015-01-02 ...	LaGuardia	2	10	Friday	2
88	2015-01-02 ...	Manhattan	17	11	Friday	2
89	2015-01-02 ...	LaGuardia	5	11	Friday	2
90	2015-01-02 ...	JFK	5	11	Friday	2
91	2015-01-02 ...	Manhattan	26	12	Friday	2
92	2015-01-02 ...	JFK	3	12	Friday	2
93	2015-01-02 ...	Manhattan	24	13	Friday	2
94	2015-01-02 ...	JFK	2	13	Friday	2
95	2015-01-02 ...	Manhattan	21	14	Friday	2
96	2015-01-02 ...	LaGuardia	5	14	Friday	2

	PickupTime	Location	TripCount	TimeOfDay	DayOfWeek	DayOfMonth
97	2015-01-02 ...	JFK	7	14	Friday	2
98	2015-01-02 ...	Manhattan	21	15	Friday	2
99	2015-01-02 ...	LaGuardia	8	15	Friday	2
100	2015-01-02 ...	Manhattan	16	17	Friday	2

⋮

Model Training

```
treemodel =fitrtree(taxitrain,"TripCount", ...
    "PredictorNames",["DayOfMonth","TimeOfDay","DayOfWeek","DayOfYear","Location"], ...
    "MinLeafSize",6)
```

```
treemodel =
  RegressionTree
           PredictorNames: {'DayOfMonth'  'TimeOfDay'  'DayOfWeek'  'DayOfYear'  'Location'}
             ResponseName: 'TripCount'
    CategoricalPredictors: [3 5]
        ResponseTransform: 'none'
          NumObservations: 20974


  Properties, Methods
```

```
ypredict = predict(treemodel,taxitrain)
```

```
ypredict = 20974×1
    4.0000
    4.4286
    9.3750
    0.6250
    2.4000
    7.3333
    0.0099
    0.2105
    5.7500
    0.0099
      ⋮
```

```
yActual = taxitrain.TripCount
```

```
yActual = 20974×1
     2
     2
    10
     0
     2
    14
     0
     0
     9
     0
     ⋮
```

Model Testing and Evaluation

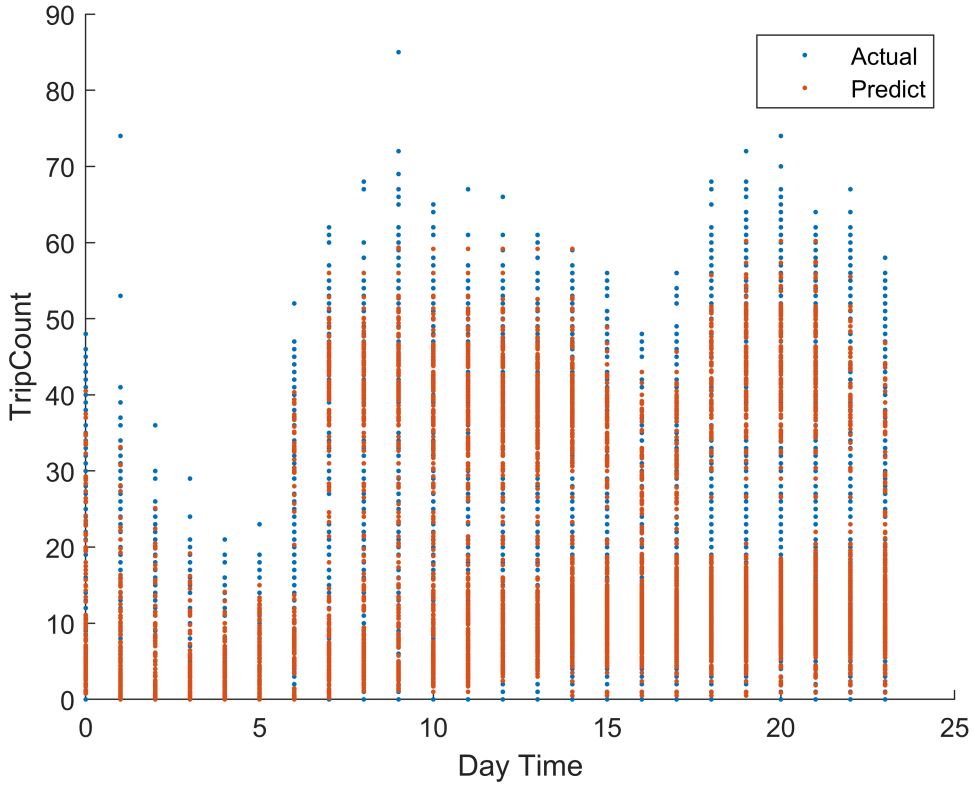
```
residual = yActual - ypredict
```

```
residual = 20974×1
   -2.0000
   -2.4286
    0.6250
   -0.6250
   -0.4000
    6.6667
   -0.0099
   -0.2105
    3.2500
   -0.0099
      ⋮
      ⋮
```

