

# ML Raport

AutoPrep

January 8, 2025

## Abstract

This raport has been generated with AutoPrep.

## Contents

<b>1</b>	<b>Overview</b>	<b>2</b>
1.1	System . . . . .	2
1.2	Dataset . . . . .	2
<b>2</b>	<b>Eda</b>	<b>3</b>
2.1	Eda . . . . .	4
2.2	Categorical . . . . .	5
2.3	Numerical . . . . .	6
<b>3</b>	<b>Preprocessing</b>	<b>8</b>
<b>4</b>	<b>Modeling</b>	<b>13</b>
4.1	Overview . . . . .	13
4.2	Scores for 0th best model . . . . .	13
4.3	Scores for 1th best model . . . . .	14
4.4	Scores for 2th best model . . . . .	14

# 1 Overview

## 1.1 System

System	Darwin
Machine	arm64
Processor	arm
Architecture	64bit
Python Version	3.11.10
Physical Cores	8
Logical Cores	8
CPU Frequency (MHz)	4056
Total RAM (GB)	16.00
Available RAM (GB)	4.69
Total Disk Space (GB)	460.43
Free Disk Space (GB)	247.63

Table 1: System overview.

## 1.2 Dataset

Number of samples	1047
Number of features	13
Number of numerical features	6
Number of categorical features	7

Table 2: Dataset Summary.

class	number of observations	Percentage
0	665	0.64
1	382	0.36

Table 3: Target class distribution.

classgit	number of observations	Percentage
pclass	0	0.00
name	0	0.00
sex	0	0.00
age	207	0.20
sibsp	0	0.00
parch	0	0.00
ticket	0	0.00
fare	1	0.00
cabin	813	0.78
embarked	1	0.00
boat	672	0.64
body	948	0.91
home__dest	453	0.43

Table 4: Missing values distribution.

<b>class</b>	<b>type</b>	<b>dtype</b>	<b>space usage</b>
pclass	numerical	int64	16.8 kB
name	categorical	object	96.4 kB
sex	categorical	category	9.7 kB
age	numerical	float64	16.8 kB
sibsp	numerical	int64	16.8 kB
parch	numerical	int64	16.8 kB
ticket	categorical	object	75.1 kB
fare	numerical	float64	16.8 kB
cabin	categorical	object	48.6 kB
embarked	categorical	category	9.7 kB
boat	categorical	object	51.8 kB
body	numerical	float64	16.8 kB
home__dest	categorical	object	68.2 kB

Table 5: Features dtypes description.

<b>index</b>	<b>count</b>	<b>mean</b>	<b>std</b>	<b>min</b>	<b>25%</b>	<b>50%</b>	<b>75%</b>	<b>max</b>
pclass	1047.00	2.30	0.84	1.00	2.00	3.00	3.00	3.00
age	840.00	29.53	14.27	0.17	21.00	28.00	38.62	80.00
sibsp	1047.00	0.52	1.05	0.00	0.00	0.00	1.00	8.00
parch	1047.00	0.40	0.89	0.00	0.00	0.00	0.00	9.00
fare	1046.00	33.55	51.81	0.00	7.92	14.50	31.27	512.33
body	99.00	160.90	98.35	1.00	73.50	156.00	255.50	328.00

Table 6: Numerical features description.

<b>index</b>	<b>count</b>	<b>unique</b>	<b>top</b>	<b>freq</b>
name	1047	1046	Connolly, Miss. Kate	2
ticket	1047	773	CA. 2343	9
cabin	234	161	B57 B59 B63 B66	5
boat	375	25	13	34
home__dest	594	317	New York, NY	50

Table 7: Categorical features description.

## 2 Eda

This part of the report provides basic insides to the data and the informations it holds..

