

## 4\_Preprocesamiento

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*Creado por:*

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```
[1]: # pip install pandas
```

```
[2]: # pip install scikit-learn
```

```
[3]: # pip install seaborn
```

```
[4]: import pandas as pd
from sklearn.datasets import fetch_openml
import seaborn as sns
from sklearn.impute import SimpleImputer
import numpy as np
from sklearn.preprocessing import OneHotEncoder
from sklearn.preprocessing import MinMaxScaler
from sklearn.preprocessing import StandardScaler
```

### 1 Cargar el titanic con sklearn

```
[5]: df = fetch_openml("titanic", version=1, as_frame=True)["data"]
df.head()
```

```
[5]:
```

	pclass		name	sex	age	\
0	1		Allen, Miss. Elisabeth Walton	female	29.0000	
1	1		Allison, Master. Hudson Trevor	male	0.9167	
2	1		Allison, Miss. Helen Loraine	female	2.0000	
3	1		Allison, Mr. Hudson Joshua Creighton	male	30.0000	
4	1		Allison, Mrs. Hudson J C (Bessie Waldo Daniels)	female	25.0000	

	sibsp	parch	ticket	fare	cabin	embarked	boat	body	\
0	0	0	24160	211.3375	B5	S	2	NaN	
1	1	2	113781	151.5500	C22 C26	S	11	NaN	
2	1	2	113781	151.5500	C22 C26	S	NaN	NaN	
3	1	2	113781	151.5500	C22 C26	S	NaN	135.0	
4	1	2	113781	151.5500	C22 C26	S	NaN	NaN	

```

                                home.dest
0                               St Louis, MO
1  Montreal, PQ / Chesterville, ON
2  Montreal, PQ / Chesterville, ON
3  Montreal, PQ / Chesterville, ON
4  Montreal, PQ / Chesterville, ON

```

```
[6]: # df.to_csv("Titanic_all.csv")
```

## 2 Mostrar las columnas sin datos

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

```

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1309 entries, 0 to 1308
Data columns (total 13 columns):
 #   Column        Non-Null Count  Dtype  
---  -
 0   pclass        1309 non-null  int64  
 1   name          1309 non-null  object  
 2   sex           1309 non-null  category
 3   age           1046 non-null  float64 
 4   sibsp         1309 non-null  int64  
 5   parch         1309 non-null  int64  
 6   ticket        1309 non-null  object  
 7   fare          1308 non-null  float64 
 8   cabin         295 non-null   object  
 9   embarked      1307 non-null  category
10   boat          486 non-null   object  
11   body          121 non-null   float64 
12   home.dest     745 non-null   object  
dtypes: category(2), float64(3), int64(3), object(5)
memory usage: 115.4+ KB

```

```
[8]: df.isnull().sum()
```

```

[8]: pclass      0
     name        0
     sex         0
     age        263
     sibsp       0
     parch       0
     ticket      0
     fare        1
     cabin     1014
     embarked    2
     boat       823

