PREPROCESSING FOR MACHINE LEARNING IN PYTHON

Preprocessing Data for Machine Learning

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What is data preprocessing?

- Beyond cleaning and exploratory data analysis
- Prepping data for modeling
- Modeling in Python requires numerical input

Refresher on Pandas basics

```
In [1]: import pandas as pd

In [2]: hiking = pd.read_json("datasets/hiking.json")
In [3]: print(hiking.head())

  Accessible Difficulty      Length Limited_Access
0          Y       None   0.8 miles              N
1          N       Easy    1.0 mile              N
2          N       Easy  0.75 miles              N
3          N       Easy   0.5 miles              N
4          N       Easy   0.5 miles              N
```

Refresher on Pandas basics

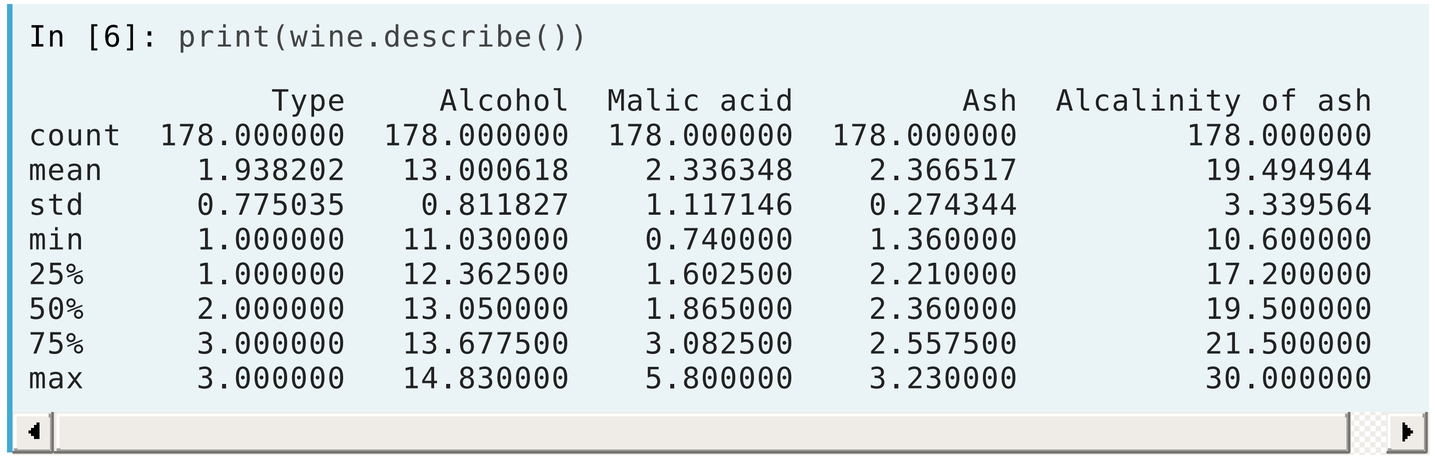
```
In [4]: print(hiking.columns)

Index(['Accessible', 'Difficulty',
       'Length', 'Limited_Access',
       'Location', 'Name',
       'Other_Details', 'Park_Name',
       'Prop_ID', 'lat', 'lon'],
dtype='object')
```

```
In [5]: print(hiking.dtypes)

Accessible         object
Difficulty         object
Length             object
Limited_Access     object
Location           object
Name               object
Other_Details      object
Park_Name          object
Prop_ID            object
lat               float64
lon               float64
dtype: object
```

Refresher on Pandas basics



```
In [6]: print(wine.describe())

             Type     Alcohol  Malic acid         Ash  Alcalinity of ash
count  178.000000  178.000000  178.000000  178.000000         178.000000
mean     1.938202   13.000618    2.336348    2.366517          19.494944
std      0.775035    0.811827    1.117146    0.274344           3.339564
min      1.000000   11.030000    0.740000    1.360000          10.600000
25%      1.000000   12.362500    1.602500    2.210000          17.200000
50%      2.000000   13.050000    1.865000    2.360000          19.500000
75%      3.000000   13.677500    3.082500    2.557500          21.500000
max      3.000000   14.830000    5.800000    3.230000          30.000000
```