## 2.1 Eda

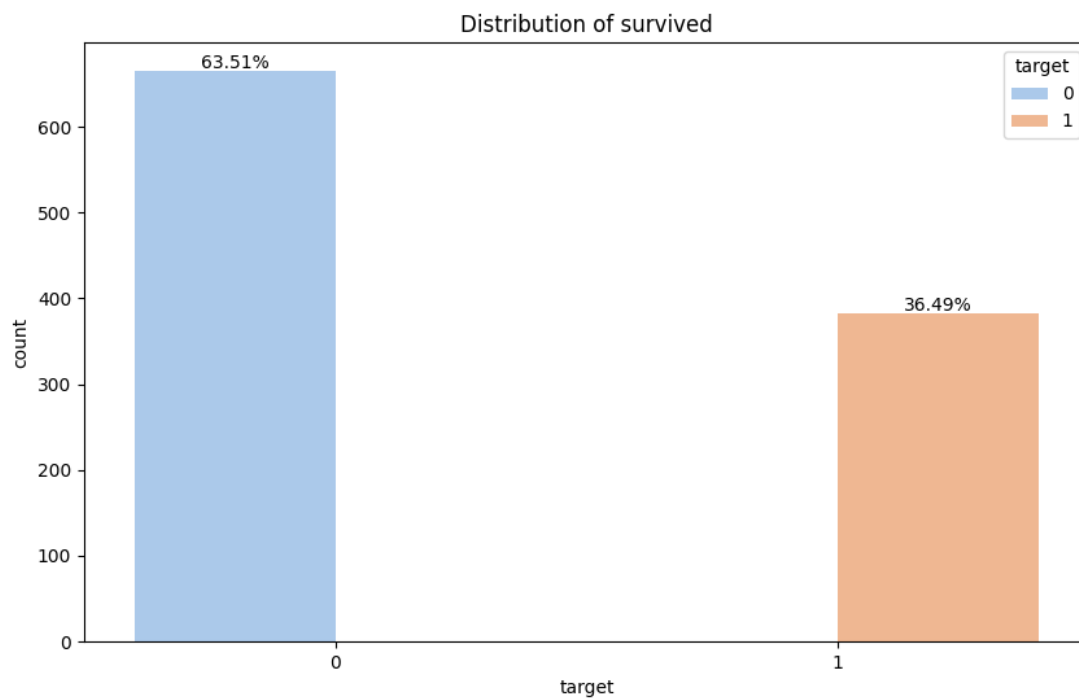


Figure 1: Target distribution.

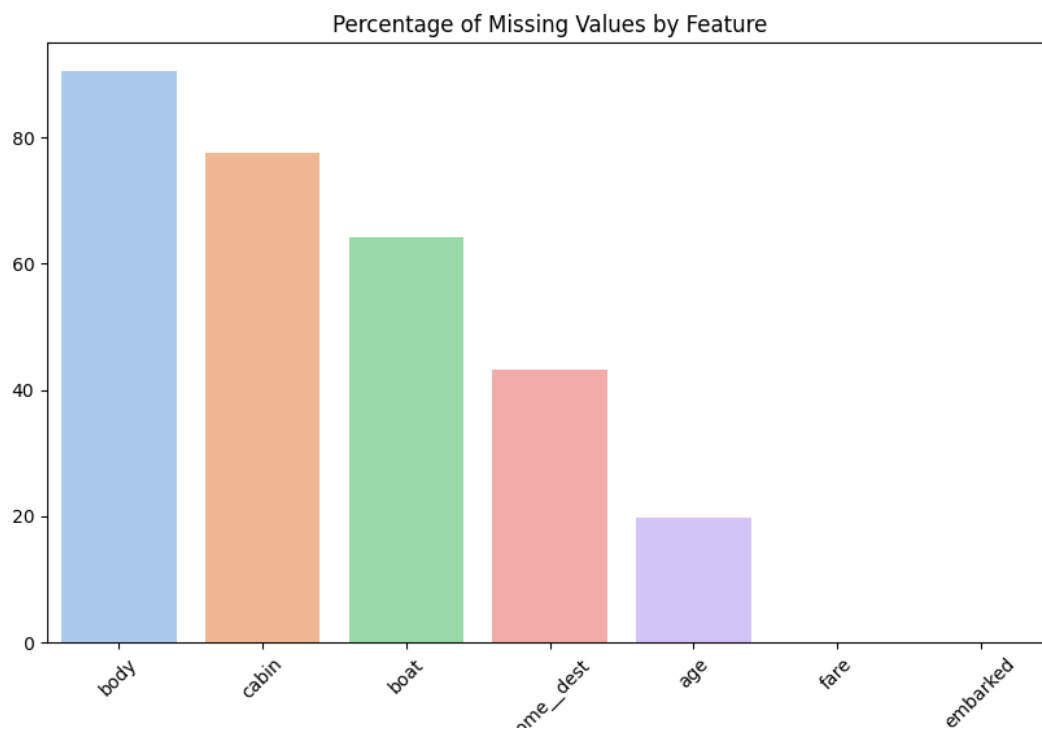


Figure 2: Missing values.

