

# Turn On The Lights Group

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IST 718 | Big Data Analytics

Final Project







# Introduction

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# Introduction (Cont.)

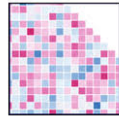




Introduction (Cont.)



PROPHET



Seaborn

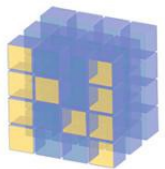
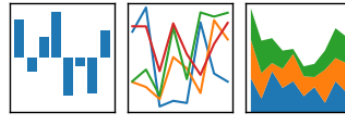
matplotlib

statsmodels

bokkeh

pandas

$$y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$$



NumPy

Libraries

Leaflet



# Obtain

[REDACTED]													
Property Area: 309,250 Sq. Ft.													
Single Property Report													
Electric Power (USD) (kWh)													
Cost Data				Building Data				Energy Data					
Month	Billed Cost	Budget Cost	% Cost Diff	Cost/Usage	Cost/Area Gross	Occupancy %	Tenant Billback	Cost/Area Net	Usage/Area	Demand	Billed Usage	Budget Usage	% Usage Diff
1/2013	\$47,140	\$43,670	-8%	\$0.12	\$0.15	42%			1,236	1,006	382,082	375,061	-2%
2/2013	\$55,159	\$42,144	-31%	\$0.12	\$0.18	54%			1,465	1,182	453,005	362,072	-25%
3/2013	\$50,990	\$30,031	-70%	\$0.12	\$0.17	87%			1,341	1,254	414,699	251,061	-65%
4/2013	\$39,846	\$31,317	-27%	\$0.12	\$0.13	87%			1,056	907	326,701	262,845	-24%
5/2013	\$53,767	\$35,572	-51%	\$0.15	\$0.17	87%			1,131	1,212	349,617	301,845	-16%
6/2013	\$63,082	\$61,286	-3%	\$0.17	\$0.20	87%			1,189	1,310	367,596	393,021	6%
7/2013	\$69,765	\$66,711	-5%	\$0.17	\$0.23	87%			1,327	1,416	410,400	429,058	4%
8/2013	\$65,004	\$57,277	-13%	\$0.17	\$0.21	83%			1,271	1,203	392,998	364,183	-8%
9/2013	\$52,731	\$70,102	25%	\$0.14	\$0.17	88%			1,204	1,333	372,441	462,515	19%
10/2013	\$52,243	\$45,850	-14%	\$0.14	\$0.17	88%			1,213	1,094	375,013	377,843	1%
11/2013	\$65,074	\$49,443	-32%	\$0.14	\$0.21	88%			1,512	1,242	467,696	409,337	-14%
12/2013	\$71,759	\$52,793	-36%	\$0.14	\$0.23	88%			1,675	1,382	517,889	438,703	-18%

