```
import pandas as pd
import numpy as np
df = pd.read_csv
('https://raw.githubusercontent.com/yessss28/Estadistica/refs/heads/
main/Churn_Modelling%20(1).csv')
df.dropna(inplace=True)
df
df.drop(columns = ["RowNumber", "CustomerId", "Surname"], inplace =
True)
df
```

{"summary":"{\n \"name\": \"df\",\n \"rows\": 9998,\n \"fields\":
[\n   {\n   \"column\": \"CreditScore\",\n   \"properties\": {\
n   \"dtype\": \"number\",\n   \"std\": 96,\n
\"min\": 350,\n   \"max\": 850,\n   \"num_unique_values\":
460,\n   \"samples\": [\n   716,\n   475,\n
588\n   ],\n   \"semantic_type\": \"\",\n
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\"min\": 18.0,\n   \"max\": 92.0,\n   \"num_unique_values\":
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n   ],\n   \"semantic_type\": \"\",\n
\"description\": \"\"\n   }\n   },\n   {\n   \"column\":
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\"max\": 250898.09,\n   \"num_unique_values\": 6379,\n
\"samples\": [\n   156834.34,\n   161592.76\n   ],\
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}\n   },\n   {\n   \"column\": \"NumOfProducts\",\n
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\"num_unique_values\": 4,\n   \"samples\": [\n   3,\n

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\"semantic_type\": \"\",\n   \"description\": \"\"\n   }\
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1.0\n   ],\n   \"semantic_type\": \"\",\n
\"description\": \"\"\n   }\n   },\n   {\n   \"column\":
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121408.55\n   ],\n   \"semantic_type\": \"\",\n
\"description\": \"\"\n   }\n   },\n   {\n   \"column\":
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1\n   ],\n   \"semantic_type\": \"\",\n
\"description\": \"\"\n   }\n   }\n]\
n}","type":"dataframe","variable_name":"df"}

```
df["Geography"].unique()
```

```
array(['France', 'Spain', 'Germany'], dtype=object)
```

```
import statsmodels.api as sm
import statsmodels.formula.api as smf

modelo=smf.ols("EstimatedSalary ~ C(Geography)",data=df).fit()
tabla_anova = sm.stats.anova_lm(modelo)
tabla_anova

#No se rechaza la hipotesis nula, no hay diferencia de grupos
```

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\"description\": \"\"\n   }\n   },\n   {\n   \"column\":
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\"samples\": [\n   33061377573564.785,\n

```
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\"semantic_type\": \"\",\n        \"description\": \"\"\n      }\
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\"description\": \"\"\n      }\n    },\n    {\n      \"column\":
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n    }\n  ]\n}","type":"dataframe","variable_name":"tabla_anova"}

import seaborn as sns
import matplotlib.pyplot as plt

sns.histplot(df['CreditScore'], kde = True, color = 'pink')
plt.xlabel('Creditos')
plt.ylabel('Fecuencia')
plt.title('Distriucion de Creditos')

plt.gca().spines['right'].set_visible(False)
plt.gca().spines['top'].set_visible(False)

# no hay datos atipicos
```

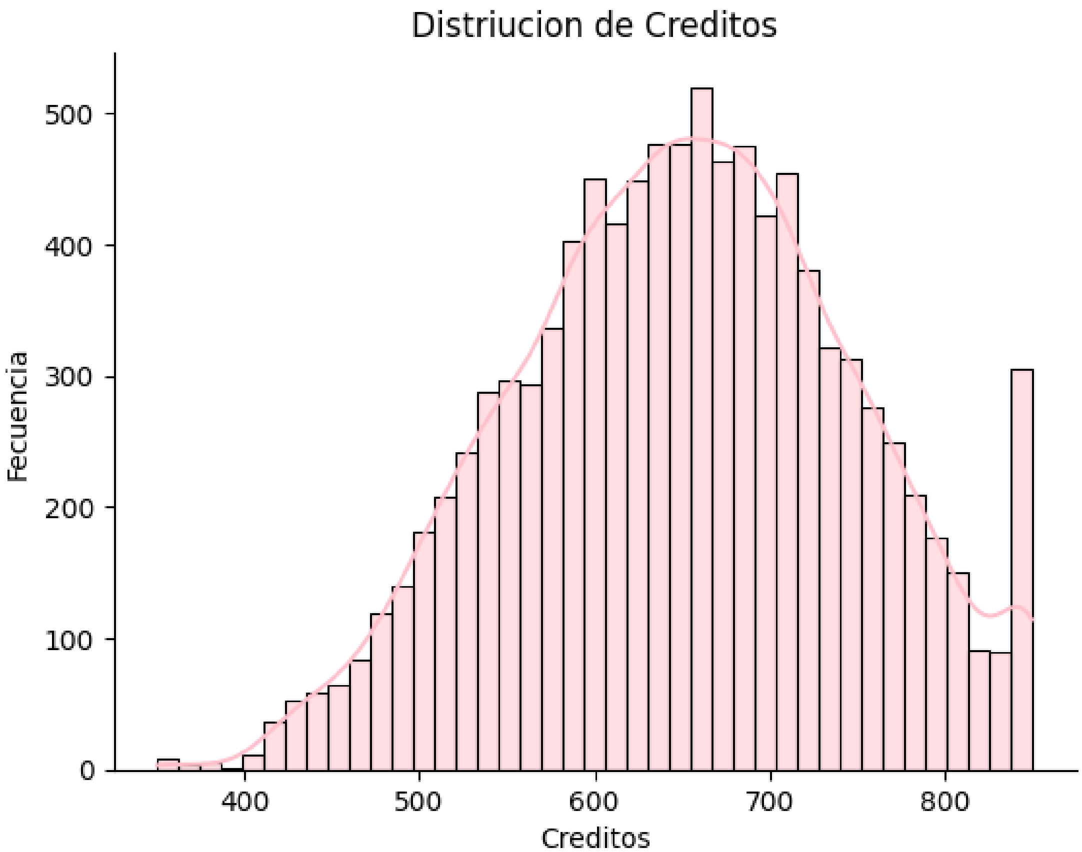


```
import statsmodels.api as sm
import statsmodels.formula.api as smf

modelo=smf.ols("EstimatedSalary ~ C(Geography)",data=df).fit()
tabla_anova = sm.stats.anova_lm(modelo)
tabla_anova

#No se rechaza la hipotesis nula por que no hay diferencia de grupos
```


```
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2.0\n        ],\n        \"semantic_type\": \"\",\n
\"description\": \"\"\n      }\n    },\n    {\n      \"column\":
\"sum_sq\",\n      \"properties\": {\n        \"dtype\": \"number\",\n
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\"max\": 33061377573564.785,\n        \"num_unique_values\": 2,\n
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```
df.drop(columns = ["Geography"], inplace = True)
df
```