## 2.2 Categorical

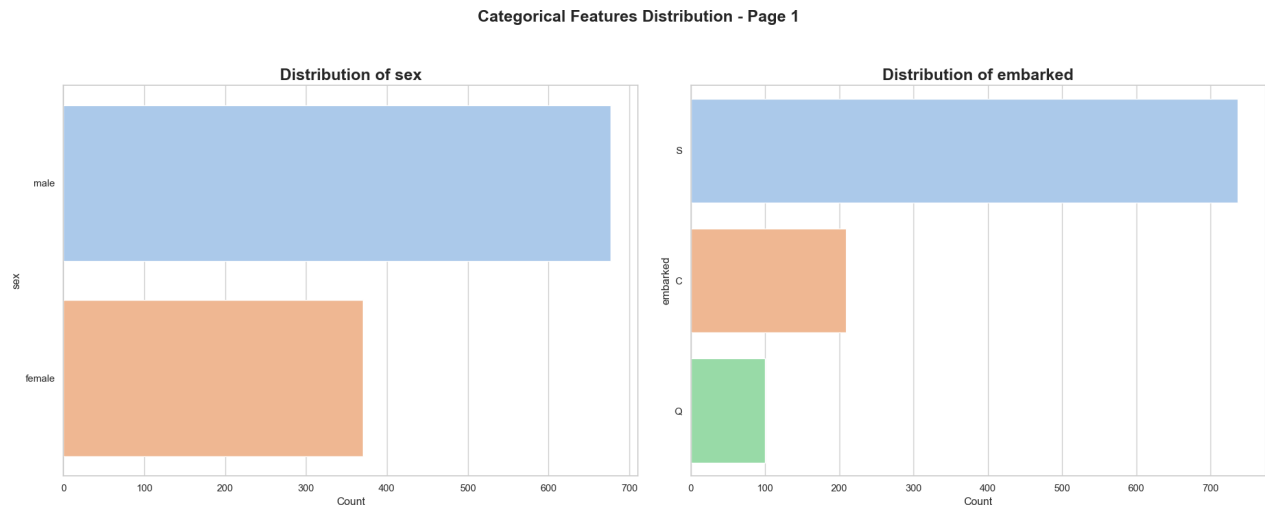


Figure 3: Categorical Features Distribution - Page 1

## 2.3 Numerical

