hito1

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[2]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

from sklearn.metrics import classification_report
from sklearn.model_selection import train_test_split, GridSearchCV
from sklearn.pipeline import Pipeline

from feature_engine.imputation import CategoricalImputer, MeanMedianImputer
from feature_engine.encoding import OrdinalEncoder, OneHotEncoder
from feature_engine.wrappers import SklearnTransformerWrapper
from sklearn.preprocessing import StandardScaler

from sklearn.tree import DecisionTreeClassifier
from sklearn.linear_model import LogisticRegression
from sklearn.svm import SVC
from sklearn.naive_bayes import GaussianNB
from sklearn.neighbors import KNeighborsClassifier
from sklearn.ensemble import VotingClassifier, RandomForestClassifier,␣
↪GradientBoostingClassifier, AdaBoostClassifier

from sklearn import set_config
import utils
set_config(display='diagram')
```

[3]:
```
df = pd.read_csv('../db/true_car_listings.csv')
df
```

[3]:

	Price	Year	Mileage	City	State	Vin	\
0	8995	2014	35725	El Paso	TX	19VDE2E53EE000083	
1	10888	2013	19606	Long Island City	NY	19VDE1F52DE012636	
2	8995	2013	48851	El Paso	TX	19VDE2E52DE000025	
3	10999	2014	39922	Windsor	CO	19VDE1F71EE003817	
4	14799	2016	22142	Lindon	UT	19UDE2F32GA001284	
…	…	…	…	…	…	…	
852117	63215	2017	9	Culver City	CA	YV1A22MK9H1013237	
852118	72260	2017	3201	Englewood	NJ	YV4A22PL3H1186162	

```
852119  55999  2016    28941      Fort Collins    CO  YV4A22PL4G1000868
852120  60240  2017     3005       San Leandro    CA  YV4A22NLXH1006162
852121  76995  2017     2502          New York    NY  YV4BC0ZX1H1109845

         Make         Model
0       Acura    ILX6-Speed
1       Acura    ILX5-Speed
2       Acura    ILX6-Speed
3       Acura    ILX5-Speed
4       Acura  ILXAutomatic
…       …            …
852117  Volvo          S90T6
852118  Volvo         XC90T6
852119  Volvo        XC90AWD
852120  Volvo            V90
852121  Volvo         XC90T8

[852122 rows x 8 columns]
```

1 Tamaño del dataset: 852122 filas

[4]:
```
len(df.Vin.unique())
```

[4]:
```
852075
```

[5]:
```
df.shape
```

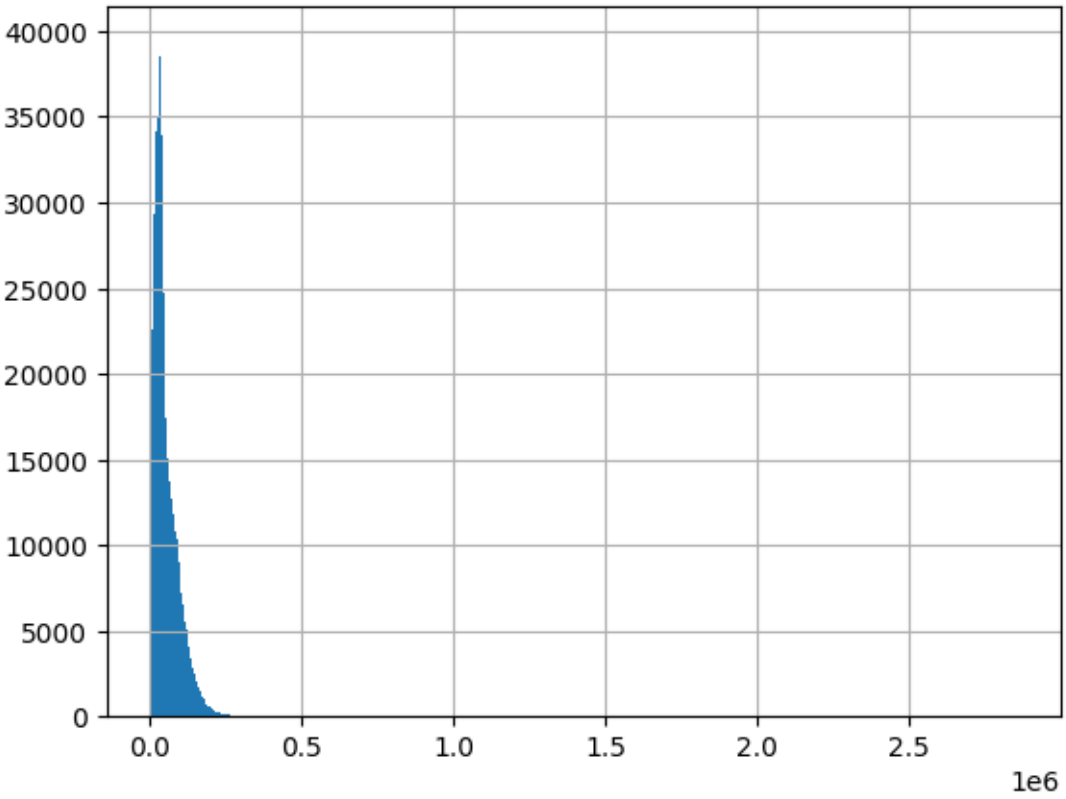
[5]:
```
(852122, 8)
```

2 Distribución por millas recorridas

3 Distribución por millas recorridas

[10]:
```
df.Mileage.hist(bins=1000)
```

[10]:
```
<AxesSubplot: >
```



4 Datos de autos de 2553 ciudades

[13]:
```
len(df.City.unique())
```

[13]: 2553

5 Datos de 51 estados

[23]:
```
len(df.State.str.lower().unique())
```

[23]: 51

[26]:
```
data = utils.cat_num_rate_analysis(df);
```

