Objective: To explore various AutoEDA capabilities and perform analysis on a given dataset

This notebook will focus on DataPrep

2. AutoEDA - DataPrep

Dataset Reference: Loan Prediction dataset from Kaggle

Features:

- General Overview - Quick insights of all variables in the dataset using the plot dataframe.
- Details about each variables / features in the dataset by using create_report - overview, variables, interactions, correlations, missing values
- Interactions - based on x-axis and y-axis scatter plots
- Correlations between variables - Pearson's Correlation Coefficient, Spearman's Rank Correlation Coefficient, Kendall's Rank Correlation Coefficient
- Missing Values - Bar chart, Spectrum, Heatmap, Dendogram representations
- We can pick one particular feature and analyze - Stats, Bar chart, Pie chart, Word Count, Word Frequency etc as per applicability

When To Use?

- Dataset size is fairly very large (this seems to be 10X faster than Pandas Profiling tools due to it's highly optimized Dask-based computing module)
- Need some quick insights about an unknown dataset
- Use this as a basis for your further EDA analysis on top of it

In [36]:

```
import pandas as pd
import warnings

warnings.filterwarnings("ignore")
```

In [37]:

```
!pip --disable-pip-version-check install dataprep  # Please use it for the first time if it is not installed in your environment
```

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In [38]:
```
from dataprep.eda import create_report, plot, plot_correlation, plot_missing, plot_diff
```

In [39]:
```
df_train = pd.read_csv("../input/loan-eligible-dataset/loan-train.csv")

df_train.head()
```

Out[39]:

	Loan_ID	Gender	Married	Dependents	Education	Self_Employed	ApplicantIncome	CoapplicantIncome	LoanAmount	Loan_Amount_Term	Credit_Hist
0	LP001002	Male	No	0	Graduate	No	5849	0.0	NaN	360.0	
1	LP001003	Male	Yes	1	Graduate	No	4583	1508.0	128.0	360.0	
2	LP001005	Male	Yes	0	Graduate	Yes	3000	0.0	66.0	360.0	
3	LP001006	Male	Yes	0	Not Graduate	No	2583	2358.0	120.0	360.0	
4	LP001008	Male	No	0	Graduate	No	6000	0.0	141.0	360.0	

In [40]:
```
df_test = pd.read_csv("../input/loan-eligible-dataset/loan-test.csv")

df_test.head()
```

Out[40]:

	Loan_ID	Gender	Married	Dependents	Education	Self_Employed	ApplicantIncome	CoapplicantIncome	LoanAmount	Loan_Amount_Term	Credit_Hist
0	LP001015	Male	Yes	0	Graduate	No	5720	0	110.0	360.0	
1	LP001022	Male	Yes	1	Graduate	No	3076	1500	126.0	360.0	
2	LP001031	Male	Yes	2	Graduate	No	5000	1800	208.0	360.0	
3	LP001035	Male	Yes	2	Graduate	No	2340	2546	100.0	360.0	
4	LP001051	Male	No	0	Not Graduate	No	3276	0	78.0	360.0	

In [41]:
```
df_train.shape
```

Out[41]:
```
(614, 13)
```

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In [42]:
```
df_test.shape
```

```
Out[42]: (367, 12)
```

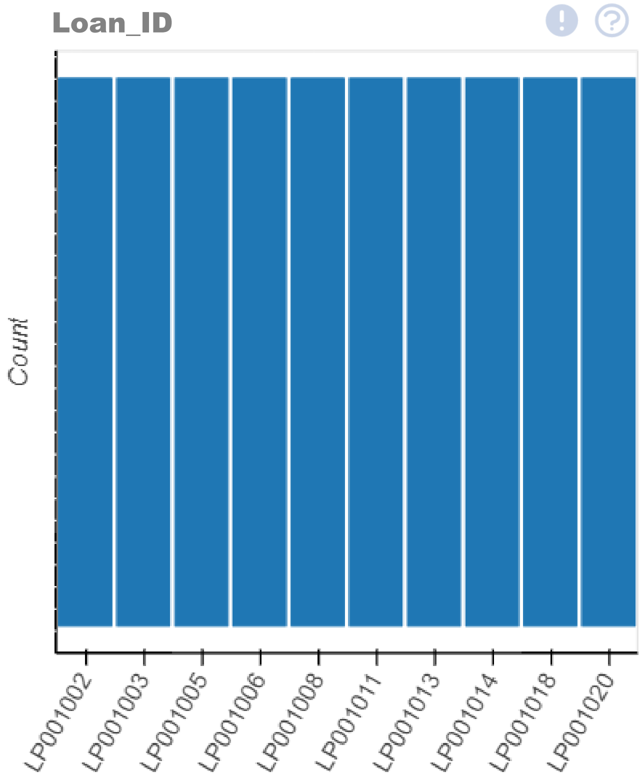
2.1 Analyze distributions

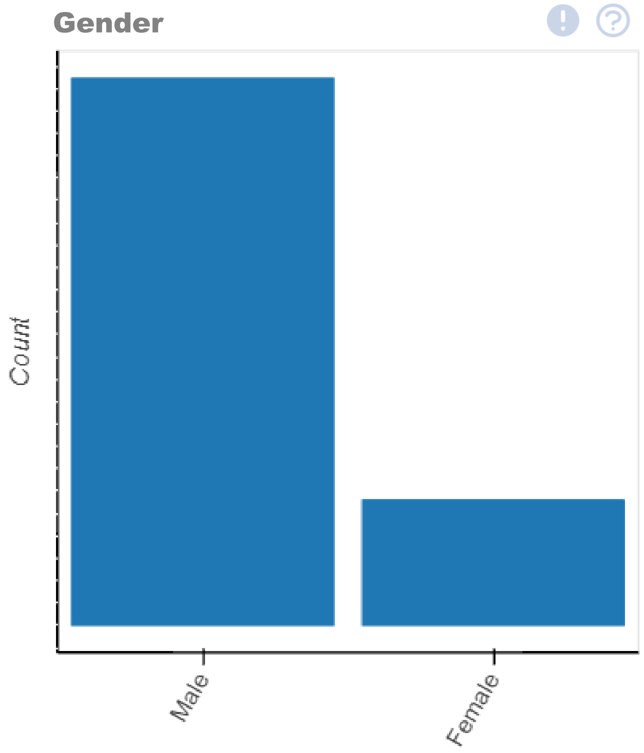
- plot(df): plots the distribution of each column and computes dataset statistics
- plot(df, col1): plots the distribution of column col1 in various ways, and computes its statistics
- plot(df, col1, col2): generates plots depicting the relationship between columns col1 and col2

```
In [44]: plot(df_train)
```

```
Out[44]:
```

Show Stats and Insights





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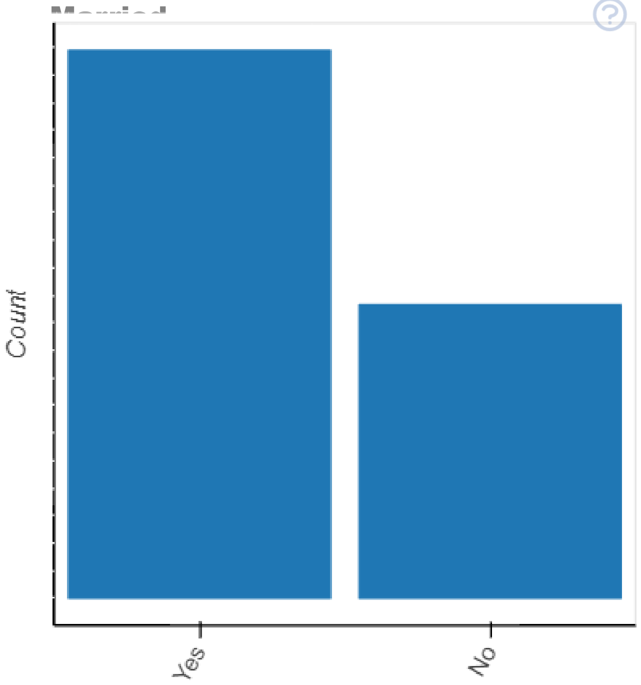