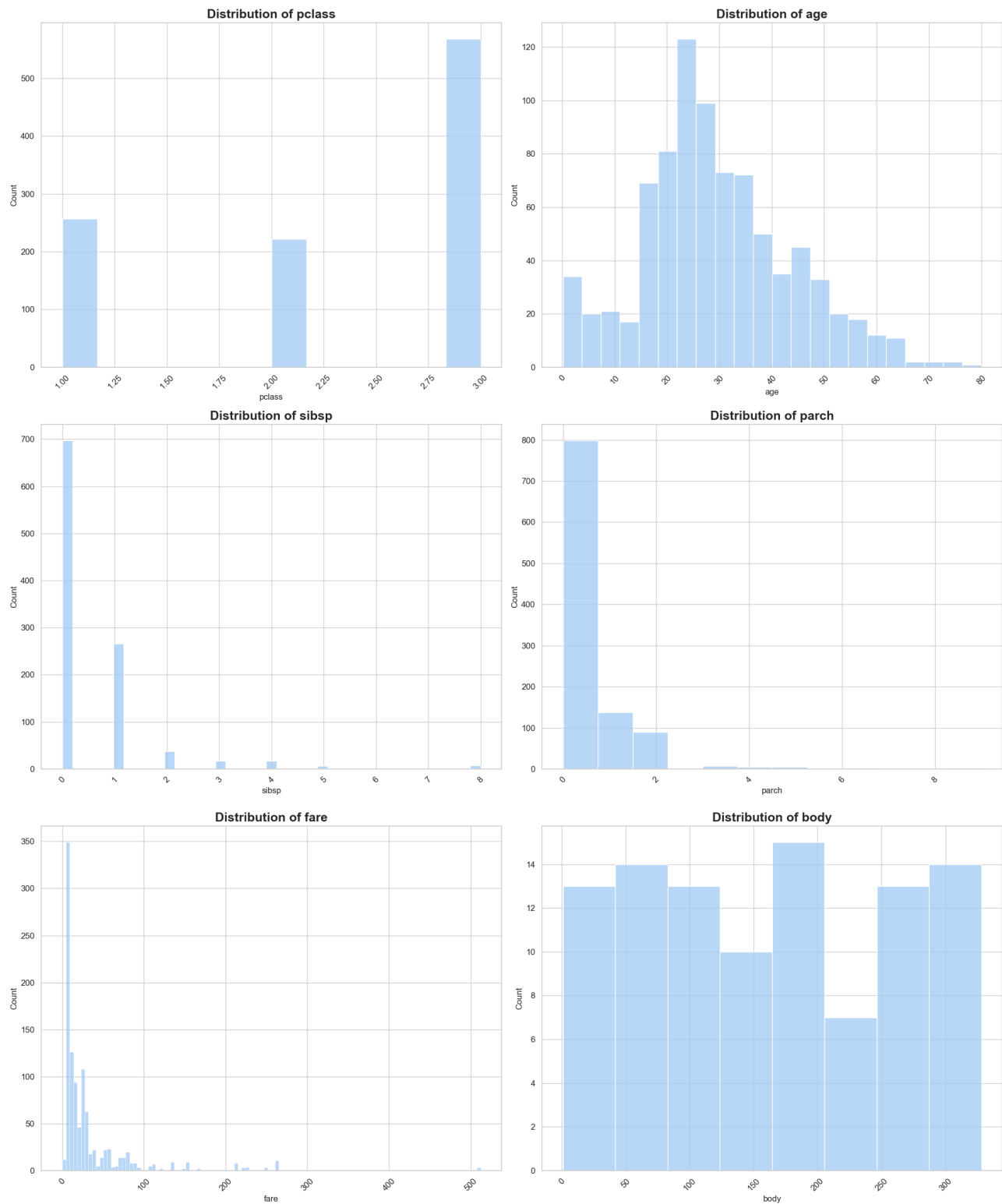


Figure 4: Numerical Features Distribution - Page 1

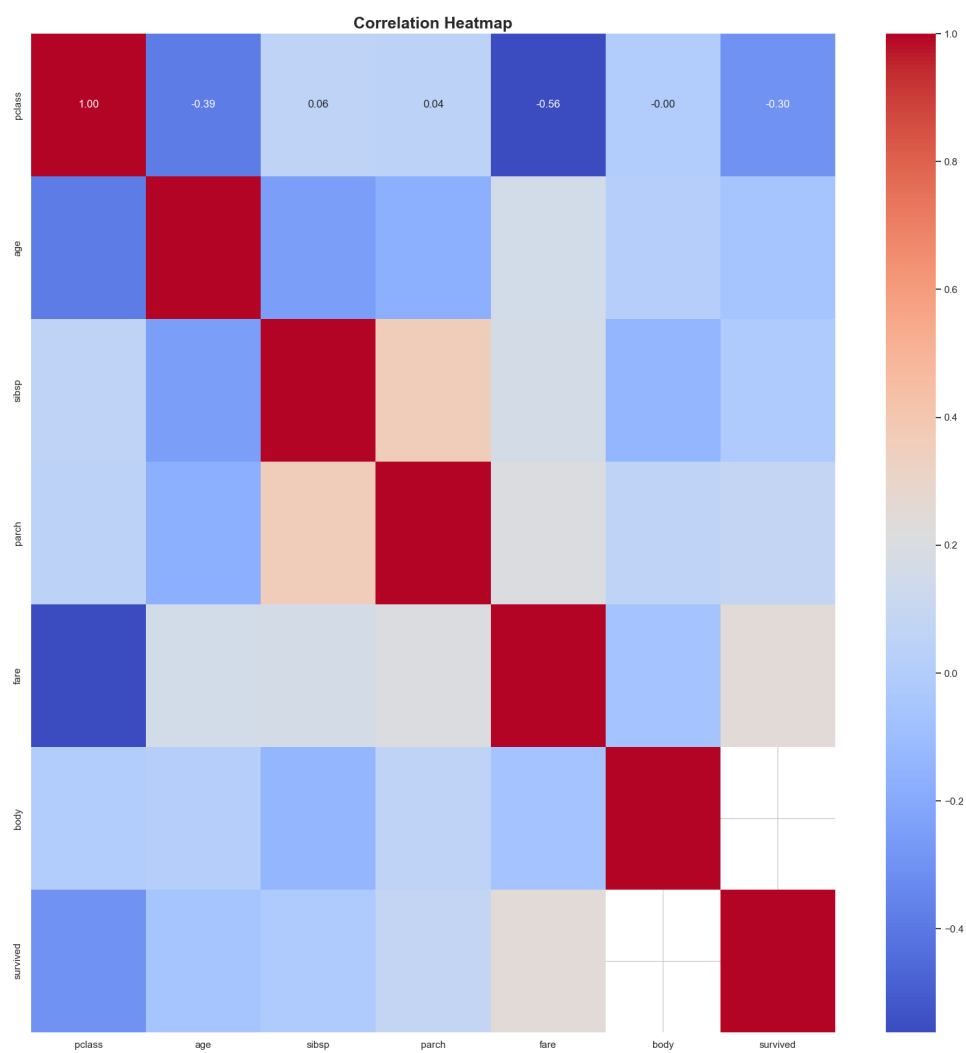


Figure 5: Correlation heatmap.