{"summary":"{\n \"name\": \"df\",\n \"rows\": 9998,\n \"fields\":
[\n   {\n   \"column\": \"CreditScore\",\n   \"properties\": {\
n   \"dtype\": \"number\",\n   \"std\": 96,\n
\"min\": 350,\n   \"max\": 850,\n   \"num_unique_values\":
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\"min\": 18.0,\n   \"max\": 92.0,\n   \"num_unique_values\":
73,\n   \"samples\": [\n   29.0,\n   71.0\
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\"description\": \"\"\n   }\n   },\n   {\n   \"column\":
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\"max\": 250898.09,\n   \"num_unique_values\": 6379,\n
\"samples\": [\n   156834.34,\n   161592.76\n   ],\
n   \"semantic_type\": \"\",\n   \"description\": \"\"\n
}\n   },\n   {\n   \"column\": \"NumOfProducts\",\n
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1.0\n   ],\n   \"semantic_type\": \"\",\n
\"description\": \"\"\n   }\n   },\n   {\n   \"column\":
\"EstimatedSalary\",\n   \"properties\": {\n   \"dtype\":
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11.58,\n   \"max\": 199992.48,\n   \"num_unique_values\":
9995,\n   \"samples\": [\n   51752.18,\n
121408.55\n   ],\n   \"semantic_type\": \"\",\n
\"description\": \"\"\n   }\n   },\n   {\n   \"column\":
\"Exited\",\n   \"properties\": {\n   \"dtype\": \"number\",\n
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1\n   ],\n   \"semantic_type\": \"\",\n
\"description\": \"\"\n   }\n   }\n]\
n}","type":"dataframe","variable_name":"df"}

```
import statsmodels.api as sm
import statsmodels.formula.api as smf

modelo=smf.ols("EstimatedSalary ~ C(Gender)",data=df).fit()
tabla_anova = sm.stats.anova_lm(modelo)
tabla_anova

#No rechazamos las hipotesis nula, no hay diferencia de grupos
```

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n    }\n  ]\n}","type":"dataframe","variable_name":"tabla_anova"}
```