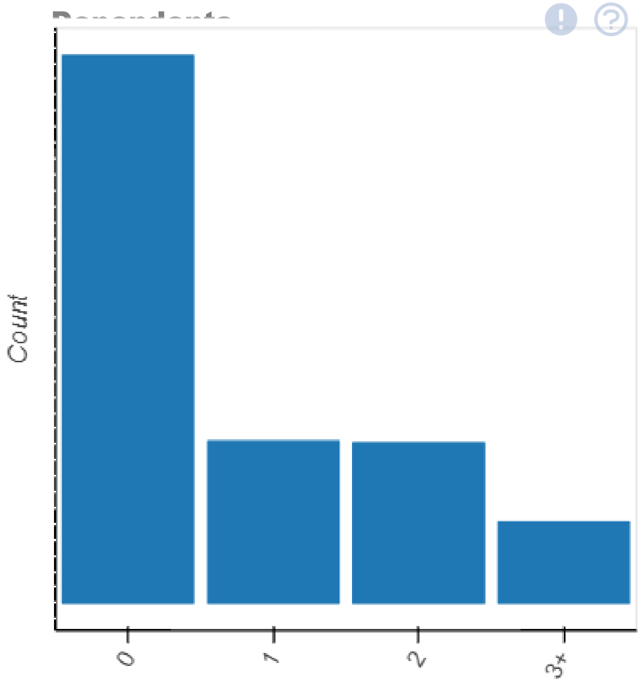

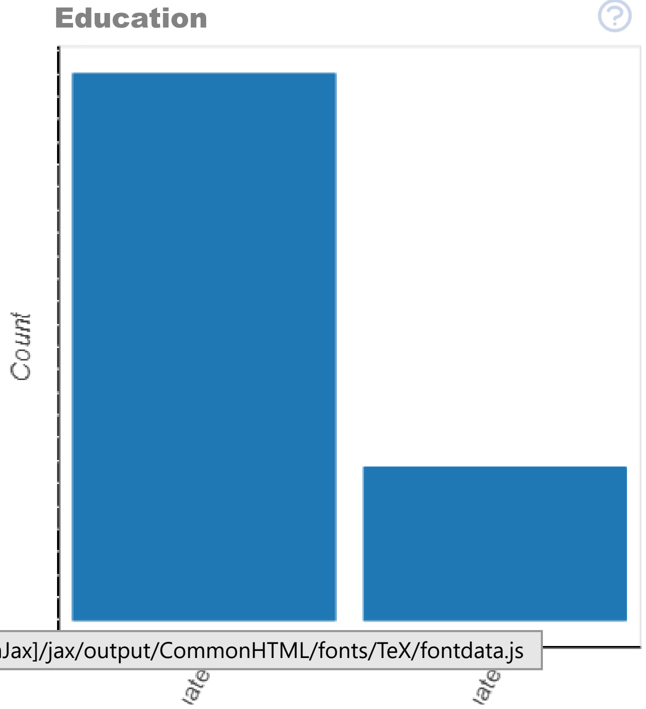

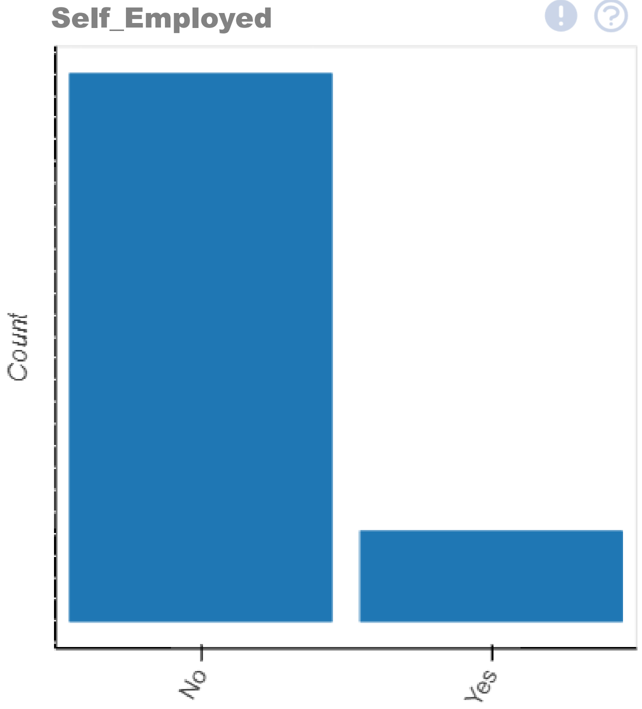

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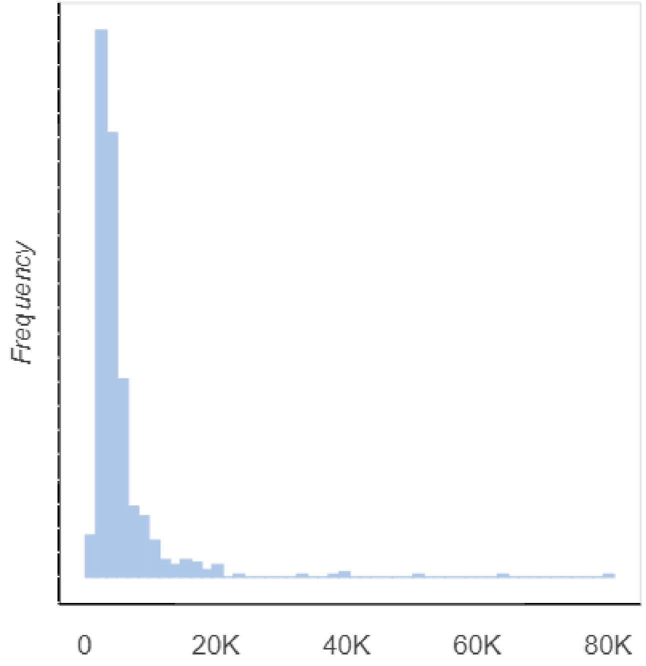
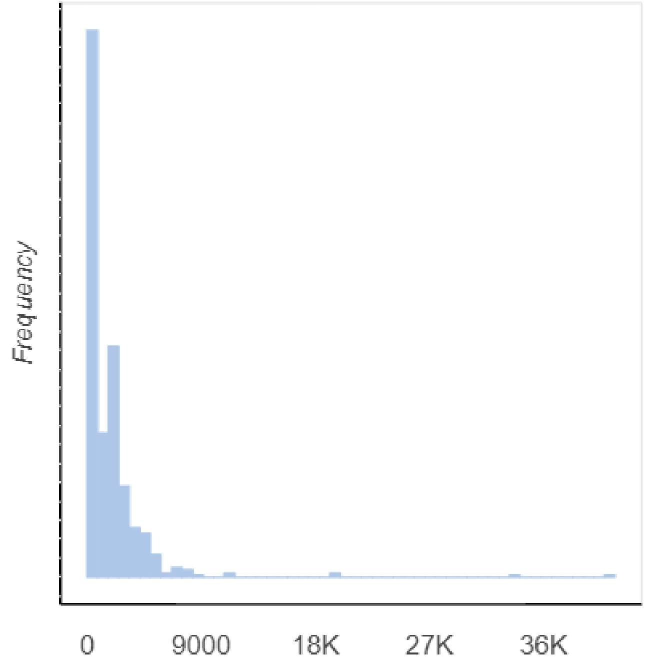
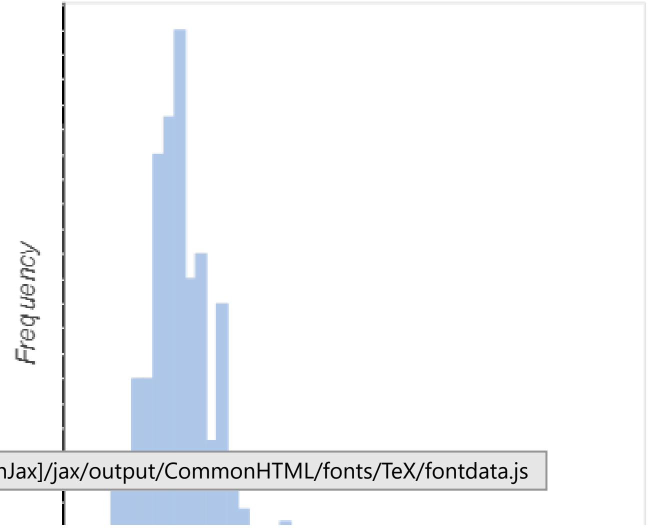
ApplicantIncome



CoapplicantIncome



LoanAmount



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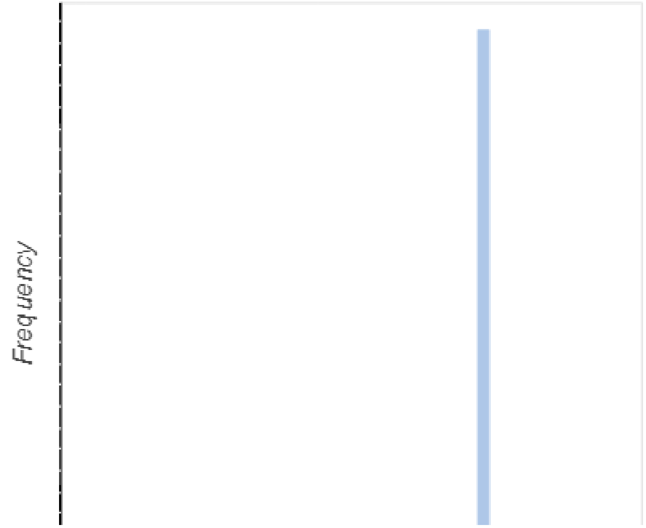
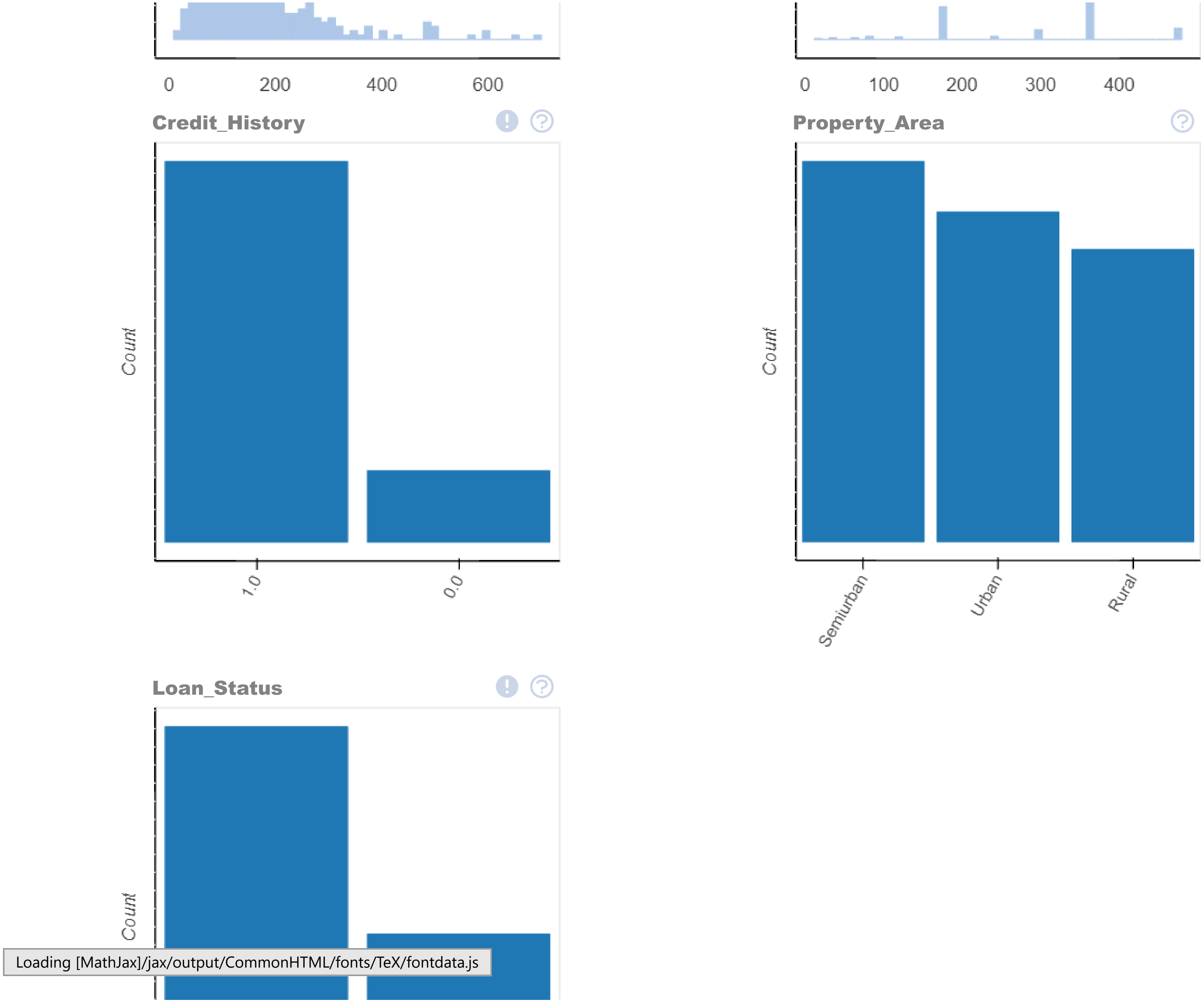
Loan_Amount_Term





Credit_History

Property_Area

Loan_Status

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In [45]:

```
# plots the distribution of column x in various ways and calculates column statistics

plot(df_train, "Property_Area")
```

Out[45]: Stats Bar Chart Pie Chart Word Cloud Word Frequency Word Length Value Table

Overview

Approximate Distinct Count	3
Approximate Unique (%)	0.5%
Missing	0
Missing (%)	0.0%
Memory Size	42.9 KB

Sample

1st row	Urban
2nd row	Rural
3rd row	Urban
4th row	Urban
5th row	Urban

Length

Mean	6.5179
Standard Deviation	1.9426
Median	5
Minimum	5
Maximum	9

Letter

Count	4002
Lowercase Letter	3388
Space Separator	0
Uppercase Letter	614
Dash Punctuation	0
Decimal Number	0

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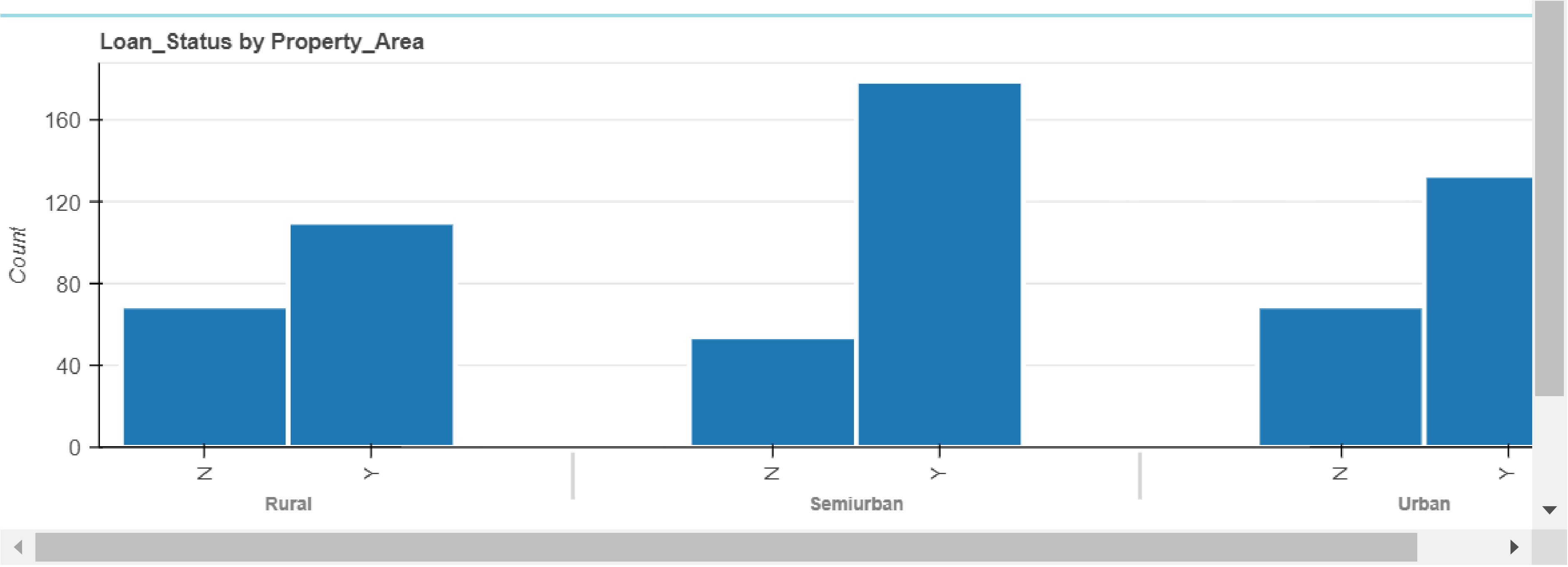
In [47]:

```
# generates plots depicting the relationship between columns
```

```
plot(df_train, "Property_Area","Loan_Status")
```

Out[47]:

