Import All Libraries

```
In [ ]: import pandas as pd      # pip install pandas
        import numpy as np       # pip install numpy
        import seaborn as sns    # pip install seaborn
        import datetime
        import matplotlib.pyplot as plt     # pip install matplotlib
        import missingno as msno            # pip install missingno
```

Import Dataset

```
In [ ]: df = pd.read_csv('./data.csv')
```

Dataset Statistics

```
In [ ]: print(f'No of observations (Rows): {df.shape[0]}')
        print(f'No of variables (Columns): {df.shape[1]}')
        print(f'Duplicate rows: {df.duplicated().sum()}')

        mc = 0
        for i, j in dict(df.isnull().sum()).items(): mc += int(j)   # for getting columns that come with less than 0.5 percent NaN values
        print(f'Missing cells: {mc}')
        print(f'Missing cells(%): {mc * 100 / (df.shape[0] * df.shape[1])}%')
```

```
No of observations (Rows): 191393
No of variables (Columns): 24
Duplicate rows: 0
Missing cells: 94759
Missing cells(%): 2.0629237572255343%
```

Variable Types

```
In [ ]: # Convert columns to best data types
        df['date_added'] = pd.to_datetime(df['date_added'])
```

```
In [ ]: print(df.dtypes)
```

```
property_id               int64
location_id               int64
page_url                 object
property_type            object
price                     int64
price_bin                object
location                 object
city                     object
province_name            object
locality                 object
latitude                float64
longitude               float64
baths                     int64
area                     object
area_marla              float64
area_sqft               float64
purpose                  object
bedrooms                  int64
date_added       datetime64[ns]
year                      int64
month                     int64
day                       int64
agency                   object
agent                    object
dtype: object
```

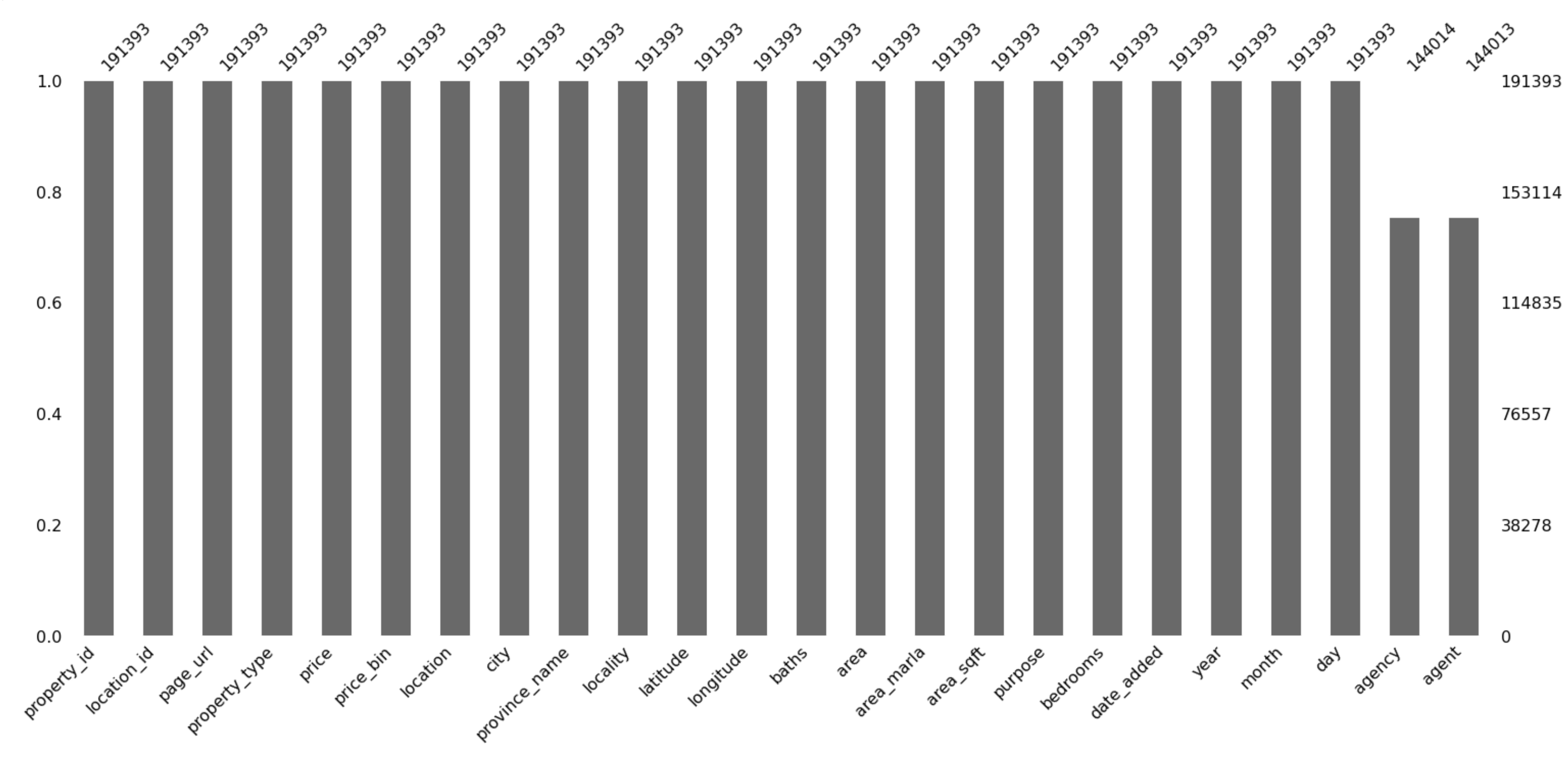
```
In [ ]: # count same variables data type
        my_dict = {i:list(df.dtypes).count(i) for i in list(df.dtypes)}
        for i, j in my_dict.items():
            print(f'Variable type: {i}, Count: {j}')
```

```
Variable type: int64, Count: 8
Variable type: object, Count: 11
Variable type: float64, Count: 4
Variable type: datetime64[ns], Count: 1
```