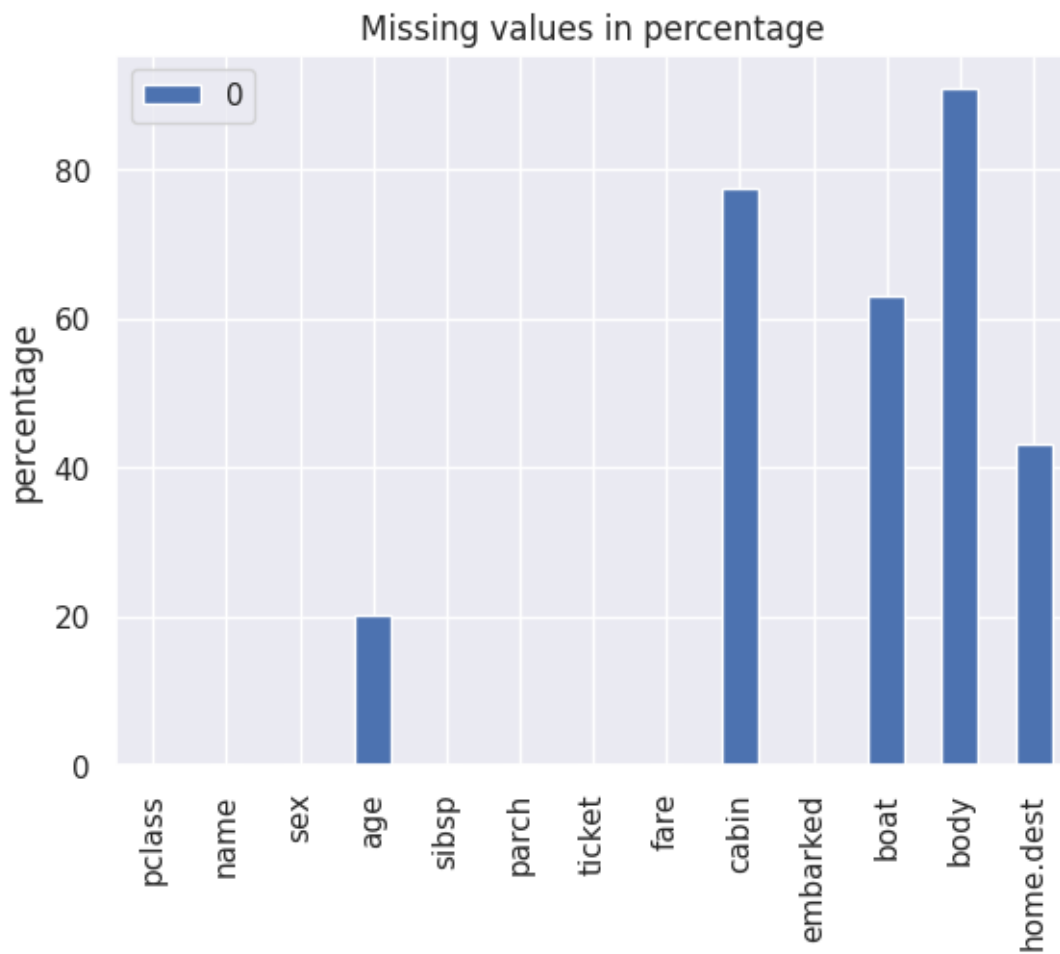
```

```
body          1188
home.dest     564
dtype: int64
```

```
[9]: # Visualización de los datos

sns.set()
miss_vals = pd.DataFrame(df.isnull().sum()/ len(df)*100)
miss_vals.plot(kind="bar",
                  title="Missing values in percentage",
                  ylabel="percentage")
```

```
[9]: <Axes: title={'center': 'Missing values in percentage'}, ylabel='percentage'>
```



## 2.1 Procedimiento para valores nulos

Existen dos maneras:

- Eliminar la columna
- Asignamos a los valores la media, mediana, moda, etc

## Eliminación

- Eliminamos los valores nulos:

```
[10]: print(f"Size of the dataset: {df.shape}")
df.drop(["cabin", "boat", "body", "home.dest"], axis=1, inplace=True)
df.dropna(inplace=True)
print(f"Size of the dataset: {df.shape}")
```

Size of the dataset: (1309, 13)

Size of the dataset: (1043, 9)

## Sustitución

- Sustituir por el valor más común (media):

```
[11]: df = fetch_openml("titanic", version=1, as_frame=True)["data"]
df.head()
```

```
[11]:
```

	pclass		name	sex	age	\
0	1		Allen, Miss. Elisabeth Walton	female	29.0000	
1	1		Allison, Master. Hudson Trevor	male	0.9167	
2	1		Allison, Miss. Helen Loraine	female	2.0000	
3	1		Allison, Mr. Hudson Joshua Creighton	male	30.0000	
4	1		Allison, Mrs. Hudson J C (Bessie Waldo Daniels)	female	25.0000	

	sibsp	parch	ticket	fare	cabin	embarked	boat	body	\
0	0	0	24160	211.3375	B5	S	2	NaN	
1	1	2	113781	151.5500	C22 C26	S	11	NaN	
2	1	2	113781	151.5500	C22 C26	S	NaN	NaN	
3	1	2	113781	151.5500	C22 C26	S	NaN	135.0	
4	1	2	113781	151.5500	C22 C26	S	NaN	NaN	

	home.dest
0	St Louis, MO
1	Montreal, PQ / Chesterville, ON
2	Montreal, PQ / Chesterville, ON
3	Montreal, PQ / Chesterville, ON
4	Montreal, PQ / Chesterville, ON