[REDACTED]													
Property Area: 1,118,146 Sq. Ft.													
Single Property Report													
Electric Power (USD) (kWh)													
Cost Data				Building Data				Energy Data					
Month	Billed Cost	Budget Cost	% Cost Diff	Cost/Usage	Cost/Area Gross	Occupancy %	Tenant Billback	Cost/Area Net	Usage/Area	Demand	Billed Usage	Budget Usage	% Usage Diff
1/2013	\$151,061	\$149,647	-1%	\$0.07	\$0.14	100%			1,869	4,149	2,090,286	2,029,156	-3%
2/2013	\$138,663	\$137,028	-1%	\$0.08	\$0.12	100%			1,625	4,649	1,817,538	1,822,404	0%
3/2013	\$137,218	\$125,122	-10%	\$0.08	\$0.12	100%			1,594	4,738	1,782,014	1,567,048	-14%
4/2013	\$115,162	\$111,917	-3%	\$0.08	\$0.10	100%			1,279	4,506	1,429,617	1,354,892	-6%
5/2013	\$101,712	\$94,377	-8%	\$0.08	\$0.09	100%			1,135	3,688	1,269,579	1,092,007	-16%
6/2013	\$105,955	\$125,081	15%	\$0.08	\$0.10	100%			1,188	3,724	1,328,594	1,585,081	16%
7/2013	\$110,053	\$137,899	20%	\$0.08	\$0.10	100%			1,216	4,476	1,359,366	1,784,192	24%
8/2013	\$120,507	\$137,104	12%	\$0.08	\$0.11	100%			1,412	3,635	1,579,381	1,802,964	12%
9/2013	\$105,723	\$123,797	15%	\$0.08	\$0.10	100%			1,184	3,837	1,324,162	1,576,960	16%
10/2013	\$89,468	\$102,745	13%	\$0.08	\$0.08	100%			0,985	3,230	1,101,715	1,274,049	14%
11/2013	\$89,183	\$89,411	0%	\$0.08	\$0.08	100%			0,975	3,697	1,090,109	1,077,016	-1%
12/2013	\$152,712	\$125,230	-22%	\$0.07	\$0.14	100%			1,851	5,006	2,069,797	1,674,516	-24%
1/2014	\$207,636	\$163,983	-27%	\$0.08	\$0.19				2,328	5,832	2,602,518	2,090,286	-25%

[REDACTED]													
Property Area: 54,235 Sq. Ft.													
Single Property Report													
Electric Power (USD) (kWh)													
Cost Data				Building Data				Energy Data					
Month	Billed Cost	Budget Cost	% Cost Diff	Cost/Usage	Cost/Area Gross	Occupancy %	Tenant Billback	Cost/Area Net	Usage/Area	Demand	Billed Usage	Budget Usage	% Usage Diff
7/2012													
8/2012													
9/2012													
10/2012													
11/2012	\$1,923				\$0.25	\$0.04			0.144	264	7,800		
12/2012	\$2,172				\$0.32	\$0.04			0.127	387	6,900		
1/2013	\$1,236				\$0.15	\$0.02	61%		0.155	0	8,400		
2/2013	\$17,078				\$0.12	\$0.32	61%		2.655	408	144,000		
3/2013	\$8,505				\$0.12	\$0.16	61%		1.278	0	69,300		
4/2013	\$8,015				\$0.13	\$0.15	61%		1.123	0	60,900		
5/2013	\$7,632				\$0.11	\$0.14	61%		1.311	0	71,100		