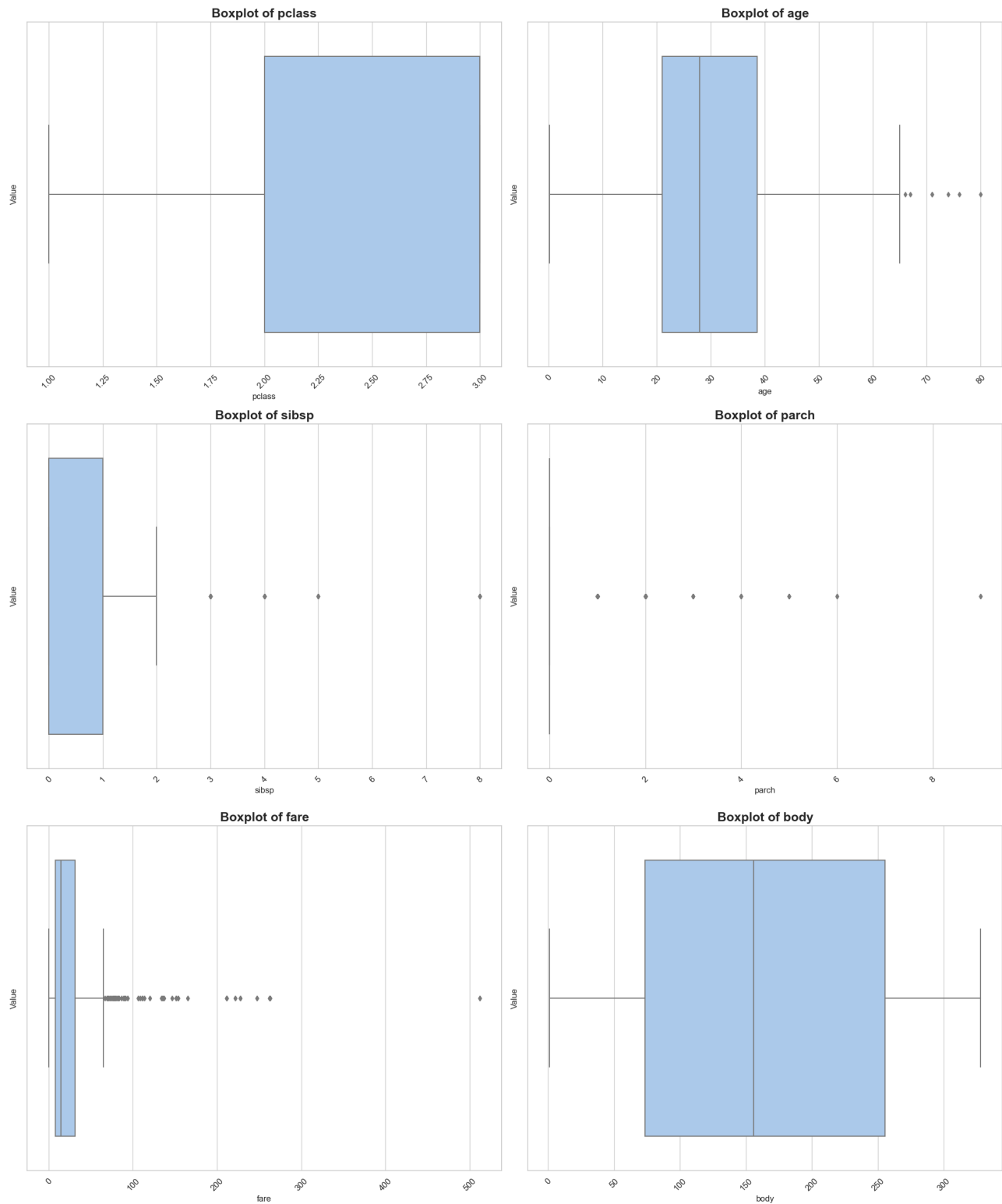


Figure 6: Boxplot page 1

### 3 Preprocessing

This part of the report presents the results of the preprocessing process. It was configured to create up to 3 unique preprocessing pipelines.



<b>Category</b>	<b>Value</b>
Unique created pipelines	32
All created pipelines (after exploding each step params)	96
All pipelines fit time	22 seconds
All pipelines score time	13 seconds
scores_count	96.00
scores_mean	0.70
scores_std	0.06
scores_min	0.54
scores_25%	0.64
scores_50%	0.74
scores_75%	0.75
scores_max	0.77
Scoring function	<class 'str'>
Scoring model	RandomForestClassifier

Table 8: Preprocessing pipelines runtime statistics.

index	steps
0	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, CorrelationFilter
1	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, VarianceFilter
2	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, CorrelationFilter, CorrelationSelector
3	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, VarianceFilter, CorrelationSelector
4	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, CorrelationFilter, FeatureImportanceClassificationSelector
5	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, VarianceFilter, FeatureImportanceClassificationSelector
6	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, CorrelationFilter, FeatureImportanceRegressionSelector
7	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, VarianceFilter, FeatureImportanceRegressionSelector
8	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, CorrelationFilter, PCADimensionReducer
9	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, VarianceFilter, PCADimensionReducer
10	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, CorrelationFilter, CorrelationSelector, PCADimensionReducer
11	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, VarianceFilter, CorrelationSelector, PCADimensionReducer
12	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, CorrelationFilter, FeatureImportanceClassificationSelector, PCADimensionReducer
13	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, VarianceFilter, FeatureImportanceClassificationSelector, PCADimensionReducer
14	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, CorrelationFilter, FeatureImportanceRegressionSelector, PCADimensionReducer