Missing values

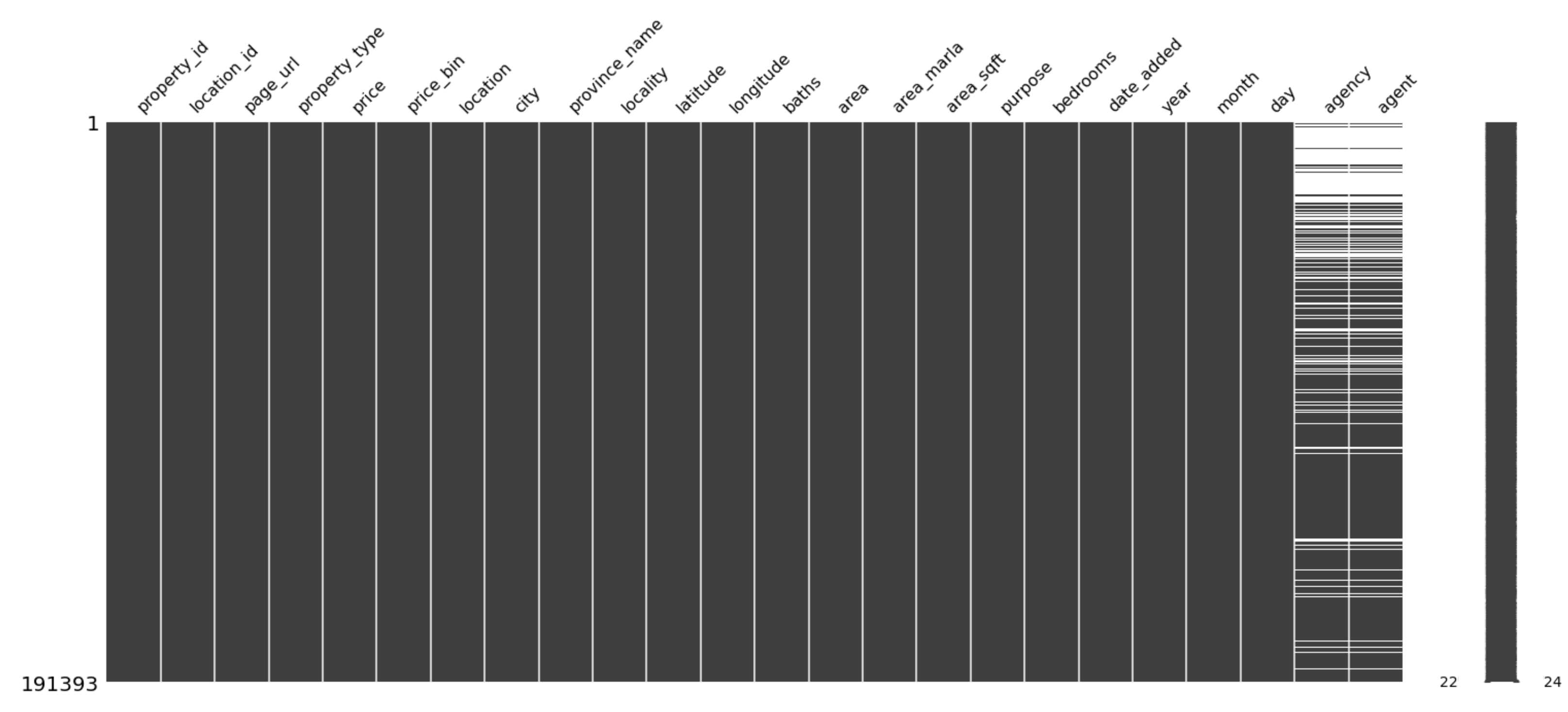
```
In [ ]: # create a bar chart of the missing values
        msno.bar(df)
```

