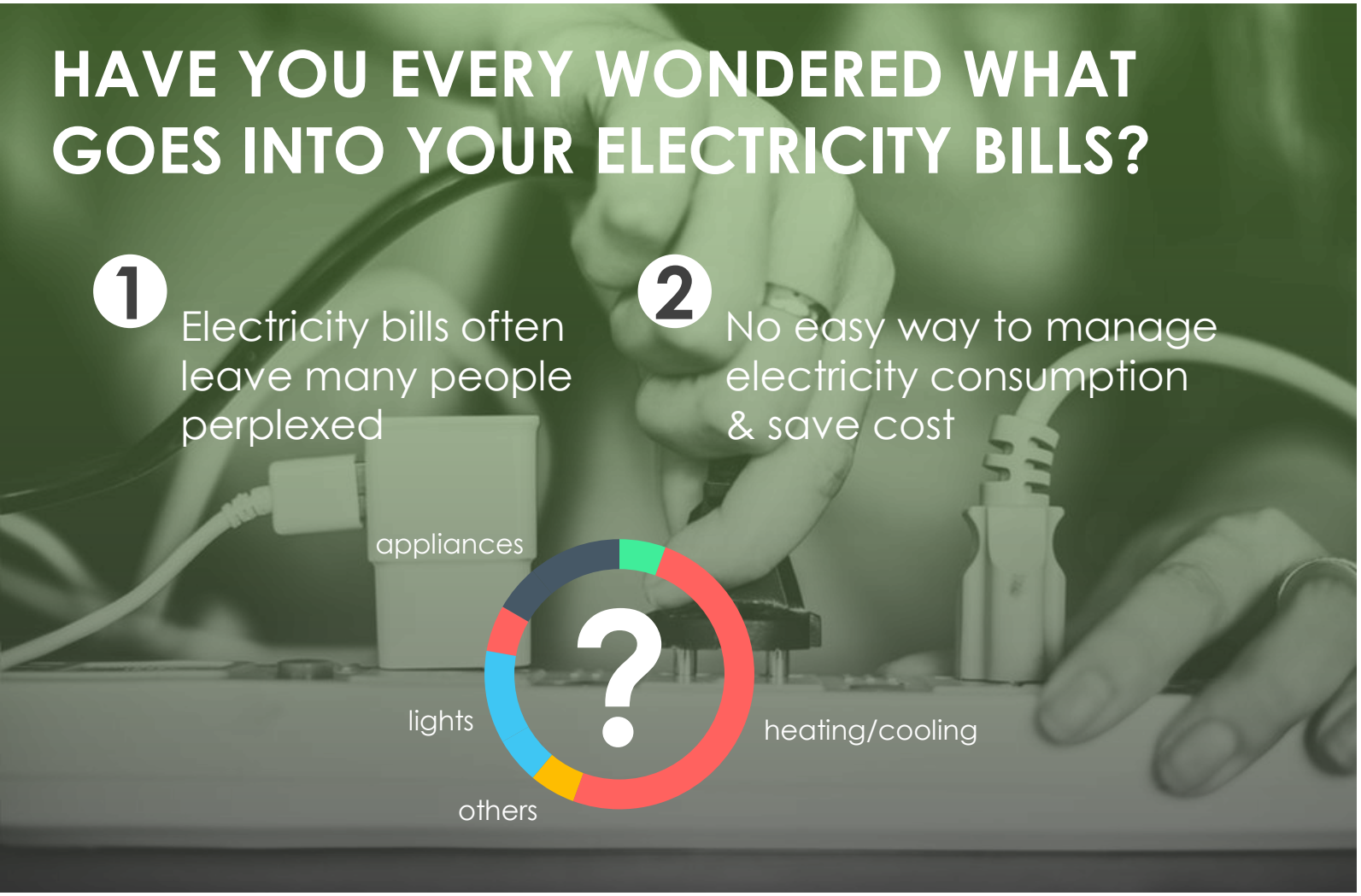

energAIze
12.07.2018

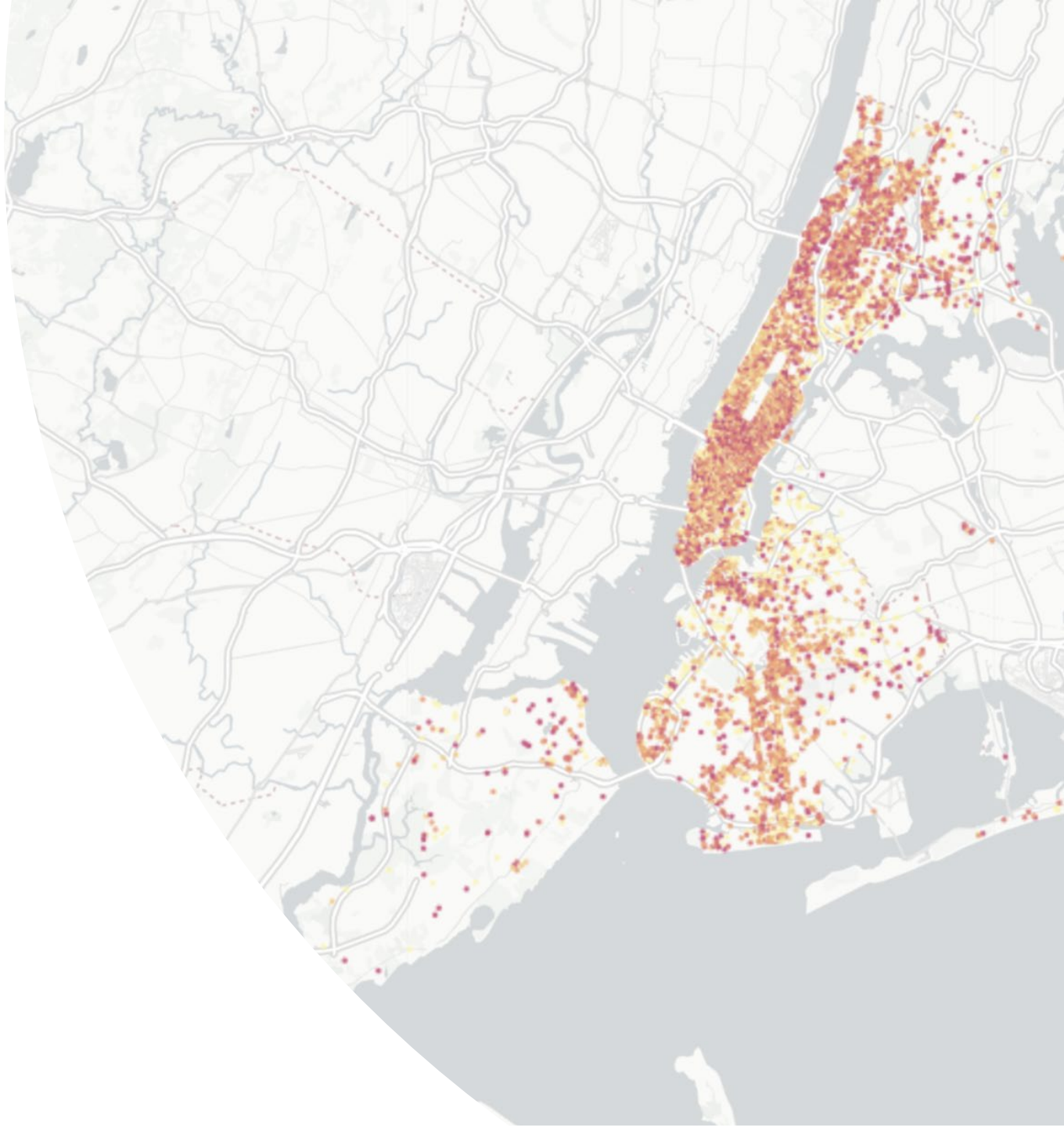
PROBLEM: DEMYSTIFYING THE ENERGY USAGE



and on a larger scale…

- Energy usage per person around the world has been **on the rise**
- Buildings contribute **over 30% to 70%** of total energy use
- Buildings are a **key contributor** to greenhouse gas emissions
- Occupancy behaviour one of the **most difficult** parameters to predict & manage