15	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, VarianceFilter, FeatureImportanceRegressionSelector, PCADimensionReducer
16	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, CorrelationFilter, UMAPDimensionReducer
17	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, VarianceFilter, UMAPDimensionReducer
18	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, CorrelationFilter, CorrelationSelector, UMAPDimensionReducer
19	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, VarianceFilter, CorrelationSelector, UMAPDimensionReducer
20	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, CorrelationFilter, FeatureImportanceClassificationSelector, UMAPDimensionReducer
21	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, VarianceFilter, FeatureImportanceClassificationSelector, UMAPDimensionReducer
22	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, CorrelationFilter, FeatureImportanceRegressionSelector, UMAPDimensionReducer
23	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, VarianceFilter, FeatureImportanceRegressionSelector, UMAPDimensionReducer
24	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, CorrelationFilter, VIFDimensionReducer
25	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, VarianceFilter, VIFDimensionReducer
26	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, CorrelationFilter, CorrelationSelector, VIFDimensionReducer
27	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, VarianceFilter, CorrelationSelector, VIFDimensionReducer
28	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, CorrelationFilter, FeatureImportanceClassificationSelector, VIFDimensionReducer
29	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, VarianceFilter, FeatureImportanceClassificationSelector, VIFDimensionReducer
30	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, CorrelationFilter, FeatureImportanceRegressionSelector, VIFDimensionReducer
31	NAImputer, UniqueFilter, ColumnEncoder, ColumnScaler, VarianceFilter, FeatureImportanceRegressionSelector, VIFDimensionReducer

Table 9: Pipelines steps overview.

score index	file name	score	fit duration	score duration
0	preprocessing_pipeline_0.joblib	0.77	a moment	a moment
1	preprocessing_pipeline_1.joblib	0.76	a moment	a moment
2	preprocessing_pipeline_2.joblib	0.76	a moment	a moment

