05 판다스를 활용한 데이터 이해(실전 데이터 탐색)

02 캘리포니아 데이터 확인해 보기

In [1]:

```
import pandas as pd
```

In [2]:

```
print("pandas 버전 ", pd.__version__)
```

```
pandas 버전  0.23.0
```

In [6]:

```
test = pd.read_csv("./california_housing/california_housing_test.csv")
train = pd.read_csv("./california_housing/california_housing_train.csv")
```

In [7]:

```
### 데이터 확인
print("test 데이터 셋 행열 크기 :", test.shape)
print("train 데이터 셋 행열 크기 : ", train.shape)
```

```
test 데이터 셋 행열 크기 : (3000, 9)
train 데이터 셋 행열 크기 :  (17000, 9)
```

In [8]:

```
### 데이터 5행 확인
test.head()
```

Out[8]:

	longitude	latitude	housing_median_age	total_rooms	total_bedrooms	population	household
0	-122.05	37.37	27.0	3885.0	661.0	1537.0	606.
1	-118.30	34.26	43.0	1510.0	310.0	809.0	277.
2	-117.81	33.78	27.0	3589.0	507.0	1484.0	495.
3	-118.36	33.82	28.0	67.0	15.0	49.0	11.
4	-119.67	36.33	19.0	1241.0	244.0	850.0	237.

In [9]:

```
### 데이터 5행 확인
train.head()
```

Out[9]:

	longitude	latitude	housing_median_age	total_rooms	total_bedrooms	population	household
0	-114.31	34.19	15.0	5612.0	1283.0	1015.0	472.
1	-114.47	34.40	19.0	7650.0	1901.0	1129.0	463.
2	-114.56	33.69	17.0	720.0	174.0	333.0	117.
3	-114.57	33.64	14.0	1501.0	337.0	515.0	226.
4	-114.57	33.57	20.0	1454.0	326.0	624.0	262.

In [10]:

```
### 어떤 컬럼명을 가지고 있을까?
print(test.columns)
print(train.columns)
```

```
Index(['longitude', 'latitude', 'housing_median_age', 'total_rooms',
       'total_bedrooms', 'population', 'households', 'median_income',
       'median_house_value'],
      dtype='object')
Index(['longitude', 'latitude', 'housing_median_age', 'total_rooms',
       'total_bedrooms', 'population', 'households', 'median_income',
       'median_house_value'],
      dtype='object')
```

In [11]:

```
### 데이터는 어떤 자료형을 갖는가?
print(test.dtypes)
print()
print(train.dtypes)
```

```
longitude           float64
latitude            float64
housing_median_age  float64
total_rooms         float64
total_bedrooms      float64
population          float64
households          float64
median_income       float64
median_house_value  float64
dtype: object

longitude           float64
latitude            float64
housing_median_age  float64
total_rooms         float64
total_bedrooms      float64
population          float64
households          float64
median_income       float64
median_house_value  float64
dtype: object
```

In [12]:

```
### 데이터는 어떤 자료형을 갖는가?
print(test.info())
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 3000 entries, 0 to 2999
Data columns (total 9 columns):
longitude           3000 non-null float64
latitude            3000 non-null float64
housing_median_age  3000 non-null float64
total_rooms         3000 non-null float64
total_bedrooms      3000 non-null float64
population          3000 non-null float64
households          3000 non-null float64
median_income       3000 non-null float64
median_house_value  3000 non-null float64
dtypes: float64(9)
memory usage: 211.0 KB
None
```

In [13]:

```
print(train.info())
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 17000 entries, 0 to 16999
Data columns (total 9 columns):
longitude             17000 non-null float64
latitude              17000 non-null float64
housing_median_age    17000 non-null float64
total_rooms           17000 non-null float64
total_bedrooms        17000 non-null float64
population            17000 non-null float64
households            17000 non-null float64
median_income         17000 non-null float64
median_house_value    17000 non-null float64
dtypes: float64(9)
memory usage: 1.2 MB
None
```

In [14]:

```
### 데이터는 어떤 값들을 갖는가?
train.describe()
```

Out[14]:

	longitude	latitude	housing_median_age	total_rooms	total_bedrooms	popu
count	17000.000000	17000.000000	17000.000000	17000.000000	17000.000000	17000.0
mean	-119.562108	35.625225	28.589353	2643.664412	539.410824	1429.5
std	2.005166	2.137340	12.586937	2179.947071	421.499452	1147.8
min	-124.350000	32.540000	1.000000	2.000000	1.000000	3.0
25%	-121.790000	33.930000	18.000000	1462.000000	297.000000	790.0
50%	-118.490000	34.250000	29.000000	2127.000000	434.000000	1167.0
75%	-118.000000	37.720000	37.000000	3151.250000	648.250000	1721.0
max	-114.310000	41.950000	52.000000	37937.000000	6445.000000	35682.0

- 1. longitude: A measure of how far west a house is; a higher value is farther west
- 2. latitude: A measure of how far north a house is; a higher value is farther north
- 3. housingMedianAge: Median age of a house within a block; a lower number is a newer building
- 4. totalRooms: Total number of rooms within a block
- 5. totalBedrooms: Total number of bedrooms within a block
- 6. population: Total number of people residing within a block
- 7. households: Total number of households, a group of people residing within a home unit, for a block
- 8. medianIncome: Median income for households within a block of houses (measured in tens of thousands of US Dollars)
- 9. medianHouseValue: Median house value for households within a block (measured in US Dollars)