INVESTIGATING THE PROBLEM



DATA WRANGLING AND CLEANING

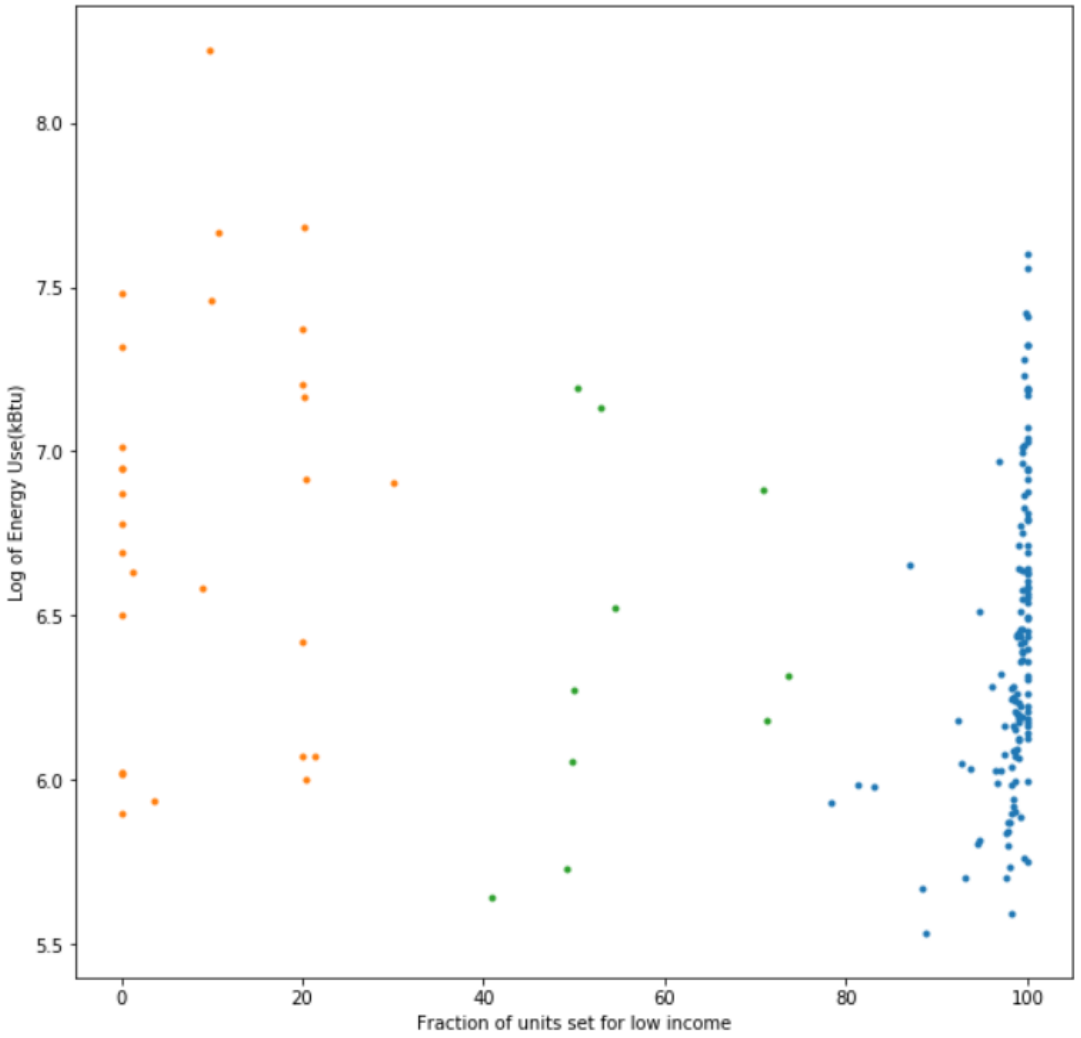
Data Sources

- Energy and Water Data Disclosure for Local Law 84 2017 (Data for Calendar Year 2016)
- NYC PLUTO
- Housing New York Units by Building