```
[12]: print(f"Número de valores nulos de la columna edad: {df.age.isnull().sum()}")
```

Número de valores nulos de la columna edad: 263

```
[13]: df["age"] = df["age"].fillna(df["age"].mean())
print(f"Número de valores nulos de la columna edad: {df.age.isnull().sum()}")
```

Número de valores nulos de la columna edad: 0

```
[14]: df.describe()
```

```
[14]:
```

	pclass	age	sibsp	parch	fare \
count	1309.000000	1309.000000	1309.000000	1309.000000	1308.000000
mean	2.294882	29.881135	0.498854	0.385027	33.295479
std	0.837836	12.883199	1.041658	0.865560	51.758668
min	1.000000	0.166700	0.000000	0.000000	0.000000
25%	2.000000	22.000000	0.000000	0.000000	7.895800
50%	3.000000	29.881135	0.000000	0.000000	14.454200
75%	3.000000	35.000000	1.000000	0.000000	31.275000
max	3.000000	80.000000	8.000000	9.000000	512.329200

	body
count	121.000000
mean	160.809917
std	97.696922
min	1.000000
25%	72.000000
50%	155.000000
75%	256.000000
max	328.000000

- Otra opción: Simple transformación con Sklearn

```
[15]: df = fetch_openml("titanic", version=1, as_frame=True)["data"]
df.head()
```

```
[15]:
```

	pclass		name	sex	age \
0	1		Allen, Miss. Elisabeth Walton	female	29.0000
1	1		Allison, Master. Hudson Trevor	male	0.9167
2	1		Allison, Miss. Helen Loraine	female	2.0000
3	1		Allison, Mr. Hudson Joshua Creighton	male	30.0000
4	1	Allison, Mrs. Hudson J C (Bessie Waldo Daniels)	female	25.0000	

	sibsp	parch	ticket	fare	cabin	embarked	boat	body \
0	0	0	24160	211.3375	B5	S	2	NaN
1	1	2	113781	151.5500	C22 C26	S	11	NaN
2	1	2	113781	151.5500	C22 C26	S	NaN	NaN
3	1	2	113781	151.5500	C22 C26	S	NaN	135.0
4	1	2	113781	151.5500	C22 C26	S	NaN	NaN

	home.dest
0	St Louis, MO
1	Montreal, PQ / Chesterville, ON
2	Montreal, PQ / Chesterville, ON
3	Montreal, PQ / Chesterville, ON
4	Montreal, PQ / Chesterville, ON

```
[16]: print(f"Número de valores nulos de la columna edad: {df.age.isnull().sum()}")
```

Número de valores nulos de la columna edad: 263

```
[17]: imp = SimpleImputer(strategy="mean")
df["age"] = imp.fit_transform(df[["age"]])
print(f"Número de valores nulos de la columna edad: {df.age.isnull().sum()}")
```

Número de valores nulos de la columna edad: 0

```
[18]: print("Tipos de datos con valores Nulos:")
for col in df.columns[df.isnull().any()]:
    print(col, df[col][df[col].isnull()].values[0])
```

Tipos de datos con valores Nulos:

fare nan  
cabin nan  
embarked nan  
boat nan  
body nan  
home.dest nan

- Modificamos los None:

```
[19]: df = fetch_openml("titanic", version=1, as_frame=True)["data"]
df.head()
```

```
[19]:
```

	pclass		name	sex	age	\
0	1		Allen, Miss. Elisabeth Walton	female	29.0000	
1	1		Allison, Master. Hudson Trevor	male	0.9167	
2	1		Allison, Miss. Helen Loraine	female	2.0000	
3	1		Allison, Mr. Hudson Joshua Creighton	male	30.0000	
4	1		Allison, Mrs. Hudson J C (Bessie Waldo Daniels)	female	25.0000	

	sibsp	parch	ticket	fare	cabin	embarked	boat	body	\
0	0	0	24160	211.3375	B5	S	2	NaN	
1	1	2	113781	151.5500	C22 C26	S	11	NaN	
2	1	2	113781	151.5500	C22 C26	S	NaN	NaN	
3	1	2	113781	151.5500	C22 C26	S	NaN	135.0	
4	1	2	113781	151.5500	C22 C26	S	NaN	NaN	

	home.dest
0	St Louis, MO
1	Montreal, PQ / Chesterville, ON
2	Montreal, PQ / Chesterville, ON
3	Montreal, PQ / Chesterville, ON
4	Montreal, PQ / Chesterville, ON