Nested Bar Chart　Stacked Bar Chart　Heat Map



2.2 Analyze correlations

- plot_correlation(df): plots correlation matrices (correlations between all pairs of columns)
- plot_correlation(df, col1): plots the most correlated columns to column col1
- plot_correlation(df, col1, col2): plots the joint distribution of column col1 and column col2 and computes a regression line

In [48]:

```
# plots correlation matrices (correlations between all pairs of columns)

plot_correlation(df_train)
```

Out[48]:

Stats　Pearson　Spearman　KendallTau

	Pearson	Spearman	KendallTau
Highest Positive Correlation	0.571	0.515	0.372

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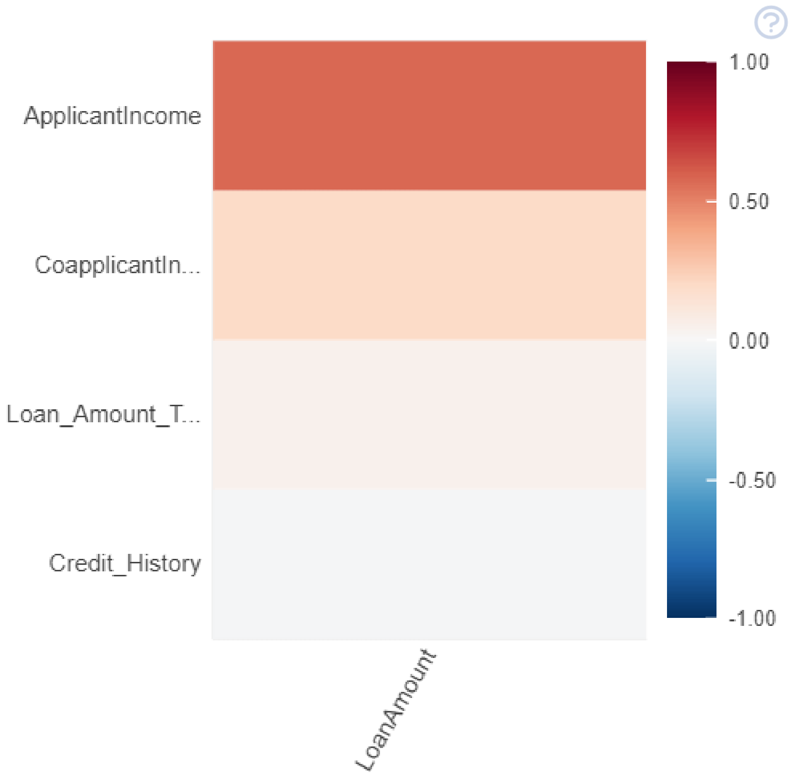
	Pearson	Spearman	KendallTau
Highest Negative Correlation	-0.117	-0.32	-0.23
Lowest Correlation	0.001	0.002	0.002
Mean Correlation	0.044	0.038	0.029

In [53]:

```
# plots the most correlated columns to column x
# Please ensure x are numerical columns to be analyzed for this

plot_correlation(df_train, "LoanAmount")
```

Out[53]: Pearson Spearman KendallTau



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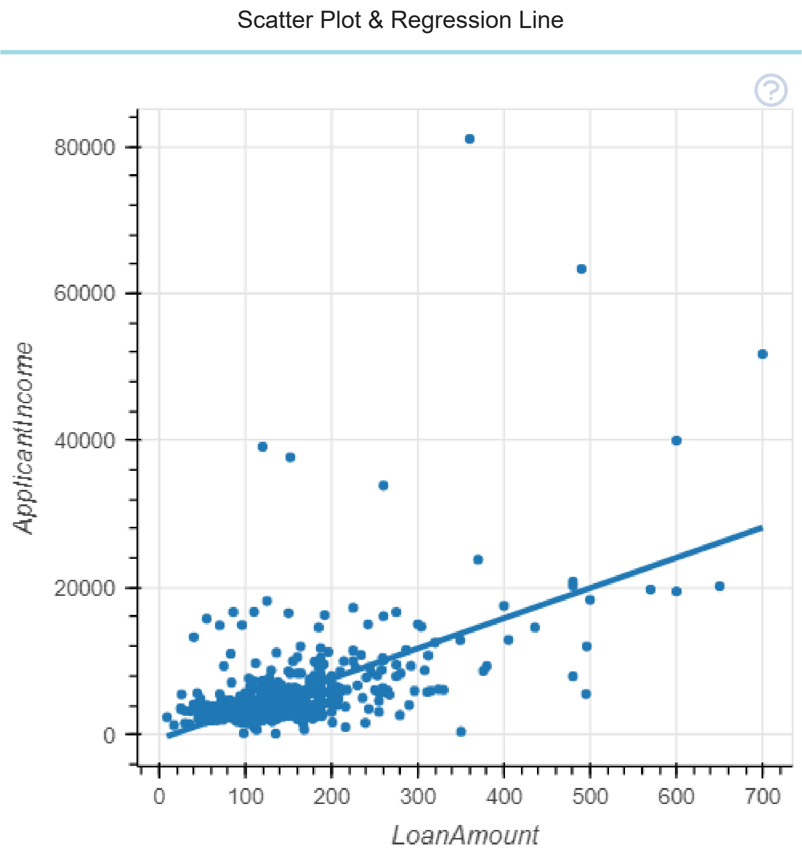
In [54]:

```
# plots the joint distribution of column col1 and column col2 and computes a regression line
```

```
plot_correlation(df_train, "LoanAmount","ApplicantIncome")
```

Out[54]:



2.3 Analyze missing values

- plot_missing(df): plots the amount and position of missing values, and their relationship between columns
- plot_missing(df, col1): plots the impact of the missing values in column col1 on all other columns
- plot_missing(df, col1, col2): plots the impact of the missing values from column col1 on column col2 in various ways.

In [56]:

```
# plots the amount and position of missing values, and their relationship between columns
```

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Out[56]: Stats Bar Chart Spectrum Heat Map Dendrogram

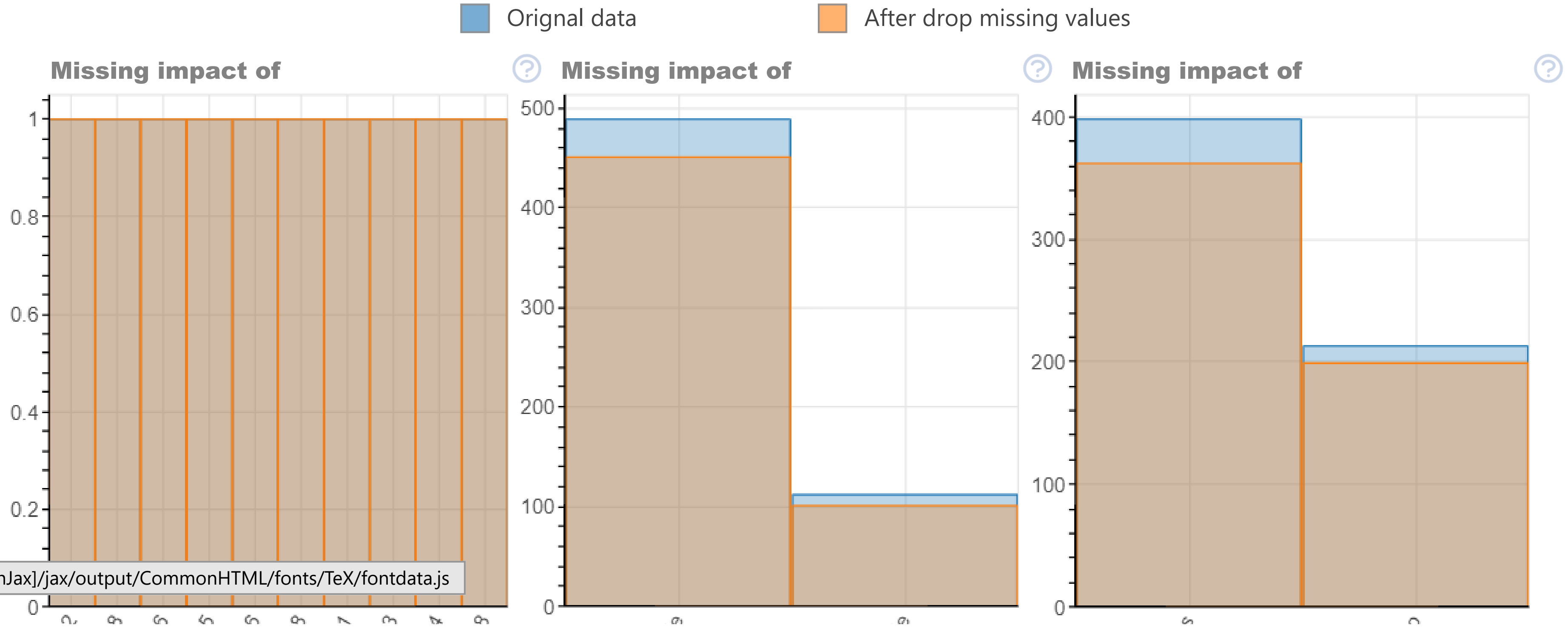
Missing Statistics

Missing Cells	149
Missing Cells (%)	1.9%
Missing Columns	7
Missing Rows	134
Avg Missing Cells per Column	11.46
Avg Missing Cells per Row	0.24

In [58]:
```python
# plots the impact of the missing values in column col1 on all other columns

plot_missing(df_train, "Credit_History")
```

Out[58]:



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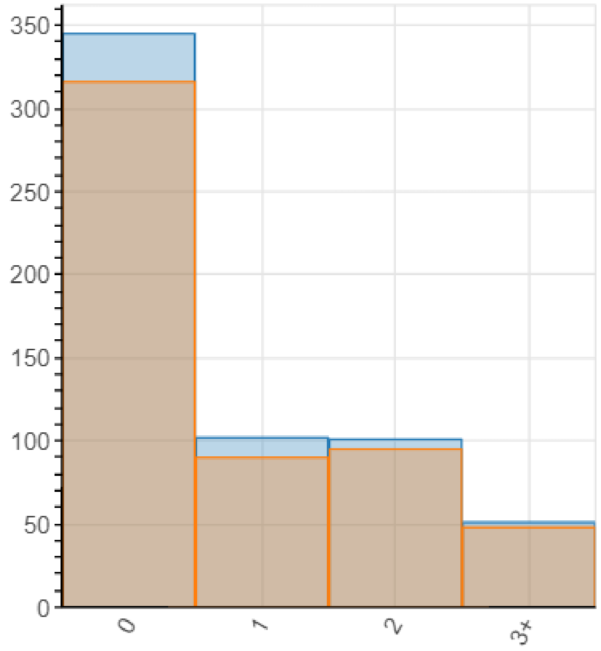
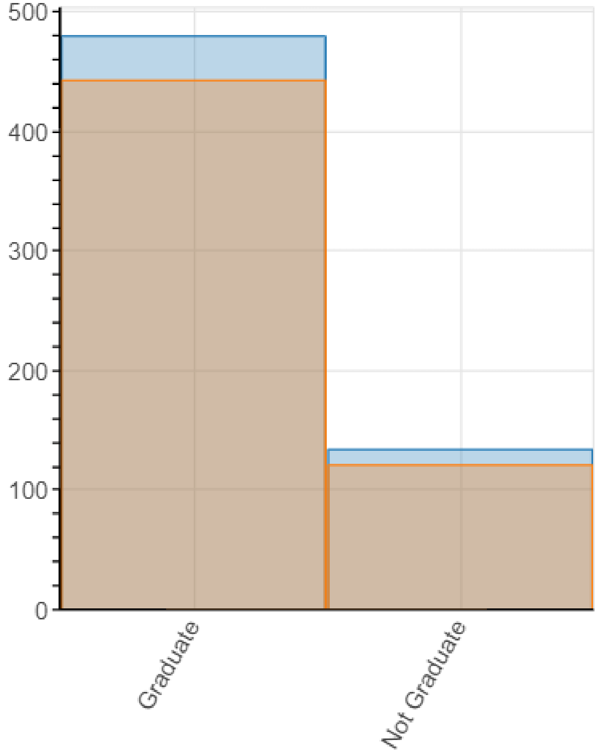
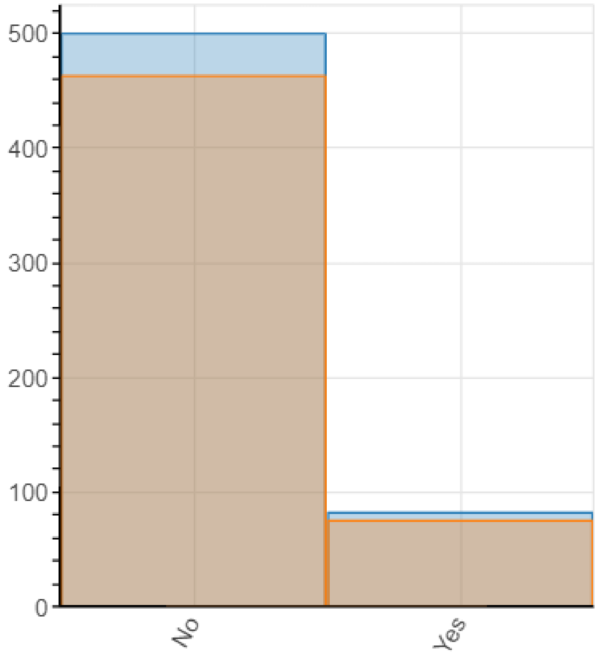
Missing impact of