In [15]:

```
import matplotlib.pyplot as plt
train.hist(bins=50, figsize=(20,15))
plt.show()
```

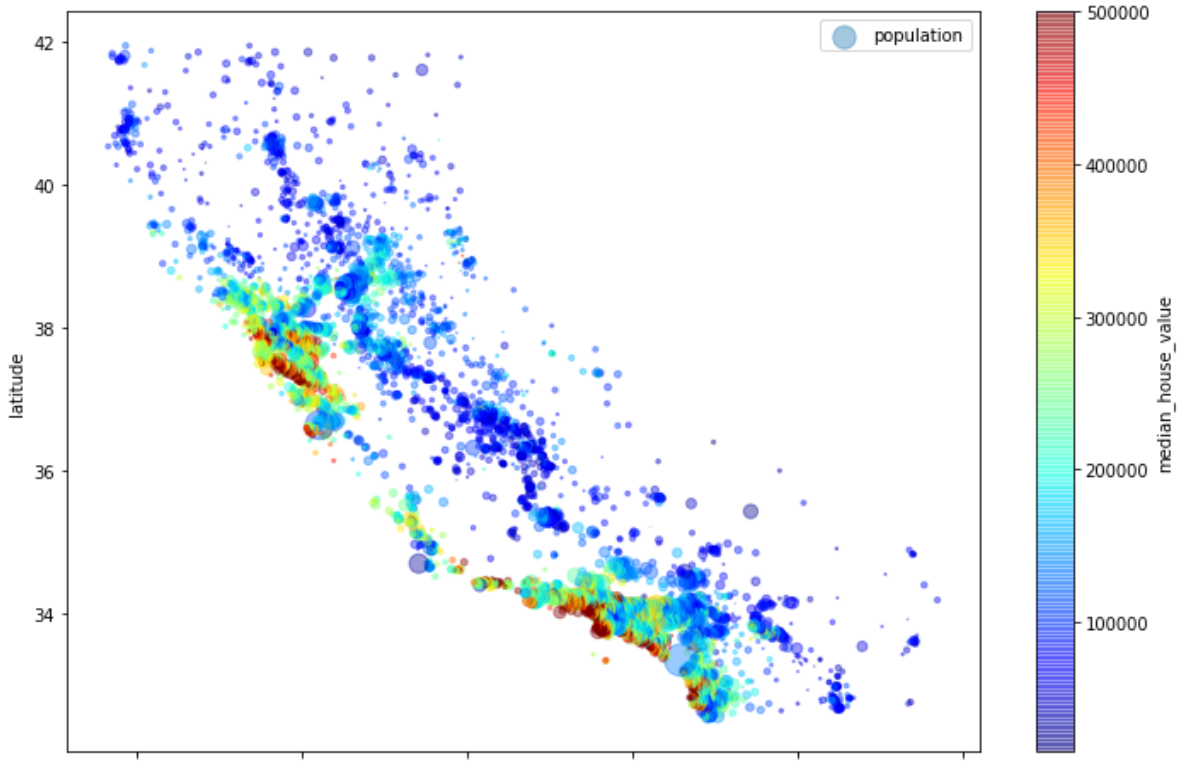
<Figure size 2000x1500 with 9 Axes>

In [16]:

```
### 위도 경도에 따른 산점도 분포
train.plot(kind="scatter", x="longitude", y="latitude",
             alpha=0.4, s=train["population"]/100,
             label="population", c="median_house_value", figsize=(12,8),
             cmap=plt.get_cmap("jet"), colorbar=True)
```

Out[16]:

<matplotlib.axes._subplots.AxesSubplot at 0x2502ca5e5f8>



In [17]:

```
train.columns
```

Out[17]:

```
Index(['longitude', 'latitude', 'housing_median_age', 'total_rooms',
       'total_bedrooms', 'population', 'households', 'median_income',
       'median_house_value'],
      dtype='object')
```

In [18]:

```
sel = ['total_rooms', 'total_bedrooms', 'population']

temp_train = train[ sel  ]

print("데이터 가공 셋의 크기 : ", temp_train.shape)
print("데이터 가공 셋의 일부 : ", temp_train.head())
```

```
데이터 가공 셋의 크기 :  (17000, 3)
데이터 가공 셋의 일부 :     total_rooms  total_bedrooms  population
0        5612.0          1283.0      1015.0
1        7650.0          1901.0      1129.0
2         720.0           174.0       333.0
3        1501.0           337.0       515.0
4        1454.0           326.0       624.0
```

In [19]:

```
temp_train.describe()
```

Out[19]:

	total_rooms	total_bedrooms	population
count	17000.000000	17000.000000	17000.000000
mean	2643.664412	539.410824	1429.573941
std	2179.947071	421.499452	1147.852959
min	2.000000	1.000000	3.000000
25%	1462.000000	297.000000	790.000000
50%	2127.000000	434.000000	1167.000000
75%	3151.250000	648.250000	1721.000000
max	37937.000000	6445.000000	35682.000000