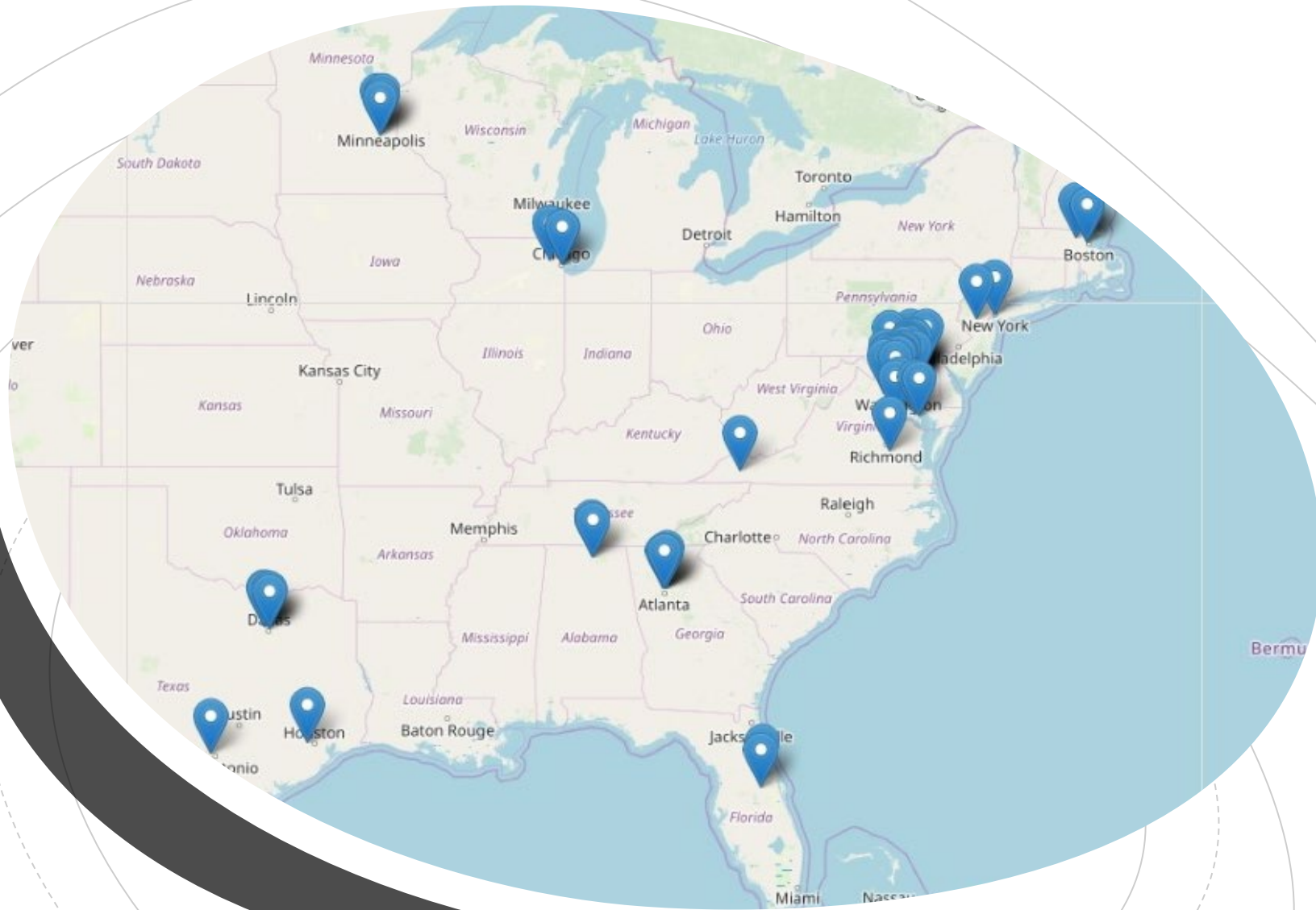
[REDACTED]													
Property Area: 57,872 Sq. Ft.													
Single Property Report													
Electric Power (USD) (kWh)													
Cost Data				Building Data				Energy Data					
Month	Billed Cost	Budget Cost	% Cost Diff	Cost/Usage	Cost/Area Gross	Occupancy %	Tenant Billback	Cost/Area Net	Usage/Area	Demand	Billed Usage	Budget Usage	% Usage Diff
7/2012													
8/2012													
9/2012													
10/2012													
11/2012	\$9,963				\$0.13	\$0.17			1.362	120	78,824		
12/2012	\$11,305				\$0.13	\$0.20			1.524	222	88,195		
1/2013	\$13,426				\$0.13	\$0.23	57%		1.792	268	103,692		
2/2013	\$13,571				\$0.12	\$0.24	57%		1.922	248	111,254		
3/2013	\$12,498				\$0.12	\$0.22	59%		1.758	213	101,766		
4/2013	\$10,674				\$0.12	\$0.18	59%		1.506	209	87,158		
5/2013	\$13,439				\$0.12	\$0.23	59%		1.919	172	111,071		
6/2013	\$10,881				\$0.12	\$0.19	59%		1.547	196	89,521		



