Lab1

June 22, 2023

[ ]:
```
import pandas as pd
import seaborn as sns
```

[ ]:
```
# Enable inline plots
%matplotlib inline

# Set plot style
sns.set(style="ticks")

# Set plots formats to save high resolution PNG
from IPython.display import set_matplotlib_formats
set_matplotlib_formats("retina")
```

```
/var/folders/fs/5xh23h99763f_blp7m50x23h0000gq/T/ipykernel_66332/2802708398.py:9
: DeprecationWarning: `set_matplotlib_formats` is deprecated since IPython 7.23,
directly use `matplotlib_inline.backend_inline.set_matplotlib_formats()`
  set_matplotlib_formats("retina")
```

[ ]:
```
pd.set_option("display.width", 70)
```

[ ]:
```
data = pd.read_csv("datasets/cars.csv")
```

[ ]:
```
data.dtypes
```

[ ]:
```
Unnamed: 0        int64
price             int64
brand            object
model            object
year              int64
title_status     object
mileage         float64
color            object
vin              object
lot               int64
state            object
country          object
condition        object
dtype: object
```

[ ]:
```
data.head()
```

[ ]:
```
   Unnamed: 0  price      brand    model  year   title_status  \
0           0   6300     toyota  cruiser  2008  clean vehicle
1           1   2899       ford       se  2011  clean vehicle
2           2   5350      dodge      mpv  2018  clean vehicle
3           3  25000       ford     door  2014  clean vehicle
4           4  27700  chevrolet     1500  2018  clean vehicle

    mileage   color                 vin        lot       state  \
0  274117.0   black    jtezu11f88k007763  159348797  new jersey
1  190552.0  silver    2fmdk3gc4bbb02217  166951262   tennessee
2   39590.0  silver    3c4pdcgg5jt346413  167655728     georgia
3   64146.0    blue    1ftfw1et4efc23745  167753855    virginia
4    6654.0     red    3gcpcrec2jg473991  167763266     florida

  country      condition
0     usa   10 days left
1     usa    6 days left
2     usa    2 days left
3     usa  22 hours left
4     usa  22 hours left
```

[ ]:
```
data.shape
```

[ ]:
```
(2499, 13)
```

[ ]:
```
data.describe()
```

[ ]:
```
        Unnamed: 0         price         year       mileage  \
count  2499.000000   2499.000000  2499.000000  2.499000e+03
mean   1249.000000  18767.671469  2016.714286  5.229869e+04
std     721.543484  12116.094936     3.442656  5.970552e+04
min       0.000000      0.000000  1973.000000  0.000000e+00
25%     624.500000  10200.000000  2016.000000  2.146650e+04
50%    1249.000000  16900.000000  2018.000000  3.536500e+04
75%    1873.500000  25555.500000  2019.000000  6.347250e+04
max    2498.000000  84900.000000  2020.000000  1.017936e+06

                lot
count  2.499000e+03
mean   1.676914e+08
std    2.038772e+05
min    1.593488e+08
25%    1.676253e+08
50%    1.677451e+08
75%    1.677798e+08
```