In [20]:

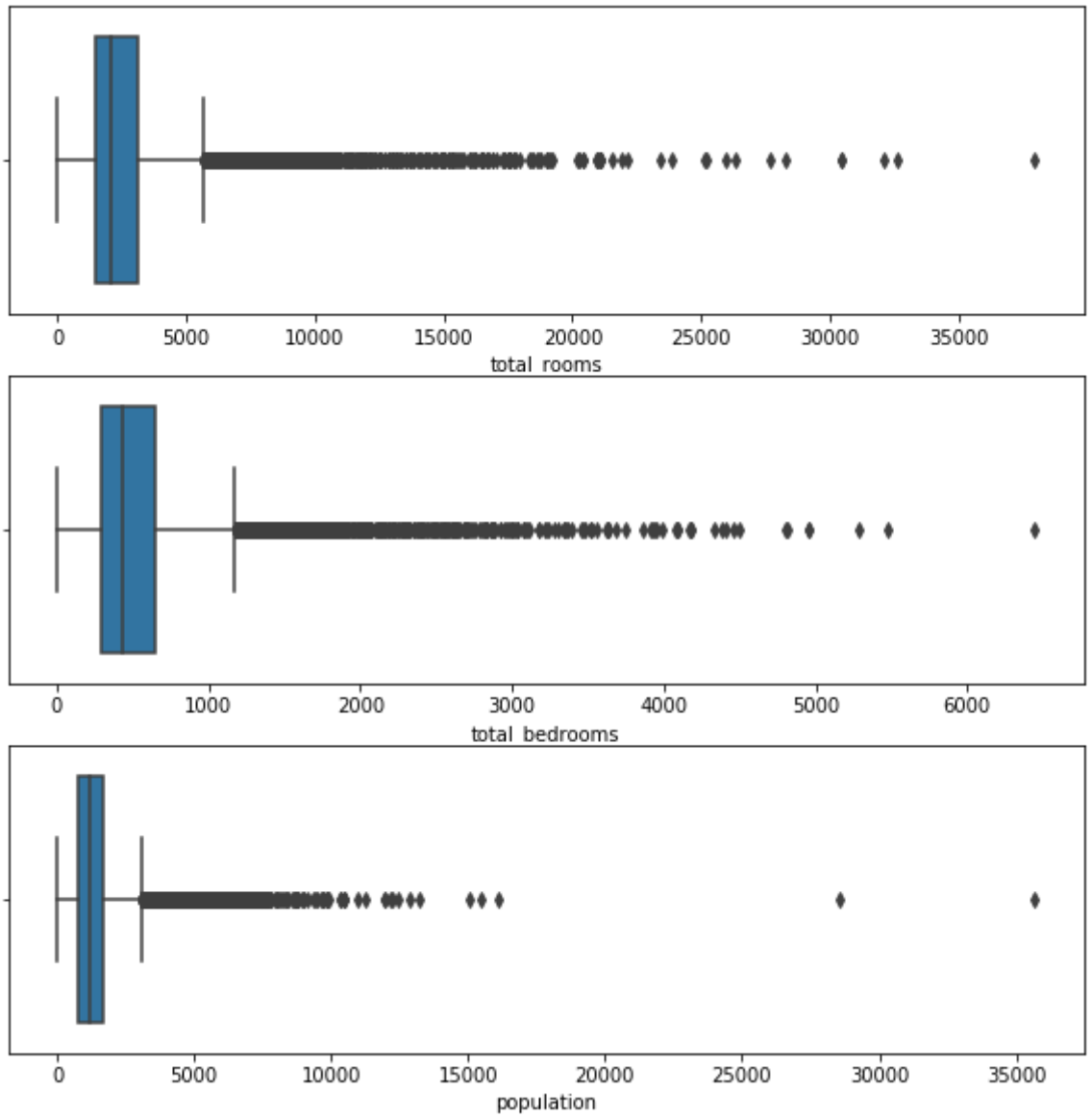
```
import seaborn as sns
```

In [21]:

```
plt.figure(figsize=(10,10))

plt.subplot(3,1,1)
sns.boxplot(x="total_rooms", data=temp_train)
plt.subplot(3,1,2)
sns.boxplot(x="total_bedrooms", data=temp_train)
plt.subplot(3,1,3)
sns.boxplot(x="population", data=temp_train)
```

Out[21]:

<matplotlib.axes._subplots.AxesSubplot at 0x2502efc5be0>

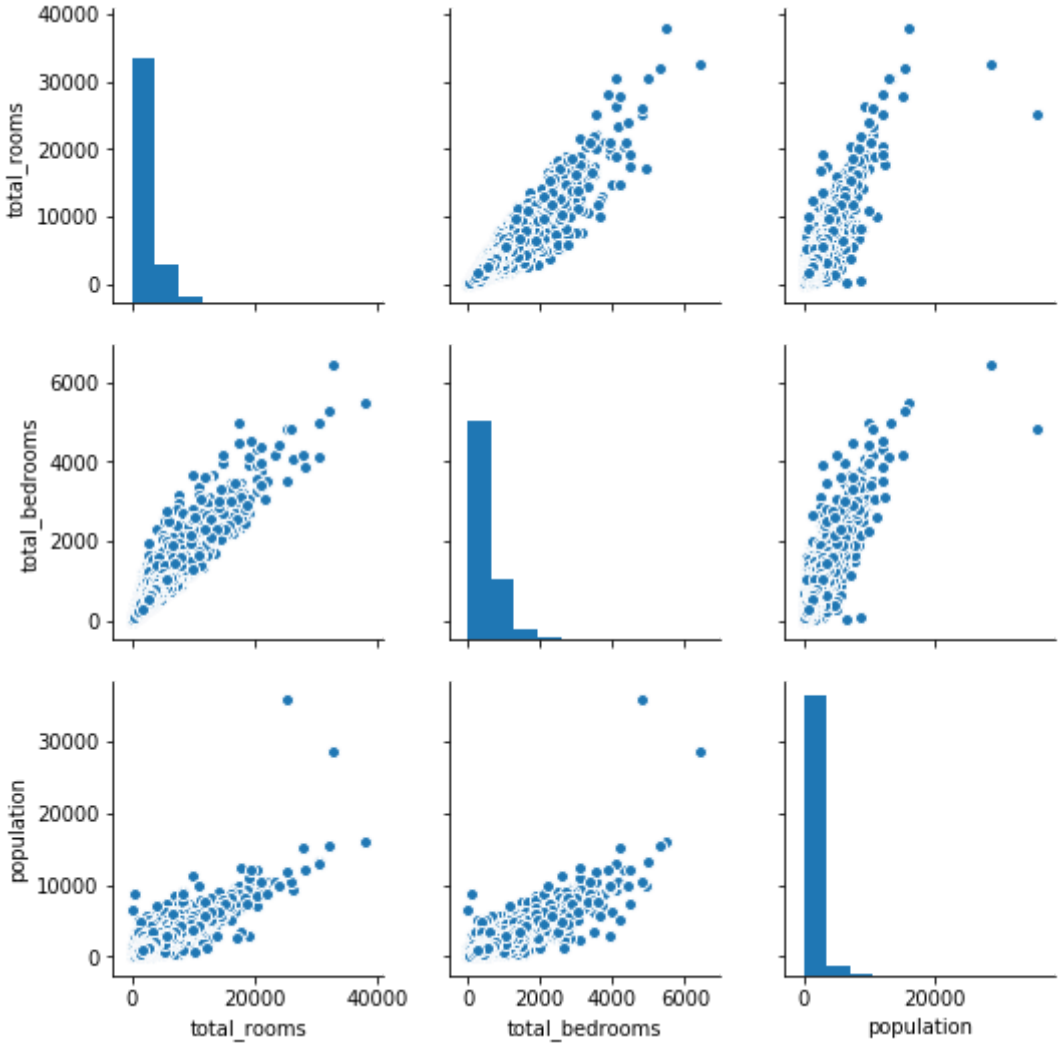


In [22]:

```
sns.pairplot(temp_train)
```

Out[22]:

```
<seaborn.axisgrid.PairGrid at 0x2502ef22978>
```



iloc, Loc 이해하기

In [23]:

```
train.columns
```

Out[23]:

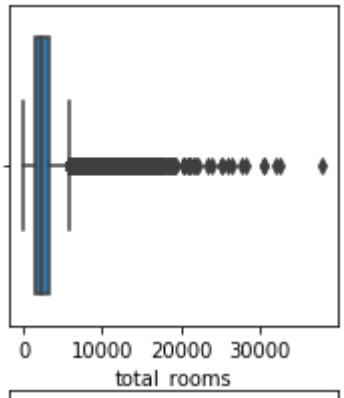
```
Index(['longitude', 'latitude', 'housing_median_age', 'total_rooms',
       'total_bedrooms', 'population', 'households', 'median_income',
       'median_house_value'],
      dtype='object')
```

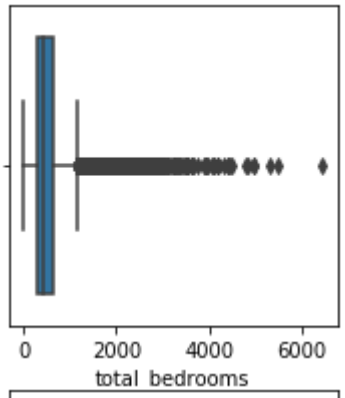
In [24]:

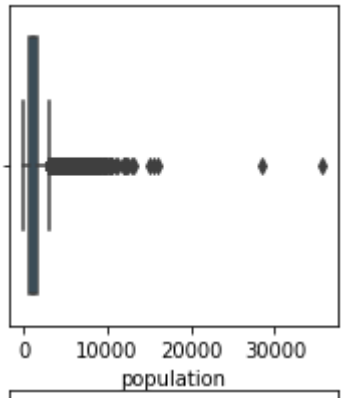
```
plt.figure(figsize=(10,10))

plt.subplot(3,3,1)
sns.boxplot(x="total_rooms", data=train)
plt.subplot(3,3,2)
sns.boxplot(x="total_bedrooms", data=train)
plt.subplot(3,3,3)
sns.boxplot(x="population", data=train)

plt.subplot(3,3,4)
sns.boxplot(x="longitude", data=train)
plt.subplot(3,3,5)
sns.boxplot(x="latitude", data=train)
plt.subplot(3,3,6)
sns.boxplot(x="households", data=train)

plt.subplot(3,3,7)
sns.boxplot(x="median_income", data=train)
plt.subplot(3,3,8)
sns.boxplot(x="median_house_value", data=train)
```