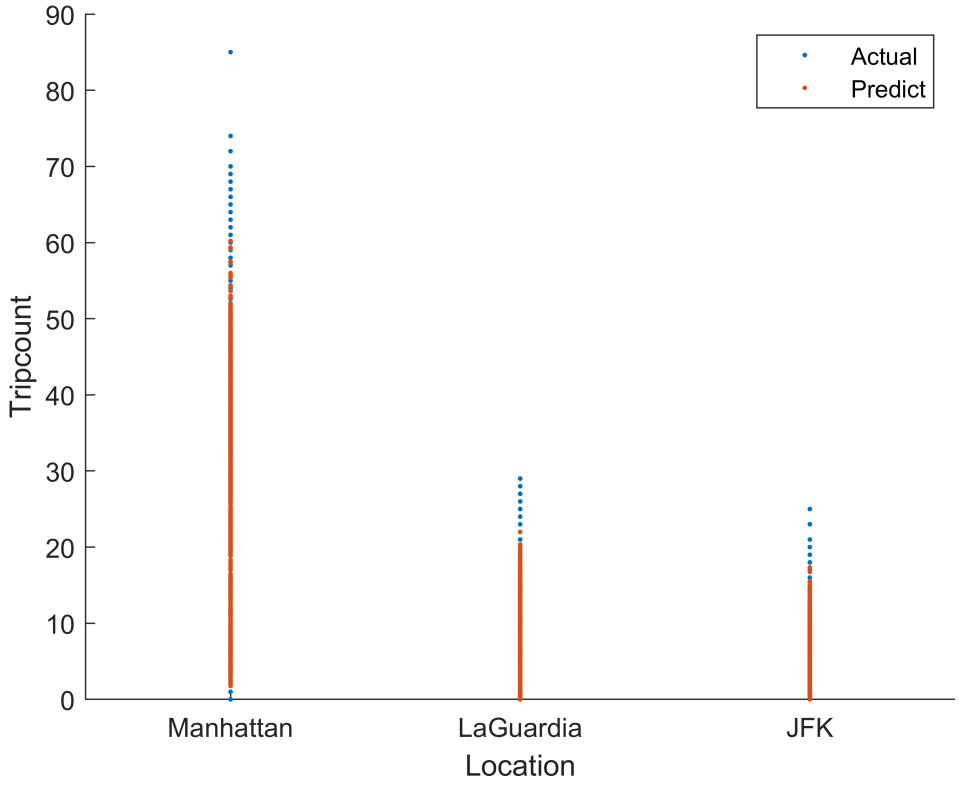
```
rmse = sqrt(mean(residual.^2))
```

```
rmse = 3.7618
```

```
scatter(taxitrain.TimeOfDay,yActual,'.' )
hold on
scatter(taxitrain.TimeOfDay,ypredict,'.')
hold off
xlabel("Day Time")
ylabel("TripCount")
legend("Actual","Predict")
```




```
scatter(taxitrain.Location,yActual,'.' )
hold on
scatter(taxitrain.Location,ypredict,'.')
hold off
xlabel("Location")
ylabel("Tripcount")
legend("Actual","Predict")
```