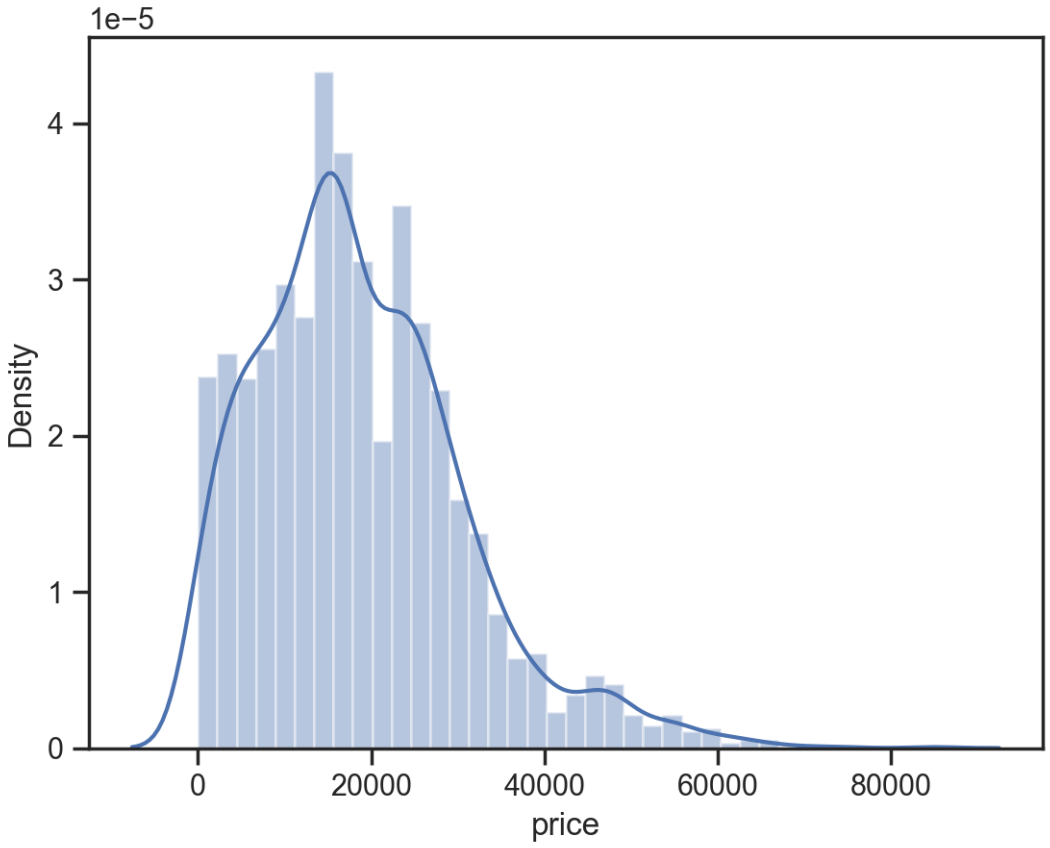
```
max     1.678055e+08
```

1

— :

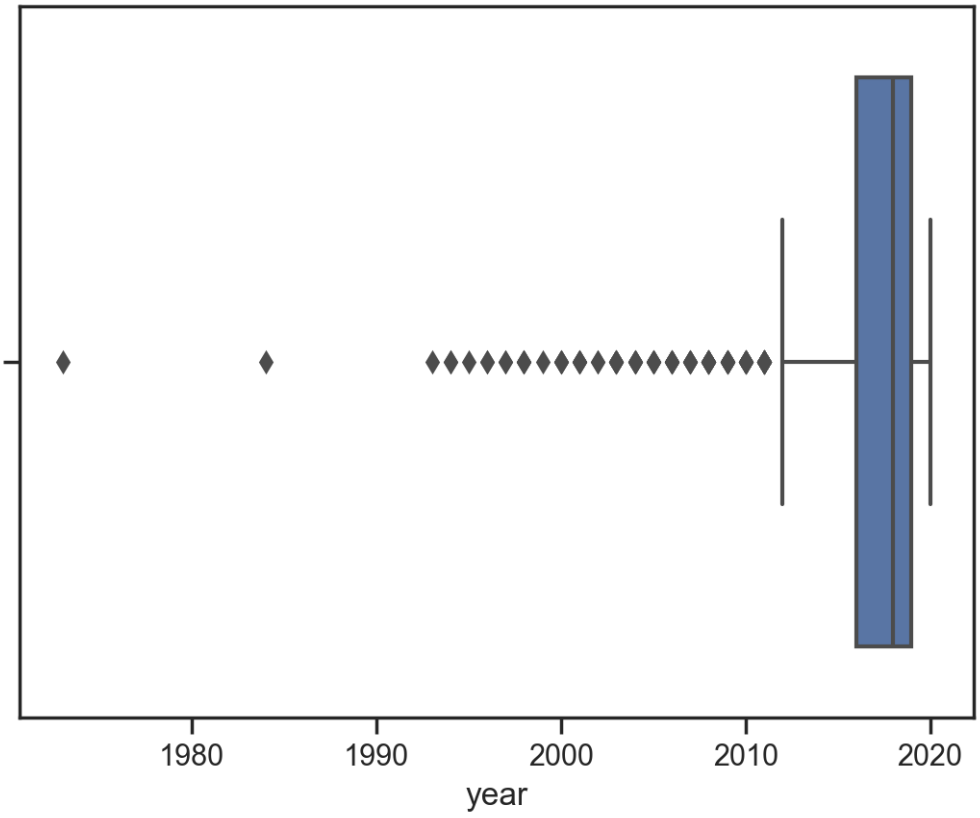
[ ]:
```
sns.distplot(data["price"]);
```

```
/var/folders/fs/5xh23h99763f_blp7m50x23h0000gq/T/ipykernel_66332/2055821964.py:1
: UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751

  sns.distplot(data["price"]);
```