Out[ ]: <AxesSubplot:>



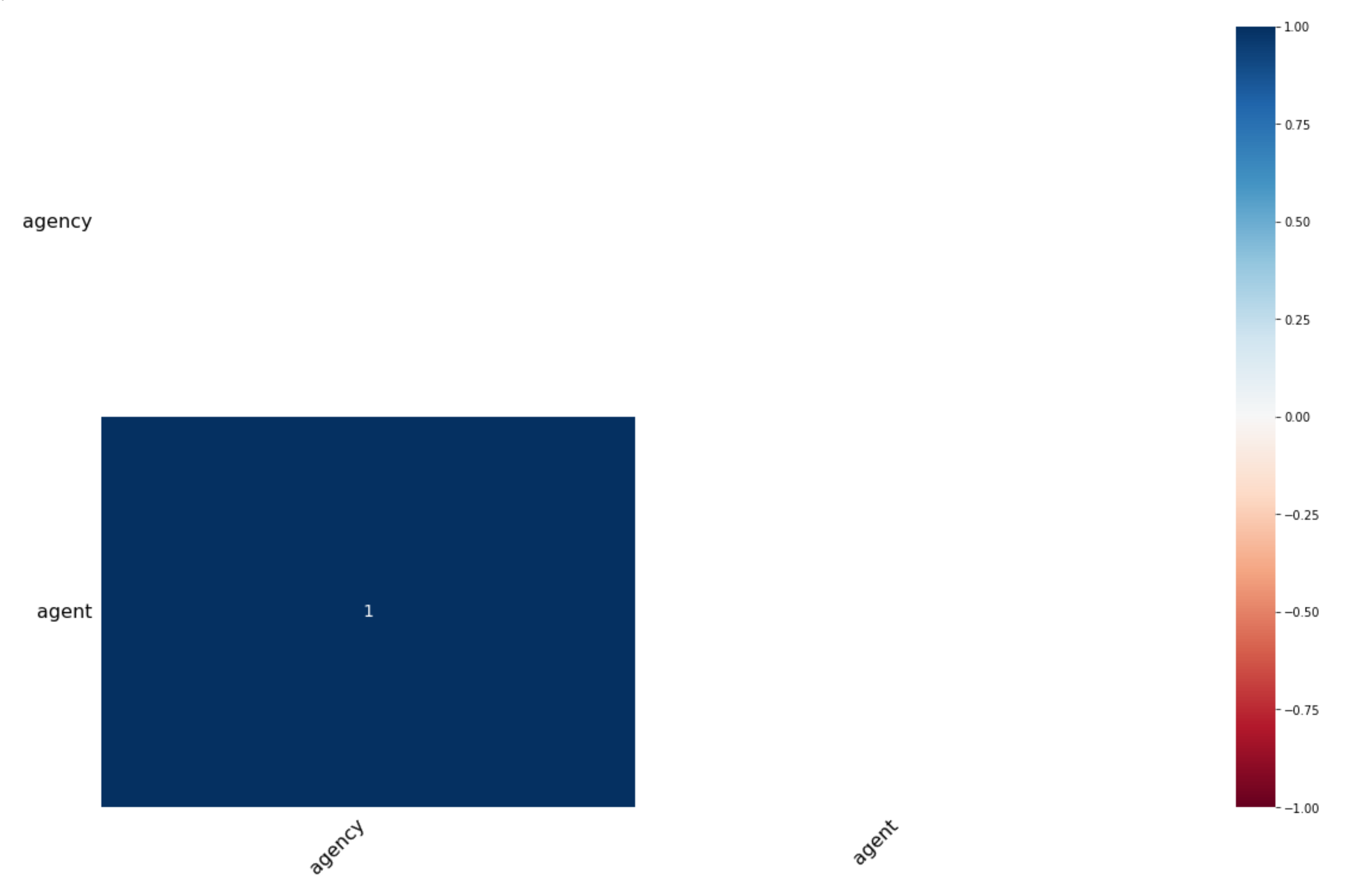

```
In [ ]: # create positional information of the missing values
        msno.matrix(df)
```