# DATA CLEANING

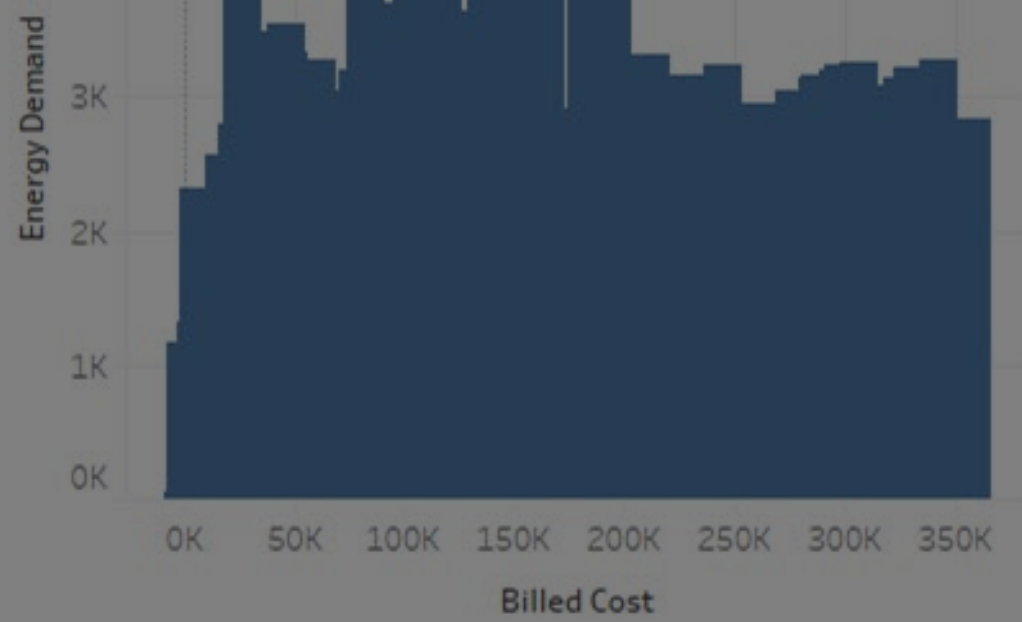
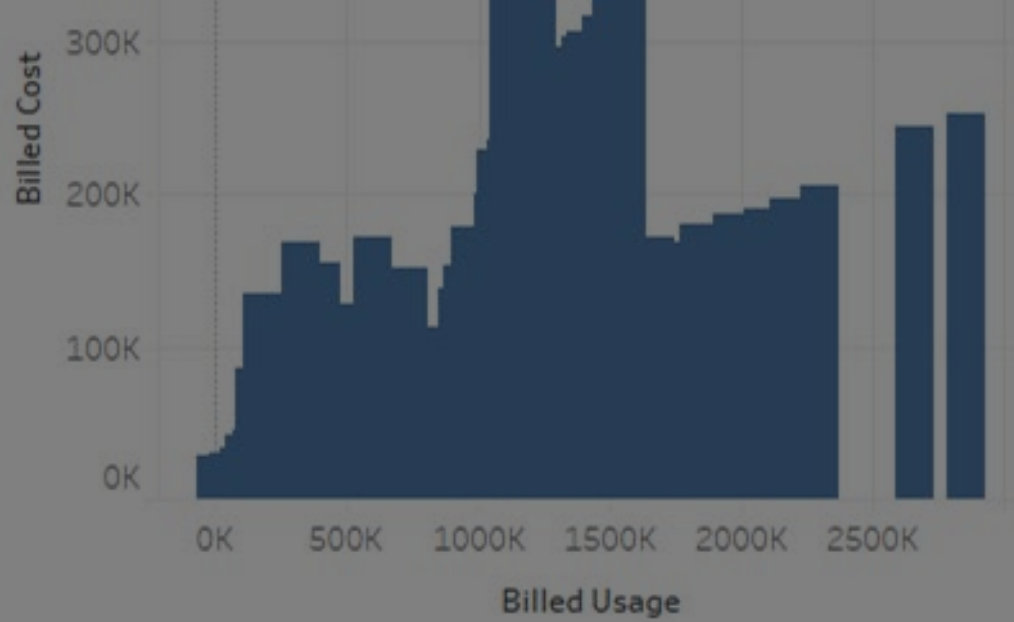
Scrub