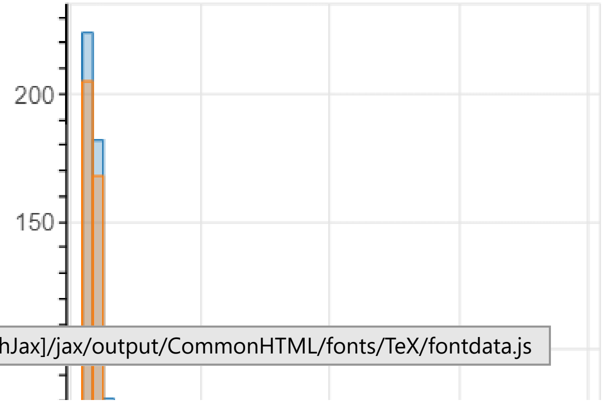
Missing impact of



Missing impact of



Missing impact of



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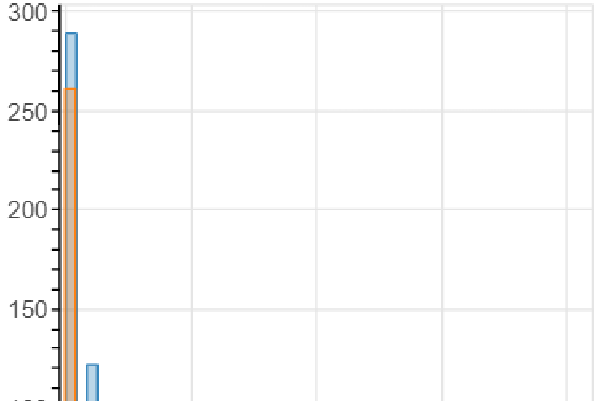
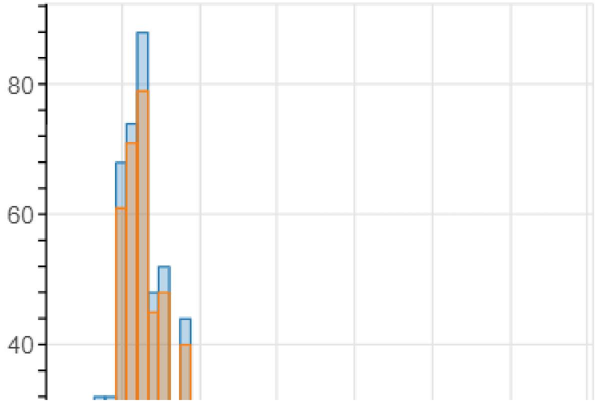
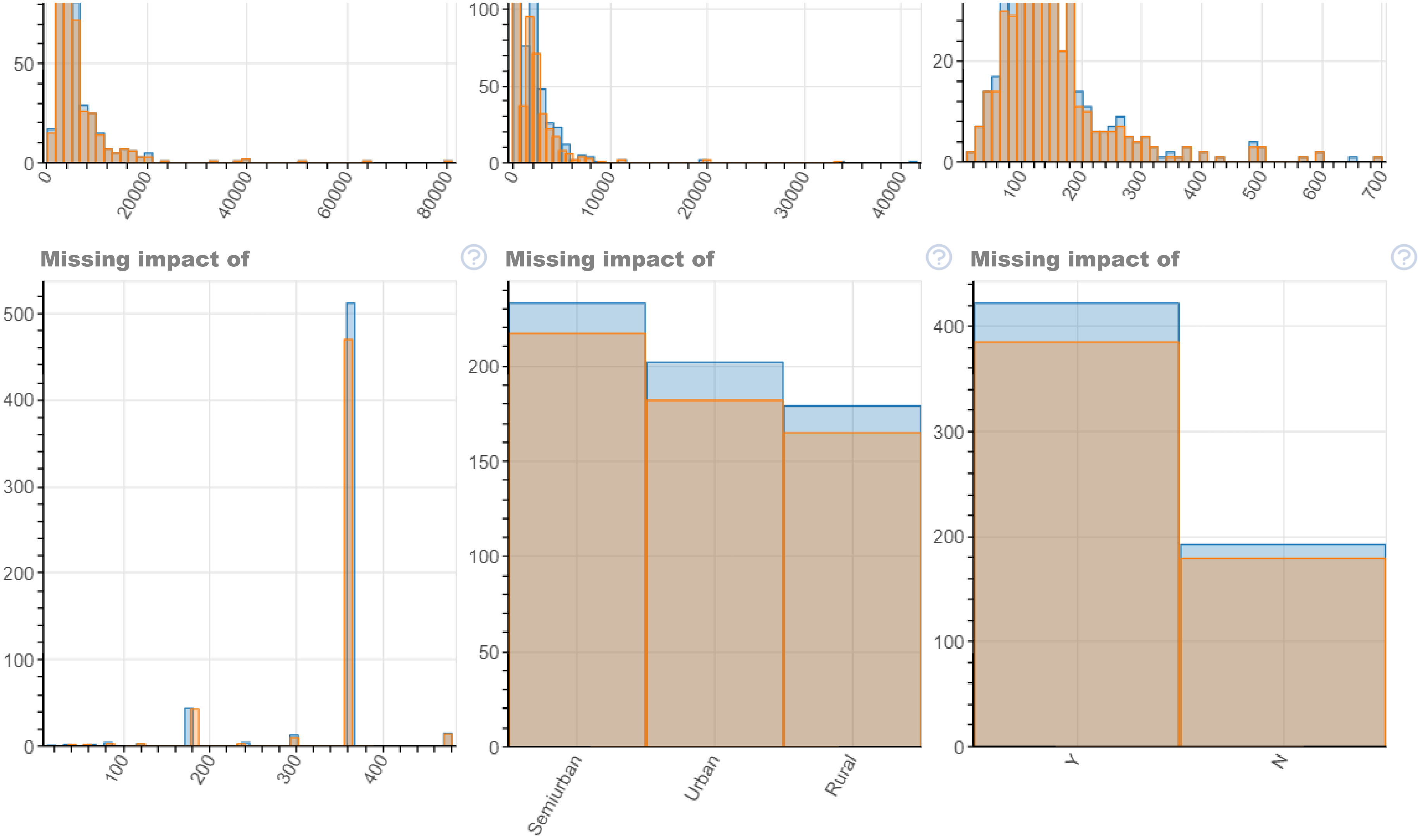
Missing impact of



Missing impact of





In [60]:

```python
# plots the impact of the missing values from column col1 on column col2 in various ways

plot_missing(df_train, "Credit_History", "Loan_Status")
```

Out[60]:

Missing impact of Credit_History by Loan_Status

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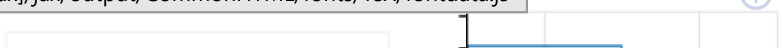
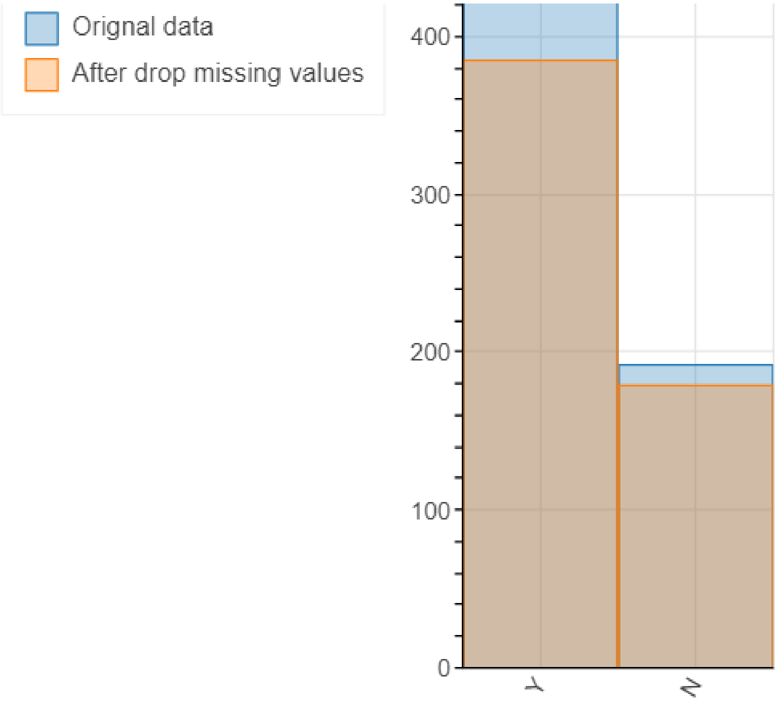




2.4 Analyze difference between dataframes

- plot_diff(): explores the difference of column distributions and statistics across multiple datasets

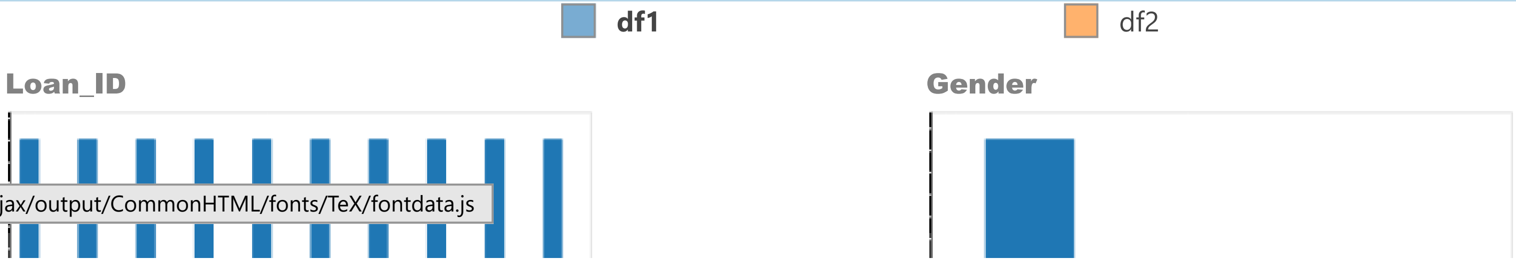
In [61]:

```
# We can analyze differences with plot_diff()
# This is a quick way to get some insights between Train and Test datasets

plot_diff([df_train,df_test])
```

Out[61]:

Show Stats



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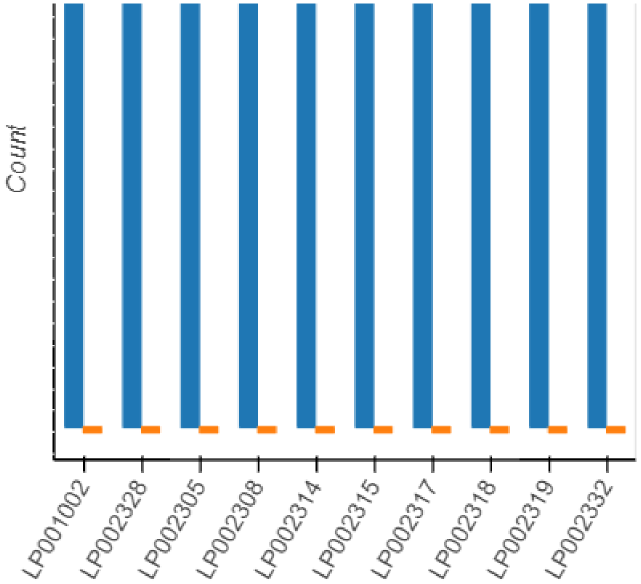
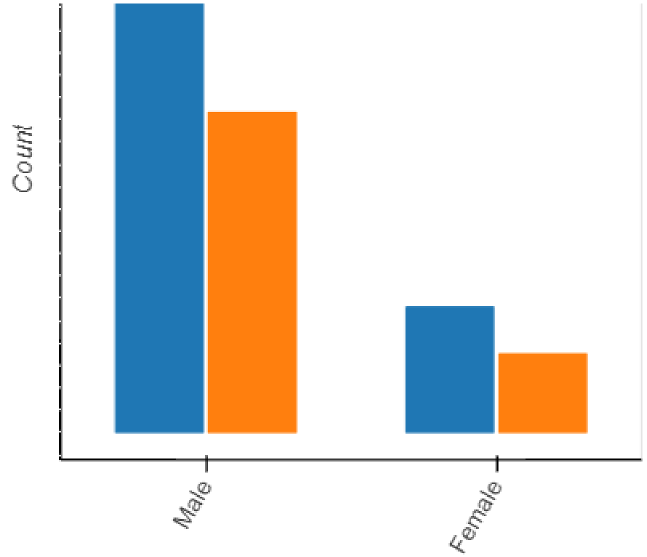
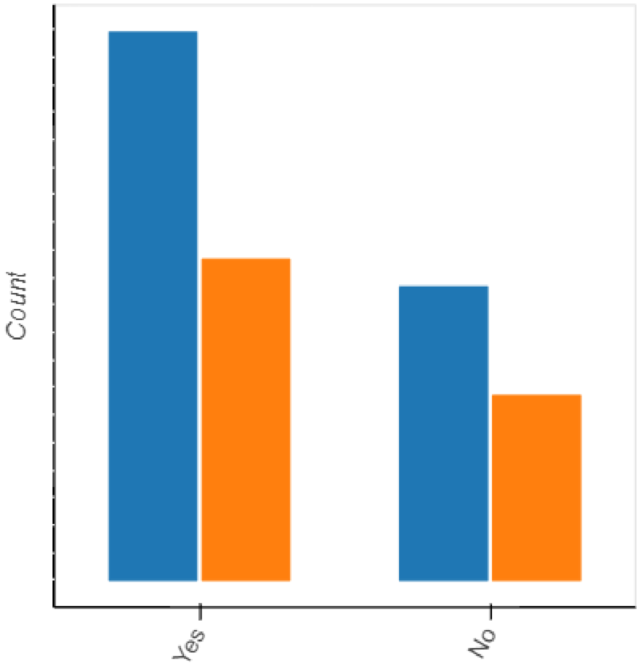
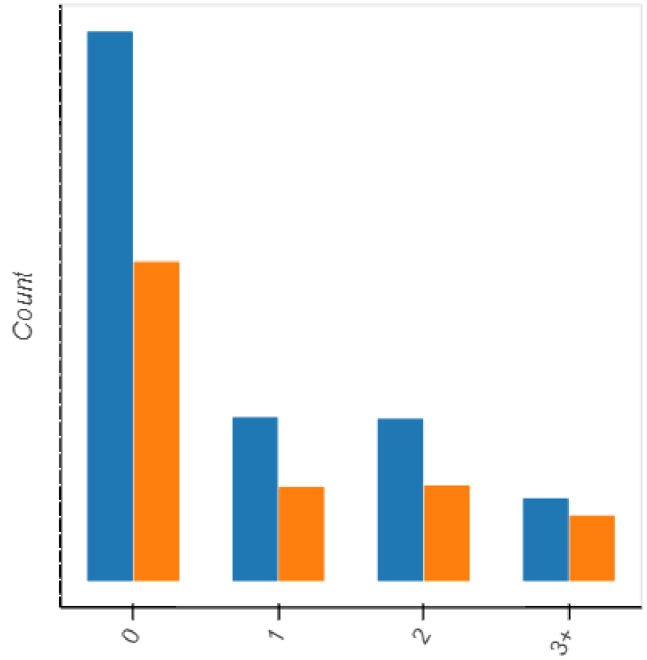




Married



Dependents



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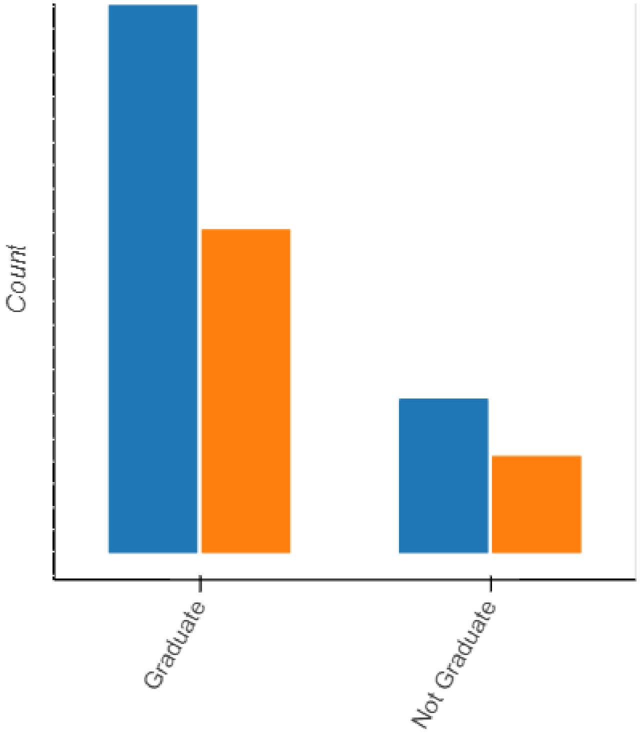
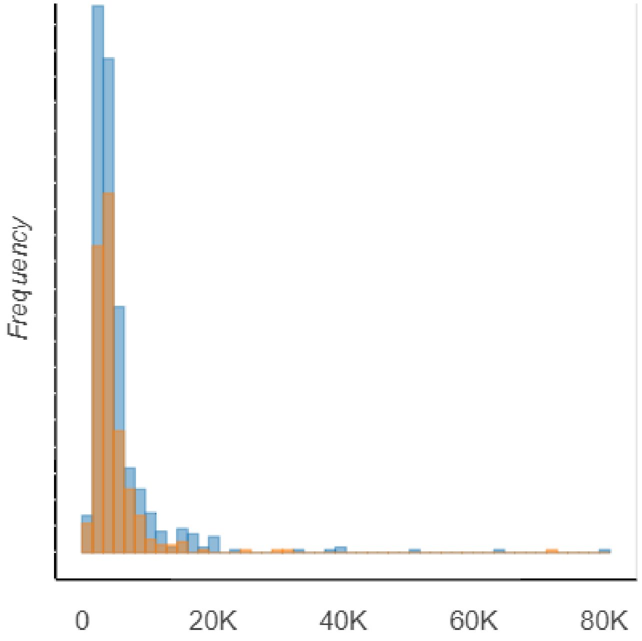
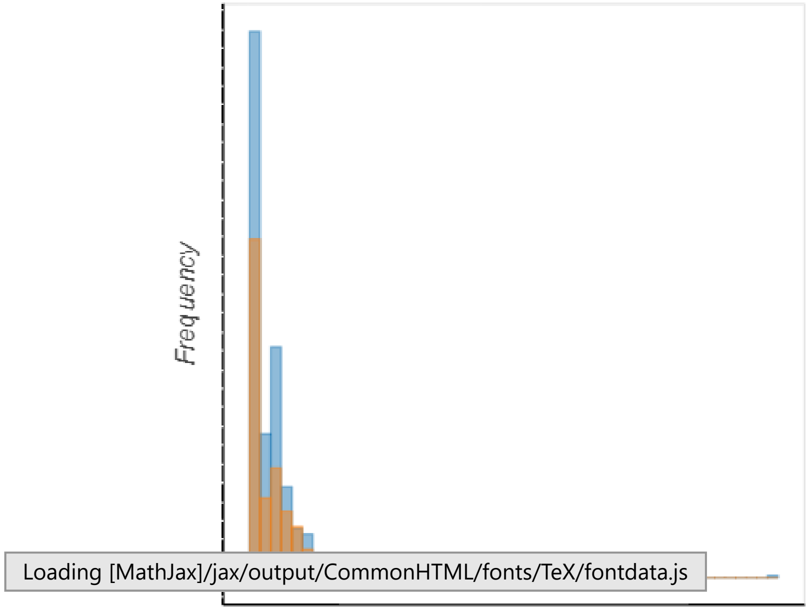
ApplicantIncome





CoapplicantIncome



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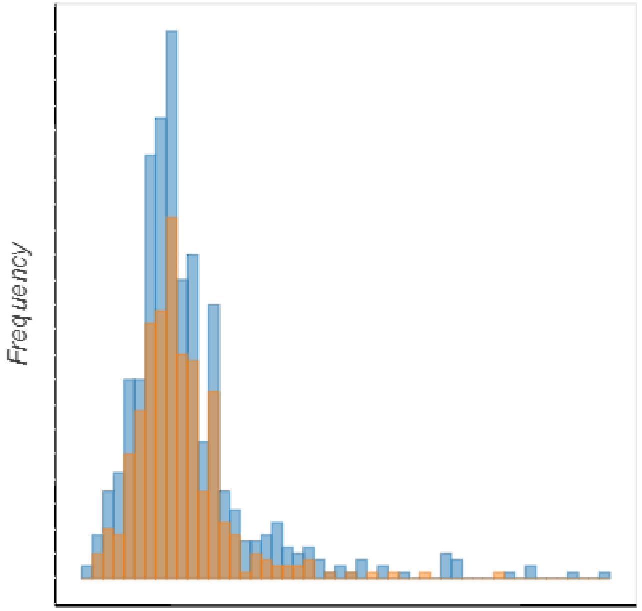
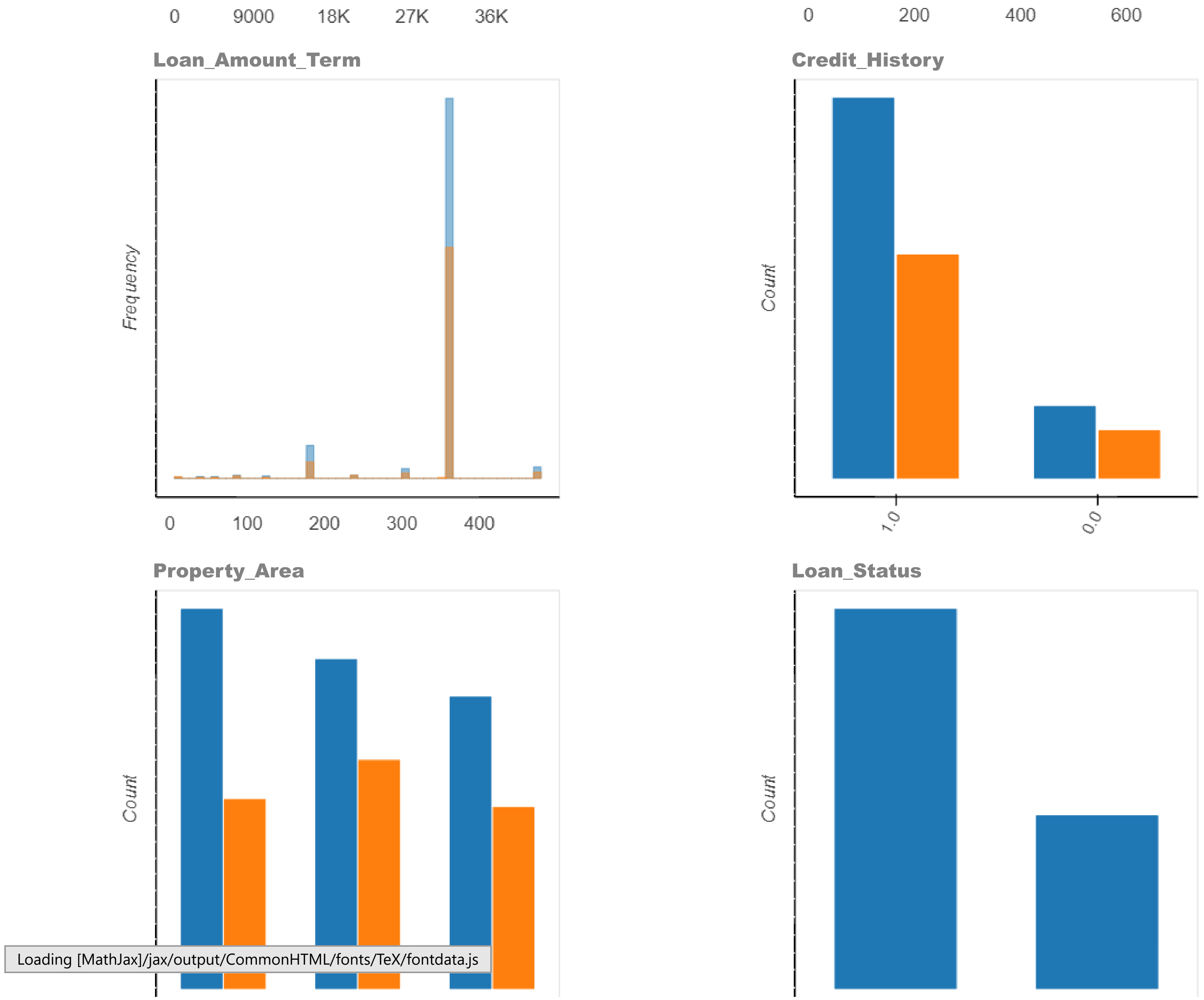
LoanAmount