Out[ ]: <AxesSubplot:>




```
In [ ]: # create a heatmap of how missing values are related
        msno.heatmap(df)
```

Out[ ]: <AxesSubplot:>



Sample

- ## First Rows

```
In [ ]: df.head(5)
```

Out[ ]:

	property_id	location_id	page_url	property_type	price	price_bin	location	city	province_name	locality	...	area_marla	area_sqft	purpose	bedrooms	date_added	ye
0	347795	8	https://www.zameen.com/Property/lahore_model_t...	House	220000000	Very High	Model Town	Lahore	Punjab	Model Town, Lahore, Punjab	...	120.0	32670.12	For Sale	0	2019-07-17	20
1	482892	48	https://www.zameen.com/Property/lahore_multan_...	House	40000000	Very High	Multan Road	Lahore	Punjab	Multan Road, Lahore, Punjab	...	20.0	5445.02	For Sale	5	2018-10-06	20
2	555962	75	https://www.zameen.com/Property/eden_eden_aven...	House	9500000	Low	Eden	Lahore	Punjab	Eden, Lahore, Punjab	...	9.0	2450.26	For Sale	3	2019-07-03	20
3	562843	3821	https://www.zameen.com/Property/gulberg_2_gulb...	House	125000000	Very High	Gulberg	Lahore	Punjab	Gulberg, Lahore, Punjab	...	20.0	5445.02	For Sale	8	2019-04-04	20
4	686990	3522	https://www.zameen.com/Property/allama_iqbal_t...	House	21000000	High	Allama Iqbal Town	Lahore	Punjab	Allama Iqbal Town, Lahore, Punjab	...	11.0	2994.76	For Sale	6	2019-04-04	20

5 rows × 24 columns

- ## Last Rows

```
In [ ]: df.tail()
```

Out[ ]:

	property_id	location_id	page_url	property_type	price	price_bin	location	city	province_name	locality	...	area_marla	area_sqft	purpose	bedrooms	date_add
191388	17468383	174	https://www.zameen.com/Property/islamabad_i_8_...	Upper Portion	70000	Very High	I-8	Islamabad	Islamabad Capital	I-8, Islamabad, Islamabad Capital	...	12.4	3375.91	For Rent	3	2019-07-
191389	17468384	174	https://www.zameen.com/Property/islamabad_i_8_...	Upper Portion	40000	Medium	I-8	Islamabad	Islamabad Capital	I-8, Islamabad, Islamabad Capital	...	12.4	3375.91	For Rent	2	2019-07-
191390	17468482	167	https://www.zameen.com/Property/islamabad_g_10...	House	160000	High	G-10	Islamabad	Islamabad Capital	G-10, Islamabad, Islamabad Capital	...	20.0	5445.02	For Rent	6	2019-07-
191391	17468586	339	https://www.zameen.com/Property/dha_defence_dh...	Flat	25000	Low	DHA Defence	Islamabad	Islamabad Capital	DHA Defence, Islamabad, Islamabad Capital	...	2.7	735.08	For Rent	2	2019-07-
191392	17468660	3421	https://www.zameen.com/Property/i_10_i_10_2_i_...	Upper Portion	26000	Low	I-10	Islamabad	Islamabad Capital	I-10, Islamabad, Islamabad Capital	...	0.0	0.00	For Rent	3	2019-07-