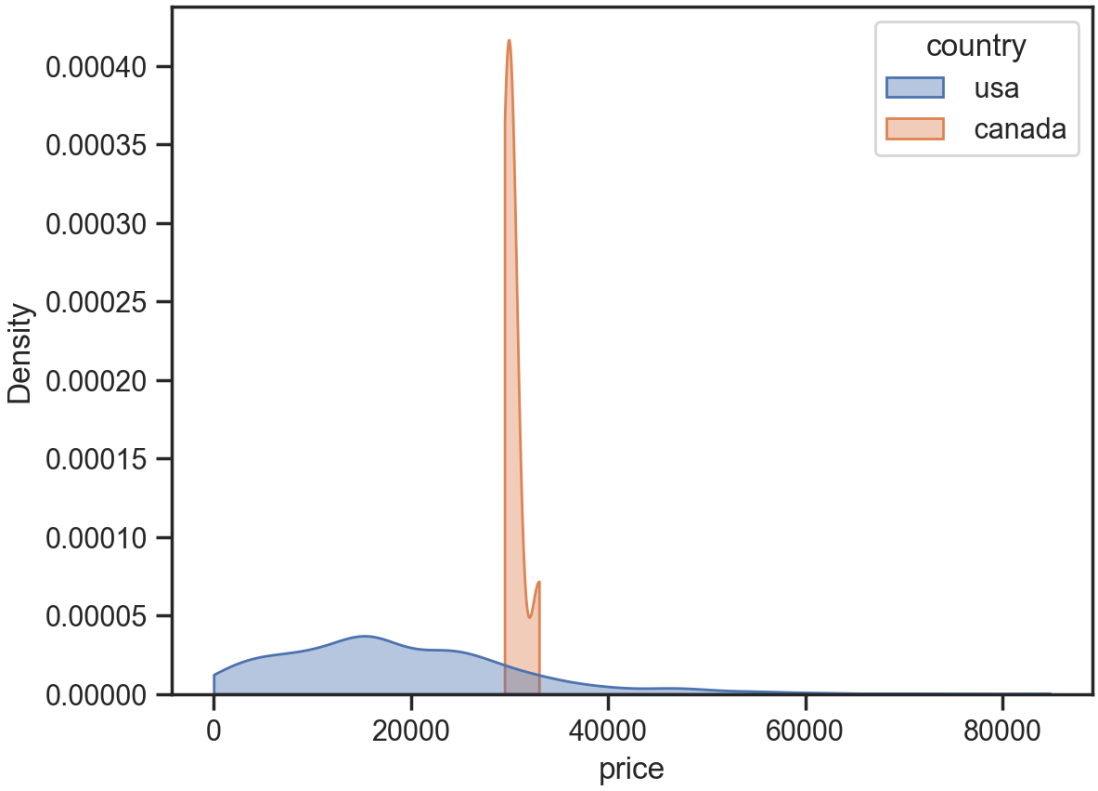
[ ]:
```
sns.boxplot(x=data['year'])
```