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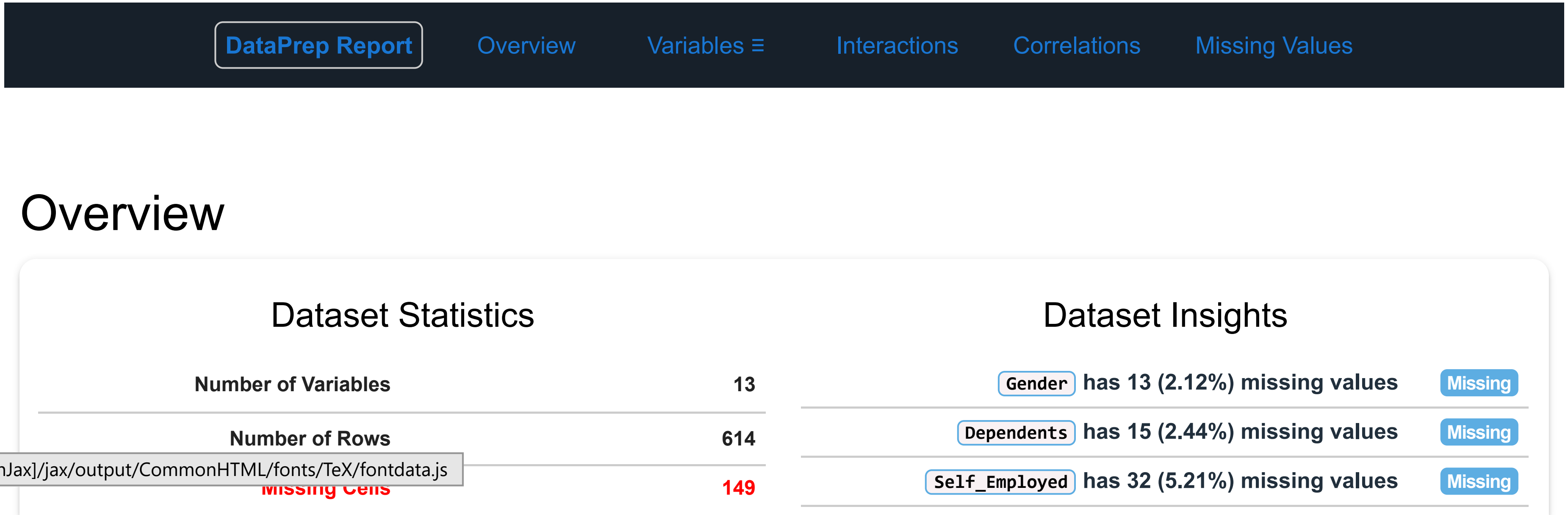
2.5 Create Profile Report

- Captures a consolidated report with summary
  - Overview: detect the types of columns in a dataframe
  - Variables: variable type, unique values, distint count, missing values
  - Quantile statistics like minimum value, Q1, median, Q3, maximum, range, interquartile range
  - Descriptive statistics like mean, mode, standard deviation, sum, median absolute deviation, coefficient of variation, kurtosis, skewness
  - Text analysis for length, sample and letter
  - Correlations: highlighting of highly correlated variables, Spearman, Pearson and Kendall matrices
  - Missing Values: bar chart, heatmap and spectrum of missing values

In [62]:
```
create_report(df_train)
```

Out[62]:



Overview

Dataset Statistics

Number of Variables	13
Number of Rows	614
Missing Cells	149

Dataset Insights

Gender has 13 (2.12%) missing values	Missing
Dependents has 15 (2.44%) missing values	Missing
Self_Employed has 32 (5.21%) missing values	Missing

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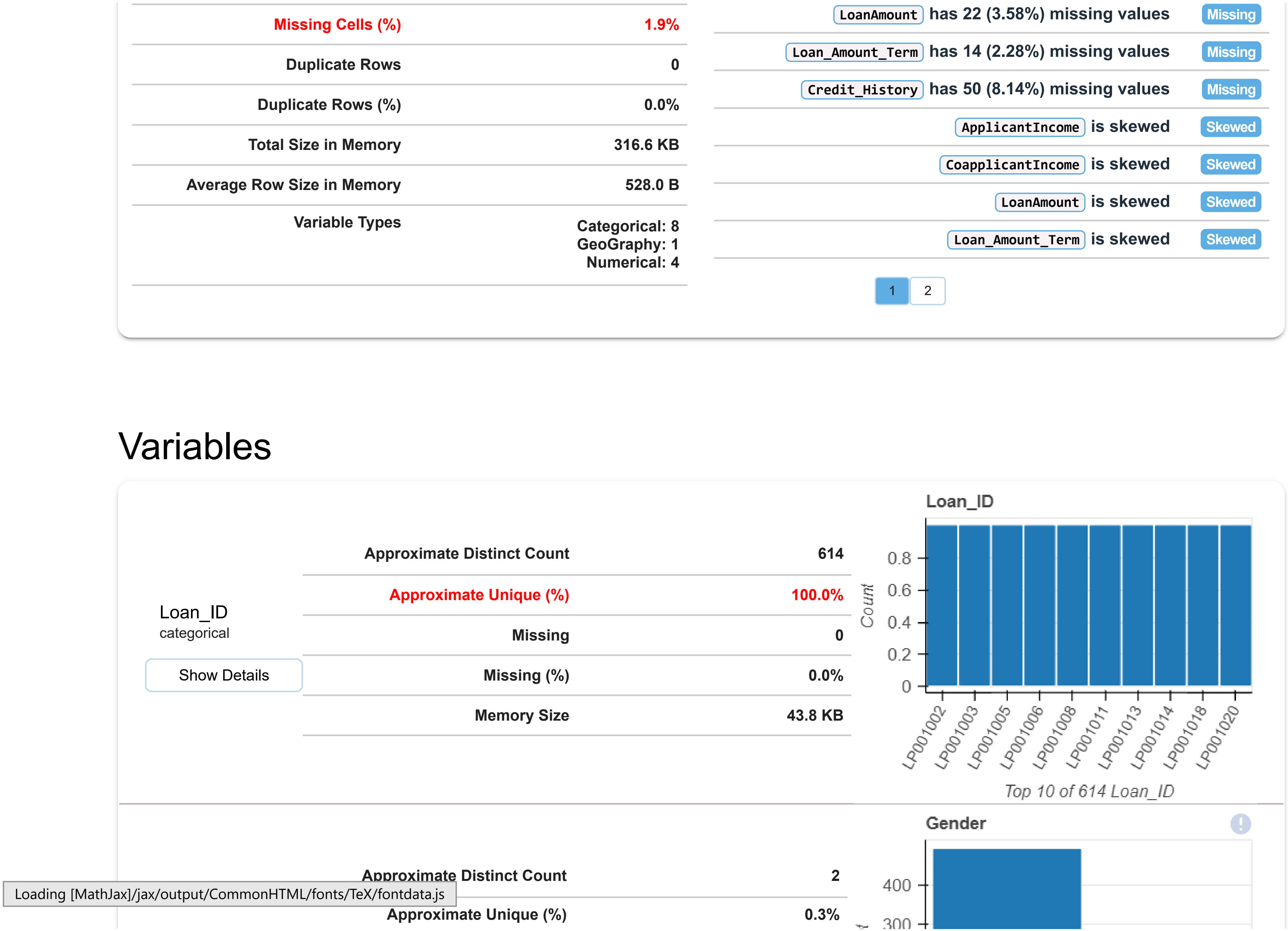

Missing Cells (%)	1.9%
Duplicate Rows	0
Duplicate Rows (%)	0.0%
Total Size in Memory	316.6 KB
Average Row Size in Memory	528.0 B
Variable Types	Categorical: 8 GeoGraphy: 1 Numerical: 4

`LoanAmount` has 22 (3.58%) missing values	Missing
`Loan_Amount_Term` has 14 (2.28%) missing values	Missing
`Credit_History` has 50 (8.14%) missing values	Missing
`ApplicantIncome` is skewed	Skewed
`CoapplicantIncome` is skewed	Skewed
`LoanAmount` is skewed	Skewed
`Loan_Amount_Term` is skewed	Skewed

Variables

Loan_ID
categorical

Approximate Distinct Count	614
Approximate Unique (%)	100.0%
Missing	0
Missing (%)	0.0%
Memory Size	43.8 KB

Approximate Distinct Count	2
Approximate Unique (%)	0.3%

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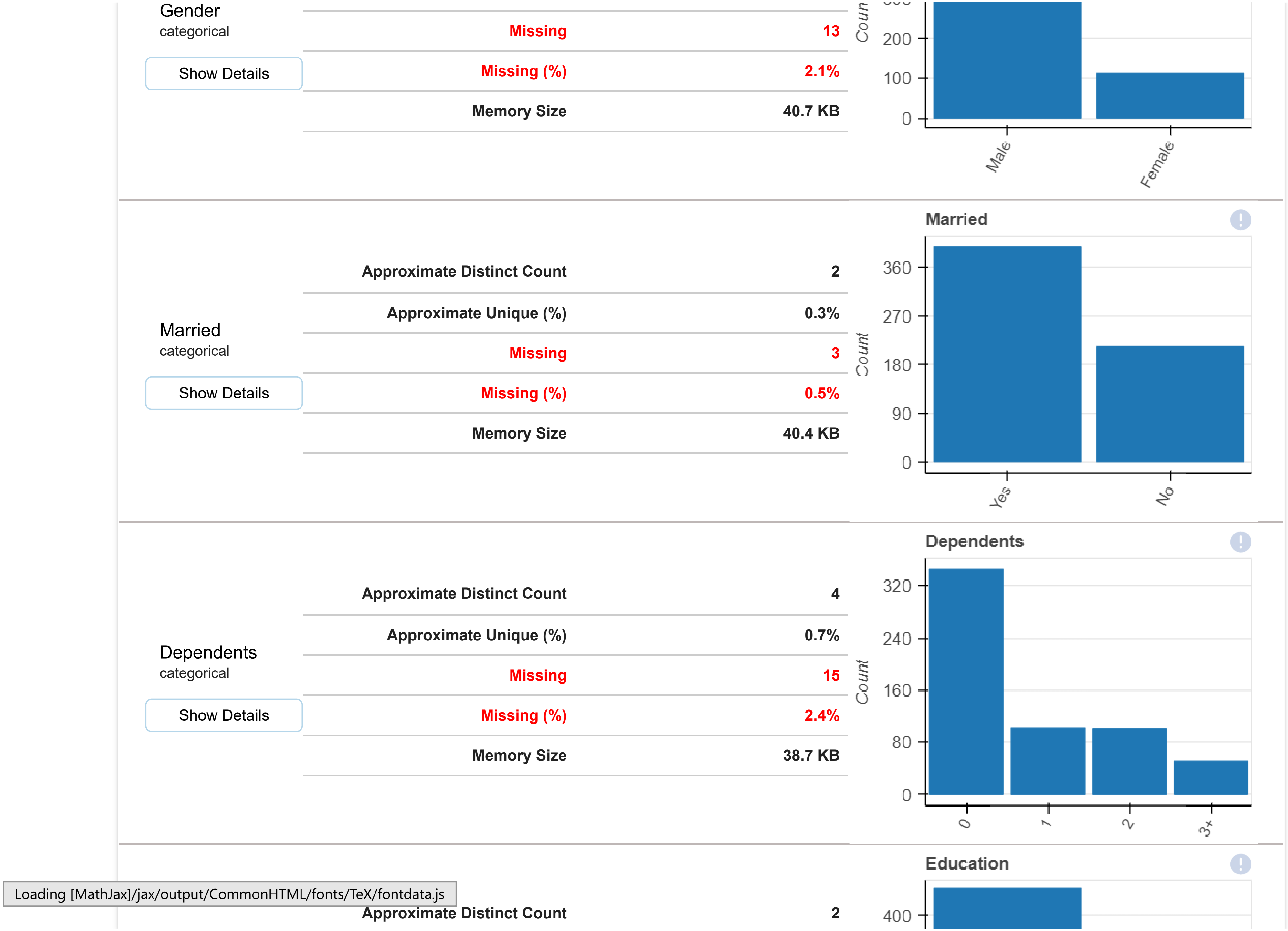

Gender
categorical

Show Details

Missing	13
Missing (%)	2.1%
Memory Size	40.7 KB

Married
categorical

Show Details

Approximate Distinct Count	2
Approximate Unique (%)	0.3%
Missing	3
Missing (%)	0.5%
Memory Size	40.4 KB