- Couldn't get granular data
- Worked at BBL level

	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	BBL	ZipCode	YearAlter1	YearAlter2	YearBuilt	UnitsRes	NumFloors	NumBldgs	BldgArea	OfficeArea	ResArea	RetailArea	GarageAre	Electricity Use - Grid Purchase (kBtu)	Water Use	Latitude	Longitude	Site EUI (kBtu/ftÂ²)	Total GHG	Year Built	Age
2	1E+09	10004	0	0	1900	0	0	159	2725731	0	0	0	0								
3	1E+09	10004	0	0	1900	0	0	11	541886	0	0	0	0								
4	1E+09	10004	0	0	1900	0	0	13	603130	0	0	0	0								
5	1E+09	10004	0	0	0	0	0	0	0	0	0	0	0								
6	1E+09	10004	0	0	0	0	0	0	0	0	0	0	0								
7	1E+09	10004	2006	2006	1908	0	5	2	280000	0	0	0	0								
8	1E+09	10004	2001	0	1900	0	5	1	158197	0	0	0	0								
9	1E+09	10004	0	0	1900	0	1	0	7500	0	0	0	0								
10	1E+09	10004	0	0	1987	0	2	1	24346	0	0	0	0								
11	1E+09	10004	0	0	1951	0	1	6	945425	0	0	0	0								
12	1E+09	10004	0	0	0	0	0	0	0	0	0	0	0								
13	1E+09	10004	0	0	0	0	0	3	0	0	0	0	0								
14	1E+09	10004	0	0	0	0	0	0	0	0	0	0	0								
15	1E+09	10004	0	0	1960	0	3	2	123800	123800	0	0	0								
16	1E+09	10004	0	0	1969	0	50	1	1888126	1848626	0	39500	0	116307222.2	49920.3	40.70244	-74.0127	104.8	19319.9	1970	48
17	1E+09	10004	2013	0	1969	0	22	1	1016406	1016406	0	0	0	60067921.6		40.70249	-74.0114	69.1	6614.7	1969	49
18	1E+09	10004	0	0	1970	0	40	1	559271	559271	0	0	0	62199391.9	30656.2	40.70211	-74.0112	124.3		1970	48
19	1E+09	10004	0	0	0	0	0	0	0	0	0	0	0								
20	1E+09	10004	0	0	1900	0	4.5	1	3632	0	0	3632	0								
21	1E+09	10004	0	0	1920	0	4.5	1	4104	1026	0	3078	0								
22	1E+09	10004	0	0	1900	0	5	1	4800	0	0	1600	0								
23	1E+09	10004	0	0	1900	0	5	1	6045	0	0	2016	0								
24	1E+09	10004	0	0	1935	0	5	1	7475	1495	2990	2990	0								
25	1E+09	10004	0	0	1900	0	3	1	6120	0	0	2180	0								
26	1E+09	10004	0	0	1900	0	4	1	8119	0	0	2351	0								
27	1E+09	10004	0	0	1900	0	5.5	1	9240	0	0	3770	0								
28	1E+09	10004	0	0	1900	3	5	1	7485	1491	4473	1521	0								
29	1E+09	10004	0	0	1880	42	6	1	44097	0	32843	7200	0								
30	1E+09	10004	1996	0	1920	1	4.5	1	14894	0	9807	5087	0								
31	1E+09	10004	2009	2009	1950	0	7.5	1	46724	0	0	0	0								
32	1E+09	10004	0	0	0	0	0	1	0	0	0	0	0								
33	1E+09	10004	2015	0	2015	0	29	1	102407	0	0	0	0								
34	1E+09	10004	2007	2007	1985	97	19	1	169061	0	126420	42641	0	7660120		40.70304	-74.013	124	1652.4	1985	33
35	1E+09	10004	1979	2002	1970	0	34	1	692431	655773	0	5089	0	41724669.2	11992.8	40.70303	-74.013	67.3	4911.4	1969	49
36	1E+09	10004	1965	0	1954	0	4.5	1	8685	0	0	0	0								
37	1E+09	10004	1985	0	1987	0	42	1	544015	542515	0	0	0	33190336.7		40.7028	-74.0142	76	3781.9	1987	31
38	1E+09	10004	0	0	1971	0	35	1	896956	864078	0	2878	30000	43986845.5	10430.1	40.70353	-74.0144	108.6	7358.5	1969	49
39	1E+09	10004	2015	0	1963	0	2	1	26013	8671	0	17342	0								
40	1E+09	10004	2003	2004	1986	0	30	1	365792	365792	0	0	0	35675166.6		40.70331	-74.013	101.1	3662.4	1986	32
41	1E+09	10004	1982	0	1921	0	7	1	14829	10829	0	4000	0								
42	1E+09	10004	1988	0	1930	0	24	1	336025	317613	0	18412	0	14306197.6	4121.4	40.70395	-74.0116	60.1	1717.7	1931	87
43	1E+09	10004	1979	0	1910	0	5	1	7403	0	0	4491	0								