```
        num_to_cat_rate len of unique len of data col type  \
Vin            0.999945        852075      852122   object
Mileage        0.186401        158836      852122    int64
Price          0.055302         47124      852122    int64
Model          0.003211          2736      852122   object
City           0.002996          2553      852122   object
State          0.000069            59      852122   object
```

```
Make            0.000068            58      852122   object
Year            0.000026            22      852122    int64


                                                                                ␣
 ↪                                                                 unique of col ␣
 ↪\
Vin      [19VDE2E53EE000083, 19VDE1F52DE012636, 19VDE2E52DE000025,␣
 ↪19VDE1F71EE003817, 19UDE2F32GA001284, JH4CU2F83CC019895, JH4CU2F84EC002686,␣
 ↪JH4CU2F64DC0…
Mileage  [35725, 19606, 48851, 39922, 22142, 105246, 34032, 32384, 57596, 63887,␣
 ↪58550, 40527, 91980, 13797, 35035, 23454, 23603, 19250, 68289, 60552, 2394…
Price    [8995, 10888, 10999, 14799, 7989, 14490, 13995, 10495, 9995, 12921,␣
 ↪12000, 7750, 17628, 13999, 14995, 14990, 14590, 9500, 7990, 16994, 15499, 1349…
Model    [ILX6-Speed, ILX5-Speed, ILXAutomatic, TSXAutomatic, TSXSpecial,␣
 ↪TSX5-Speed, TSX4dr, TSX, ILX4dr, ILXAcuraWatch, ILXHybrid, TSXManual,␣
 ↪TSXPremium,…
City     [El Paso, Long Island City, Windsor, Lindon, Miami, Greatneck, West␣
 ↪Jordan, Waterbury, Boise, San Antonio, Fargo, Santa Ana, Hackettstown, Freepor…
State    [ TX,  NY,  CO,  UT,  FL,  CT,  ID,  ND,  CA,  NJ,  OH,  VA,  IN,  AZ, ␣
 ↪OR,  KS,  NE,  MA,  MD,  GA,  MN,  HI,  LA,  NM,  IL,  AL,  PA,  SC,  NC, …
Make     [Acura, Alfa, AM, Aston, Audi, Bentley, BMW, Buick, Cadillac,␣
 ↪Chevrolet, Chrysler, Dodge, Ferrari, FIAT, Fisker, Ford, Freightliner,␣
 ↪Genesis, Geo,…
Year                     [2014, 2013, 2016, 2012, 2009, 2015, 2010, 2011, 2007,␣
 ↪2006, 2008, 2004, 2017, 2005, 2003, 2002, 1999, 2001, 2000, 1998, 2018, 1997]

        count of nan
Vin                0
Mileage            0
Price              0
Model              0
City               0
State              0
Make               0
Year               0
```

6 58 Marcas de auto

[51]:
```
marcas = data['unique of col']['Make']
marcas.sort()
marcas
```

[51]:
```
array(['AM', 'Acura', 'Alfa', 'Aston', 'Audi', 'BMW', 'Bentley', 'Buick',
       'Cadillac', 'Chevrolet', 'Chrysler', 'Dodge', 'FIAT', 'Ferrari',
       'Fisker', 'Ford', 'Freightliner', 'GMC', 'Genesis', 'Geo',
       'HUMMER', 'Honda', 'Hyundai', 'INFINITI', 'Isuzu', 'Jaguar',
```

```
'Jeep', 'Kia', 'Lamborghini', 'Land', 'Lexus', 'Lincoln', 'Lotus',
'MINI', 'Maserati', 'Maybach', 'Mazda', 'McLaren', 'Mercedes-Benz',
'Mercury', 'Mitsubishi', 'Nissan', 'Oldsmobile', 'Plymouth',
'Pontiac', 'Porsche', 'Ram', 'Rolls-Royce', 'Saab', 'Saturn',
'Scion', 'Subaru', 'Suzuki', 'Tesla', 'Toyota', 'Volkswagen',
'Volvo', 'smart'], dtype=object)
```

7 Datos entre 1997 y 2018

[37]:
```
years = data['unique of col']['Year']
years.sort()
years
```

[37]:
```
array([1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007,
       2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018],
      dtype=int64)
```

[ ]:
```

```