[ ]:
```
<Axes: xlabel='year'>
```

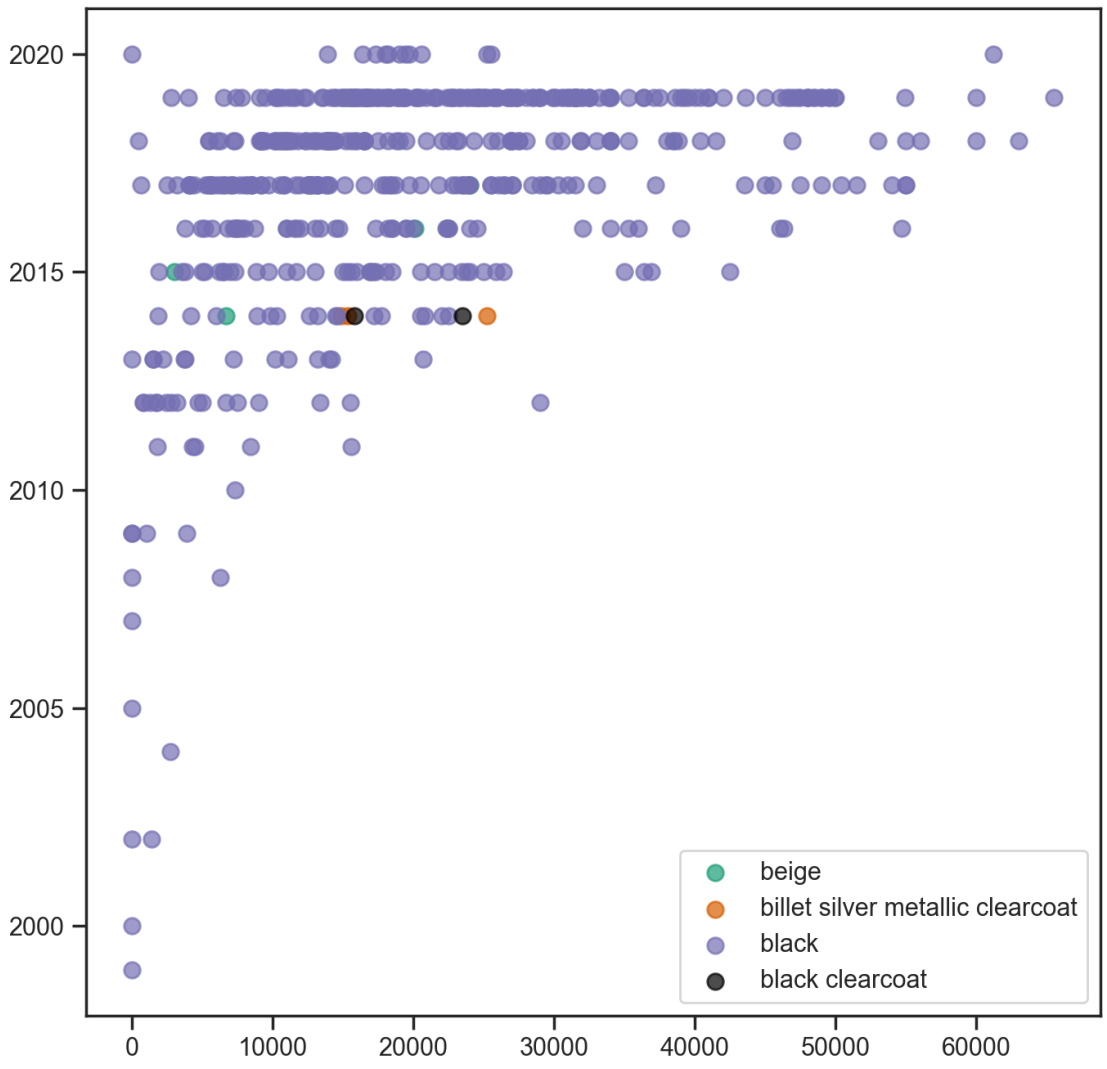


[ ]:
```
sns.kdeplot(data=data, x="price", hue="country", cut=0, fill=True,␣
↪common_norm=False, alpha=0.4)
```