Examine





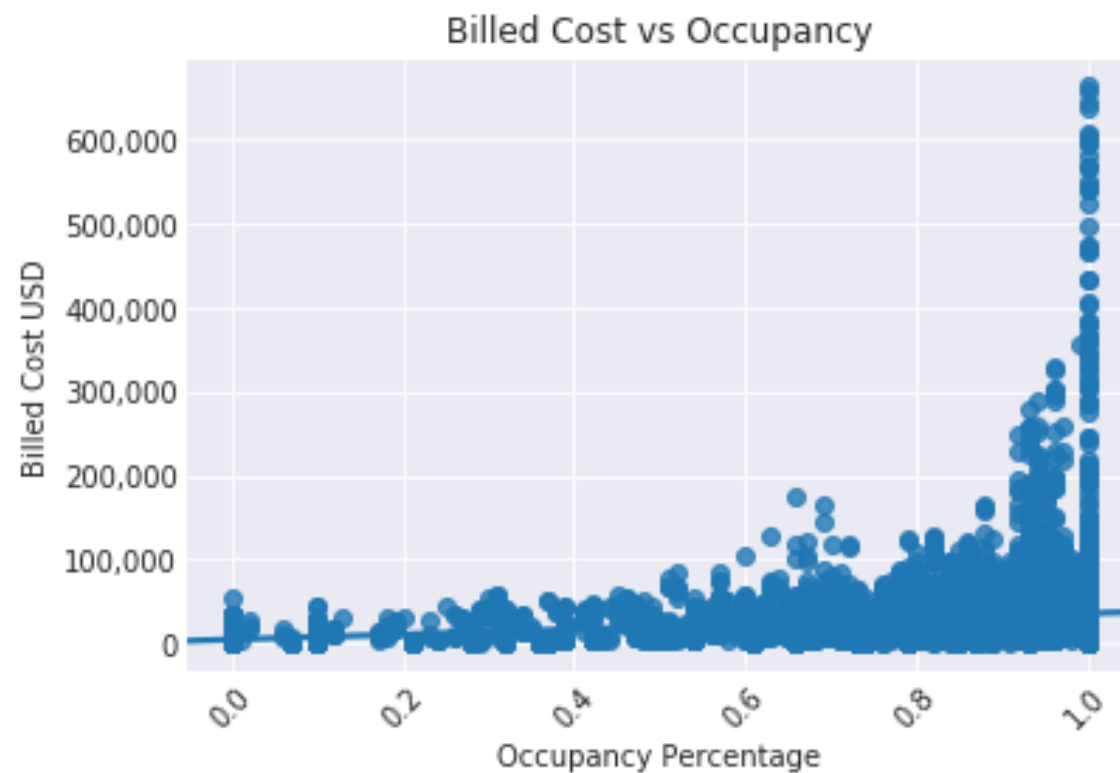
Demand by Month & Area



Demand by Month & Occupancy



Examine



# I - Regression

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## Interpret: Regression Results