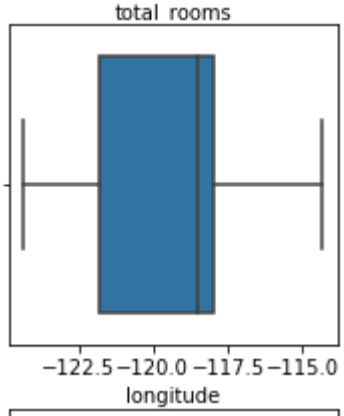
Out[24]:

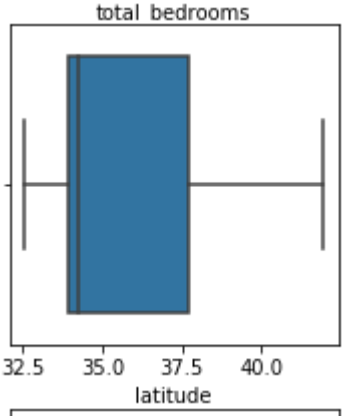
```
<matplotlib.axes._subplots.AxesSubplot at 0x2502f9606d8>
```

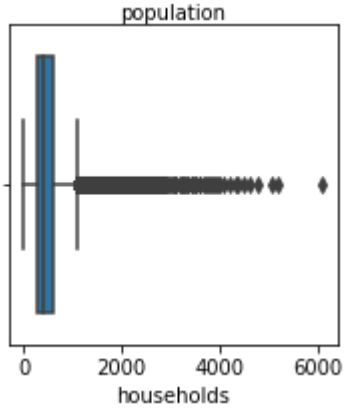

0
10000
20000
30000
total_rooms

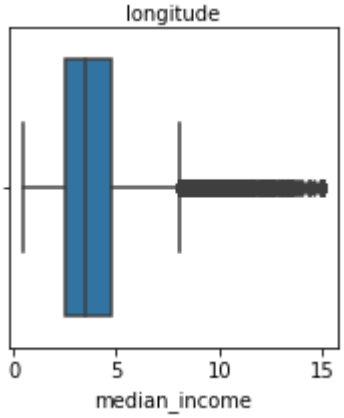

0
2000
4000
6000
total_bedrooms

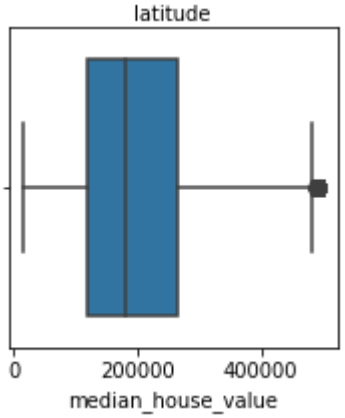

0
10000
20000
30000
population


−122.5
−120.0
−117.5
−115.0
longitude


32.5
35.0
37.5
40.0
latitude


0
2000
4000
6000
households


0
5
10
15
median_income

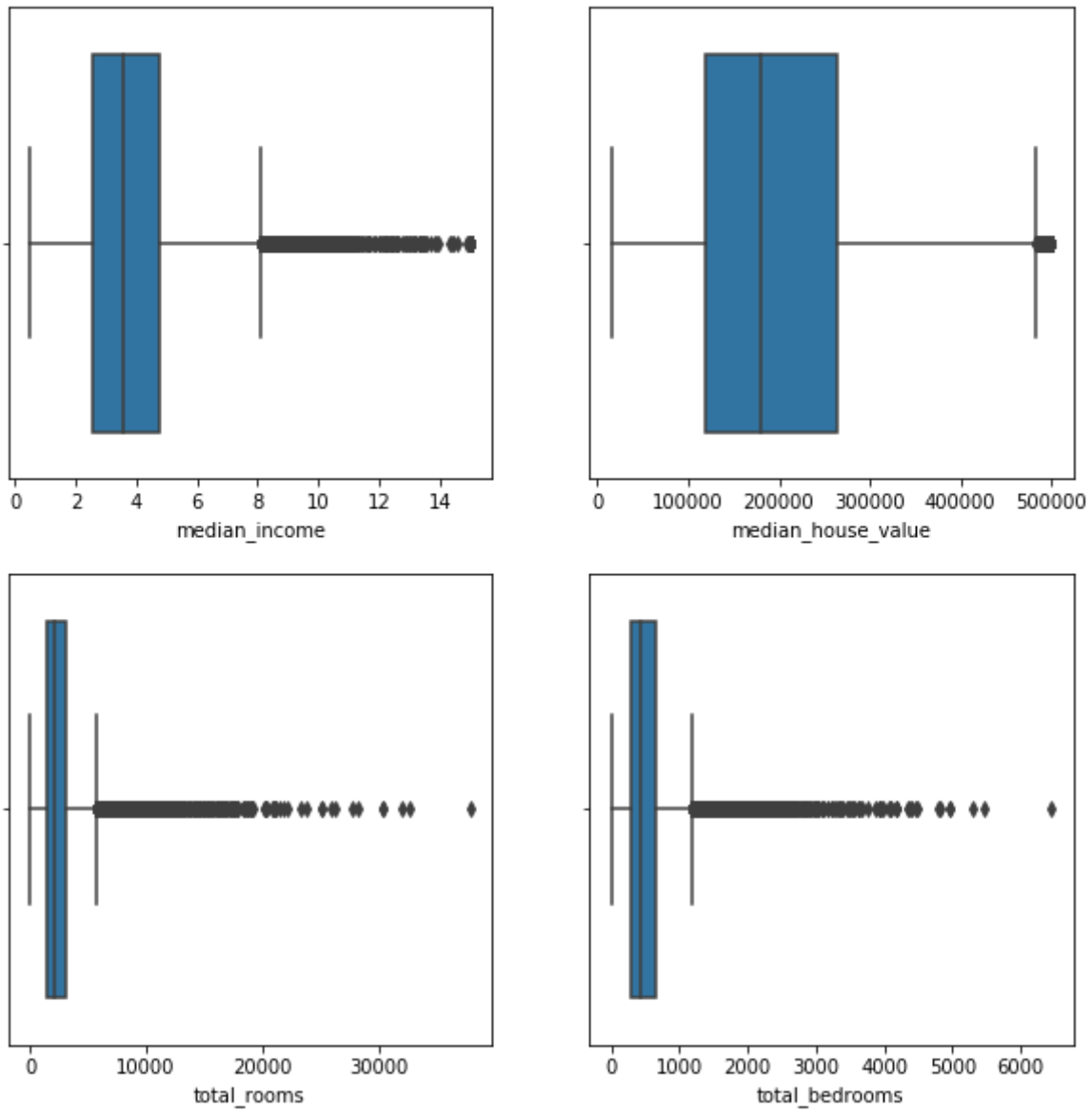

0
200000
400000
median_house_value

In [25]:

```
plt.figure(figsize=(10,10))

plt.subplot(2,2,1)
sns.boxplot(x="median_income", data=train)
plt.subplot(2,2,2)
sns.boxplot(x="median_house_value", data=train)

plt.subplot(2,2,3)
sns.boxplot(x="total_rooms", data=train)
plt.subplot(2,2,4)
sns.boxplot(x="total_bedrooms", data=train)
```

Out[25]:

<matplotlib.axes._subplots.AxesSubplot at 0x2502fa19dd8>



In [26]:

```
## 두 컬럼 선택
temp02 = train.loc[:,  [ "median_income", "median_house_value" ] ]
temp02.head()
```

Out[26]:

	median_income	median_house_value
0	1.4936	66900.0
1	1.8200	80100.0
2	1.6509	85700.0
3	3.1917	73400.0
4	1.9250	65500.0

In [27]:

```
train.columns
```

Out[27]:

```
Index(['longitude', 'latitude', 'housing_median_age', 'total_rooms',
       'total_bedrooms', 'population', 'households', 'median_income',
       'median_house_value'],
      dtype='object')
```

In [28]:

```
## 두 컬럼 선택 8열, 9열
temp03 = train.iloc[:,  [7, 8] ]
print( temp03.head() )

temp03 = train.iloc[:,  [-2, -1] ]
print( temp03.head() )
```

```
   median_income  median_house_value
0         1.4936             66900.0
1         1.8200             80100.0
2         1.6509             85700.0
3         3.1917             73400.0
4         1.9250             65500.0
