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Exploratory Data Analysis - EDA

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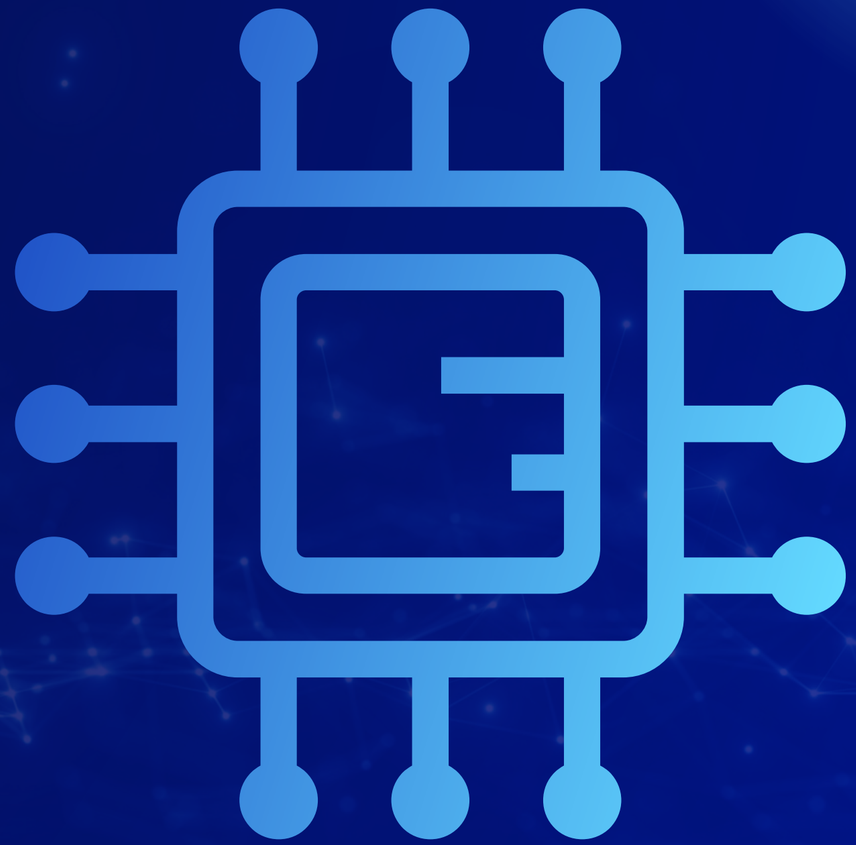

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What is EDA

EDA (Exploratory Data Analysis) is the initial process in data science used to understand the structure, patterns, anomalies, and relationships within a dataset before proceeding to modeling or further analysis.

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Eda Portfolio

In this portfolio, I show the Exploratory Data Analysis (EDA) process using the famous Titanic dataset, which is commonly used as a reference in the data science field.
The main focus of this analysis is to observe the data structure, handle missing values, and remove duplicate data that could compromise the accuracy of the analysis.

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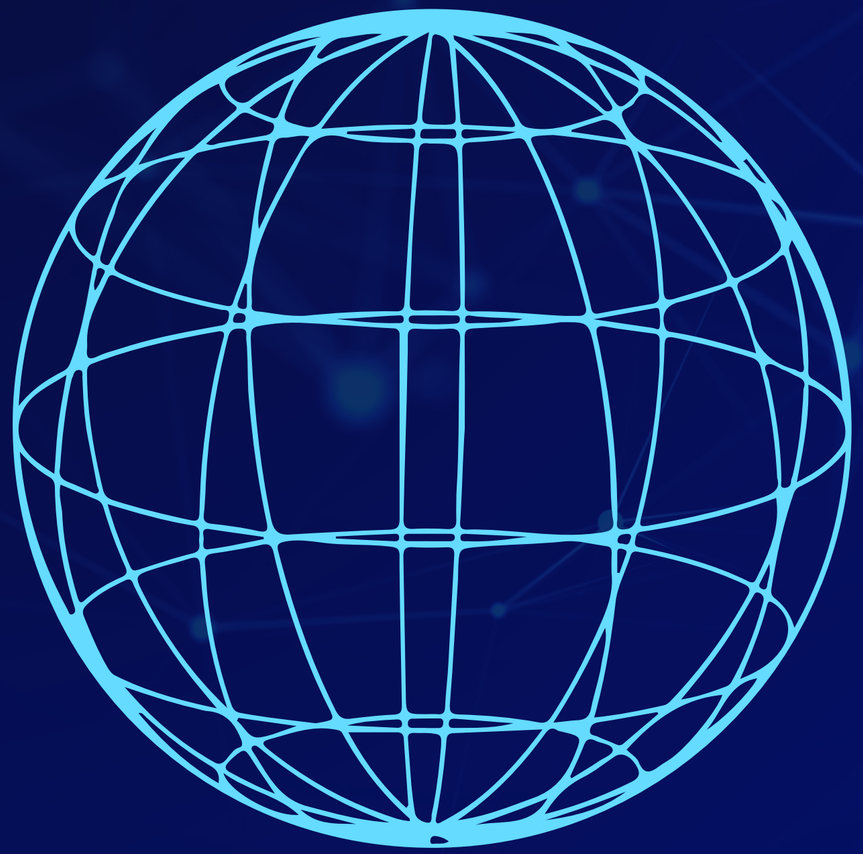