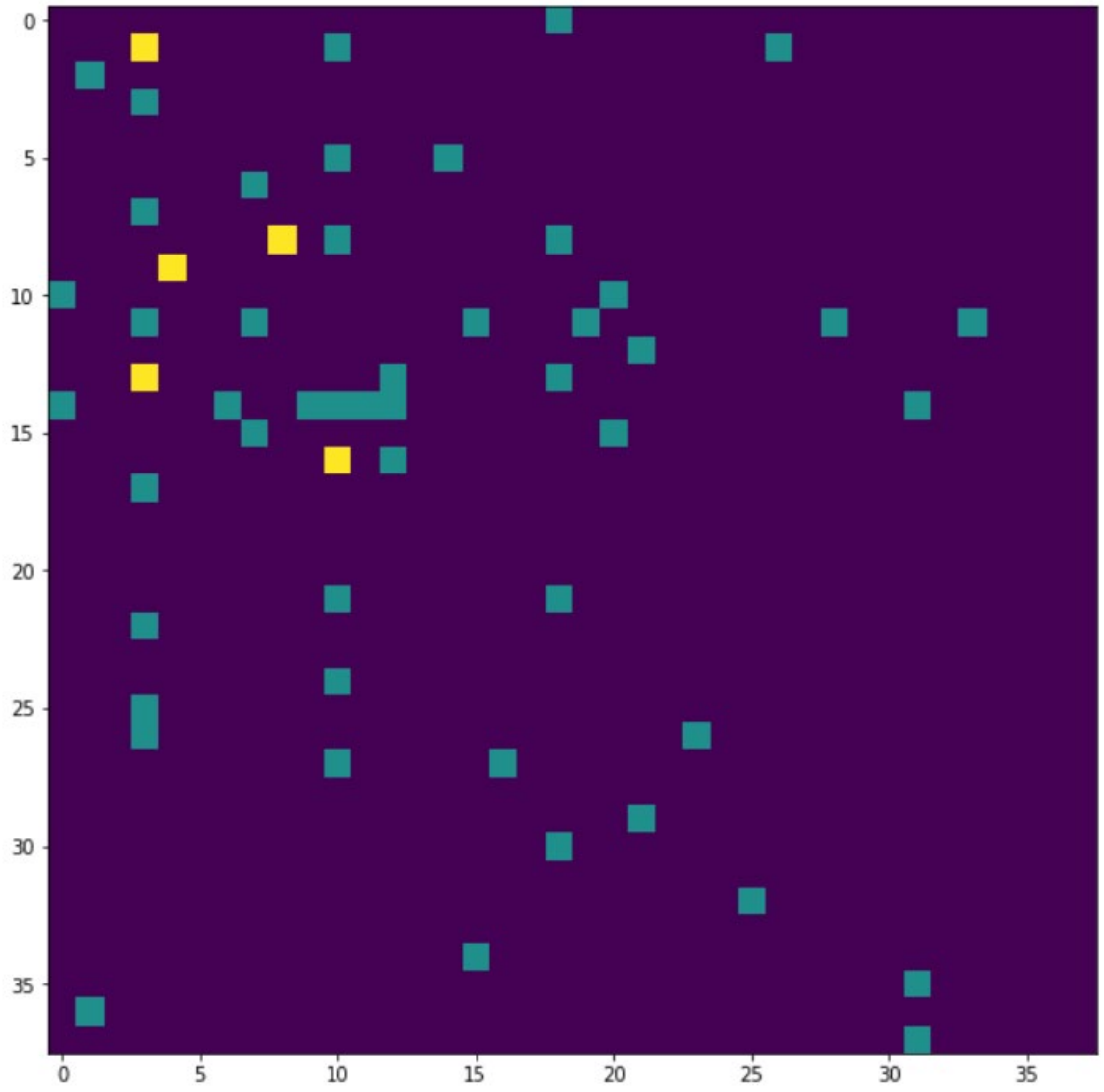
ANALYSIS



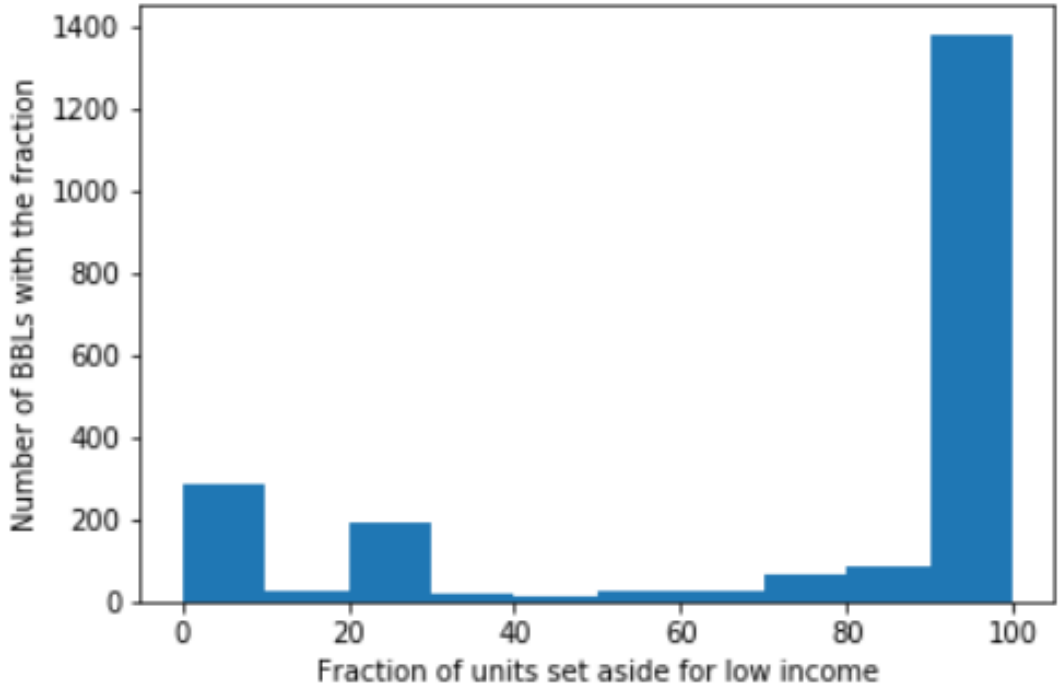
Random forest score

0.050847457627118647
Input features Age, BBL and fraction group

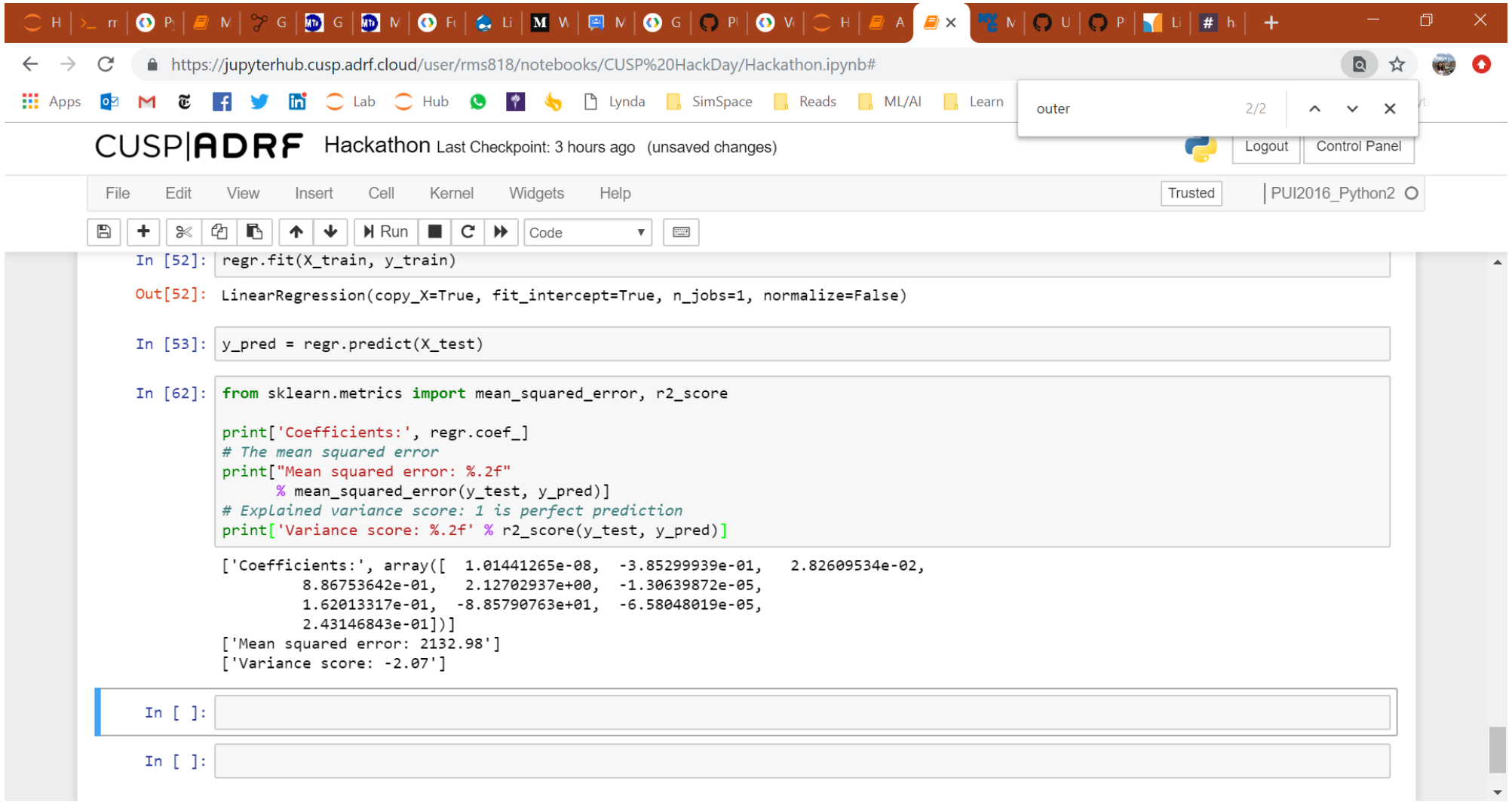
ANALYSIS



Confusion Matrix



ANALYSIS

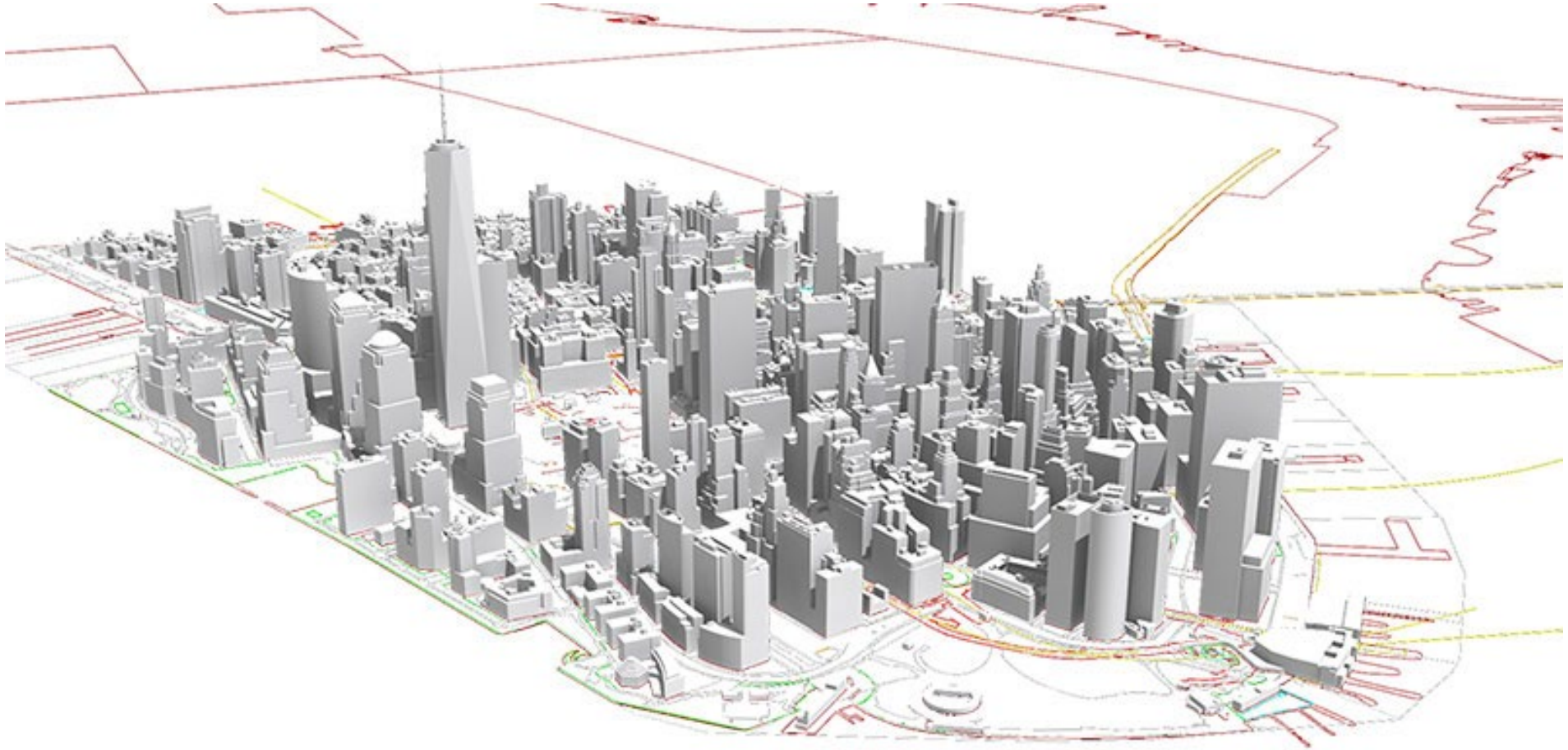

https://jupyterhub.cusp.adrf.cloud/user/rms818/notebooks/CUSP%20HackDay/Hackathon.ipynb#
Apps
Lab
Hub
Lynda
SimSpace
Reads
ML/AI
Learn
outer
2/2
CUSP|ADRF
Hackathon
Last Checkpoint: 3 hours ago