[ ]:
```
<Axes: xlabel='price', ylabel='Density'>
```



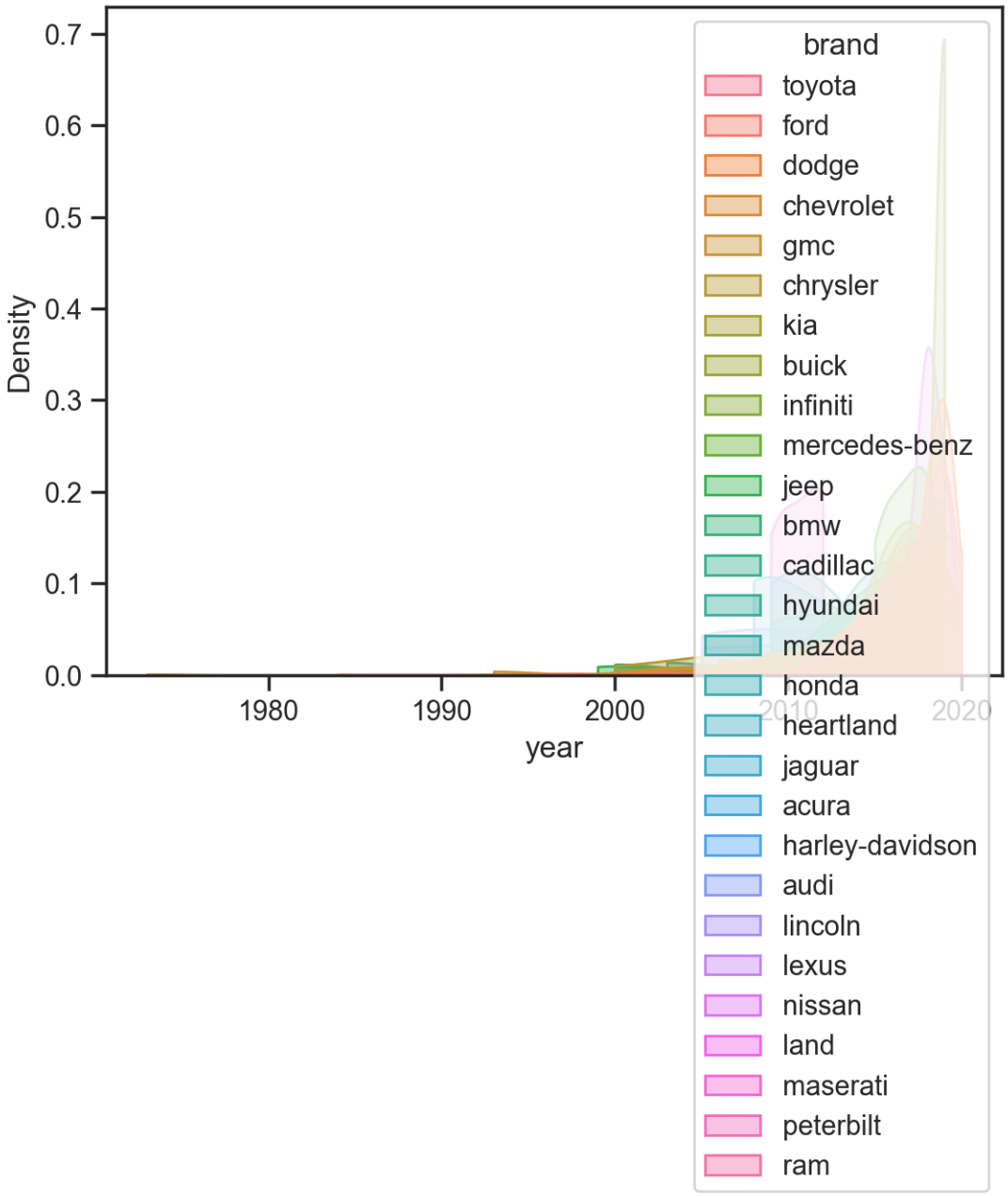
[ ]:
```
import numpy as np
import matplotlib.pyplot as plt
FLIPPER_LENGTH = data["price"].values
BILL_LENGTH = data["year"].values

SPECIES = data["color"].values
SPECIES_ = np.unique(SPECIES)

COLORS = ["#1B9E77", "#D95F02", "#7570B3", "#000000"]

fig, ax = plt.subplots(figsize=(8,8))
for species, color in zip(SPECIES_, COLORS):
    idxs = np.where(SPECIES == species)
    # No legend will be generated if we don't pass label=species
    ax.scatter(
        FLIPPER_LENGTH[idxs], BILL_LENGTH[idxs], label=species,
        s=50, color=color, alpha=0.7
    )

ax.legend();
```



[ ]:
```
sns.kdeplot(data=data, x="year", hue="brand", cut=0, fill=True,␣
↪common_norm=False, alpha=0.4)
```