```
df.drop(columns = ["Gender"], inplace = True)
df
```


```
{"summary":"{\n  \"name\": \"df\",\n  \"rows\": 9998,\n  \"fields\":
[\n    {\n      \"column\": \"CreditScore\",\n      \"properties\": {\
n        \"dtype\": \"number\",\n        \"std\": 96,\n
\"min\": 350,\n        \"max\": 850,\n        \"num_unique_values\":
460,\n        \"samples\": [\n          716,\n          475,\n
588\n        ],\n        \"semantic_type\": \"\",\n
\"description\": \"\"\n      }\n    },\n    {\n      \"column\":
\"Age\",\n      \"properties\": {\n        \"dtype\": \"number\",\n
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92.0,\n        \"num_unique_values\": 73,\n        \"samples\": [\n
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}\n    },\n    {\n      \"column\": \"Balance\",\n
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],\n        \"semantic_type\": \"\",\n        \"description\": \"\"\n
}\n    },\n    {\n      \"column\": \"NumOfProducts\",\n
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```

```
\"description\": \"\"\n      }\n    },\n    {\n      \"column\":
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\"samples\": [\n          0.0,\n          1.0\n        ],\n
\"semantic_type\": \"\",\n        \"description\": \"\"\n      }\
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1.0\n        ],\n        \"semantic_type\": \"\",\n
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11.58,\n        \"max\": 199992.48,\n        \"num_unique_values\":
9995,\n        \"samples\": [\n          51752.18,\n
121408.55\n        ],\n        \"semantic_type\": \"\",\n
\"description\": \"\"\n      }\n    },\n    {\n      \"column\":
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1\n        ],\n        \"semantic_type\": \"\",\n
\"description\": \"\"\n      }\n    }\n  ]\
n}","type":"dataframe","variable_name":"df"}

import seaborn as sns
import matplotlib.pyplot as plt

sns.histplot(df['Age'], kde = True, color = 'pink')
plt.xlabel('Edad')
plt.ylabel('Fecuencia')
plt.title('Distriucion de Edad')

plt.gca().spines['right'].set_visible(False)
plt.gca().spines['top'].set_visible(False)

# no hay datos atipicos
```
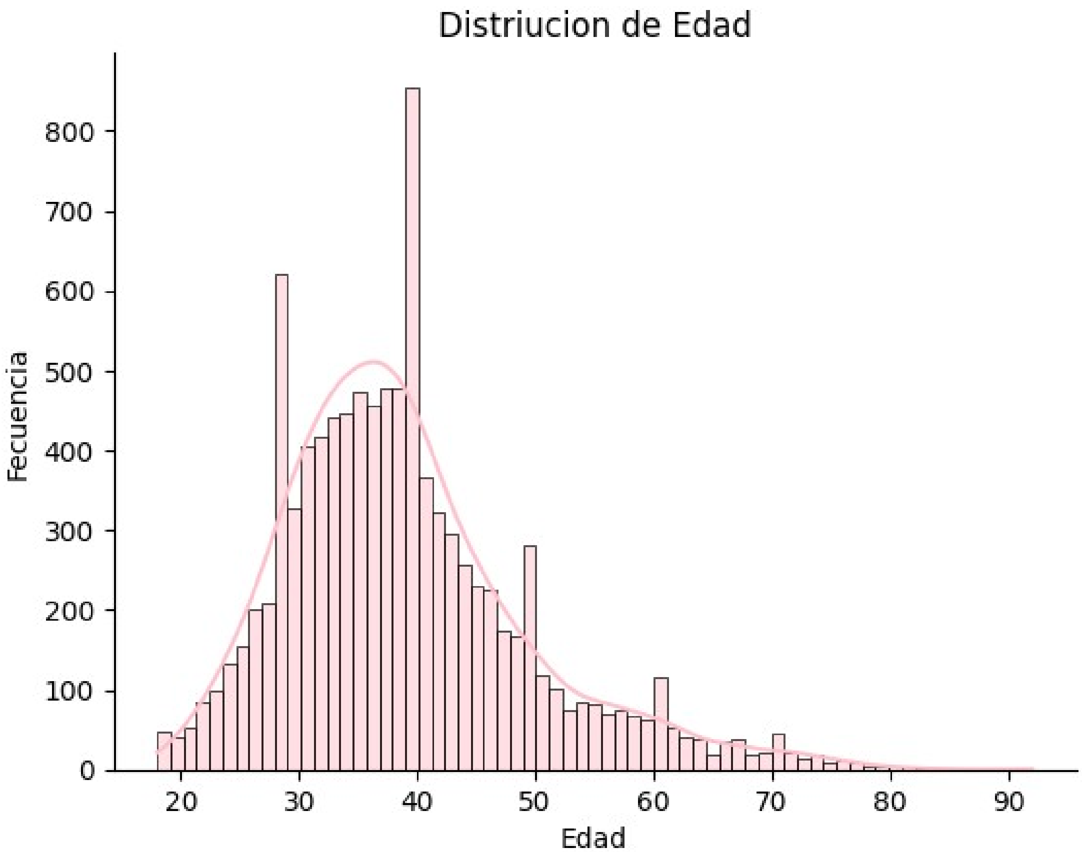
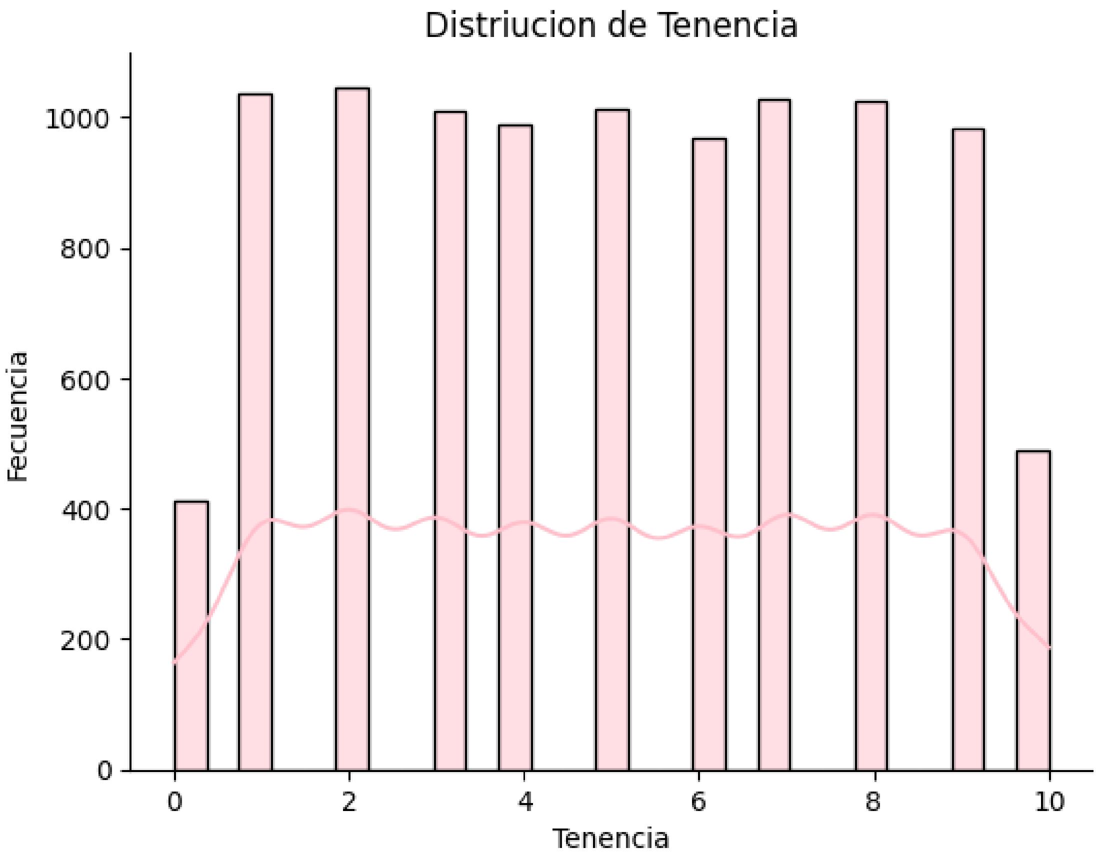
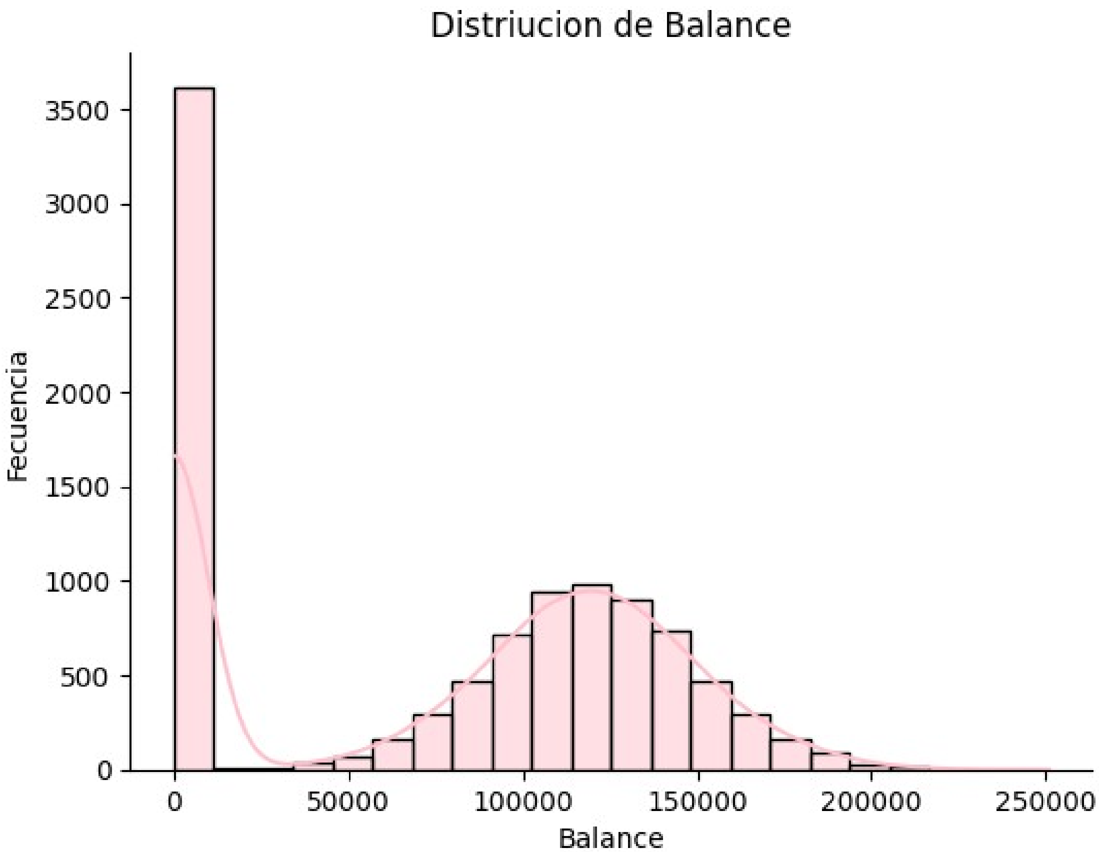




```
import seaborn as sns
import matplotlib.pyplot as plt

sns.histplot(df['Tenure'], kde = True, color = 'pink')
plt.xlabel('Tenencia')
plt.ylabel('Fecuencia')
plt.title('Distriucion de Tenencia')

plt.gca().spines['right'].set_visible(False)
plt.gca().spines['top'].set_visible(False)

# no hay datos atipicos
```




```
import seaborn as sns
import matplotlib.pyplot as plt

sns.histplot(df['Balance'], kde = True, color = 'pink')
plt.xlabel('Balance')
plt.ylabel('Fecuencia')
plt.title('Distriucion de Balance')

plt.gca().spines['right'].set_visible(False)
plt.gca().spines['top'].set_visible(False)

# este si es atipico
```