(unsaved changes)
Logout
Control Panel
File
Edit
View
Insert
Cell
Kernel
Widgets
Help
Trusted
PUI2016_Python2
Run
Code
In [52]:
regr.fit(X_train, y_train)
Out[52]:
LinearRegression(copy_X=True, fit_intercept=True, n_jobs=1, normalize=False)
In [53]:
y_pred = regr.predict(X_test)
In [62]:
from sklearn.metrics import mean_squared_error, r2_score
print['Coefficients:', regr.coef_]
The mean squared error
print["Mean squared error: %.2f"
% mean_squared_error(y_test, y_pred)]
# Explained variance score: 1 is perfect prediction
print['Variance score: %.2f' % r2_score(y_test, y_pred)]
['Coefficients:', array([1.01441265e-08, -3.85299939e-01, 2.82609534e-02,
8.86753642e-01, 2.12702937e+00, -1.30639872e-05,
1.62013317e-01, -8.85790763e+01, -6.58048019e-05,
2.43146843e-01])]
['Mean squared error: 2132.98']
['Variance score: -2.07']
In [ ]:
In [ ]:

USE CASE I : POTENTIAL CONSULTANCY BUSINESS

- User friendly, suitable for individual household or business users
- Analyse options for savings
- Understand energy usage
- Conduct predictive analysis
- Compare against benchmarks
- Designed to be compatible with existing appliances

Free webapp as "starter" – users can opt for personalised consultation after that. Individual data is then aggregated for future models.

USE CASE 2 : SIMULATING FUTURE ENERGY CONSUMPTIONS



Source: https://www1.nyc.gov/site/planning/data-maps/open-data/dwn-nyc-3d-model-download.page


energAIze
THANK YOU