```
[20]: cols_categoricas = ["pclass", "sex", "embarked"]

df[cols_categoricas] = df[cols_categoricas].astype("category")
df.dtypes
```

```
[20]: pclass      category
      name      object
      sex      category
      age      float64
      sibsp     int64
      parch     int64
      ticket    object
      fare      float64
      cabin     object
      embarked  category
      boat      object
      body      float64
      home.dest  object
      dtype: object
```

```
[21]: df["pclass"] = pd.Categorical(df["pclass"],categories=[3, 2, 1],
                                   ordered=True)
df.dtypes
```

```
[21]: pclass      category
      name      object
      sex      category
      age      float64
      sibsp     int64
      parch     int64
      ticket    object
      fare      float64
      cabin     object
      embarked  category
      boat      object
      body      float64
      home.dest  object
      dtype: object
```

```
[22]: cols_numericas = ["age", "fare"]

df[cols_numericas] = df[cols_numericas].astype("float")
df.dtypes
```

```
[22]: pclass      category
      name      object
      sex      category
```

```

age          float64
sibsp        int64
parch        int64
ticket       object
fare         float64
cabin        object
embarked     category
boat         object
body         float64
home.dest    object
dtype: object

```

```

df = df.drop(['boat', 'body', 'home.dest', 'name', 'ticket', 'cabin'], axis=1)
df.head()

```

```

[23]: def get_parameters(df):
        parameters = {}
        for col in df.columns[df.isnull().any()]:
            if df[col].dtype == "float64" or df[col].dtype == "int64" or df[col].
dtype == "int32":
                strategy = "mean"
            else:
                strategy = "most_frequent"
                missing_values = df[col][df[col].isnull()].values[0]
                parameters[col] = {"missing_values": missing_values, "strategy":
strategy}
        return parameters
get_parameters(df)

```

```

[23]: {'age': {'missing_values': np.float64(nan), 'strategy': 'mean'},
'fare': {'missing_values': np.float64(nan), 'strategy': 'mean'},
'cabin': {'missing_values': nan, 'strategy': 'most_frequent'},
'embarked': {'missing_values': nan, 'strategy': 'most_frequent'},
'boat': {'missing_values': nan, 'strategy': 'most_frequent'},
'body': {'missing_values': np.float64(nan), 'strategy': 'mean'},
'home.dest': {'missing_values': nan, 'strategy': 'most_frequent'}}

```

```

[24]: parameters = get_parameters(df)

for col, param in parameters.items():
    missing_values = param["missing_values"]
    strategy = param["strategy"]
    imp = SimpleImputer(missing_values=missing_values, strategy=strategy)
    if strategy == "most_frequent":
        df[[col]] = imp.fit_transform(df[[col]])
    else:
        df[col] = imp.fit_transform(df[[col]])

```



```
df.isnull().sum()
```

```
[24]: pclass      0
      name        0
      sex         0
      age         0
      sibsp       0
      parch       0
      ticket      0
      fare        0
      cabin       0
      embarked    0
      boat        0
      body        0
      home.dest    0
      dtype: int64
```

```
[25]: df.head()
```

```
[25]:  pclass      name      sex      age \
0      1      Allen, Miss. Elisabeth Walton  female  29.0000
1      1      Allison, Master. Hudson Trevor   male    0.9167
2      1      Allison, Miss. Helen Loraine  female    2.0000
3      1      Allison, Mr. Hudson Joshua Creighton   male  30.0000
4      1  Allison, Mrs. Hudson J C (Bessie Waldo Daniels)  female  25.0000

      sibsp  parch  ticket      fare      cabin embarked boat      body \
0      0      0    24160  211.3375      B5      S      2  160.809917
1      1      2   113781  151.5500  C22 C26      S     11  160.809917
2      1      2   113781  151.5500  C22 C26      S     13  160.809917
3      1      2   113781  151.5500  C22 C26      S     13  135.000000
4      1      2   113781  151.5500  C22 C26      S     13  160.809917

      home.dest
0      St Louis, MO
1  Montreal, PQ / Chesterville, ON
2  Montreal, PQ / Chesterville, ON
3  Montreal, PQ / Chesterville, ON
4  Montreal, PQ / Chesterville, ON
```

## 2.2 Crear nuevas características (Feature Engineering)

- Sibsp: pasajeros que viajan con hermanos
- Parch: viajeros que viajan con niños

Calculamos el número de pasajeros que viajan solos:

```
[26]: df = fetch_openml("titanic", version=1, as_frame=True)["data"]
df.head()
```

```
[26]:
```

	pclass	name	sex	age	\
0	1	Allen, Miss. Elisabeth Walton	female	29.0000	
1	1	Allison, Master. Hudson Trevor	male	0.9167	
2	1	Allison, Miss. Helen Loraine	female	2.0000	
3	1	Allison, Mr. Hudson Joshua Creighton	male	30.0000	
4	1	Allison, Mrs. Hudson J C (Bessie Waldo Daniels)	female	25.0000	

	sibsp	parch	ticket	fare	cabin	embarked	boat	body	\
0	0	0	24160	211.3375	B5	S	2	NaN	
1	1	2	113781	151.5500	C22 C26	S	11	NaN	
2	1	2	113781	151.5500	C22 C26	S	NaN	NaN	
3	1	2	113781	151.5500	C22 C26	S	NaN	135.0	
4	1	2	113781	151.5500	C22 C26	S	NaN	NaN	

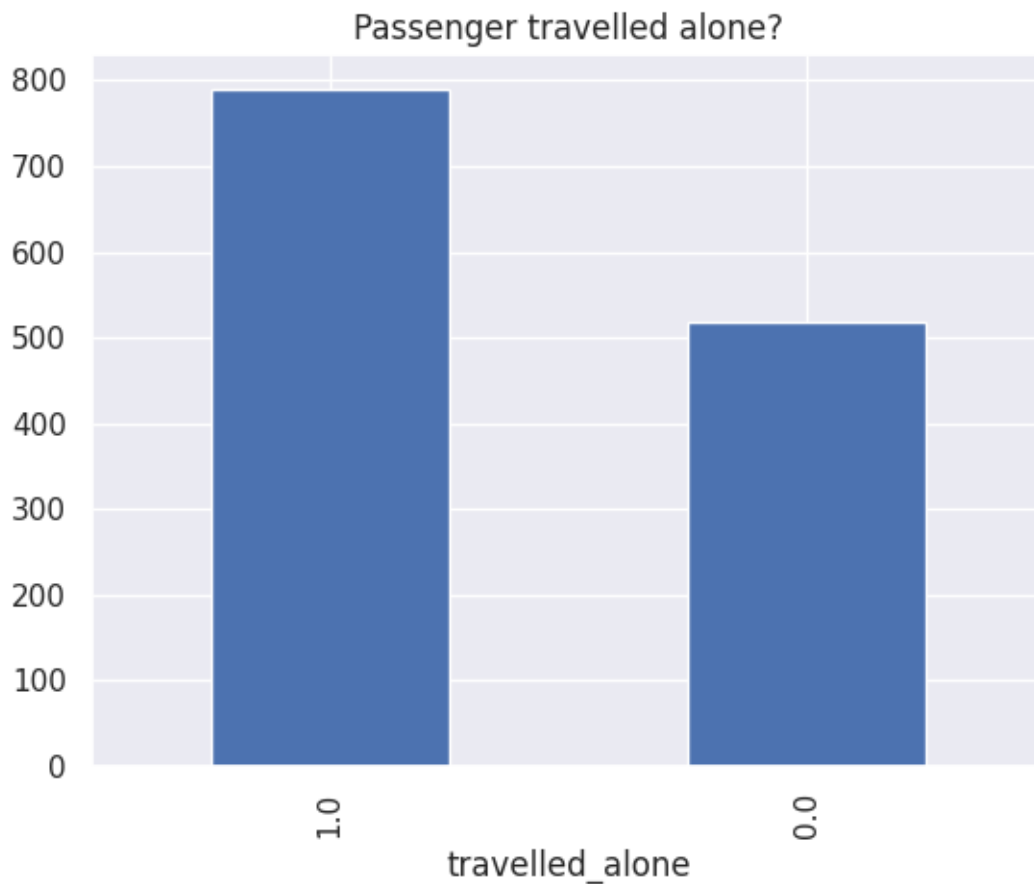
	home.dest
0	St Louis, MO
1	Montreal, PQ / Chesterville, ON
2	Montreal, PQ / Chesterville, ON
3	Montreal, PQ / Chesterville, ON
4	Montreal, PQ / Chesterville, ON