5 rows × 24 columns

Remove missing values

- ## Remove columns with 95% NaN values

```
In [ ]: for i, j in dict(df.isnull().sum()).items():    # for getting columns that come with less than 0.5 percent NaN values
            if int(df.shape[0]) * 95 / 100 < j:
                df = df.drop(i, axis=1)                # dropping columns that come with 95% percent NaN values
        df.head()
```

Out[ ]:

	property_id	location_id	page_url	property_type	price	price_bin	location	city	province_name	locality	...	area_marla	area_sqft	purpose	bedrooms	date_added	ye
0	347795	8	https://www.zameen.com/Property/lahore_model_t...	House	220000000	Very High	Model Town	Lahore	Punjab	Model Town, Lahore, Punjab	...	120.0	32670.12	For Sale	0	2019-07-17	20
1	482892	48	https://www.zameen.com/Property/lahore_multan_...	House	40000000	Very High	Multan Road	Lahore	Punjab	Multan Road, Lahore, Punjab	...	20.0	5445.02	For Sale	5	2018-10-06	20
2	555962	75	https://www.zameen.com/Property/eden_eden_aven...	House	9500000	Low	Eden	Lahore	Punjab	Eden, Lahore, Punjab	...	9.0	2450.26	For Sale	3	2019-07-03	20
3	562843	3821	https://www.zameen.com/Property/gulberg_2_gulb...	House	125000000	Very High	Gulberg	Lahore	Punjab	Gulberg, Lahore, Punjab	...	20.0	5445.02	For Sale	8	2019-04-04	20
4	686990	3522	https://www.zameen.com/Property/allama_iqbal_t...	House	21000000	High	Allama Iqbal Town	Lahore	Punjab	Allama Iqbal Town, Lahore, Punjab	...	11.0	2994.76	For Sale	6	2019-04-04	20

5 rows × 24 columns

- ## Drop NaN values cell

```
In [ ]: df = df.dropna()
        df
```

Out[ ]:

	property_id	location_id	page_url	property_type	price	price_bin	location	city	province_name	locality	...	area_marla	area_sqft	purpose	bedrooms	date_
0	347795	8	https://www.zameen.com/Property/lahore_model_t...	House	220000000	Very High	Model Town	Lahore	Punjab	Model Town, Lahore, Punjab	...	120.0	32670.12	For Sale	0	2019
1	482892	48	https://www.zameen.com/Property/lahore_multan_...	House	40000000	Very High	Multan Road	Lahore	Punjab	Multan Road, Lahore, Punjab	...	20.0	5445.02	For Sale	5	2018
2	555962	75	https://www.zameen.com/Property/eden_eden_aven...	House	9500000	Low	Eden	Lahore	Punjab	Eden, Lahore, Punjab	...	9.0	2450.26	For Sale	3	2019
5	785289	3102	https://www.zameen.com/Property/gulberg_paf_fa...	House	52000000	Very High	Gulberg	Lahore	Punjab	Gulberg, Lahore, Punjab	...	20.0	5445.02	For Sale	5	2019
7	983065	3749	https://www.zameen.com/Property/eme_society_em...	House	32500000	High	EME Society	Lahore	Punjab	EME Society, Lahore, Punjab	...	20.0	5445.02	For Sale	5	2019
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
191388	17468383	174	https://www.zameen.com/Property/islamabad_i_8_...	Upper Portion	70000	Very High	I-8	Islamabad	Islamabad Capital	I-8, Islamabad, Islamabad Capital	...	12.4	3375.91	For Rent	3	2019
191389	17468384	174	https://www.zameen.com/Property/islamabad_i_8_...	Upper Portion	40000	Medium	I-8	Islamabad	Islamabad Capital	I-8, Islamabad, Islamabad Capital	...	12.4	3375.91	For Rent	2	2019
191390	17468482	167	https://www.zameen.com/Property/islamabad_g_10...	House	160000	High	G-10	Islamabad	Islamabad Capital	G-10, Islamabad, Islamabad Capital	...	20.0	5445.02	For Rent	6	2019
191391	17468586	339	https://www.zameen.com/Property/dha_defence_dh...	Flat	25000	Low	DHA Defence	Islamabad	Islamabad Capital	DHA Defence, Islamabad, Islamabad Capital	...	2.7	735.08	For Rent	2	2019
191392	17468660	3421	https://www.zameen.com/Property/i_10_i_10_2_i_...	Upper Portion	26000	Low	I-10	Islamabad	Islamabad Capital	I-10, Islamabad, Islamabad Capital	...	0.0	0.00	For Rent	3	2019