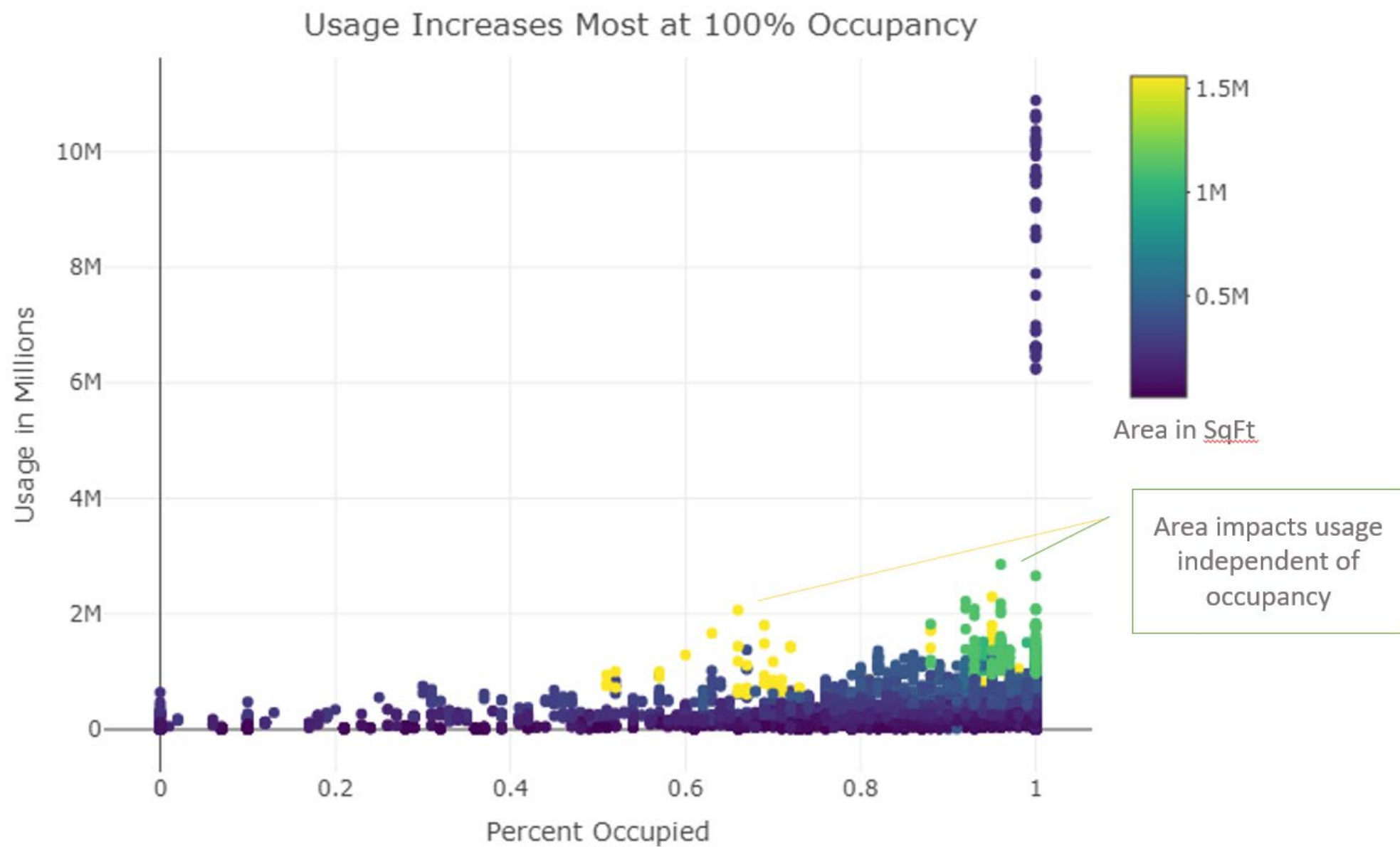
```

1      OLS Regression Results
2      =====
3      Dep. Variable:          BilledCost    R-squared:                0.949
4      Model:                  OLS          Adj. R-squared:         0.949
5      Method:                 Least Squares  F-statistic:              2.183e+04
6      Date:                   Sun, 01 Dec 2019  Prob (F-statistic):      0.00
7      Time:                   15:48:32      Log-Likelihood:          -49970.
8      No. Observations:       4726          AIC:                     9.995e+04
9      Df Residuals:           4721          BIC:                     9.998e+04
10     Df Model:                4
11     Covariance Type:        nonrobust
12     =====
13           coef      std err          t      P>|t|      [0.025      0.975]