Portfolio Goals

Duplicate Data Handling, Missing Values Handling, Data Observation

Load Data

At the beginning of the analysis, the Titanic dataset was loaded and explored using functions like head(), tail(), and sample() to get a general idea of the data structure.

Some of the main columns in the dataset include:

- survived: 0 means did not survive, 1 means survived
- name: passenger's full name
- sex: gender (male or female)
- age: age of the passenger in decimal format

Load Data

```
# import data
df = pd.read_excel('titanic.xlsx')
data = df.copy()
df.head() #Menampilkan 5 teratas
```

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

```
df.sample(5)
#Menampilkan 5 data acak
```

	survived	name	sex	age
78	1	Compton, Mrs. Alexander Taylor (Mary Eliza Ing...	female	64.0
498	0	Maybery, Mr. Frank Hubert	male	40.0
137	1	Graham, Miss. Margaret Edith	female	19.0
166	0	Hoyt, Mr. William Fisher	male	NaN
103	1	Endres, Miss. Caroline Louise	female	38.0

```
[40] df.tail()
     # Menampilkan 5 data terbawah
```

	survived	name	sex	age
495	1	Mallet, Mrs. Albert (Antoinette Magnin)	female	24.0
496	0	Mangiavacchi, Mr. Serafino Emilio	male	NaN
497	0	Matthews, Mr. William John	male	30.0
498	0	Maybery, Mr. Frank Hubert	male	40.0
499	0	McCrae, Mr. Arthur Gordon	male	32.0

Load Data

Using the data.info() function, we found that the Titanic dataset contains 500 rows and 4 columns: survived, name, sex, and age.
Key Points:

- All columns except age have complete data (500 entries).
- The age column has only 451 non-null values, meaning there are 49 missing entries.
- Data types for each column:
  - survived: integer (int64)
  - name and sex: string (object)
  - age: float (float64)

```
[42] df.info()
     # Menampilkan informasi umum dataset
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 500 entries, 0 to 499
Data columns (total 4 columns):
 #   Column    Non-Null Count  Dtype
---  ------    --------------  -----
 0   survived  500 non-null    int64
 1   name      500 non-null    object
 2   sex       500 non-null    object
 3   age       451 non-null    float64
dtypes: float64(1), int64(1), object(2)
memory usage: 15.8+ KB
```

survived : Bertipe integer (int64), berisi 0 atau 1 yang menunjukkan apakah penumpang tidak selamat (0) atau selamat (1).

name : Bertipe objek (object), berisi nama penumpang.

sex : Bertipe objek (object), berisi informasi jenis kelamin penumpang.

age : Bertipe float (float64), berisi usia penumpang. Namun, hanya terdapat 451 data yang tidak kosong, artinya ada 49 missing values di kolom ini.

Statistical Summary

STATISTICAL SUMMARY

```
df.describe()
```

	survived	age
count	500.000000	451.000000
mean	0.540000	35.917775
std	0.498897	14.766454
min	0.000000	0.666700
25%	0.000000	24.000000
50%	1.000000	35.000000
75%	1.000000	47.000000
max	1.000000	80.000000

0s

```
df.describe(include='object')
```

	name	sex
count	500	500
unique	499	2
top	Eustis, Miss. Elizabeth Mussey	male
freq	2	288

Using the describe() function, we can summarize the key statistics of the Titanic dataset:
For numerical columns:

- The survived column has a mean of 0.54, which suggests that around 54% of passengers survived.
- The age column shows an average age of 35.91 years, ranging from 0.67 to 80 years.
- There are 451 valid age entries, meaning 49 are missing.
- The standard deviation for age is 14.77, showing a wide variation in passenger ages.

For categorical columns (via describe(include='object')):

- The sex column contains 2 unique values: male and female, with male being the most common (288 passengers).
- The name column has 499 unique names out of 500 entries, indicating there is 1 duplicate name.