Removing missing data

```
In [7]: print(df)

     A    B    C
0  1.0  NaN  2.0
1  4.0  7.0  3.0
2  7.0  NaN  NaN
3  NaN  7.0  NaN
4  5.0  9.0  7.0

In [8]: print(df.dropna())

     A    B    C
1  4.0  7.0  3.0
4  5.0  9.0  7.0
```

Removing missing data

```
In [9]: print(df)

     A    B    C
0  1.0  NaN  2.0
1  4.0  7.0  3.0
2  7.0  NaN  NaN
3  NaN  7.0  NaN
4  5.0  9.0  7.0

In [10]: print(df.drop([1, 2, 3]))

     A    B    C
0  1.0  NaN  2.0
4  5.0  9.0  7.0
```

Removing missing data

```
In [11]: print(df)

     A    B    C
0  1.0  NaN  2.0
1  4.0  7.0  3.0
2  7.0  NaN  NaN
3  NaN  7.0  NaN
4  5.0  9.0  7.0

In [12]: print(df.drop("A", axis=1))

     B    C
0  NaN  2.0
1  7.0  3.0
2  NaN  NaN
3  7.0  NaN
4  9.0  7.0
```

Removing missing data

```
In [13]: print(df)

     A    B    C
0  1.0  NaN  2.0
1  4.0  7.0  3.0
2  7.0  NaN  NaN
3  NaN  7.0  NaN
4  5.0  9.0  7.0

In [14]: print(df[df["B"] == 7])

     A    B    C
1  4.0  7.0  3.0
3  NaN  7.0  NaN
```

Removing missing data

```
In [15]: print(df)

     A    B    C
0  1.0  NaN  2.0
1  4.0  7.0  3.0
2  7.0  NaN  NaN
3  NaN  7.0  NaN
4  5.0  9.0  7.0

In [16]: print(df["B"].isnull().sum())

2

In [17]: print(df[df["B"].notnull()])

     A    B    C
1  4.0  7.0  3.0
3  NaN  7.0  NaN
4  5.0  9.0  7.0
```

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Let's practice!

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Working With Data Types

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Why are types important?

```
In [1]: print(volunteer.dtypes)

opportunity_id          int64
content_id              int64
vol_requests            int64
event_time              int64
title                  object
hits                    int64
summary                object
is_priority            object
category_id           float64
...
```

- object: string/mixed types
- int64: integer
- float64: float

Converting column types

```
In [2]: print(df)

   A        B    C
0  1   string  1.0
1  2  string2  2.0
2  3  string3  3.0

In [3]: print(df.dtypes)

A      int64
B     object
C     object
dtype: object
```

Converting column types

```
In [4]: print(df)

   A        B    C
0  1   string  1.0
1  2  string2  2.0
2  3  string3  3.0

In [5]: df["C"] = df["C"].astype("float")
In [6]: print(df.dtypes)

A      int64
B     object
C    float64
dtype: object
```

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Training and Test Sets

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Splitting up your dataset

```
In [1]: from sklearn.model_selection import train_test_split

In [2]: X_train, X_test, y_train, y_test = train_test_split(X, y)

   X_train y_train
0      1.0       n
1      4.0       n
2      7.0       n
3      2.0       n
4      5.0       n
5      5.0       n
6      6.0       n

   X_test y_test
0     9.0      y
1     1.0      n
2     4.0      n
```

Stratified sampling

- 100 samples, 80 class 1 and 20 class 2
- Training set: 75 samples, 60 class 1 and 15 class 2
- Test set: 25 samples, 20 class 1 and 5 class 2

Stratified sampling

```
In [3]: y["labels"].value_counts()

class1    80
class2    20
Name: labels, dtype: int64

In [4]: X_train, X_test, y_train, y_test = train_test_split(X, y, stratify=
In [5]: y_train["labels"].value_counts()

class1    60
class2    15
Name: labels, dtype: int64

In [6]: y_test["labels"].value_counts()

class1    20
class2    5
Name: labels, dtype: int64
```

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Let's practice!