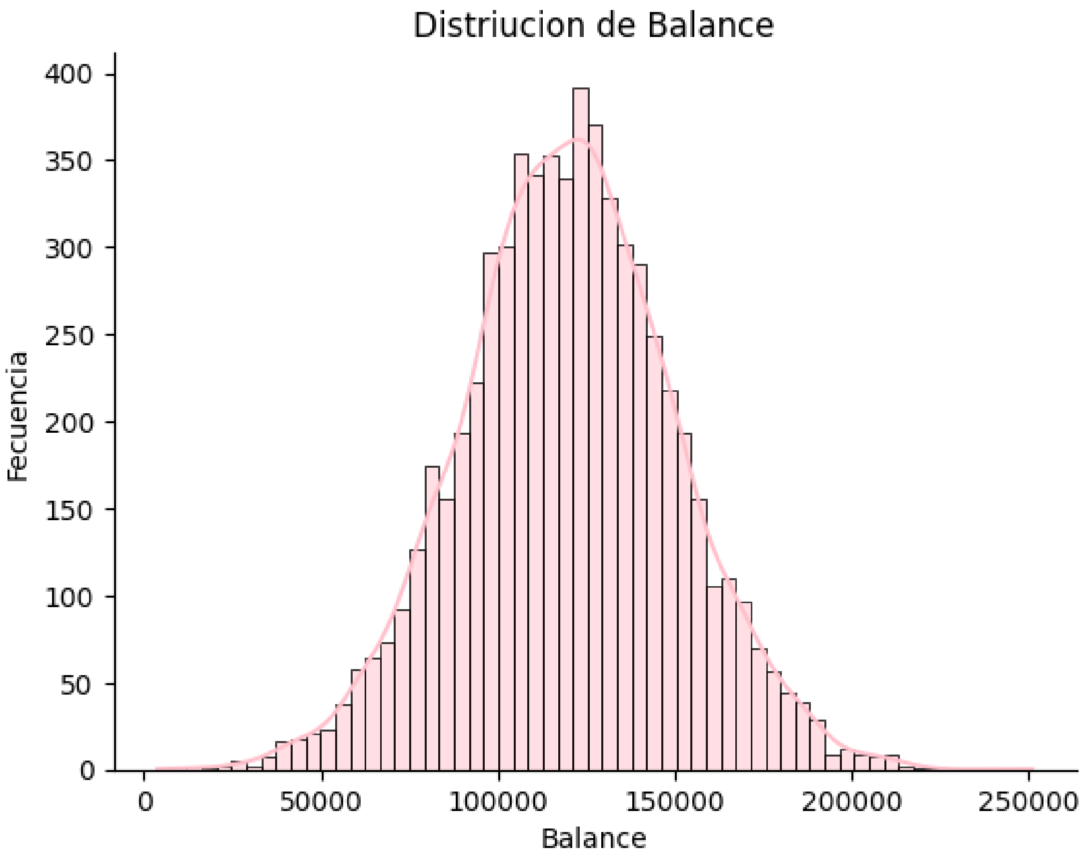



```
df = df.loc[df["Balance"]!=0.0,:]
df
```

{"summary":"{\n \"name\": \"df\",\n \"rows\": 6382,\n \"fields\": [\n   {\n   \"column\": \"CreditScore\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": 96,\n   \"min\": 350,\n   \"max\": 850,\n   \"num_unique_values\": 450,\n   \"samples\": [\n   810,\n   467,\n   763\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   },\n   {\n   \"column\": \"Age\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": 10.476612570392128,\n   \"min\": 18.0,\n   \"max\": 92.0,\n   \"num_unique_values\": 67,\n   \"samples\": [\n   47.0,\n   39.0,\n   31.0\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   },\n   {\n   \"column\": \"Tenure\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": 2,\n   \"min\": 0,\n   \"max\": 10,\n   \"num_unique_values\": 11,\n   \"samples\": [\n   2,\n   1,\n   5\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   },\n   {\n   \"column\": \"Balance\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": 30100.964691131376,\n   \"min\": 3768.69,\n   \"max\":