Data Duplication Handling

```
[69] len(df.drop_duplicates()) / len(df)
```

```
0.998
```

```
[70] # Menampilkan baris duplikat
duplicates = df[df.duplicated(keep=False)]

duplicate_counts = duplicates.groupby(list(df.columns)).size().reset_index(name='jumlah_duplikat')

sorted_duplicates = duplicate_counts.sort_values(by='jumlah_duplikat', ascending=False)

print("Baris yang terduplikasi:")
sorted_duplicates
```

```
Baris yang terduplikasi:
```

	survived	name	sex	age	jumlah_duplikat
0	1	Eustis, Miss. Elizabeth Mussey	female	54.0	2

```
# Hapus duplikat
df = df.drop_duplicates()
```

```
len(df.drop_duplicates()) / len(df)
```

```
1.0
```

To check for duplicate data

Findings:

- Before cleaning, 99.8% of the rows were unique, meaning there was 1 duplicate row.
- The duplicate was from Eustis, Miss. Elizabeth Mussey, aged 54.0, with a survival status of 1.
- This exact row appeared twice in the dataset.

Action Taken:

- The duplicate was removed using df.drop_duplicates().
- After this step, the dataset became 100% unique, ensuring there are no repeated entries.

Missing Value Handling

```python
# Cek jumlah dan persentase missing value
missing = df.isnull().sum()
missing_percent = (missing / len(df)) * 100

print("Jumlah Missing Value:")
print(missing)
print("\nPersentase Missing Value:")
print(missing_percent)

# Handling: isi missing value pada kolom 'age' dengan median
median_age = df['age'].median()
df['age'].fillna(median_age, inplace=True)

print("\nMissing value pada kolom 'age' telah diisi dengan nilai median:", median_age)
```

```
Jumlah Missing Value:
survived     0
name         0
sex          0
age         49
dtype: int64

Persentase Missing Value:
survived    0.000000
name        0.000000
sex         0.000000
age         9.819639
dtype: float64

Missing value pada kolom 'age' telah diisi dengan nilai median: 35.0
```

Findings:

- The dataset contains 4 columns: survived, name, sex, and age.
- Based on the missing value inspection:
  - The age column contains 49 missing values.
  - This represents 9.819639 (9.82%) of the total dataset.
  - The other columns (survived, name, and sex) do not have any missing values.

Handling:

- To handle the missing values in the age column:
  - The median value of the age column was calculated using df['age'].median().
  - The missing entries in the age column were then filled with this median value using df['age'].fillna(median_age, inplace=True).

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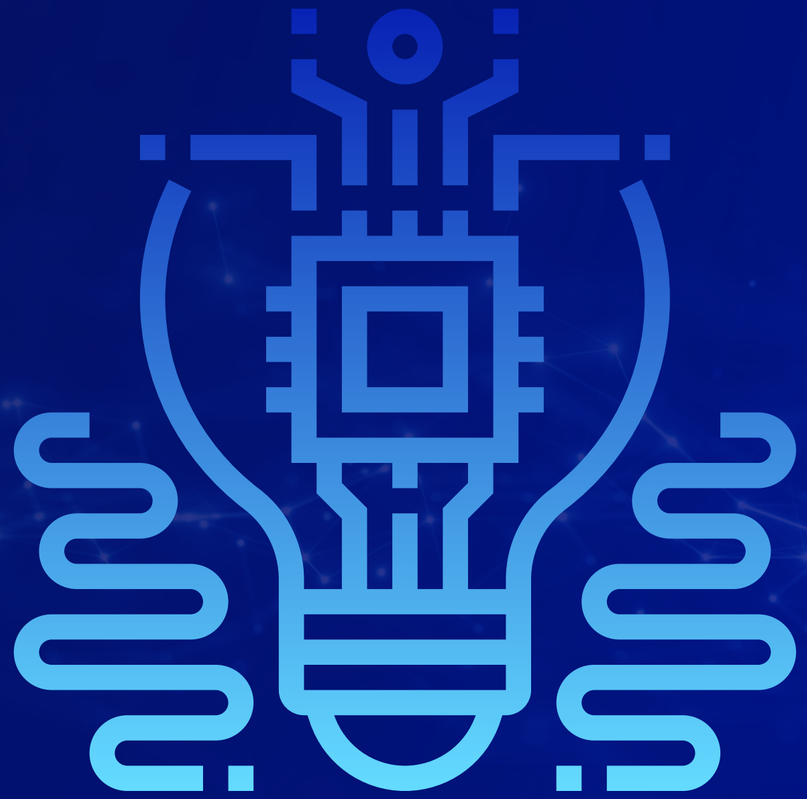
Final Result Missing Value Handling

- The age column no longer contains missing values.
- The median value used for imputation was 35.0, as displayed in the final print output.
- This process ensures data consistency by replacing missing values with a statistically representative value, minimizing potential bias.



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Thankyou

Thank you for your attention.
This analysis is just the beginning — deeper insights can be uncovered through further exploration and modeling.
Let’s keep learning and growing in the world of data science!

Muhammad Yusuf Ardiansyah

Data Science