```
[27]: df["family"] = df["sibsp"] + df["parch"]

df.loc[df["family"] > 0, "travelled_alone"] = 0
df.loc[df["family"] == 0, "travelled_alone"] = 1

df["travelled_alone"].value_counts().plot(title="Passenger travelled alone?",
↪kind="bar")
```

```
[27]: <Axes: title={'center': 'Passenger travelled alone?'}, xlabel='travelled_alone'>
```



## 2.3 Encode categorical features

- scikit-learn: `OneHotEncoder()`
- pandas: `get_dummies()`

```
[28]: df = fetch_openml("titanic", version=1, as_frame=True)["data"]
df.head()
```

```
[28]:
```

	pclass		name	sex	age	\
0	1		Allen, Miss. Elisabeth Walton	female	29.0000	
1	1		Allison, Master. Hudson Trevor	male	0.9167	
2	1		Allison, Miss. Helen Loraine	female	2.0000	
3	1		Allison, Mr. Hudson Joshua Creighton	male	30.0000	
4	1		Allison, Mrs. Hudson J C (Bessie Waldo Daniels)	female	25.0000	

	sibsp	parch	ticket	fare	cabin	embarked	boat	body	\
0	0	0	24160	211.3375	B5	S	2	NaN	
1	1	2	113781	151.5500	C22 C26	S	11	NaN	
2	1	2	113781	151.5500	C22 C26	S	NaN	NaN	

3	1	2	113781	151.5500	C22 C26	S	NaN	135.0
4	1	2	113781	151.5500	C22 C26	S	NaN	NaN

	home.dest
0	St Louis, MO
1	Montreal, PQ / Chesterville, ON
2	Montreal, PQ / Chesterville, ON
3	Montreal, PQ / Chesterville, ON
4	Montreal, PQ / Chesterville, ON

```
[29]: df[["female", "male"]] = OneHotEncoder().fit_transform(df[['sex']]).toarray()
df[["sex", "female", "male"]]
```

```
[29]:
```

	sex	female	male
0	female	1.0	0.0
1	male	0.0	1.0
2	female	1.0	0.0
3	male	0.0	1.0
4	female	1.0	0.0
...	...	...	...
1304	female	1.0	0.0
1305	female	1.0	0.0
1306	male	0.0	1.0
1307	male	0.0	1.0
1308	male	0.0	1.0

[1309 rows x 3 columns]

Eliminaremos uno de las columnas para evitar la colinealidad

```
[30]: df = fetch_openml("titanic", version=1, as_frame=True)["data"]
df["sex"] = OneHotEncoder().fit_transform(df[['sex']]).toarray()[:, 1]
df.head()
```

```
[30]:
```

	pclass		name	sex	age	\
0	1		Allen, Miss. Elisabeth Walton	0.0	29.0000	
1	1		Allison, Master. Hudson Trevor	1.0	0.9167	
2	1		Allison, Miss. Helen Loraine	0.0	2.0000	
3	1		Allison, Mr. Hudson Joshua Creighton	1.0	30.0000	
4	1		Allison, Mrs. Hudson J C (Bessie Waldo Daniels)	0.0	25.0000	

	sibsp	parch	ticket	fare	cabin	embarked	boat	body	\
0	0	0	24160	211.3375	B5	S	2	NaN	
1	1	2	113781	151.5500	C22 C26	S	11	NaN	
2	1	2	113781	151.5500	C22 C26	S	NaN	NaN	
3	1	2	113781	151.5500	C22 C26	S	NaN	135.0	
4	1	2	113781	151.5500	C22 C26	S	NaN	NaN	