Dependents
categorical

Show Details

Approximate Distinct Count	4
Approximate Unique (%)	0.7%
Missing	15
Missing (%)	2.4%
Memory Size	38.7 KB

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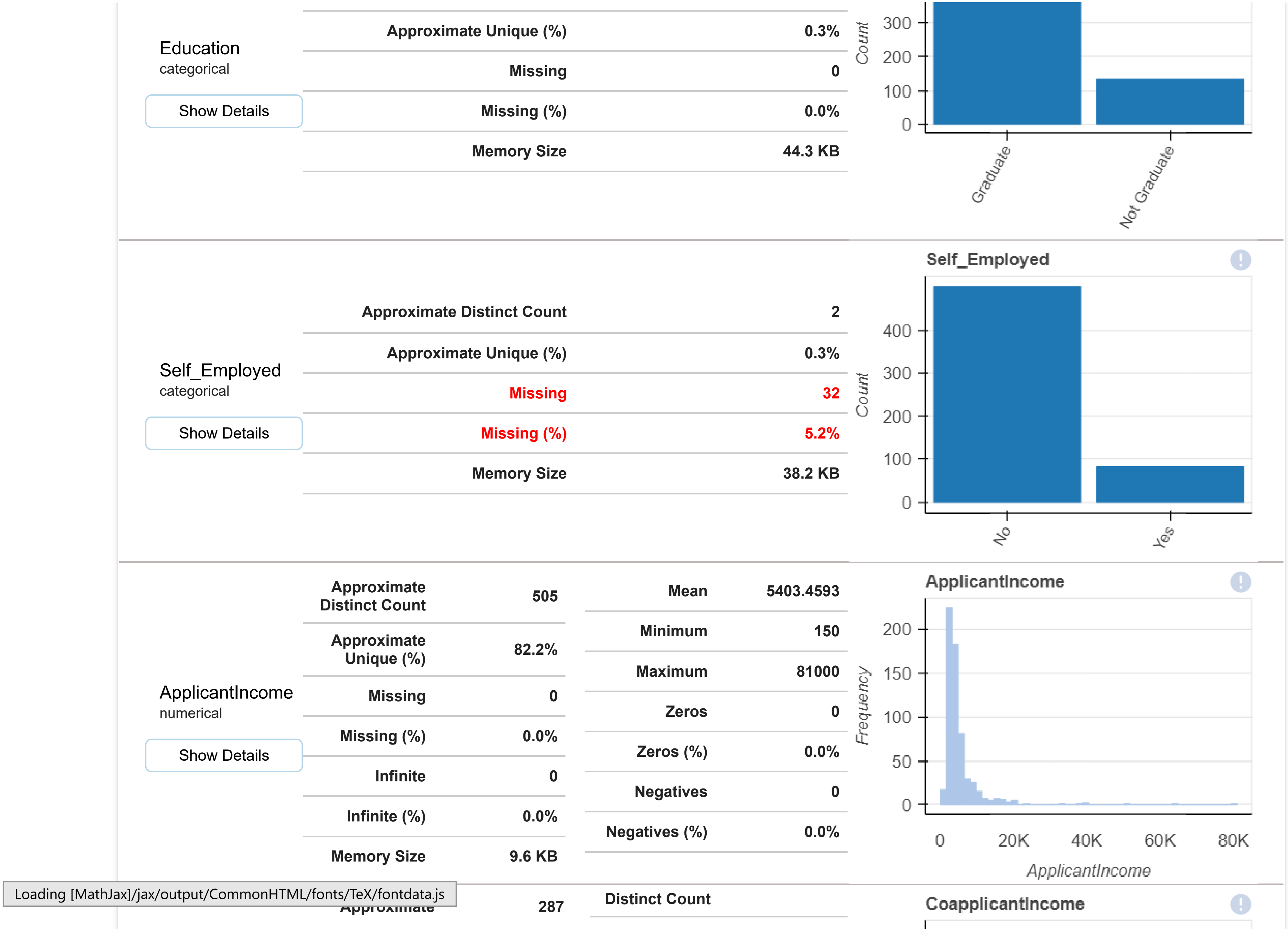
Approximate Distinct Count	2



Education
categorical

Show Details

Approximate Unique (%)	0.3%
Missing	0
Missing (%)	0.0%
Memory Size	44.3 KB

Self_Employed
categorical

Show Details

Approximate Distinct Count	2
Approximate Unique (%)	0.3%
Missing	32
Missing (%)	5.2%
Memory Size	38.2 KB

ApplicantIncome
numerical

Show Details

Approximate Distinct Count	505
Approximate Unique (%)	82.2%
Missing	0
Missing (%)	0.0%
Infinite	0
Infinite (%)	0.0%
Memory Size	9.6 KB

Mean	5403.4593
Minimum	150
Maximum	81000
Zeros	0
Zeros (%)	0.0%
Negatives	0
Negatives (%)	0.0%

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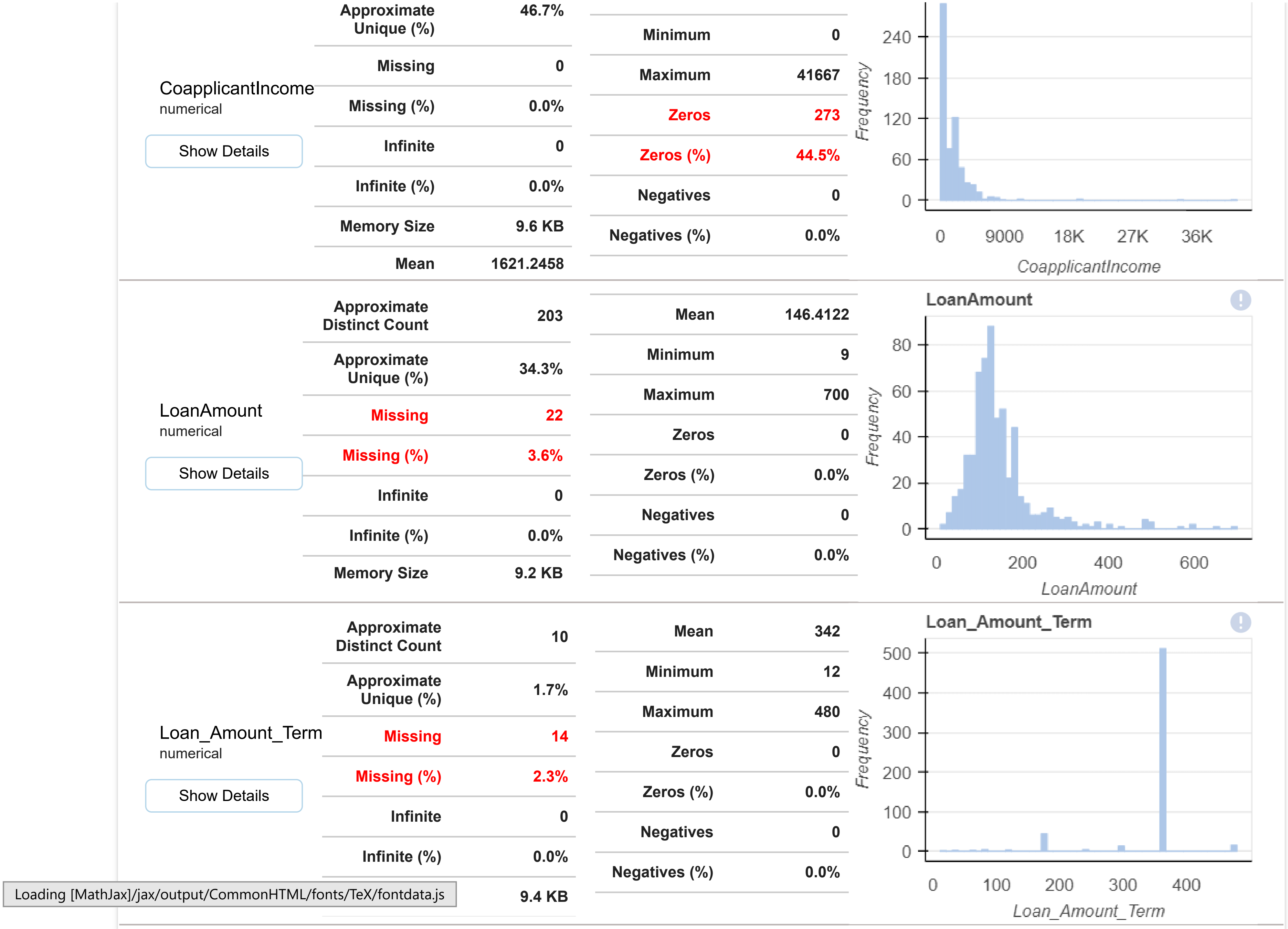
Approximate 287

Distinct Count



CoapplicantIncome
numerical

Show Details

Approximate Unique (%)	46.7%
Missing	0
Missing (%)	0.0%
Infinite	0
Infinite (%)	0.0%
Memory Size	9.6 KB
Mean	1621.2458

Minimum	0
Maximum	41667
Zeros	273
Zeros (%)	44.5%
Negatives	0
Negatives (%)	0.0%

LoanAmount
numerical

Show Details

Approximate Distinct Count	203
Approximate Unique (%)	34.3%
Missing	22
Missing (%)	3.6%
Infinite	0
Infinite (%)	0.0%
Memory Size	9.2 KB

Mean	146.4122
Minimum	9
Maximum	700
Zeros	0
Zeros (%)	0.0%
Negatives	0
Negatives (%)	0.0%

Loan_Amount_Term
numerical

Show Details

Approximate Distinct Count	10
Approximate Unique (%)	1.7%
Missing	14
Missing (%)	2.3%
Infinite	0
Infinite (%)	0.0%
	9.4 KB

Mean	342
Minimum	12
Maximum	480
Zeros	0
Zeros (%)	0.0%
Negatives	0
Negatives (%)	0.0%

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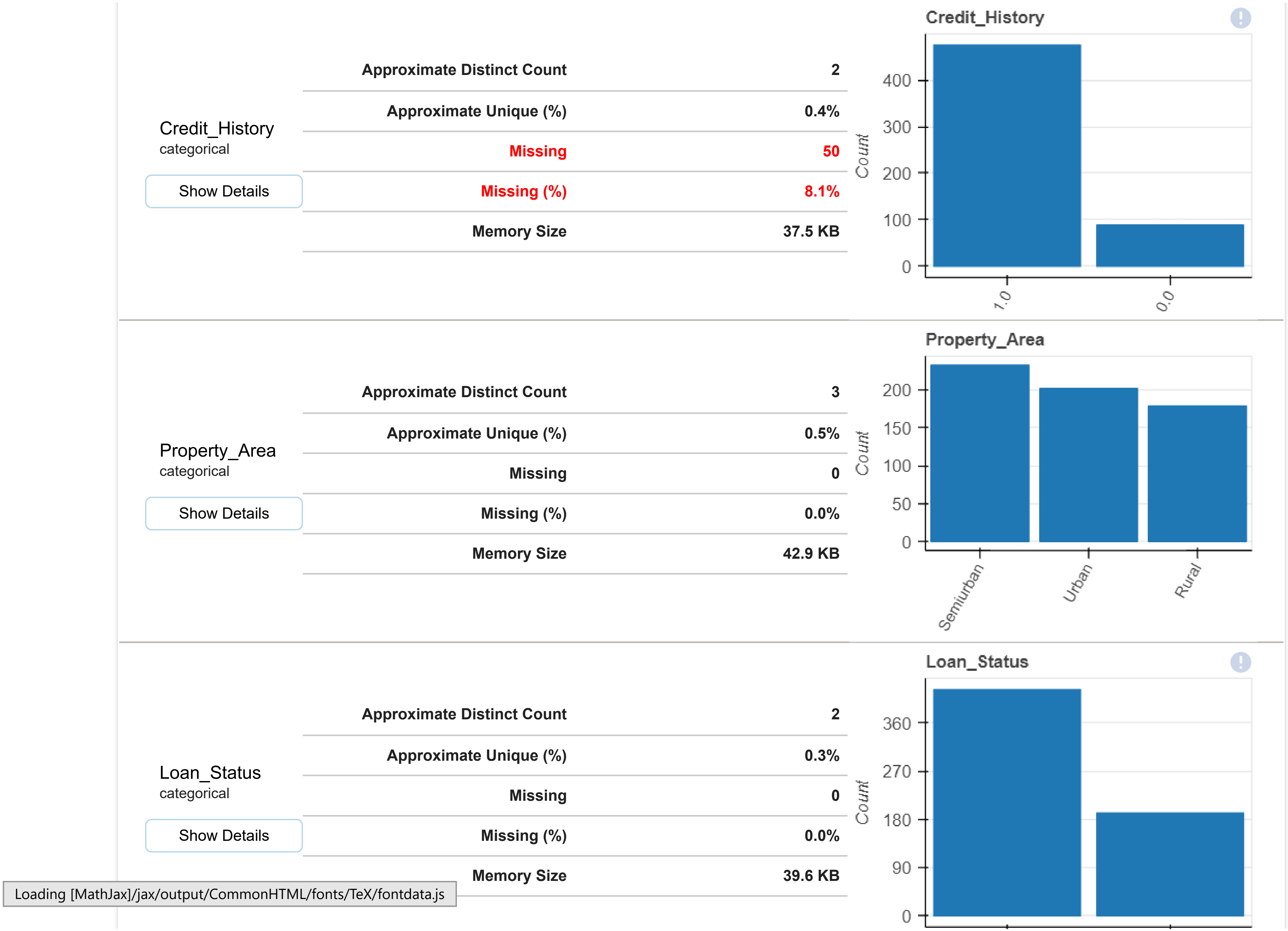