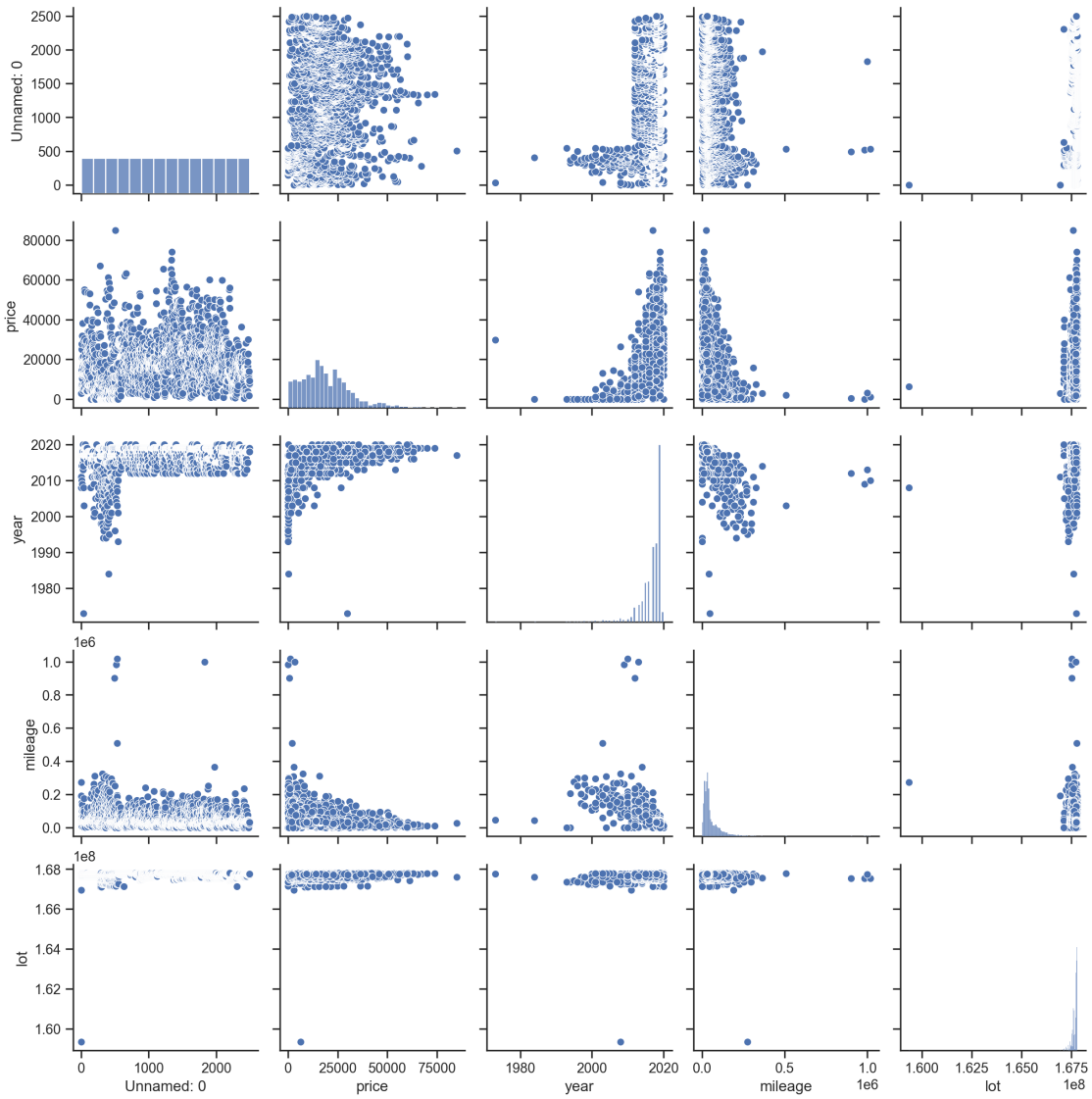
```
/var/folders/fs/5xh23h99763f_blp7m50x23h0000gq/T/ipykernel_66332/32137796.py:1:
UserWarning: Dataset has 0 variance; skipping density estimate. Pass
`warn_singular=False` to disable this warning.
  sns.kdeplot(data=data, x="year", hue="brand", cut=0, fill=True,
common_norm=False, alpha=0.4)
```