Table 10: Best preprocessing pipelines.

step	name	description	params
0	NAImputer	Imputes missing data.	{"numeric_imputer": "median", "categorical_imputer": "most_frequent"}
1	UniqueFilter	Removes categorical columns with 100% unique values. Dropped columns: []	{}
2	ColumnEncoder	Encodes categorical columns using OneHotEncoder (for columns with <5 unique values) or TolerantLabelEncoder (for columns with >=5 unique values). Encodes target variable using LabelEncoder if provided.	{}
3	ColumnScaler	Scales numerical columns using one of 3 scaling methods.	{"method": "standard"}
4	CorrelationFilter	Removes one column from pairs of columns correlated above correlation threshold: 0.8.	{}
5	CorrelationSelector	Selects the top 70.0% (rounded to whole number) of features most correlated with the target variable. Number of features that were selected: 0	{"correlation_percent": 0.7}
6	PCADimensionReducer	Combines PCA with automatic selection of the number of components to preserve 95% of the variance.	{"n_components": null}

Table 11: 0th best pipeline overview on training set.

index	count	mean	std	min	25%	50%	75%	max
pclass	1047.00	0.00	1.00	-1.55	-0.36	0.84	0.84	0.84
name	1047.00	0.00	1.00	-1.73	-0.87	-0.00	0.87	1.73
age	1047.00	-0.00	1.00	-2.27	-0.57	-0.10	0.45	3.97
sibsp	1047.00	-0.00	1.00	-0.50	-0.50	-0.50	0.46	7.13
parch	1047.00	0.00	1.00	-0.44	-0.44	-0.44	-0.44	9.63
ticket	1047.00	-0.00	1.00	-1.68	-0.90	0.00	0.93	1.67
fare	1047.00	0.00	1.00	-0.65	-0.49	-0.37	-0.04	9.25
home__dest	1047.00	0.00	1.00	-2.74	-0.22	0.30	0.30	1.94
sex_female	1047.00	0.00	1.00	-0.74	-0.74	-0.74	1.35	1.35
embarked_C	1047.00	-0.00	1.00	-0.50	-0.50	-0.50	-0.50	2.00
embarked_Q	1047.00	0.00	1.00	-0.32	-0.32	-0.32	-0.32	3.08
embarked_S	1047.00	-0.00	1.00	-1.55	-1.55	0.65	0.65	0.65

Table 12: 0th best pipeline output overview.

step	name	description	params
0	NAImputer	Imputes missing data.	{"numeric_imputer": "median", "categorical_imputer": "most_frequent"}
1	UniqueFilter	Removes categorical columns with 100% unique values. Dropped columns: []	{}
2	ColumnEncoder	Encodes categorical columns using OneHotEncoder (for columns with <5 unique values) or TolerantLabelEncoder (for columns with >=5 unique values). Encodes target variable using LabelEncoder if provided.	{}
3	ColumnScaler	Scales numerical columns using one of 3 scaling methods.	{"method": "robust"}
4	VarianceFilter	Removes columns with zero variance. Dropped columns: []	{}

Table 13: 1th best pipeline overview on training set.

index	count	mean	std	min	25%	50%	75%	max
pclass	1047.00	0.65	0.42	0.00	0.50	1.00	1.00	1.00
name	1047.00	0.50	0.29	0.00	0.25	0.50	0.75	1.00
age	1047.00	0.36	0.16	0.00	0.27	0.35	0.44	1.00
sibsp	1047.00	0.07	0.13	0.00	0.00	0.00	0.12	1.00
parch	1047.00	0.04	0.10	0.00	0.00	0.00	0.00	1.00
ticket	1047.00	0.50	0.30	0.00	0.23	0.50	0.78	1.00
fare	1047.00	0.07	0.10	0.00	0.02	0.03	0.06	1.00
home__dest	1047.00	0.59	0.21	0.00	0.54	0.65	0.65	1.00
sex_female	1047.00	0.35	0.48	0.00	0.00	0.00	1.00	1.00
embarked_C	1047.00	0.20	0.40	0.00	0.00	0.00	0.00	1.00
embarked_Q	1047.00	0.10	0.29	0.00	0.00	0.00	0.00	1.00
embarked_S	1047.00	0.70	0.46	0.00	0.00	1.00	1.00	1.00

Table 14: 1th best pipeline output overview.