From the predicted result of tripcount with having the low RMSE than 4.9 and looking somewhere equal to original data of 2015. we can say that this model is sutaible for estimating the pickup location of 2016

```
taxiPickups2016 = table;
taxiPickups2016.PickupTime = taxiPickups.PickupTime + years(1);
taxiPickups2016.Location = taxiPickups.Location;
taxiPickups2016 = providedPreprocessing(taxiPickups2016);
% Display only the first 8 rows of the table
head(taxiPickups2016)
```

ans = 8×6 table

	PickupTime	Location	TimeOfDay	DayOfWeek	DayOfMonth	DayOfYear
1	2016-01-01 ...	Manhattan	5.8200	Friday	1	1
2	2016-01-01 ...	LaGuardia	5.8200	Friday	1	1
3	2016-01-01 ...	JFK	5.8200	Friday	1	1
4	2016-01-01 ...	Manhattan	6.8200	Friday	1	1
5	2016-01-01 ...	LaGuardia	6.8200	Friday	1	1
6	2016-01-01 ...	JFK	6.8200	Friday	1	1
7	2016-01-01 ...	Manhattan	7.8200	Friday	1	1
8	2016-01-01 ...	LaGuardia	7.8200	Friday	1	1

From the below command we can estimated the maximum pickups points from three given locations for a particular selected day of 2016.

```
myDay = datetime("2016-03-6")
```

```
myDay = datetime
   06-Mar-2016
```

```
taxiPickupsMyDay = taxiPickups2016(day(taxiPickups2016.PickupTime,"dayofyear") ...
    == day(myDay,"dayofyear"),:)
```

taxiPickupsMyDay = 72×6 table

	PickupTime	Location	TimeOfDay	DayOfWeek	DayOfMonth	DayOfYear
1	2016-03-06 ...	Manhattan	0.8200	Sunday	6	66
2	2016-03-06 ...	LaGuardia	0.8200	Sunday	6	66
3	2016-03-06 ...	JFK	0.8200	Sunday	6	66
4	2016-03-06 ...	Manhattan	1.8200	Sunday	6	66
5	2016-03-06 ...	LaGuardia	1.8200	Sunday	6	66
6	2016-03-06 ...	JFK	1.8200	Sunday	6	66
7	2016-03-06 ...	Manhattan	2.8200	Sunday	6	66
8	2016-03-06 ...	LaGuardia	2.8200	Sunday	6	66
9	2016-03-06 ...	JFK	2.8200	Sunday	6	66
10	2016-03-06 ...	Manhattan	3.8200	Sunday	6	66
11	2016-03-06 ...	LaGuardia	3.8200	Sunday	6	66
12	2016-03-06 ...	JFK	3.8200	Sunday	6	66
13	2016-03-06 ...	Manhattan	4.8200	Sunday	6	66
14	2016-03-06 ...	LaGuardia	4.8200	Sunday	6	66
15	2016-03-06 ...	JFK	4.8200	Sunday	6	66
16	2016-03-06 ...	Manhattan	5.8200	Sunday	6	66
17	2016-03-06 ...	LaGuardia	5.8200	Sunday	6	66
18	2016-03-06 ...	JFK	5.8200	Sunday	6	66
19	2016-03-06 ...	Manhattan	6.8200	Sunday	6	66
20	2016-03-06 ...	LaGuardia	6.8200	Sunday	6	66
21	2016-03-06 ...	JFK	6.8200	Sunday	6	66
22	2016-03-06 ...	Manhattan	7.8200	Sunday	6	66
23	2016-03-06 ...	LaGuardia	7.8200	Sunday	6	66
24	2016-03-06 ...	JFK	7.8200	Sunday	6	66
25	2016-03-06 ...	Manhattan	8.8200	Sunday	6	66