   median_income  median_house_value
0         1.4936             66900.0
1         1.8200             80100.0
2         1.6509             85700.0
3         3.1917             73400.0
4         1.9250             65500.0
```

In [29]:

```
temp04 = train.iloc[:,  [6, 7, 8] ]
print(temp04.head() )
```

```
   households  median_income  median_house_value
0       472.0         1.4936             66900.0
1       463.0         1.8200             80100.0
2       117.0         1.6509             85700.0
3       226.0         3.1917             73400.0
4       262.0         1.9250             65500.0
```

In [30]:

```
## 그렇다면 일부 열의 부분을 가져올 수 없을까?
## range 와
scope = list(range(6,9,1))   # 6번째부터 8번째까지 범위 지정.
temp = train.iloc[:, scope ] # 6,7,8 열을 가져온다.
print(temp.head() )

temp = train.iloc[:, 6:9:1 ] # 6,7,8 열을 가져온다.
print(temp.head() )
```

```
   households  median_income  median_house_value
0       472.0         1.4936             66900.0
1       463.0         1.8200             80100.0
2       117.0         1.6509             85700.0
3       226.0         3.1917             73400.0
4       262.0         1.9250             65500.0
   households  median_income  median_house_value
0       472.0         1.4936             66900.0
1       463.0         1.8200             80100.0
2       117.0         1.6509             85700.0
3       226.0         3.1917             73400.0
4       262.0         1.9250             65500.0
```

In [31]:

```
train.head()
```

Out[31]:

	longitude	latitude	housing_median_age	total_rooms	total_bedrooms	population	household
0	-114.31	34.19	15.0	5612.0	1283.0	1015.0	472.
1	-114.47	34.40	19.0	7650.0	1901.0	1129.0	463.
2	-114.56	33.69	17.0	720.0	174.0	333.0	117.
3	-114.57	33.64	14.0	1501.0	337.0	515.0	226.
4	-114.57	33.57	20.0	1454.0	326.0	624.0	262.