[ ]:
```
<Axes: xlabel='year', ylabel='Density'>
```



[ ]:
```
sns.pairplot(data)
```

[ ]:
```
<seaborn.axisgrid.PairGrid at 0x17fcd09d0>
```



2

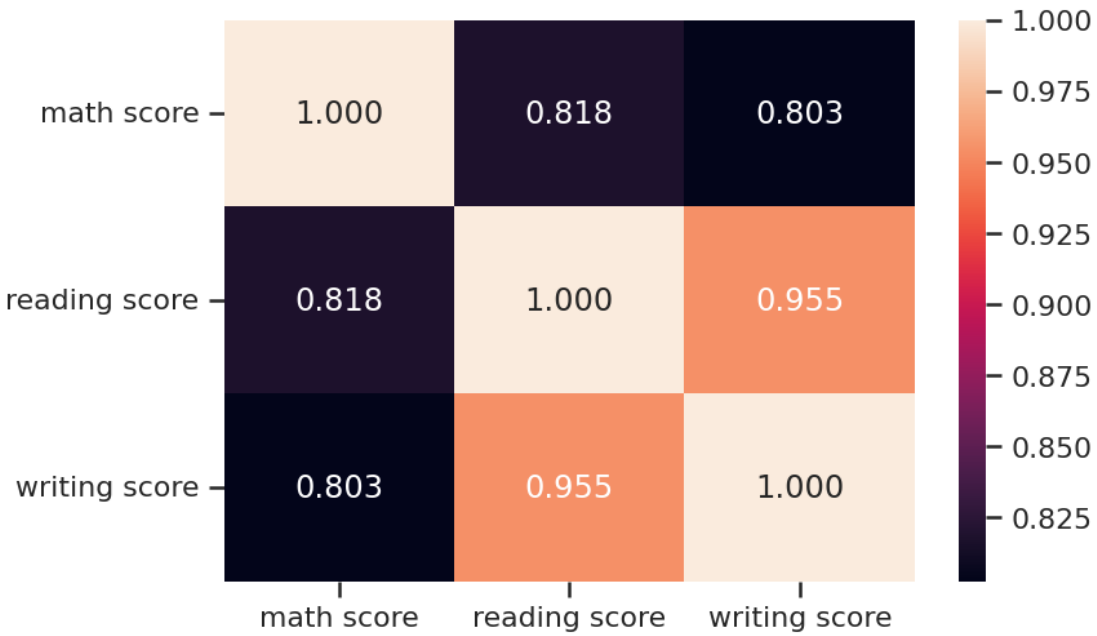
[ ]:
```
corr_matrix = data.corr()
```

```
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
Cell In[15], line 1
----> 1 corr_matrix = data.corr()

File ~/BMSTU_Labs/.env/lib/python3.11/site-packages/pandas/core/frame.py:10054,
 ↪in DataFrame.corr(self, method, min_periods, numeric_only)
  10052 cols = data.columns
```

```
  10053 idx = cols.copy()
> 10054 mat = data.to_numpy(dtype=float, na_value=np.nan, copy=False)
  10056 if method == "pearson":
  10057     correl = libalgos.nancorr(mat, minp=min_periods)

File ~/BMSTU_Labs/.env/lib/python3.11/site-packages/pandas/core/frame.py:1838,␣
 ↪in DataFrame.to_numpy(self, dtype, copy, na_value)
   1836 if dtype is not None:
   1837     dtype = np.dtype(dtype)
-> 1838 result = self._mgr.as_array(dtype=dtype, copy=copy, na_value=na_value)
   1839 if result.dtype is not dtype:
   1840     result = np.array(result, dtype=dtype, copy=False)

File ~/BMSTU_Labs/.env/lib/python3.11/site-packages/pandas/core/internals/
 ↪managers.py:1732, in BlockManager.as_array(self, dtype, copy, na_value)
   1730         arr.flags.writeable = False
   1731 else:
-> 1732     arr = self._interleave(dtype=dtype, na_value=na_value)
   1733     # The underlying data was copied within _interleave, so no need
   1734     # to further copy if copy=True or setting na_value
   1736 if na_value is not lib.no_default:

File ~/BMSTU_Labs/.env/lib/python3.11/site-packages/pandas/core/internals/
 ↪managers.py:1794, in BlockManager._interleave(self, dtype, na_value)
   1792     else:
   1793         arr = blk.get_values(dtype)
-> 1794     result[rl.indexer] = arr
   1795     itemmask[rl.indexer] = 1
   1797 if not itemmask.all():

ValueError: could not convert string to float: 'toyota'
```

[ ]:
```
sns.heatmap(data.corr(), annot=True, fmt='.3f')
```

[ ]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f2cf318d040>
```


math score
reading score
writing score
1.000
0.818
0.803
0.818
1.000
0.955
0.803
0.955
1.000
math score
reading score
writing score
1.000
0.975
0.950
0.925
0.900
0.875
0.850
0.825