	PickupTime	Location	TimeOfDay	DayOfWeek	DayOfMonth	DayOfYear
26	2016-03-06 ...	LaGuardia	8.8200	Sunday	6	66
27	2016-03-06 ...	JFK	8.8200	Sunday	6	66
28	2016-03-06 ...	Manhattan	9.8200	Sunday	6	66
29	2016-03-06 ...	LaGuardia	9.8200	Sunday	6	66
30	2016-03-06 ...	JFK	9.8200	Sunday	6	66
31	2016-03-06 ...	Manhattan	10.8200	Sunday	6	66
32	2016-03-06 ...	LaGuardia	10.8200	Sunday	6	66
33	2016-03-06 ...	JFK	10.8200	Sunday	6	66
34	2016-03-06 ...	Manhattan	11.8200	Sunday	6	66
35	2016-03-06 ...	LaGuardia	11.8200	Sunday	6	66
36	2016-03-06 ...	JFK	11.8200	Sunday	6	66
37	2016-03-06 ...	Manhattan	12.8200	Sunday	6	66
38	2016-03-06 ...	LaGuardia	12.8200	Sunday	6	66
39	2016-03-06 ...	JFK	12.8200	Sunday	6	66
40	2016-03-06 ...	Manhattan	13.8200	Sunday	6	66
41	2016-03-06 ...	LaGuardia	13.8200	Sunday	6	66
42	2016-03-06 ...	JFK	13.8200	Sunday	6	66
43	2016-03-06 ...	Manhattan	14.8200	Sunday	6	66
44	2016-03-06 ...	LaGuardia	14.8200	Sunday	6	66
45	2016-03-06 ...	JFK	14.8200	Sunday	6	66
46	2016-03-06 ...	Manhattan	15.8200	Sunday	6	66
47	2016-03-06 ...	LaGuardia	15.8200	Sunday	6	66
48	2016-03-06 ...	JFK	15.8200	Sunday	6	66
49	2016-03-06 ...	Manhattan	16.8200	Sunday	6	66
50	2016-03-06 ...	LaGuardia	16.8200	Sunday	6	66
51	2016-03-06 ...	JFK	16.8200	Sunday	6	66
52	2016-03-06 ...	Manhattan	17.8200	Sunday	6	66
53	2016-03-06 ...	LaGuardia	17.8200	Sunday	6	66
54	2016-03-06 ...	JFK	17.8200	Sunday	6	66
55	2016-03-06 ...	Manhattan	18.8200	Sunday	6	66
56	2016-03-06 ...	LaGuardia	18.8200	Sunday	6	66
57	2016-03-06 ...	JFK	18.8200	Sunday	6	66
58	2016-03-06 ...	Manhattan	19.8200	Sunday	6	66
59	2016-03-06 ...	LaGuardia	19.8200	Sunday	6	66

	PickupTime	Location	TimeOfDay	DayOfWeek	DayOfMonth	DayOfYear
60	2016-03-06 ...	JFK	19.8200	Sunday	6	66
61	2016-03-06 ...	Manhattan	20.8200	Sunday	6	66
62	2016-03-06 ...	LaGuardia	20.8200	Sunday	6	66
63	2016-03-06 ...	JFK	20.8200	Sunday	6	66
64	2016-03-06 ...	Manhattan	21.8200	Sunday	6	66
65	2016-03-06 ...	LaGuardia	21.8200	Sunday	6	66
66	2016-03-06 ...	JFK	21.8200	Sunday	6	66
67	2016-03-06 ...	Manhattan	22.8200	Sunday	6	66
68	2016-03-06 ...	LaGuardia	22.8200	Sunday	6	66
69	2016-03-06 ...	JFK	22.8200	Sunday	6	66
70	2016-03-06 ...	Manhattan	23.8200	Sunday	6	66
71	2016-03-06 ...	LaGuardia	23.8200	Sunday	6	66
72	2016-03-06 ...	JFK	23.8200	Sunday	6	66