In [32]:

```
train.total_rooms.describe()
```

Out[32]:

```
count    17000.000000
mean      2643.664412
std       2179.947071
min          2.000000
25%       1462.000000
50%       2127.000000
75%       3151.250000
max      37937.000000
Name: total_rooms, dtype: float64
```

조건을 이용하여 데이터 그룹을 시켜보자.

In [33]:

```
# 전체 방의 수를 위의 값을 기준으로 네 그룹으로 나눈다.
# A1 : 75~100  3151 ~
# A2 : 50~75   2127 ~ 3151
# A3 : 25~50   1462 ~ 2127
# A4 : 0~25    ~1462

tmp_A1 = train[ train['total_rooms']> 3151]
print(tmp_A1.head())
print(tmp_A1.shape)
```

```
    longitude  latitude  housing_median_age  total_rooms  total_bedrooms  ₩
0     -114.31     34.19                15.0       5612.0          1283.0
1     -114.47     34.40                19.0       7650.0          1901.0
8     -114.59     33.61                34.0       4789.0          1175.0
10    -114.60     33.62                16.0       3741.0           801.0
38    -115.48     32.68                15.0       3414.0           666.0

    population  households  median_income  median_house_value
0       1015.0       472.0         1.4936             66900.0
1       1129.0       463.0         1.8200             80100.0
8       3134.0      1056.0         2.1782             58400.0
10      2434.0       824.0         2.6797             86500.0
38      2097.0       622.0         2.3319             91200.0
(4250, 9)
```

In [34]:

```
import numpy as np
```

In [35]:

```
## 두개의 조건문 np.where를 이용하여 확인
bool_val = np.where( (train['total_rooms']> 1462) & (train['total_rooms'] <= 2127), True, False)
type(bool_val)
print(bool_val)
```

```
[False False False ... False False  True]
```

In [36]:

```
train[ bool_val ]
```

Out[36]:

	longitude	latitude	housing_median_age	total_rooms	total_bedrooms	population	house
3	-114.57	33.64	14.0	1501.0	337.0	515.0	
9	-114.60	34.83	46.0	1497.0	309.0	787.0	
11	-114.60	33.60	21.0	1988.0	483.0	1182.0	
16	-114.65	33.60	28.0	1678.0	322.0	666.0	
20	-114.68	33.49	20.0	1491.0	360.0	1135.0	
24	-115.22	33.54	18.0	1706.0	397.0	3424.0	
26	-115.37	32.82	30.0	1602.0	322.0	1130.0	
30	-115.38	32.82	38.0	1892.0	394.0	1175.0	
40	-115.49	32.69	17.0	1960.0	389.0	1691.0	
41	-115.49	32.67	29.0	1523.0	440.0	1302.0	
46	-115.51	33.24	32.0	1995.0	523.0	1069.0	
53	-115.52	32.98	32.0	1615.0	382.0	1307.0	
54	-115.52	32.97	24.0	1617.0	366.0	1416.0	
55	-115.52	32.97	10.0	1879.0	387.0	1376.0	
56	-115.52	32.77	18.0	1715.0	337.0	1166.0	
61	-115.53	32.97	35.0	1583.0	340.0	933.0	
63	-115.53	32.73	14.0	1527.0	325.0	1453.0	
65	-115.54	32.99	17.0	1697.0	268.0	911.0	
66	-115.54	32.98	27.0	1513.0	395.0	1121.0	
68	-115.54	32.79	23.0	1712.0	403.0	1370.0	
71	-115.55	32.82	34.0	1540.0	316.0	1013.0	
77	-115.56	32.80	28.0	1672.0	416.0	1335.0	
84	-115.56	32.78	29.0	1568.0	283.0	848.0	
89	-115.57	32.83	31.0	1494.0	289.0	959.0	
92	-115.57	32.78	20.0	1534.0	235.0	871.0	
97	-115.58	32.79	14.0	1687.0	507.0	762.0	
99	-115.59	32.85	20.0	1608.0	274.0	862.0	
103	-115.60	32.87	3.0	1629.0	317.0	1005.0	
107	-115.69	32.79	18.0	1564.0	340.0	1161.0	
110	-115.73	33.35	23.0	1586.0	448.0	338.0	
...	...	...	...	...	...	...	
16894	-124.00	40.22	16.0	2088.0	535.0	816.0	
16895	-124.01	40.89	28.0	1470.0	336.0	811.0	
16901	-124.05	40.59	32.0	1878.0	340.0	937.0	