step	name	description	params
0	NAImputer	Imputes missing data.	{"numeric_imputer": "median", "categorical_imputer": "most_frequent"}
1	UniqueFilter	Removes categorical columns with 100% unique values. Dropped columns: []	{}
2	ColumnEncoder	Encodes categorical columns using OneHotEncoder (for columns with <5 unique values) or TolerantLabelEncoder (for columns with >=5 unique values). Encodes target variable using LabelEncoder if provided.	{}
3	ColumnScaler	Scales numerical columns using one of 3 scaling methods.	{"method": "robust"}
4	VarianceFilter	Removes columns with zero variance. Dropped columns: []	{}
5	PCADimensionReducer	Combines PCA with automatic selection of the number of components to preserve 95% of the variance.	{"n_components": null}

Table 15: 2th best pipeline overview on training set.

index	count	mean	std	min	25%	50%	75%	max
pclass	1047.00	-0.70	0.84	-2.00	-1.00	0.00	0.00	0.00
name	1047.00	0.00	0.58	-1.00	-0.50	0.00	0.50	1.00
age	1047.00	0.09	0.98	-2.14	-0.46	0.00	0.54	4.00
sibsp	1047.00	0.52	1.05	0.00	0.00	0.00	1.00	8.00
parch	1047.00	0.40	0.89	0.00	0.00	0.00	0.00	9.00
ticket	1047.00	-0.00	0.55	-0.92	-0.49	0.00	0.51	0.91
fare	1047.00	0.81	2.22	-0.62	-0.28	0.00	0.72	21.32
home__dest	1047.00	-0.57	1.93	-5.86	-1.00	0.00	0.00	3.17
sex_female	1047.00	0.35	0.48	0.00	0.00	0.00	1.00	1.00
embarked_C	1047.00	0.20	0.40	0.00	0.00	0.00	0.00	1.00
embarked_Q	1047.00	0.10	0.29	0.00	0.00	0.00	0.00	1.00
embarked_S	1047.00	-0.30	0.46	-1.00	-1.00	0.00	0.00	0.00

Table 16: 2th best pipeline output overview.

## 4 Modeling

This part of the report presents the results of the modeling process. It was configured to create up to 3 models.

### 4.1 Overview

Category	Value
task	classification
unique models param sets checked (for each dataset)	43
unique models	5
scoring function	roc_auc_score
search parameters	{"cv": 3, "verbose": 0, "n_jobs": -1, "random_state": 42, "n_iter": 10}
train	1047 samples, 13 features
valid	131 samples, 13 features
test	131 samples, 13 features

Table 17: General input data overview.

name	unique params distributions checked
ModelKNeighboursClassifier	10
ModelLogisticRegression	10
ModelGaussianNaiveClassifier	3
ModelSVC	10
ModelDecisionTreeClassifier	10

Table 18: Used models.

### 4.2 Scores for 0th best model

- final pipeline name: final\_pipeline\_0.joblib
- name: ModelKNeighboursClassifier
- params: {"weights": "distance", "p": 1, "n\_neighbors": 15, "leaf\_size": 30, "algorithm": "brute"}
- combined score (after re-training): 0.99
- mean\_test\_score: nan
- std\_test\_score: nan

- test score (after re-training): 0.73
- mean\_fit\_time: a moment
- re-training time: a moment
- std\_fit\_time: a moment

### 4.3 Scores for 1th best model

- final pipeline name: final\_pipeline\_1.joblib
- name: ModelKNeighboursClassifier
- params: {"weights": "distance", "p": 2, "n\_neighbors": 10, "leaf\_size": 40, "algorithm": "auto"}
- combined score (after re-training): 0.99
- mean\_test\_score: nan
- std\_test\_score: nan
- test score (after re-training): 0.7
- mean\_fit\_time: a moment
- re-training time: a moment
- std\_fit\_time: a moment

### 4.4 Scores for 2th best model

- final pipeline name: final\_pipeline\_2.joblib
- name: ModelKNeighboursClassifier
- params: {"weights": "uniform", "p": 2, "n\_neighbors": 15, "leaf\_size": 30, "algorithm": "kd\_tree"}
- combined score (after re-training): 0.76
- mean\_test\_score: nan
- std\_test\_score: nan
- test score (after re-training): 0.76
- mean\_fit\_time: a moment
- re-training time: a moment
- std\_fit\_time: a moment