144013 rows × 24 columns

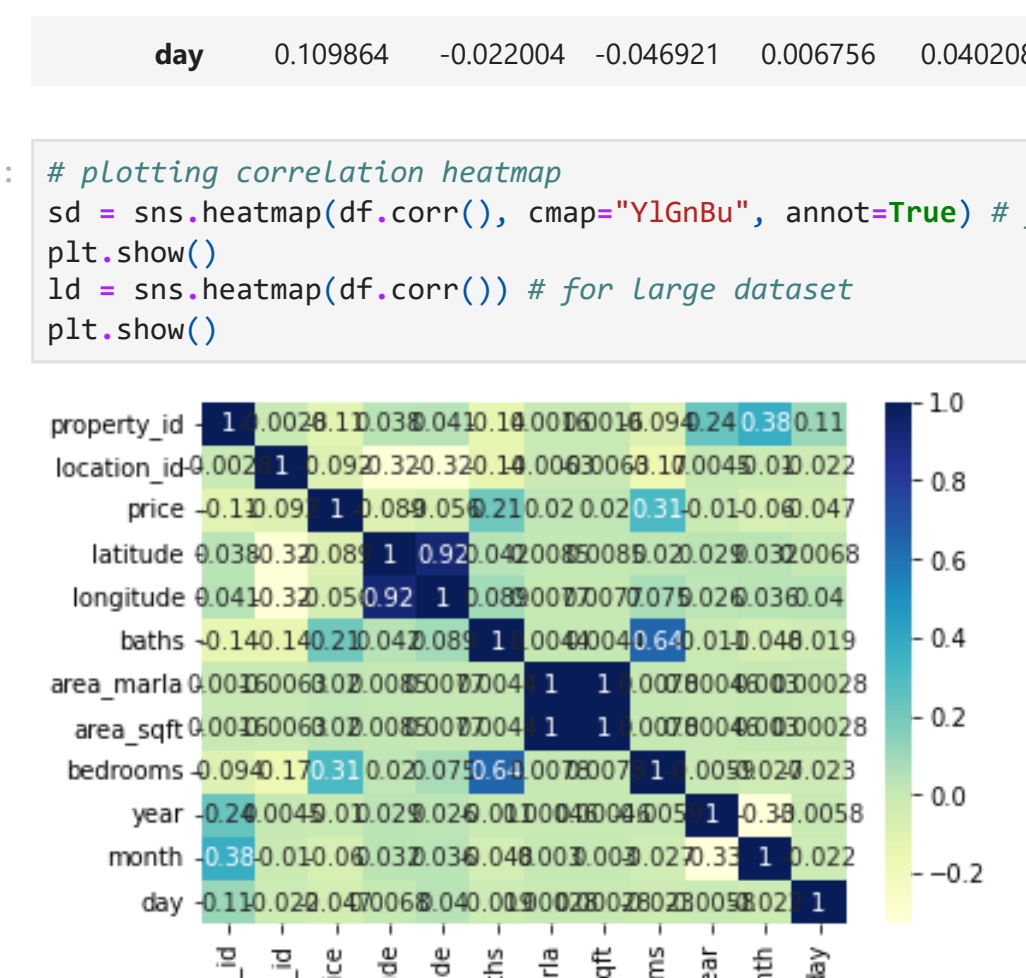
Correlations

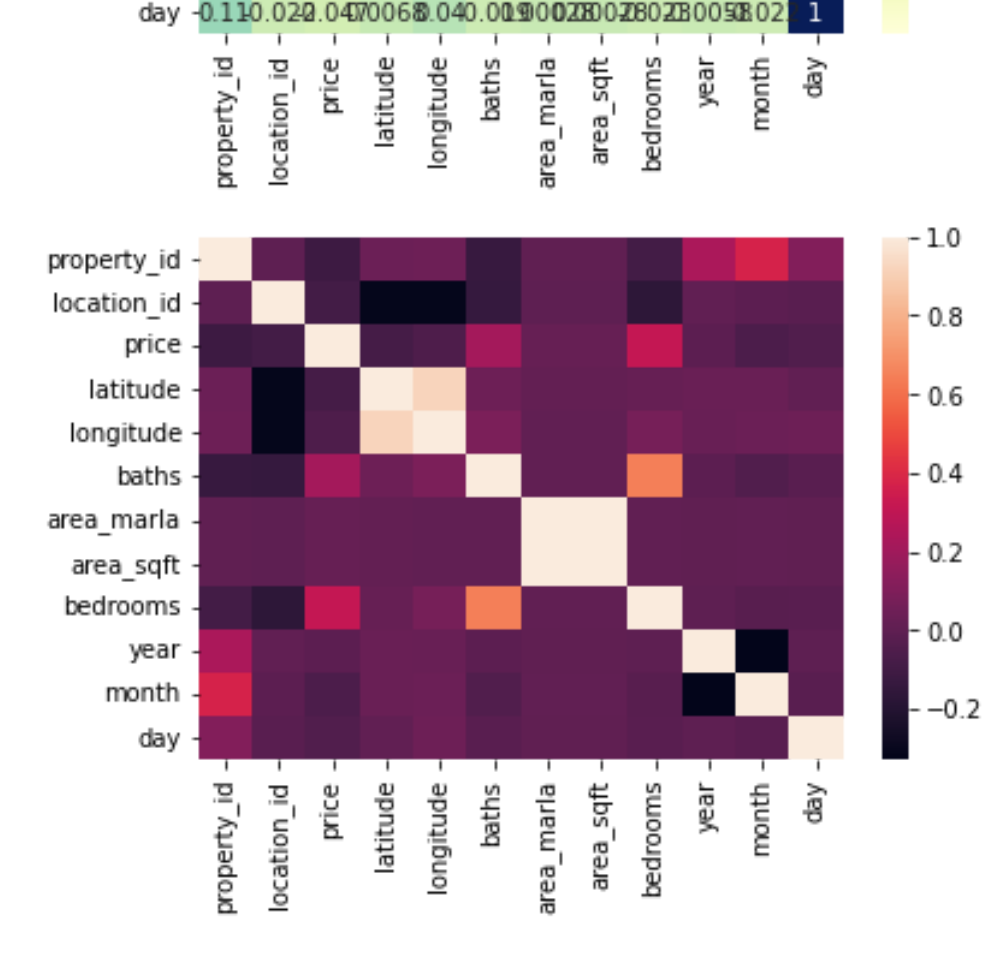
```
In [ ]: df.corr()
```

Out[ ]:

	property_id	location_id	price	latitude	longitude	baths	area_marla	area_sqft	bedrooms	year	month	day
property_id	1.000000	-0.002764	-0.112201	0.037823	0.040613	-0.136773	0.001649	0.001649	-0.093526	0.235318	0.375019	0.109864
location_id	-0.002764	1.000000	-0.091685	-0.319226	-0.316023	-0.139412	-0.006277	-0.006277	-0.170148	0.004482	-0.010343	-0.022004
price	-0.112201	-0.091685	1.000000	-0.089110	-0.055683	0.213947	0.019659	0.019659	0.313657	-0.010134	-0.059769	-0.046921
latitude	0.037823	-0.319226	-0.089110	1.000000	0.917338	0.042402	0.008533	0.008533	0.020375	0.029013	0.031519	0.006756
longitude	0.040613	-0.316023	-0.055683	0.917338	1.000000	0.089241	0.007658	0.007658	0.074699	0.025945	0.035730	0.040208
baths	-0.136773	-0.139412	0.213947	0.042402	0.089241	1.000000	0.004371	0.004371	0.641813	-0.010733	-0.048169	-0.018537
area_marla	0.001649	-0.006277	0.019659	0.008533	0.007658	0.004371	1.000000	1.000000	0.007770	0.000460	0.003045	0.000283
area_sqft	0.001649	-0.006277	0.019659	0.008533	0.007658	0.004371	1.000000	1.000000	0.007770	0.000460	0.003045	0.000283
bedrooms	-0.093526	-0.170148	0.313657	0.020375	0.074699	0.641813	0.007770	0.007770	1.000000	-0.005941	-0.027107	-0.023173
year	0.235318	0.004482	-0.010134	0.029013	0.025945	-0.010733	0.000460	0.000460	-0.005941	1.000000	-0.329782	-0.005827
month	0.375019	-0.010343	-0.059769	0.031519	0.035730	-0.048169	0.003045	0.003045	-0.027107	-0.329782	1.000000	-0.021786
day	0.109864	-0.022004	-0.046921	0.006756	0.040208	-0.018537	0.000283	0.000283	-0.023173	-0.005827	-0.021786	1.000000

```
In [ ]: # plotting correlation heatmap
        sd = sns.heatmap(df.corr(), cmap="YlGnBu", annot=True) # for small dataset
        plt.show()
        ld = sns.heatmap(df.corr()) # for large dataset
        plt.show()
```