	longitude	latitude	housing_median_age	total_rooms	total_bedrooms	population	house
16903	-124.06	40.88	12.0	2087.0	424.0	1603.0	
16905	-124.07	40.87	47.0	1765.0	326.0	796.0	
16907	-124.07	40.81	23.0	2103.0	411.0	1019.0	
16910	-124.08	40.94	18.0	1550.0	345.0	941.0	
16916	-124.09	40.88	31.0	1982.0	495.0	1052.0	
16921	-124.10	41.04	26.0	1633.0	380.0	890.0	
16926	-124.10	40.50	30.0	1927.0	393.0	996.0	
16928	-124.11	40.95	19.0	1734.0	365.0	866.0	
16930	-124.11	40.93	17.0	1661.0	329.0	948.0	
16934	-124.13	40.79	32.0	2017.0	359.0	855.0	
16941	-124.14	40.79	38.0	1552.0	290.0	873.0	
16945	-124.14	40.59	22.0	1665.0	405.0	826.0	
16947	-124.14	40.58	25.0	1899.0	357.0	891.0	
16952	-124.15	40.80	47.0	1486.0	335.0	765.0	
16954	-124.15	40.78	36.0	2112.0	374.0	829.0	
16958	-124.16	41.02	23.0	1672.0	385.0	1060.0	
16961	-124.16	40.80	52.0	1703.0	500.0	952.0	
16965	-124.16	40.78	46.0	1975.0	346.0	791.0	
16970	-124.17	40.80	52.0	1606.0	419.0	891.0	
16971	-124.17	40.80	52.0	1557.0	344.0	758.0	
16973	-124.17	40.78	39.0	1606.0	330.0	731.0	
16974	-124.17	40.77	30.0	1895.0	366.0	990.0	
16975	-124.17	40.76	26.0	1776.0	361.0	992.0	
16977	-124.17	40.62	32.0	1595.0	309.0	706.0	
16978	-124.18	40.79	39.0	1836.0	352.0	883.0	
16980	-124.18	40.78	34.0	1592.0	364.0	950.0	
16999	-124.35	40.54	52.0	1820.0	300.0	806.0	

4249 rows × 9 columns

In [37]:

```
bool_val = np.where( (train['total_rooms']> 2127) & (train['total_rooms'] <= 3151), True, False)
print(bool_val.shape)
tmp_A2 = train[ bool_val ]
print(tmp_A2.shape)
```

```
(17000,)
(4247, 9)
```

In [38]:

```
bool_val = np.where( (train['total_rooms']> 1462) & (train['total_rooms'] <= 2127), True, False)
print(bool_val.shape)
tmp_A3 = train[ bool_val ]
print(tmp_A3.shape)
```

```
(17000,)
(4249, 9)
```

In [39]:

```
bool_val = np.where( (train['total_rooms']> 1462) , True, False)
print(bool_val.shape)
tmp_A4 = train[ bool_val ]
print(tmp_A4.shape)
```

```
(17000,)
(12746, 9)
```

In [40]:

```
print(tmp_A1.shape, tmp_A2.shape, tmp_A3.shape, tmp_A4.shape )
```

```
(4250, 9) (4247, 9) (4249, 9) (12746, 9)
```

In [41]:

```
### 새로운 컬럼 room_level 만들기
# 전체 방의 수를 위의 값을 기준으로 네 그룹으로 나눈다.
# A1 : 75~100  3151 ~
# A2 : 50~75   2127 ~ 3151
# A3 : 25~50   1462 ~ 2127
# A4 : 0~25    ~1462

bool_val = np.where( (train['total_rooms']> 1462) & (train['total_rooms'] <= 2127), True, False)
train.loc[bool_val, "room_level"] = 3
train['room_level'].head()
```

Out[41]:

```
0    NaN
1    NaN
2    NaN
3    3.0
4    NaN
Name: room_level, dtype: float64
```

In [42]:

```
bool_val = np.where( (train['total_rooms']> 2127) & (train['total_rooms'] <= 3151), True, False)
train.loc[bool_val, "room_level"] = 2
train['room_level'].head()
```

Out[42]:

```
0    NaN
1    NaN
2    NaN
3    3.0
4    NaN
Name: room_level, dtype: float64
```

In [43]:

```
### 새로운 컬럼 room_level 만들기
bool_val = np.where( (train['total_rooms']> 3151) , True, False)
train.loc[bool_val, "room_level"] = 1

bool_val = np.where( (train['total_rooms'] <= 1462) , True, False)
train.loc[bool_val, "room_level"] = 4
train['room_level'].head()
```

Out[43]:

```
0    1.0
1    1.0
2    4.0
3    3.0
4    4.0
Name: room_level, dtype: float64
```

In [44]:

```
train.columns
```

Out[44]:

```
Index(['longitude', 'latitude', 'housing_median_age', 'total_rooms',
       'total_bedrooms', 'population', 'households', 'median_income',
       'median_house_value', 'room_level'],
      dtype='object')
```

groupby를 활용한 그룹별 평균

In [45]:

```
### room_level의 그룹별 나이대 알아보기
print(train.groupby('room_level')['housing_median_age'].mean())
```

```
room_level
1.0    21.170353
2.0    28.872145
3.0    31.580137
4.0    32.731782
Name: housing_median_age, dtype: float64
```

In [46]:

```
### room_level별 boxplot
### 방이 적으면 적을 수록 나이대가 높다.
### 젊은 층이 많을 수록 지역별 총 방의 수는 많음을 알 수 있다.
sns.boxplot(x="room_level", y="housing_median_age", data=train)
```

Out[46]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x2502fae7e48>
```