```

                                home.dest
0                                St Louis, MO
1  Montreal, PQ / Chesterville, ON
2  Montreal, PQ / Chesterville, ON
3  Montreal, PQ / Chesterville, ON
4  Montreal, PQ / Chesterville, ON

```

0 == female; 1 == male

- Pandas:

```

[31]: df = fetch_openml("titanic", version=1, as_frame=True)["data"]

df["sex"] = pd.get_dummies(df["sex"], drop_first=True, dtype=int)
df.head()

```

```

[31]:
   pclass      name  sex  age \
0        1  Allen, Miss. Elisabeth Walton    0  29.0000
1        1  Allison, Master. Hudson Trevor    1   0.9167
2        1  Allison, Miss. Helen Loraine    0   2.0000
3        1  Allison, Mr. Hudson Joshua Creighton    1  30.0000
4        1  Allison, Mrs. Hudson J C (Bessie Waldo Daniels)    0  25.0000

   sibsp  parch  ticket      fare  cabin embarked boat  body \
0        0     0   24160  211.3375    B5         S     2   NaN
1        1     2  113781  151.5500  C22 C26         S    11   NaN
2        1     2  113781  151.5500  C22 C26         S   NaN   NaN
3        1     2  113781  151.5500  C22 C26         S   NaN  135.0
4        1     2  113781  151.5500  C22 C26         S   NaN   NaN

```

```

                                home.dest
0                                St Louis, MO
1  Montreal, PQ / Chesterville, ON
2  Montreal, PQ / Chesterville, ON
3  Montreal, PQ / Chesterville, ON
4  Montreal, PQ / Chesterville, ON

```

0 == female; 1 == male

## 2.4 Encoding all categorical features

```

[32]: df = fetch_openml("titanic", version=1, as_frame=True)["data"]

cat_cols = df.select_dtypes(include=["category"]).columns
print(f"Columnas Categoricals: {cat_cols}")

```

Columnas Categoricals: Index(['sex', 'embarked'], dtype='object')

```
[33]: for col in cat_cols:
        fill_value = df[col].mode()[0]
        df[col].fillna(fill_value)

        append_to = list(df[col].unique())

        print(append_to)

        df[append_to] = OneHotEncoder().fit_transform(df[[col]]).toarray()

        df.drop(col, axis=1, inplace=True)
        df.drop(append_to[0], axis=1, inplace=True)

    print(df.columns)
    df[["male", "C", "Q"]].head()
```

```
['female', 'male']
['S', 'C', nan, 'Q']
Index([ 'pclass',      'name',      'age',      'sibsp',      'parch',
        'ticket',      'fare',      'cabin',      'boat',      'body',
        'home.dest',    'male',      'C',      nan,      'Q'],
      dtype='object')
```

```
[33]:   male    C    Q
0    0.0  0.0  0.0
1    1.0  0.0  0.0
2    0.0  0.0  0.0
3    1.0  0.0  0.0
4    0.0  0.0  0.0
```

```
[34]: df.head()
```

```
[34]:   pclass      name      age  sibsp \
0        1  Allen, Miss. Elisabeth Walton  29.0000    0
1        1  Allison, Master. Hudson Trevor   0.9167    1
2        1  Allison, Miss. Helen Loraine    2.0000    1
3        1  Allison, Mr. Hudson Joshua Creighton  30.0000    1
4        1  Allison, Mrs. Hudson J C (Bessie Waldo Daniels)  25.0000    1

      parch  ticket      fare      cabin boat  body \
0         0   24160  211.3375         B5    2   NaN
1         2  113781  151.5500      C22 C26   11   NaN
2         2  113781  151.5500      C22 C26   NaN   NaN
3         2  113781  151.5500      C22 C26   NaN  135.0
4         2  113781  151.5500      C22 C26   NaN   NaN

      home.dest  male    C  NaN    Q
0  St Louis, MO   0.0  0.0  1.0  0.0
```

```

1  Montreal, PQ / Chesterville, ON    1.0  0.0  1.0  0.0
2  Montreal, PQ / Chesterville, ON    0.0  0.0  1.0  0.0
3  Montreal, PQ / Chesterville, ON    1.0  0.0  1.0  0.0
4  Montreal, PQ / Chesterville, ON    0.0  0.0  1.0  0.0

```

## 2.5 MinMaxScaler

MinMaxScaler() pone todos los valores numéricos de 0 a 1:

```

[35]: df = fetch_openml("titanic", version=1, as_frame=True)["data"]

num_cols = df.select_dtypes(include=["int64", "int32", "float64"]).columns
print(num_cols)

```

```
Index(['pclass', 'age', 'sibsp', 'parch', 'fare', 'body'], dtype='object')
```

```

[36]: for col in num_cols:
        fill_value = df[col].mean()
        df[col].fillna(fill_value)

minmax = MinMaxScaler()

df[num_cols] = minmax.fit_transform(df[num_cols])
df[num_cols]

```

```

[36]:      pclass      age  sibsp   parch   fare   body
0         0.0  0.361169  0.000  0.000000  0.412503   NaN
1         0.0  0.009395  0.125  0.222222  0.295806   NaN
2         0.0  0.022964  0.125  0.222222  0.295806   NaN
3         0.0  0.373695  0.125  0.222222  0.295806  0.409786
4         0.0  0.311064  0.125  0.222222  0.295806   NaN
...
1304      1.0  0.179540  0.125  0.000000  0.028213  1.000000
1305      1.0         NaN  0.125  0.000000  0.028213   NaN
1306      1.0  0.329854  0.000  0.000000  0.014102  0.926606
1307      1.0  0.336117  0.000  0.000000  0.014102   NaN
1308      1.0  0.361169  0.000  0.000000  0.015371   NaN

```

```
[1309 rows x 6 columns]
```

## 2.6 StandardScaler

StandardScaler() poner todos los valores tengan una media de 0 y de desviación de 1

```

[37]: df = fetch_openml("titanic", version=1, as_frame=True)["data"]

num_cols = df.select_dtypes(include=["int64", "int32", "float64"]).columns
print(num_cols)

```

```
Index(['pclass', 'age', 'sibsp', 'parch', 'fare', 'body'], dtype='object')
```

```
[38]: for col in num_cols:
      fill_value = df[col].mean()
      df[col].fillna(fill_value)

      ss = StandardScaler()

      df[num_cols] = ss.fit_transform(df[num_cols])
      df[num_cols].head()
```

```
[38]:      pclass      age      sibsp      parch      fare      body
0 -1.546098 -0.061162 -0.479087 -0.445000  3.441165      NaN
1 -1.546098 -2.010496  0.481288  1.866526  2.285603      NaN
2 -1.546098 -1.935302  0.481288  1.866526  2.285603      NaN
3 -1.546098  0.008251  0.481288  1.866526  2.285603 -0.265282
4 -1.546098 -0.338812  0.481288  1.866526  2.285603      NaN
```

```
[39]: df[num_cols].describe()
```

```
[39]:      pclass      age      sibsp      parch      fare \
count  1.309000e+03  1.046000e+03  1.309000e+03  1.309000e+03  1.308000e+03
mean   -1.737003e-16 -1.358590e-16 -8.142201e-18  1.628440e-17 -8.691654e-17
std     1.000382e+00  1.000478e+00  1.000382e+00  1.000382e+00  1.000382e+00
min    -1.546098e+00 -2.062556e+00 -4.790868e-01 -4.449995e-01 -6.435292e-01
25%    -3.520907e-01 -6.164626e-01 -4.790868e-01 -4.449995e-01 -4.909206e-01
50%     8.419164e-01 -1.305744e-01 -4.790868e-01 -4.449995e-01 -3.641609e-01
75%     8.419164e-01  6.329641e-01  4.812878e-01 -4.449995e-01 -3.905147e-02
max     8.419164e-01  3.478880e+00  7.203909e+00  9.956864e+00  9.258680e+00

      body
count  1.210000e+02
mean   -8.074349e-17
std     1.004158e+00
min    -1.642574e+00
25%    -9.128147e-01
50%    -5.971606e-02
75%     9.783920e-01
max     1.718429e+00
```

Usando el método de describe() podemos ver la media y la desviación estandar de las columnas escaladas.

La media no parece ser igual a 0 pero, de hecho 4.342507e-17 es igual 0,000000000000000043425. Esto es tan cercano a 0 que puede considerarse igual a 0. Lo mismo ocurre con la desviación estándar que es tan cercana a 1 que puede considerarse igual a 1.

*Creado por:*

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