250898.09,\n   \"num_unique_values\": 6378,\n   \"samples\": [\n   121863.61,\n   142946.18,\n   125167.74\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   },\n   {\n   \"column\": \"NumOfProducts\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": 0,\n   \"min\": 1,\n   \"max\": 4,\n   \"num_unique_values\": 4,\n   \"samples\": [\n   3,\n   4,\n   1\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   },\n   {\n   \"column\": \"HasCrCard\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": 0.45859377845608573,\n   \"min\": 0.0,\n   \"max\": 1.0,\n   \"num_unique_values\": 2,\n   \"samples\": [\n   1.0,\n   0.0\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   },\n   {\n   \"column\": \"IsActiveMember\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": 0.4998658949563229,\n   \"min\": 0.0,\n   \"max\": 1.0,\n   \"num_unique_values\": 2,\n   \"samples\": [\n   0.0,\n   1.0\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   },\n   {\n   \"column\": \"EstimatedSalary\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": 57387.54061299657,\n   \"min\": 11.58,\n   \"max\": 199970.74,\n   \"num_unique_values\": 6380,\n   \"samples\": [\n   82276.62,\n   138051.19\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   },\n   {\n   \"column\": \"Exited\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": 0,\n   \"min\": 0,\n   \"max\": 1,\n   \"num_unique_values\": 2,\n   \"samples\": [\n   1,\n   0\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   }\n]\n}","type":"dataframe","variable_name":"df"}

```
import seaborn as sns
import matplotlib.pyplot as plt

sns.histplot(df['Balance'], kde = True, color = 'pink')
plt.xlabel('Balance')
plt.ylabel('Fecuencia')
plt.title('Distriucion de Balance')

plt.gca().spines['right'].set_visible(False)
plt.gca().spines['top'].set_visible(False)
```




```
df['NumOfProducts'].unique()
```

```
array([1, 3, 2, 4])
```

```
import statsmodels.api as sm
import statsmodels.formula.api as smf

modelo=smf.ols("EstimatedSalary ~ C(NumOfProducts)",data=df).fit()
tabla_anova = sm.stats.anova_lm(modelo)
tabla_anova

#Se acepta la hipotesis nula
```


```
{"summary":"{\n  \"name\": \"tabla_anova\",\n  \"rows\": 2,\n
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n        \"min\": 3.0,\n        \"max\": 6378.0,\n
\"num_unique_values\": 2,\n        \"samples\": [\n          6378.0,\n
3.0\n        ],\n        \"semantic_type\": \"\",\n
\"description\": \"\"\n      }\n    },\n    {\n      \"column\":
\"sum_sq\",\n      \"properties\": {\n        \"dtype\": \"number\",\n
\"std\": 14836100282901.814,\n        \"min\": 16661666675.839527,\n
\"max\": 20998075899482.9,\n        \"num_unique_values\": 2,\n
\"samples\": [\n          20998075899482.9,\n
```

16661666675.839527\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   },\n   {\n   \"column\": \"mean_sq\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": 1599208511.8148003,\n   \"min\": 3292266525.475525,\n   \"max\": 5553888891.946509,\n   \"num_unique_values\": 2,\n   \"samples\": [\n   3292266525.475525,\n   5553888891.946509\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   },\n   {\n   \"column\": \"F\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": null,\n   \"min\": 1.6869499625776265,\n   \"max\": 1.6869499625776265,\n   \"num_unique_values\": 1,\n   \"samples\": [\n   1.6869499625776265\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   },\n   {\n   \"column\": \"PR(>F)\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": null,\n   \"min\": 0.1675103678907714,\n   \"max\": 0.1675103678907714,\n   \"num_unique_values\": 1,\n   \"samples\": [\n   0.1675103678907714\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   }\n]\n}","type":"dataframe","variable_name":"tabla_anova"}

```
df["HasCrCard"].unique()
```

```
array([0., 1.])
```

```
df.drop(columns = ["HasCrCard"], inplace = True)
df
```

```
<ipython-input-18-05a1d017a22e>:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  df.drop(columns = ["HasCrCard"], inplace = True)
```

{"summary":"{\n \"name\": \"df\",\n \"rows\": 6382,\n \"fields\": [\n   {\n   \"column\": \"CreditScore\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": 96,\n   \"min\": 350,\n   \"max\": 850,\n   \"num_unique_values\": 450,\n   \"samples\": [\n   810,\n   467,\n   763\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   },\n   {\n   \"column\": \"Age\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": 10.476612570392128,\n   \"min\": 18.0,\n   \"max\": 92.0,\n   \"num_unique_values\": 67,\n   \"samples\": [\n   47.0,\n   39.0,\n   31.0\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   },\n   {\n   \"column\": \"Tenure\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": 2,\n

```
\"min\": 0,\n        \"max\": 10,\n        \"num_unique_values\": 11,\
n        \"samples\": [\n          2,\n          1,\n          5\n
],\n        \"semantic_type\": \"\",\n        \"description\": \"\"\n
}\n    },\n    {\n      \"column\": \"Balance\",\n
\"properties\": {\n        \"dtype\": \"number\",\n        \"std\":
30100.964691131376,\n        \"min\": 3768.69,\n        \"max\":
250898.09,\n        \"num_unique_values\": 6378,\n        \"samples\":
[\n          121863.61,\n          142946.18,\n          125167.74\n
],\n        \"semantic_type\": \"\",\n        \"description\": \"\"\n
}\n    },\n    {\n      \"column\": \"NumOfProducts\",\n
\"properties\": {\n        \"dtype\": \"number\",\n        \"std\":
0,\n        \"min\": 1,\n        \"max\": 4,\n
\"num_unique_values\": 4,\n        \"samples\": [\n          3,\n
4,\n          1\n        ],\n        \"semantic_type\": \"\",\n
\"description\": \"\"\n      }\n    },\n    {\n      \"column\":
\"IsActiveMember\",\n      \"properties\": {\n        \"dtype\":
\"number\",\n        \"std\": 0.49986589495632229,\n        \"min\":
0.0,\n        \"max\": 1.0,\n        \"num_unique_values\": 2,\n
\"samples\": [\n          0.0,\n          1.0\n        ],\n
\"semantic_type\": \"\",\n        \"description\": \"\"\n      }\
n    },\n    {\n      \"column\": \"EstimatedSalary\",\n
\"properties\": {\n        \"dtype\": \"number\",\n        \"std\":
57387.54061299657,\n        \"min\": 11.58,\n        \"max\":
199970.74,\n        \"num_unique_values\": 6380,\n        \"samples\":
[\n          82276.62,\n          138051.19\n        ],\n
\"semantic_type\": \"\",\n        \"description\": \"\"\n      }\
n    },\n    {\n      \"column\": \"Exited\",\n      \"properties\":
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\"min\": 0,\n        \"max\": 1,\n        \"num_unique_values\": 2,\n
\"samples\": [\n          1,\n          0\n        ],\n
\"semantic_type\": \"\",\n        \"description\": \"\"\n      }\
n    }\n  ]\n}","type":"dataframe","variable_name":"df"}
```


```
df["IsActiveMember"].unique()
```

```
array([1., 0.])
```

```
import statsmodels.api as sm
import statsmodels.formula.api as smf

modelo=smf.ols("EstimatedSalary ~ C(IsActiveMember)",data=df).fit()
tabla_anova = sm.stats.anova_lm(modelo)
tabla_anova
```


```
{"summary":"{\n  \"name\": \"tabla_anova\",\n  \"rows\": 2,\n
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7067.532277959543,\n        \"min\": 1.0,\n        \"max\": 9996.0,\n
\"num_unique_values\": 2,\n        \"samples\": [\n          9996.0,\n
1.0\n        ],\n        \"semantic_type\": \"\",\n
```

\"description\": \"\"\n   }\n   },\n   {\n   \"column\": \"sum_sq\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": 23374918049243.47,\n   \"min\": 4016751997.1980176,\n   \"max\": 33061142876596.96,\n   \"num_unique_values\": 2,\n   \"samples\": [\n   33061142876596.96,\n   4016751997.1980176\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   },\n   {\n   \"column\": \"mean_sq\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": 501561258.8547397,\n   \"min\": 3307437262.564722,\n   \"max\": 4016751997.1980176,\n   \"num_unique_values\": 2,\n   \"samples\": [\n   3307437262.564722,\n   4016751997.1980176\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   },\n   {\n   \"column\": \"F\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": null,\n   \"min\": 1.2144605258765404,\n   \"max\": 1.2144605258765404,\n   \"num_unique_values\": 1,\n   \"samples\": [\n   1.2144605258765404\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   },\n   {\n   \"column\": \"PR(>F)\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": null,\n   \"min\": 0.2704770549220117,\n   \"max\": 0.2704770549220117,\n   \"num_unique_values\": 1,\n   \"samples\": [\n   0.2704770549220117\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   }\n]\n}","type":"dataframe","variable_name":"tabla_anova"}

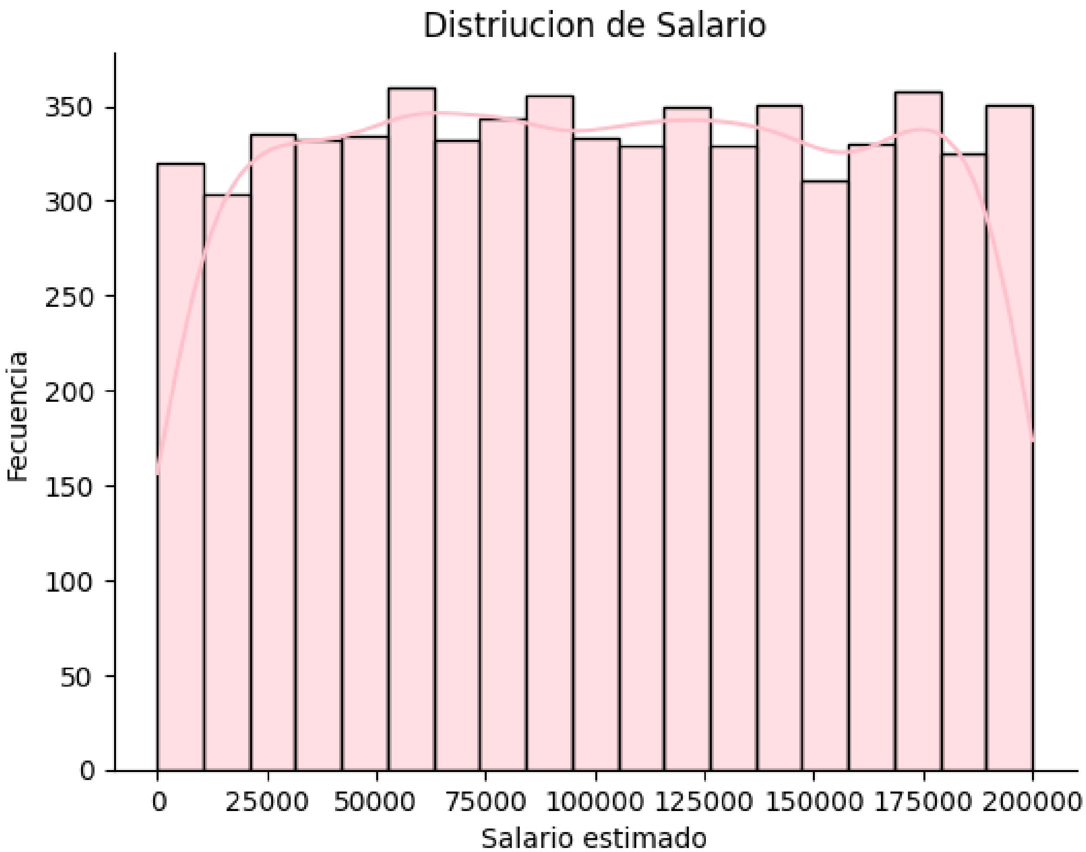
```
df.drop(columns = ["IsActiveMember"], inplace = True)
df
```

```
<ipython-input-20-13c8f583d392>:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  df.drop(columns = ["IsActiveMember"], inplace = True)
```

{"summary":"{\n \"name\": \"df\",\n \"rows\": 6382,\n \"fields\": [\n   {\n   \"column\": \"CreditScore\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": 96,\n   \"min\": 350,\n   \"max\": 850,\n   \"num_unique_values\": 450,\n   \"samples\": [\n   810,\n   467,\n   763\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   },\n   {\n   \"column\": \"Age\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": 10.476612570392128,\n   \"min\": 18.0,\n   \"max\": 92.0,\n   \"num_unique_values\": 67,\n   \"samples\": [\n   47.0,\n   39.0,\n   31.0\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   },\n   {\n   \"column\": \"Tenure\",\n   \"properties\":

```
{\n        \"dtype\": \"number\",\n        \"std\": 2,\n
\"min\": 0,\n        \"max\": 10,\n        \"num_unique_values\": 11,\
n        \"samples\": [\n          2,\n          1,\n          5\n
],\n        \"semantic_type\": \"\",\n        \"description\": \"\"\n
}\n    },\n    {\n      \"column\": \"Balance\",\n
\"properties\": {\n        \"dtype\": \"number\",\n        \"std\":
30100.964691131376,\n        \"min\": 3768.69,\n        \"max\":
250898.09,\n        \"num_unique_values\": 6378,\n        \"samples\":
[\n          121863.61,\n          142946.18,\n          125167.74\n
],\n        \"semantic_type\": \"\",\n        \"description\": \"\"\n
}\n    },\n    {\n      \"column\": \"NumOfProducts\",\n
\"properties\": {\n        \"dtype\": \"number\",\n        \"std\":
0,\n        \"min\": 1,\n        \"max\": 4,\n
\"num_unique_values\": 4,\n        \"samples\": [\n          3,\n
4,\n          1\n        ],\n        \"semantic_type\": \"\",\n
\"description\": \"\"\n      }\n    },\n    {\n      \"column\":
\"EstimatedSalary\",\n      \"properties\": {\n        \"dtype\":
\"number\",\n        \"std\": 57387.54061299657,\n        \"min\":
11.58,\n        \"max\": 199970.74,\n        \"num_unique_values\":
6380,\n        \"samples\": [\n          82276.62,\n
138051.19,\n          108008.65\n        ],\n
\"semantic_type\": \"\",\n        \"description\": \"\"\n      }\
n    },\n    {\n      \"column\": \"Exited\",\n      \"properties\":
{\n        \"dtype\": \"number\",\n        \"std\": 0,\n
\"min\": 0,\n        \"max\": 1,\n        \"num_unique_values\": 2,\n
\"samples\": [\n          1,\n          0\n        ],\n
\"semantic_type\": \"\",\n        \"description\": \"\"\n      }\
n    }\n  ]\n}","type":"dataframe","variable_name":"df"}
```


```python
import seaborn as sns
import matplotlib.pyplot as plt

sns.histplot(df['EstimatedSalary'], kde = True, color = 'pink')
plt.xlabel('Salario estimado')
plt.ylabel('Fecuencia')
plt.title('Distriucion de Salario')

plt.gca().spines['right'].set_visible(False)
plt.gca().spines['top'].set_visible(False)
```




```
df["Exited"].unique()
```

```
array([0, 1])
```

```
import statsmodels.api as sm
import statsmodels.formula.api as smf

modelo=smf.ols("EstimatedSalary ~ C(Exited)",data=df).fit()
tabla_anova = sm.stats.anova_lm(modelo)
tabla_anova

#Los datos no aportan nada
```

{"summary":"{\n \"name\": \"tabla_anova\",\n \"rows\": 2,\n \"fields\": [\n   {\n   \"column\": \"df\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": 4510.634157188987,\n   \"min\": 1.0,\n   \"max\": 6380.0,\n   \"num_unique_values\": 2,\n   \"samples\": [\n   6380.0,\n   1.0\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   },\n   {\n   \"column\": \"sum_sq\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": 14858493566058.293,\n   \"min\": 827224302.8695034,\n   \"max\": 21013910341855.88,\n   \"num_unique_values\": 2,\n   \"samples\": [\n   21013910341855.88,\n

827224302.8695034\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   },\n   {\n   \"column\": \"mean_sq\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": 1744073255.4668121,\n   \"min\": 827224302.8695034,\n   \"max\": 3293716354.522865,\n   \"num_unique_values\": 2,\n   \"samples\": [\n   3293716354.522865,\n   827224302.8695034\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   },\n   {\n   \"column\": \"F\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": null,\n   \"min\": 0.2511522589774847,\n   \"max\": 0.2511522589774847,\n   \"num_unique_values\": 1,\n   \"samples\": [\n   0.2511522589774847\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   },\n   {\n   \"column\": \"PR(>F)\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": null,\n   \"min\": 0.6162821924514956,\n   \"max\": 0.6162821924514956,\n   \"num_unique_values\": 1,\n   \"samples\": [\n   0.6162821924514956\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   }\n]\n}","type":"dataframe","variable_name":"tabla_anova"}

```
df.drop(columns = ["Exited"], inplace = True)
df
```

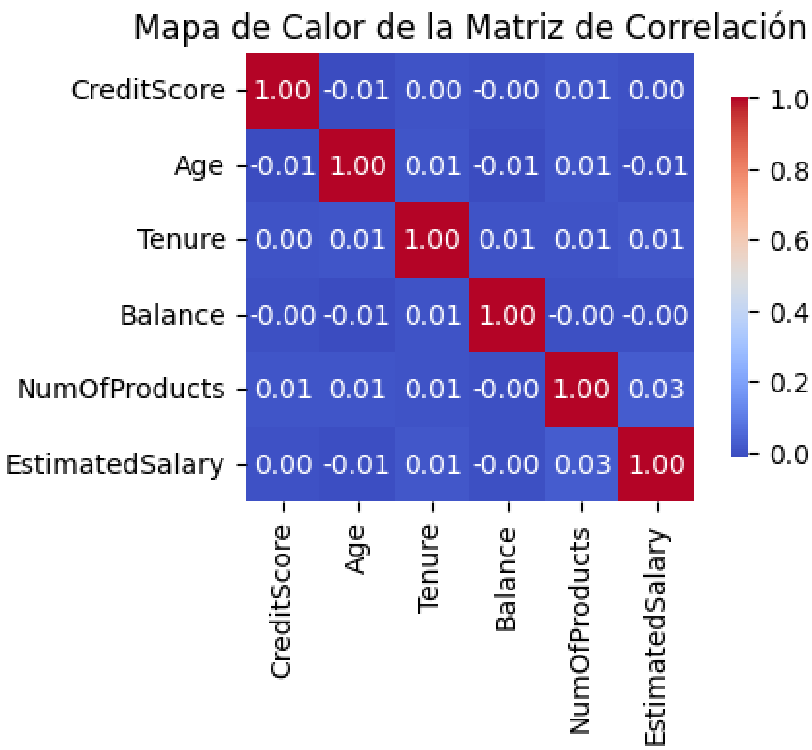
```
<ipython-input-24-bac1af30eeba>:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  df.drop(columns = ["Exited"], inplace = True)
```

{"summary":"{\n \"name\": \"df\",\n \"rows\": 6382,\n \"fields\": [\n   {\n   \"column\": \"CreditScore\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": 96,\n   \"min\": 350,\n   \"max\": 850,\n   \"num_unique_values\": 450,\n   \"samples\": [\n   810,\n   467,\n   763\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   },\n   {\n   \"column\": \"Age\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": 10.476612570392128,\n   \"min\": 18.0,\n   \"max\": 92.0,\n   \"num_unique_values\": 67,\n   \"samples\": [\n   47.0,\n   39.0,\n   31.0\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   },\n   {\n   \"column\": \"Tenure\",\n   \"properties\": {\n   \"dtype\": \"number\",\n   \"std\": 2,\n   \"min\": 0,\n   \"max\": 10,\n   \"num_unique_values\": 11,\n   \"samples\": [\n   2,\n   1,\n   5\n   ],\n   \"semantic_type\": \"\",\n   \"description\": \"\"\n   }\n   },\n   {\n   \"column\": \"Balance\",\n

```
\"properties\": {\n        \"dtype\": \"number\",\n        \"std\":
30100.964691131376,\n        \"min\": 3768.69,\n        \"max\":
250898.09,\n        \"num_unique_values\": 6378,\n        \"samples\":
[\n          121863.61,\n          142946.18,\n          125167.74\n
],\n        \"semantic_type\": \"\",\n        \"description\": \"\"\n
}\n    },\n    {\n      \"column\": \"NumOfProducts\",\n
\"properties\": {\n        \"dtype\": \"number\",\n        \"std\":
0,\n        \"min\": 1,\n        \"max\": 4,\n
\"num_unique_values\": 4,\n        \"samples\": [\n          3,\n
4,\n          1\n        ],\n        \"semantic_type\": \"\",\n
\"description\": \"\"\n      }\n    },\n    {\n      \"column\":
\"EstimatedSalary\",\n      \"properties\": {\n        \"dtype\":
\"number\",\n        \"std\": 57387.54061299657,\n        \"min\":
11.58,\n        \"max\": 199970.74,\n        \"num_unique_values\":
6380,\n        \"samples\": [\n          82276.62,\n
138051.19,\n          108008.65\n        ],\n
\"semantic_type\": \"\",\n        \"description\": \"\"\n      }\
n    }\n  ]\n}","type":"dataframe","variable_name":"df"}
```

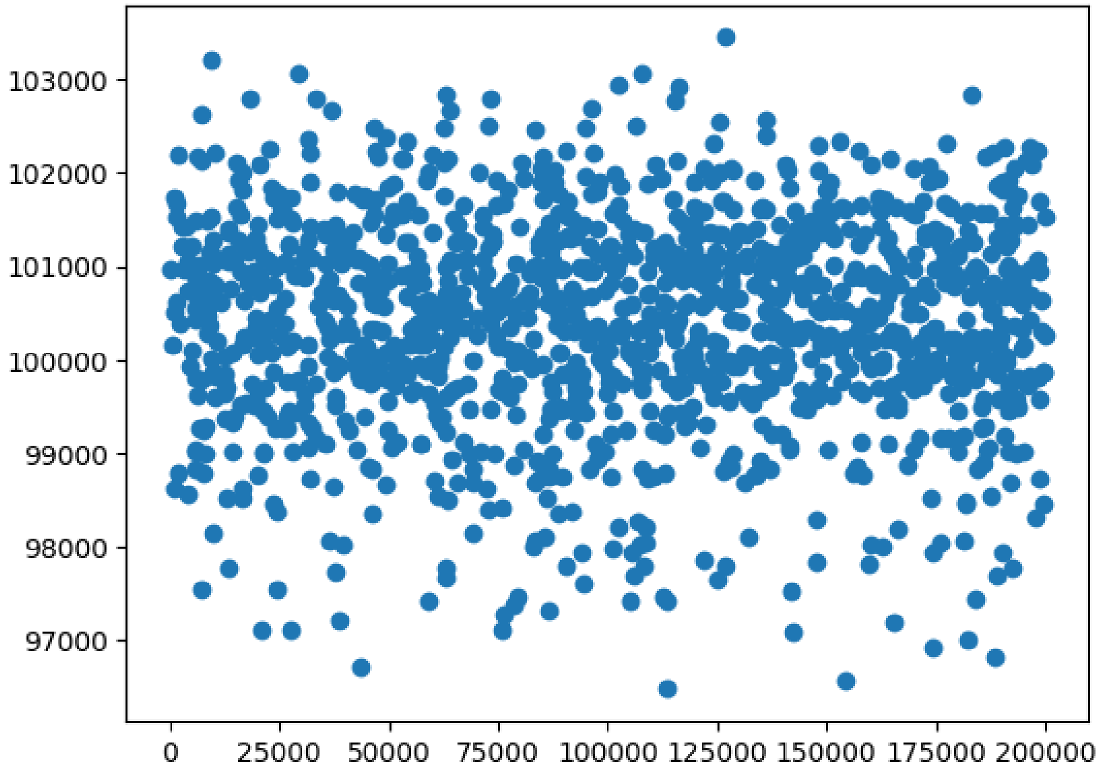

```python
import seaborn as sns
import matplotlib.pyplot as plt

matriz_de_correlacion = df.corr()
plt.figure(figsize=(5, 3))
sns.heatmap(matriz_de_correlacion, annot=True, cmap='coolwarm',
fmt=".2f", square=True, cbar_kws={"shrink": .8})
plt.title('Mapa de Calor de la Matriz de Correlación')
```

```
Text(0.5, 1.0, 'Mapa de Calor de la Matriz de Correlación')
```




```
from sklearn.model_selection import train_test_split
from sklearn.metrics import r2_score
import statsmodels.api as sm
import matplotlib.pyplot as plt


X = df[['CreditScore',     'Age',     'Tenure',  'Balance']]
Y = df["EstimatedSalary"]

# Datos de entrenamiento y datos de prueba

X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size =
0.2, random_state = 42)

X_train_constante = sm.add_constant(X_train)
X_test_constante = sm.add_constant(X_test)

modelo = sm.OLS(Y_train, X_train_constante).fit()


Yc = modelo.predict(X_test_constante)

plt.scatter(Y_test, Yc)

r2 = r2_score(Y_test, Yc)
print(f'Coeficiente de correlacion: {r2: 0.4f}\n')
```

```
Coeficiente de correlacion: -0.0012
```



Un coeficiente de correlacion de -0.0012 indica que no hay una relacion lineal aparentemente entre las variables, es decir, no hay correlacion.

```
b0, b1, b2, b3, b4 = modelo.params

Fun = lambda x1, x2, x3, x4: b0 + b1 * x1 + b2 * x2 + b3 * x3 + b4 *
x4

# El salario estimado se puede calcular usando variables como el
puntaje de crédito, edad, antigüedad laboral y saldo financiero , ya
que reflejan estabilidad, experiencia y capacidad de pago.
# Estos datos permiten predecir ingresos mediante modelos estadísticos
o de aprendizaje automático.

Fun(432, 60, 2, 120000)

97992.76900028627

from statsmodels.formula.api import ols

moedo_2 = ols(formula = 'EstimatedSalary ~ CreditScore + Age + Tenure
+ Balance', data = df).fit()
```

```python
tabla_anova = sm.stats.anova_lm(moedo_2, typ = 2)
tabla_anova
```

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CONCLUSIÓN El análisis de regresión lineal múltiple revela que las variables utilizadas en el modelo tienen poca capacidad para explicar la variabilidad del Salario Estimado (EstimatedSalary).

La suma de cuadrados residuales es considerablemente mayor que la de las variables predictoras, lo que indica que la mayor parte de la variabilidad en el salario no se debe a las variables incluidas en el modelo.

Cada variable tiene un grado de libertad, ya que se analizan individualmente, mientras que los residuos cuentan con 6377 grados de libertad.

El estadístico F es muy bajo (por ejemplo, 0.000268 para CreditScore y 0.469869 para Age), lo que sugiere que las variables no explican significativamente la variabilidad en el salario.

Los valores p son altos (todos superiores a 0.05, como 0.986941 para CreditScore y 0.493072 para Age), lo que significa que no hay suficiente evidencia estadística para afirmar que estas variables influyen en el salario estimado.

En resumen, el modelo indica que ni la edad ni el puntaje crediticio tienen un impacto significativo en el salario estimado. Esto sugiere que es necesario explorar otras variables o enfoques alternativos para mejorar la predicción del salario.