Credit_History
categorical

Show Details

Approximate Distinct Count	2
Approximate Unique (%)	0.4%
Missing	50
Missing (%)	8.1%
Memory Size	37.5 KB

Property_Area
categorical

Show Details

Approximate Distinct Count	3
Approximate Unique (%)	0.5%
Missing	0
Missing (%)	0.0%
Memory Size	42.9 KB

Loan_Status
categorical

Show Details

Approximate Distinct Count	2
Approximate Unique (%)	0.3%
Missing	0
Missing (%)	0.0%
Memory Size	39.6 KB

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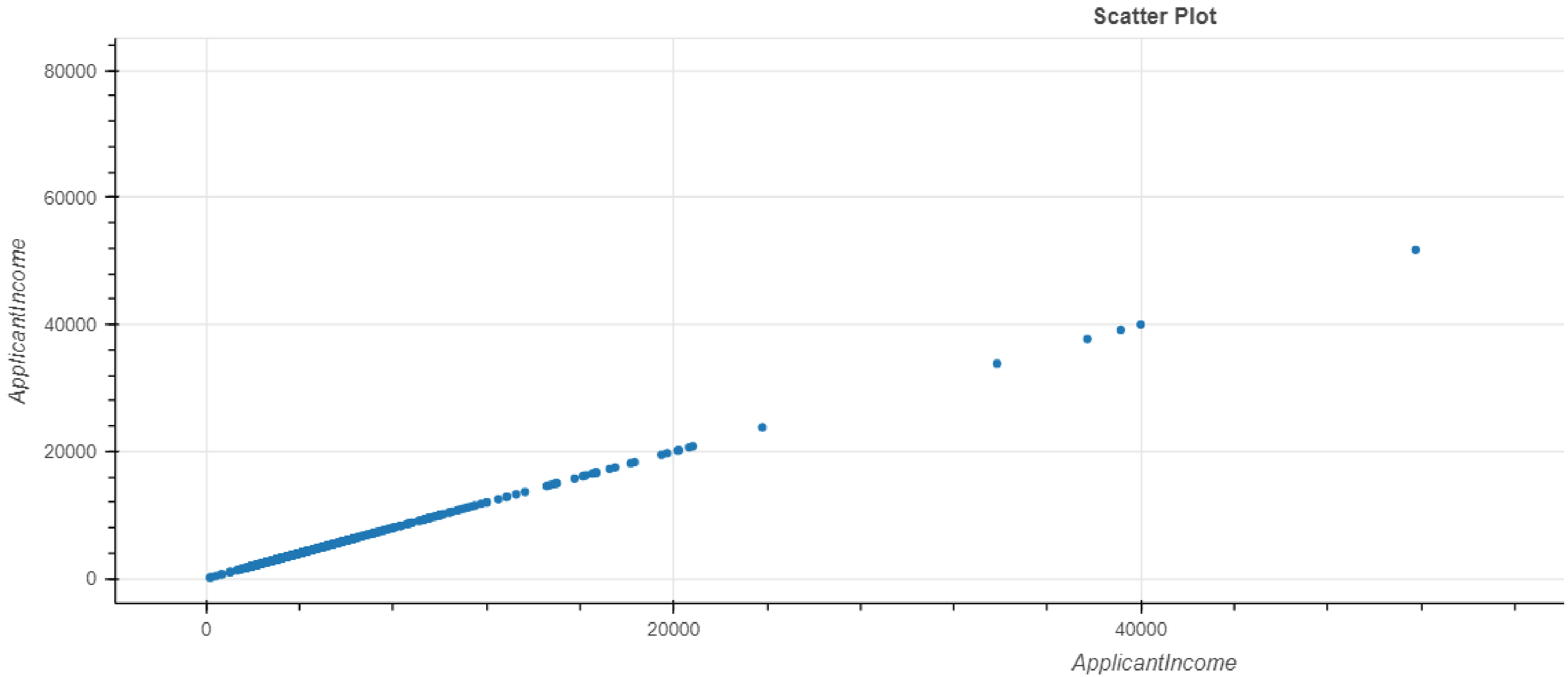
Interactions

X-Axis

ApplicantIncome ▼

Y-Axis

ApplicantIncome ▼



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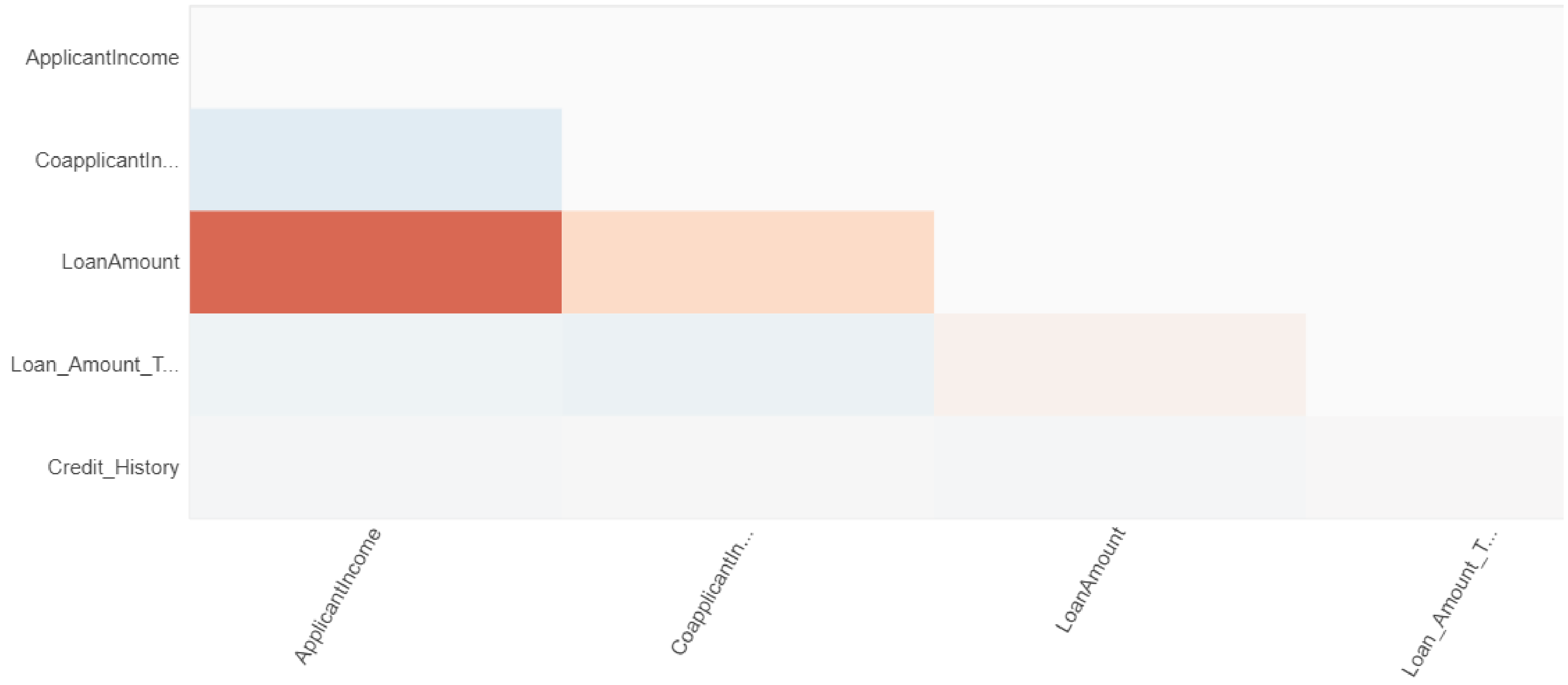
Correlations

Pearson | Spearman | KendallTau



Missing Values

Bar Chart | Spectrum | Heat Map | Dendogram

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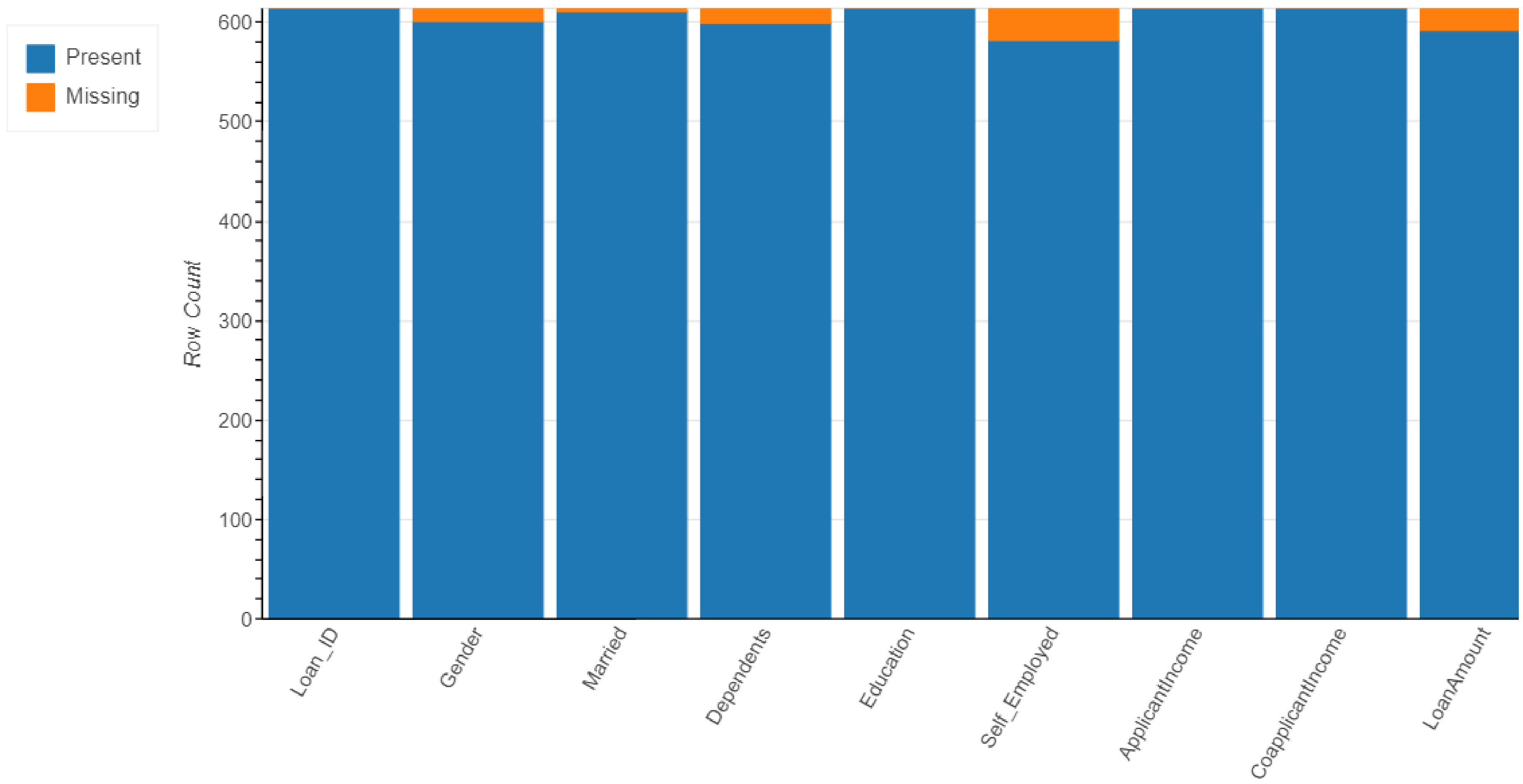

Report generated with DataPrep

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In [ ]:
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