14     -----
15     Intercept    -747.4694     515.681     -1.449     0.147    -1758.444     263.506
16     Occ          3392.4267     576.342      5.886     0.000     2262.528     4522.325
17     Energy        14.0526       0.648     21.692     0.000      12.783      15.323
18     Area           0.0294       0.002     16.782     0.000       0.026       0.033
19     BilledUsage    0.0345       0.001     35.612     0.000       0.033       0.036
20     =====
21     Omnibus:                1678.400    Durbin-Watson:           0.585
22     Prob(Omnibus):          0.000    Jarque-Bera (JB):        67917.230
23     Skew:                   0.989    Prob(JB):                 0.00
24     Kurtosis:               21.466    Cond. No.                 4.13e+06
25     =====
26
27     Warnings:
28     [1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
29     [2] The condition number is large, 4.13e+06. This might indicate that there are
30     strong multicollinearity or other numerical problems.
31
32     Proportion of Training Set Variance Accounted for:  0.949
33
34     Proportion of Test Set Variance Accounted for:  0.943

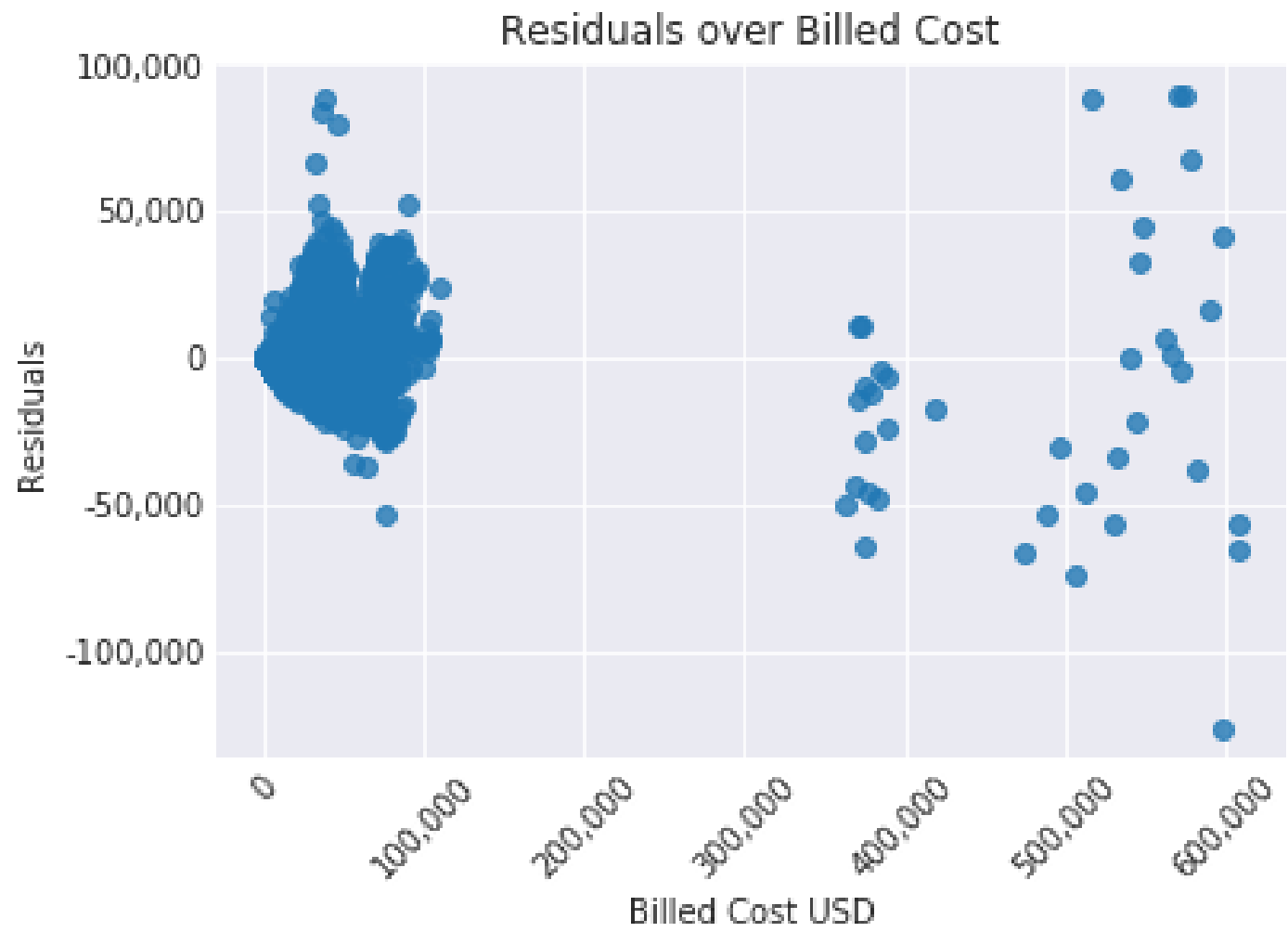
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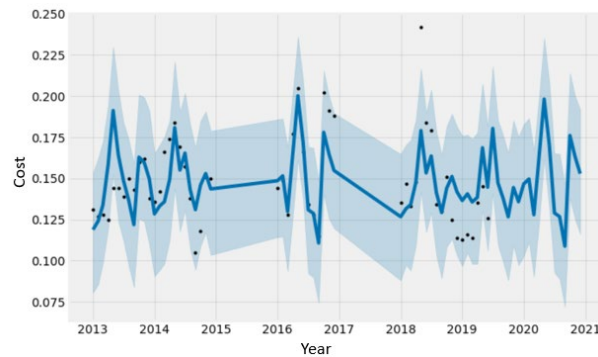
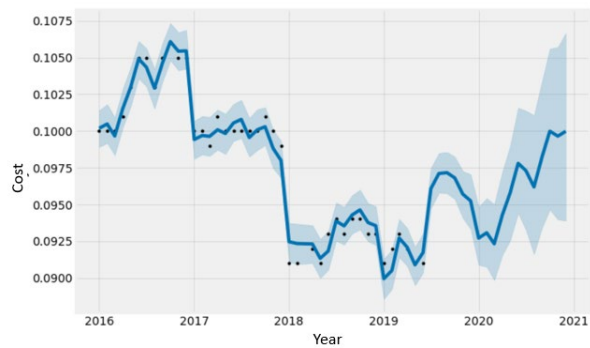
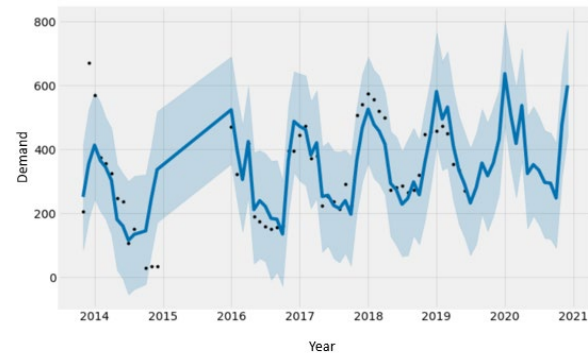
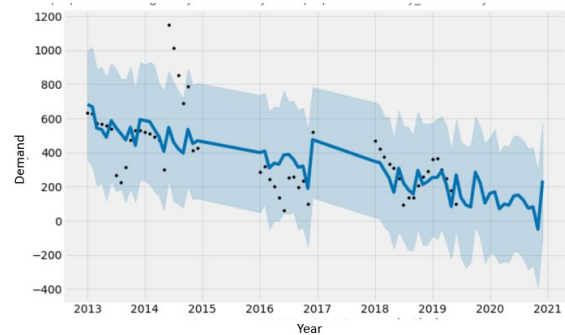


Interpret



Interpret:  
Heteroskedasticity





# Interpret-Prophet

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# Interpret: Prophet Dashboard