Short Details

```
In [ ]: df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 144013 entries, 0 to 191392
Data columns (total 24 columns):
 #   Column         Non-Null Count   Dtype
---  ------         --------------   -----
 0   property_id    144013 non-null  int64
 1   location_id    144013 non-null  int64
 2   page_url       144013 non-null  object
 3   property_type  144013 non-null  object
 4   price          144013 non-null  int64
 5   price_bin      144013 non-null  object
 6   location       144013 non-null  object
 7   city           144013 non-null  object
 8   province_name  144013 non-null  object
 9   locality       144013 non-null  object
 10  latitude       144013 non-null  float64
 11  longitude      144013 non-null  float64
 12  baths          144013 non-null  int64
 13  area           144013 non-null  object
 14  area_marla     144013 non-null  float64
 15  area_sqft      144013 non-null  float64
 16  purpose        144013 non-null  object
 17  bedrooms       144013 non-null  int64
 18  date_added     144013 non-null  datetime64[ns]
 19  year           144013 non-null  int64
 20  month          144013 non-null  int64
 21  day            144013 non-null  int64
 22  agency         144013 non-null  object
 23  agent          144013 non-null  object
dtypes: datetime64[ns](1), float64(4), int64(8), object(11)
memory usage: 27.5+ MB
```

Numarical values short describe

```
In [ ]: df.describe().T      # transpose
```

Out[ ]:

	count	mean	std	min	25%	50%	75%	max
property_id	144013.0	1.634658e+07	1.634215e+06	86575.000000	1.612579e+07	1.696419e+07	1.722522e+07	1.769386e+07
location_id	144013.0	4.186125e+03	3.704307e+03	3.000000	1.242000e+03	3.214000e+03	7.104000e+03	1.424600e+04
price	144013.0	1.756638e+07	3.608480e+07	0.000000	8.500000e+04	7.800000e+06	1.950000e+07	2.000000e+09
latitude	144013.0	3.012832e+01	3.612550e+00	24.749425	2.500530e+01	3.146249e+01	3.355084e+01	7.318409e+01
longitude	144013.0	7.162138e+01	3.065719e+00	66.863657	6.718286e+01	7.307779e+01	7.424677e+01	7.456473e+01
baths	144013.0	2.786748e+00	2.526077e+00	0.000000	0.000000e+00	3.000000e+00	4.000000e+00	4.030000e+02
area_marla	144013.0	1.584714e+01	5.090717e+02	0.000000	5.000000e+00	8.000000e+00	1.400000e+01	1.244440e+05
area_sqft	144013.0	4.314400e+03	1.385953e+05	0.000000	1.361250e+03	2.178010e+03	3.811510e+03	3.388000e+07
bedrooms	144013.0	3.140904e+00	1.930828e+00	0.000000	2.000000e+00	3.000000e+00	4.000000e+00	6.800000e+01
year	144013.0	2.018991e+03	9.360237e-02	2018.000000	2.019000e+03	2.019000e+03	2.019000e+03	2.019000e+03
month	144013.0	6.228229e+00	1.238234e+00	1.000000	6.000000e+00	7.000000e+00	7.000000e+00	1.200000e+01
day	144013.0	1.384647e+01	8.675224e+00	1.000000	5.000000e+00	1.400000e+01	2.000000e+01	3.000000e+01

In [ ]: