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#D2E3FC;\n","   --hover-bg-color: #434B5C;\n","   --hover-fill-color: #FFFFFF;\n","   --disabled-bg-color: #3B4455;\n","   --disabled-fill-color: #666;\n"," }\n","\n"," .colab-df-quickchart {\n","   background-color: var(--bg-color);\n","   border: none;\n","   border-radius: 50%;\n","   cursor: pointer;\n","   display: none;\n","   fill: var(--fill-color);\n","   height: 32px;\n","   padding: 0;\n","   width: 32px;\n"," }\n","\n"," .colab-df-quickchart:hover {\n","   background-color: var(--hover-bg-color);\n","   box-shadow: 0 1px 2px rgba(60, 64, 67, 0.3), 0 1px 3px 1px rgba(60, 64, 67, 0.15);\n","   fill: var(--button-hover-fill-color);\n"," }\n","\n"," .colab-df-quickchart-complete:disabled,\n"," .colab-df-quickchart-complete:disabled:hover {\n","   background-color: var(--disabled-bg-color);\n","   fill: var(--disabled-fill-color);\n","   box-shadow: none;\n"," }\n","\n"," .colab-df-spinner {\n","   border: 2px solid var(--fill-color);\n","   border-color: transparent;\n","   border-bottom-color: var(--fill-color);\n","   animation:\n","   spin 1s steps(1) infinite;\n"," }\n","\n"," @keyframes spin {\n","   0% {\n","   border-color: transparent;\n","   border-bottom-color: var(--fill-color);\n","   border-left-color: var(--fill-color);\n","   }\n","   20% {\n","   border-color: transparent;\n","   border-left-color: var(--fill-color);\n","   border-top-color: var(--fill-color);\n","   }\n","   30% {\n","   border-color: transparent;\n","   border-left-color: var(--fill-color);\n","   border-top-color: var(--fill-color);\n","   border-right-color: var(--fill-color);\n","   }\n","   40% {\n","   border-color: transparent;\n","   border-right-color: var(--fill-color);\n","   border-top-color: var(--fill-color);\n","   }\n","   60% {\n","   border-color: transparent;\n","   border-right-color: var(--fill-color);\n","   }\n","   80% {\n","   border-color: transparent;\n","   border-right-color: var(--fill-color);\n","   border-bottom-color: var(--fill-color);\n","   }\n","   90% {\n","   border-color: transparent;\n","   border-bottom-color: var(--fill-color);\n","   }\n"," }\n","</style>\n","\n"," <script>\n","   async function quickchart(key) {\n","   const quickchartButtonEl =\n","   document.querySelector('#' + key + ' button');\n","   quickchartButtonEl.disabled = true; // To prevent multiple clicks.\n","   quickchartButtonEl.classList.add('colab-df-spinner');\n","   try {\n","   const charts = await google.colab.kernel.invokeFunction(\n","   'suggestCharts', [key], {});\n","   } catch (error) {\n","   console.error('Error during call to suggestCharts:', error);\n","   }\n","   quickchartButtonEl.classList.remove('colab-df-spinner');\n","   quickchartButtonEl.classList.add('colab-df-quickchart-complete');\n","   }\n","   (() => {\n","   let quickchartButtonEl =\n","   document.querySelector('#df-913e8734-94f9-415e-82e0-f49a3732d108 button');\n","   quickchartButtonEl.style.display =\n","   google.colab.kernel.accessAllowed ? 'block' : 'none';\n","   })();\n"," </script>\n"," \n","\n","   \n"," \n"],"application/vnd.google.colaboratory.intrinsic+json":{"type

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1.764420      0.763161\n","min      1.000000       4.300000
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<td>3.758667</td>\n","      <td>1.198667</td>\n","    </tr>\n","
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<td>1.764420</td>\n","      <td>0.763161</td>\n","    </tr>\n","
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<td>4.300000</td>\n","      <td>2.000000</td>\n","
<td>1.000000</td>\n","      <td>0.100000</td>\n","    </tr>\n","
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<td>1.600000</td>\n","      <td>0.300000</td>\n","    </tr>\n","
<tr>\n","      <th>50%</th>\n","      <td>75.500000</td>\n","
<td>5.800000</td>\n","      <td>3.000000</td>\n","
<td>4.350000</td>\n","      <td>1.300000</td>\n","    </tr>\n","
<tr>\n","      <th>75%</th>\n","      <td>112.750000</td>\n","
<td>6.400000</td>\n","      <td>3.300000</td>\n","
<td>5.100000</td>\n","      <td>1.800000</td>\n","    </tr>\n","
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<td>7.900000</td>\n","      <td>4.400000</td>\n","
<td>6.900000</td>\n","      <td>2.500000</td>\n","    </tr>\n","
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960 960\">\n","    <path d=\"M120-120v-720h720v720H120Zm60-500h600v-
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160H180v160Zm440 0h160v-160H620v160Z\"/>\n","  </svg>\n","
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0.3));\n","      fill: #FFFFFF;\n","    }\n","  </style>\n","\n","
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google.colab.kernel.accessAllowed ? 'block' : 'none';\n","\n","
async function convertToInteractive(key) {\n","        const element =
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4f6808ebf52b');\n","        const dataTable =\n","          await
google.colab.kernel.invokeFunction('convertToInteractive',\n","
[key], {});\n","        if (!dataTable) return;\n","\n","        const
docLinkHtml = 'Like what you see? Visit the ' +\n","          '<a
target=\"_blank\"
href=https://colab.research.google.com/notebooks/data_table.ipynb>data
table notebook</a>'\n","          + ' to learn more about interactive
tables.';\n","        element.innerHTML = '';\n","
dataTable['output_type'] = 'display_data';\n","        await
google.colab.output.renderOutput(dataTable, element);\n","
const docLink = document.createElement('div');\n","
docLink.innerHTML = docLinkHtml;\n","
element.appendChild(docLink);\n","      }\n","    </script>\n","
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1px rgba(60, 64, 67, 0.15);\n","    fill: var(--button-hover-fill-
color);\n","  }\n","\n","  .colab-df-quickchart-
complete:disabled,\n","  .colab-df-quickchart-complete:disabled:hover
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var(--disabled-fill-color);\n","    box-shadow: none;\n","
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color: transparent;\n","      border-right-color: var(--fill-
color);\n","      border-bottom-color: var(--fill-color);\n","
}\n","    90% {\n","      border-color: transparent;\n","      border-
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quickchart(key) {\n","      const quickchartButtonEl =\n","
document.querySelector('#' + key + ' button');\n","
quickchartButtonEl.disabled = true;  // To prevent multiple
clicks.\n","      quickchartButtonEl.classList.add('colab-df-
spinner');\n","      try {\n","        const charts = await
google.colab.kernel.invokeFunction(\n","            'suggestCharts',
[key], {});\n","      } catch (error) {\n","
console.error('Error during call to suggestCharts:', error);\n","
}\n","      quickchartButtonEl.classList.remove('colab-df-
spinner');\n","      quickchartButtonEl.classList.add('colab-df-
quickchart-complete');\n","    }\n","    (() => {\n","      let
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\"description\": \"\"\n      }\n    }\n
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3            4.7           3.2            1.3           0.2   \n","3
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...          ...           ...            ...           ...
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}\n","\n","   pre.function-repr-contents.function-repr-contents-
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def
info(verbose: bool | None=None, buf: WriteBuffer[str] | None=None,
max_cols: int | None=None, memory_usage: bool | str | None=None,
show_counts: bool | None=None) -> None</pre><pre class=\"function-
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href=\"#\">/usr/local/lib/python3.10/dist-
packages/pandas/core/frame.pyPrint a concise summary of a
DataFrame.\n","\n","This method prints information about a DataFrame
including\n","the index dtype and columns, non-null values and memory
usage.\n","\n","Parameters\n","----------\n","verbose : bool,
optional\n","   Whether to print the full summary. By default, the
setting in\n","   ``pandas.options.display.max_info_columns`` is
followed.\n","buf : writable buffer, defaults to sys.stdout\n","
Where to send the output. By default, the output is printed to\n","
sys.stdout. Pass a writable buffer if you need to further process\n","
the output.\n","max_cols : int, optional\n","   When to switch from
the verbose to the truncated output. If the\n","   DataFrame has more
than `max_cols` columns, the truncated output\n","   is used. By
default, the setting in\n","
``pandas.options.display.max_info_columns`` is used.\n","memory_usage
: bool, str, optional\n","   Specifies whether total memory usage of
the DataFrame\n","   elements (including the index) should be
displayed. By default,\n","   this follows the
``pandas.options.display.memory_usage`` setting.\n","\n","   True
always show memory usage. False never shows memory usage.\n","   A
value of 'deep' is equivalent to "True with deep
introspection".\n","   Memory usage is shown in human-readable
units (base-2\n","   representation). Without deep introspection a
memory estimation is\n","   made based in column dtype and number of
rows assuming values\n","   consume the same memory amount for
corresponding dtypes. With deep\n","   memory introspection, a real
memory usage calculation is performed\n","   at the cost of
computational resources. See the\n","   :ref:`Frequently Asked
Questions <df-memory-usage>` for more\n","
details.\n","show_counts : bool, optional\n","   Whether to show the
non-null counts. By default, this is shown\n","   only if the
DataFrame is smaller than\n","
``pandas.options.display.max_info_rows`` and\n","
``pandas.options.display.max_info_columns``. A value of True
always\n","   shows the counts, and False never shows the
counts.\n","\n","Returns\n","-------\n","None\n","   This method

```
prints a summary of a DataFrame and returns None.\n","\n","See
Also\n","--------\n","DataFrame.describe: Generate descriptive
statistics of DataFrame\n","    columns.\n","DataFrame.memory_usage:
Memory usage of DataFrame columns.\n","\n","Examples\n","--------
\n","&gt;&gt;&gt; int_values = [1, 2, 3, 4, 5]\n","&gt;&gt;&gt;
text_values = [&#x27;alpha&#x27;, &#x27;beta&#x27;, &#x27;gamma&#x27;,
&#x27;delta&#x27;, &#x27;epsilon&#x27;]\n","&gt;&gt;&gt; float_values
= [0.0, 0.25, 0.5, 0.75, 1.0]\n","&gt;&gt;&gt; df =
pd.DataFrame({&quot;int_col&quot;: int_values, &quot;text_col&quot;:
text_values,\n","...                    &quot;float_col&quot;:
float_values})\n","&gt;&gt;&gt; df\n","    int_col text_col
float_col\n","0        1    alpha       0.00\n","1        2     beta
0.25\n","2        3    gamma       0.50\n","3        4    delta
0.75\n","4        5  epsilon       1.00\n","\n","Prints information of
all columns:\n","\n","&gt;&gt;&gt; df.info(verbose=True)\n","&lt;class
&#x27;pandas.core.frame.DataFrame&#x27;&gt;\n","RangeIndex: 5 entries,
0 to 4\n","Data columns (total 3 columns):\n"," #   Column     Non-
Null Count  Dtype\n","---  ------     --------------  -----\n"," 0
int_col    5 non-null      int64\n"," 1   text_col   5 non-null
object\n"," 2   float_col  5 non-null      float64\n","dtypes:
float64(1), int64(1), object(1)\n","memory usage: 248.0+
bytes\n","\n","Prints a summary of columns count and its dtypes but
not per column\n","information:\n","\n","&gt;&gt;&gt;
df.info(verbose=False)\n","&lt;class
&#x27;pandas.core.frame.DataFrame&#x27;&gt;\n","RangeIndex: 5 entries,
0 to 4\n","Columns: 3 entries, int_col to float_col\n","dtypes:
float64(1), int64(1), object(1)\n","memory usage: 248.0+
bytes\n","\n","Pipe output of DataFrame.info to buffer instead of
sys.stdout, get\n","buffer content and writes to a text
file:\n","\n","&gt;&gt;&gt; import io\n","&gt;&gt;&gt; buffer =
io.StringIO()\n","&gt;&gt;&gt; df.info(buf=buffer)\n","&gt;&gt;&gt; s
= buffer.getvalue()\n","&gt;&gt;&gt; with
open(&quot;df_info.txt&quot;, &quot;w&quot;,\n","...
encoding=&quot;utf-8&quot;) as f:  # doctest: +SKIP\n","...
f.write(s)\n","260\n","\n","The `memory_usage` parameter allows deep
introspection mode, specially\n","useful for big DataFrames and fine-
tune memory optimization:\n","\n","&gt;&gt;&gt; random_strings_array =
np.random.choice([&#x27;a&#x27;, &#x27;b&#x27;, &#x27;c&#x27;], 10 **
6)\n","&gt;&gt;&gt; df = pd.DataFrame({\n","...
&#x27;column_1&#x27;: np.random.choice([&#x27;a&#x27;, &#x27;b&#x27;,
&#x27;c&#x27;], 10 ** 6),\n","...     &#x27;column_2&#x27;:
np.random.choice([&#x27;a&#x27;, &#x27;b&#x27;, &#x27;c&#x27;], 10 **
6),\n","...     &#x27;column_3&#x27;: np.random.choice([&#x27;a&#x27;,
&#x27;b&#x27;, &#x27;c&#x27;], 10 ** 6)\n","... })\n","&gt;&gt;&gt;
df.info()\n","&lt;class
&#x27;pandas.core.frame.DataFrame&#x27;&gt;\n","RangeIndex: 1000000
entries, 0 to 999999\n","Data columns (total 3 columns):\n"," #
Column    Non-Null Count    Dtype\n","---  ------    --------------
-----\n"," 0   column_1  1000000 non-null  object\n"," 1   column_2
1000000 non-null  object\n"," 2   column_3  1000000 non-null
object\n","dtypes: object(3)\n","memory usage: 22.9+
MB\n","\n","&gt;&gt;&gt;
```

```
df.info(memory_usage=&#x27;deep&#x27;)\n","&lt;class
&#x27;pandas.core.frame.DataFrame&#x27;&gt;\n","RangeIndex: 1000000
entries, 0 to 999999\n","Data columns (total 3 columns):\n"," #
Column    Non-Null Count    Dtype\n","---  ------    --------------
-----\n"," 0   column_1  1000000 non-null  object\n"," 1   column_2
1000000 non-null  object\n"," 2   column_3  1000000 non-null
object\n","dtypes: object(3)\n","memory usage: 165.9 MB</pre>\n","
<script>\n","      if (google.colab.kernel.accessAllowed &&
google.colab.files && google.colab.files.view) {\n","        for
(const element of document.querySelectorAll('.filepath')) {\n","
element.style.display = 'block'\n","          element.onclick =
(event) => {\n","            event.preventDefault();\n","
event.stopPropagation();\n","
google.colab.files.view(element.textContent, 3345);\n","
};\n","        }\n","      }\n","      for (const element of
document.querySelectorAll('.function-repr-contents')) {\n","
element.onclick = (event) => {\n","
event.preventDefault();\n","          event.stopPropagation();\n","
element.classList.toggle('function-repr-contents-collapsed');\n","
};\n","      }\n","      </script>\n","
</div>"]},"metadata":{},"execution_count":8}]},{"cell_type":"code","so
urce":["#checking for null
values\n","df.isnull().sum()"],"metadata":{"colab":{"base_uri":"https:
//localhost:8080/"},"id":"yhc1I2-
wWgOh","executionInfo":{"status":"ok","timestamp":1716550040934,"user_
tz":-330,"elapsed":512,"user":{"displayName":"Rishipriya
Deekonda","userId":"04973586206988207807"}},"outputId":"d3d0ed47-40e1-
4eaf-90ac-
53cfabbfe4d9"},"execution_count":null,"outputs":[{"output_type":"execu
te_result","data":{"text/plain":["Id              0\n","SepalLengthCm
0\n","SepalWidthCm     0\n","PetalLengthCm    0\n","PetalWidthCm
0\n","Species         0\n","dtype:
int64"]},"metadata":{},"execution_count":9}]},{"cell_type":"code","sou
rce":["df.drop(columns=['Id'],inplace=True)"],"metadata":{"id":"gYiy2R
YNb36s"},"execution_count":null,"outputs":[]},{"cell_type":"code","sou
rce":["df"],"metadata":{"colab":{"base_uri":"https://localhost:8080/",
"height":423},"id":"sKlTITZkcEbd","executionInfo":{"status":"ok","time
stamp":1716551585072,"user_tz":-
330,"elapsed":462,"user":{"displayName":"Rishipriya
Deekonda","userId":"04973586206988207807"}},"outputId":"95f2d097-effc-
4f5b-a90f-
8a1fe890d465"},"execution_count":null,"outputs":[{"output_type":"execu
te_result","data":{"text/plain":["     SepalLengthCm  SepalWidthCm
PetalLengthCm  PetalWidthCm         Species\n","0             5.1
3.5            1.4           0.2     Iris-setosa\n","1
4.9           3.0           1.4           0.2     Iris-setosa\n","2
4.7           3.2           1.3           0.2     Iris-setosa\n","3
4.6           3.1           1.5           0.2     Iris-setosa\n","4
5.0           3.6           1.4           0.2     Iris-setosa\n",".."
...           ...           ...           ...              ...\n","145
6.7           3.0           5.2           2.3  Iris-virginica\n","146
6.3           2.5           5.0           1.9  Iris-virginica\n","147
```

```
6.5           3.0            5.2           2.0  Iris-virginica\n","148
6.2           3.4            5.4           2.3  Iris-virginica\n","149
5.9           3.0            5.1           1.8  Iris-
virginica\n","\n","[150 rows x 5 columns]"],"text/html":["\n","  <div
id=\"df-ff283266-9ffa-4107-b408-b924107ef5e2\" class=\"colab-df-
container\">\n","    <div>\n","<style scoped>\n","    .dataframe tbody
tr th:only-of-type {\n","        vertical-align: middle;\n","
}\n","\n","    .dataframe tbody tr th {\n","        vertical-align:
top;\n","    }\n","\n","    .dataframe thead th {\n","        text-
align: right;\n","    }\n","</style>\n","<table border=\"1\"
class=\"dataframe\">\n","  <thead>\n","    <tr style=\"text-align:
right;\">\n","      <th></th>\n","      <th>SepalLengthCm</th>\n","
<th>SepalWidthCm</th>\n","      <th>PetalLengthCm</th>\n","
<th>PetalWidthCm</th>\n","      <th>Species</th>\n","    </tr>\n","
</thead>\n","  <tbody>\n","    <tr>\n","      <th>0</th>\n","
<td>5.1</td>\n","      <td>3.5</td>\n","      <td>1.4</td>\n","
<td>0.2</td>\n","      <td>Iris-setosa</td>\n","    </tr>\n","
<tr>\n","      <th>1</th>\n","      <td>4.9</td>\n","
<td>3.0</td>\n","      <td>1.4</td>\n","      <td>0.2</td>\n","
<td>Iris-setosa</td>\n","    </tr>\n","    <tr>\n","
<th>2</th>\n","      <td>4.7</td>\n","      <td>3.2</td>\n","
<td>1.3</td>\n","      <td>0.2</td>\n","      <td>Iris-
setosa</td>\n","    </tr>\n","    <tr>\n","      <th>3</th>\n","
<td>4.6</td>\n","      <td>3.1</td>\n","      <td>1.5</td>\n","
<td>0.2</td>\n","      <td>Iris-setosa</td>\n","    </tr>\n","
<tr>\n","      <th>4</th>\n","      <td>5.0</td>\n","
<td>3.6</td>\n","      <td>1.4</td>\n","      <td>0.2</td>\n","
<td>Iris-setosa</td>\n","    </tr>\n","    <tr>\n","
<th>...</th>\n","      <td>...</td>\n","      <td>...</td>\n","
<td>...</td>\n","      <td>...</td>\n","      <td>...</td>\n","
</tr>\n","    <tr>\n","      <th>145</th>\n","      <td>6.7</td>\n","
<td>3.0</td>\n","      <td>5.2</td>\n","      <td>2.3</td>\n","
<td>Iris-virginica</td>\n","    </tr>\n","    <tr>\n","
<th>146</th>\n","      <td>6.3</td>\n","      <td>2.5</td>\n","
<td>5.0</td>\n","      <td>1.9</td>\n","      <td>Iris-
virginica</td>\n","    </tr>\n","    <tr>\n","      <th>147</th>\n","
<td>6.5</td>\n","      <td>3.0</td>\n","      <td>5.2</td>\n","
<td>2.0</td>\n","      <td>Iris-virginica</td>\n","    </tr>\n","
<tr>\n","      <th>148</th>\n","      <td>6.2</td>\n","
<td>3.4</td>\n","      <td>5.4</td>\n","      <td>2.3</td>\n","
<td>Iris-virginica</td>\n","    </tr>\n","    <tr>\n","
<th>149</th>\n","      <td>5.9</td>\n","      <td>3.0</td>\n","
<td>5.1</td>\n","      <td>1.8</td>\n","      <td>Iris-
virginica</td>\n","    </tr>\n","  </tbody>\n","</table>\n","<p>150
rows Ã— 5 columns</p>\n","</div>\n","    <div class=\"colab-df-
buttons\">\n","\n","  <div class=\"colab-df-container\">\n","
<button class=\"colab-df-convert\" onclick=\"convertToInteractive('df-
ff283266-9ffa-4107-b408-b924107ef5e2')\"\n","
title=\"Convert this dataframe to an interactive table.\"\n","
style=\"display:none;\">\n","\n","  <svg
xmlns=\"http://www.w3.org/2000/svg\" height=\"24px\" viewBox=\"0 -960
960 960\">\n","    <path d=\"M120-120v-720h720v720H120Zm60-500h600v-
```

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160H180v160Zm220 220h160v-160H400v160Zm0 220h160v-160H400v160ZM180-400h160v-160H180v160Zm440 0h160v-160H620v160ZM180-180h160v-160H180v160Zm440 0h160v-160H620v160Z\"/>\n","  </svg>\n","  </button>\n","\n","  <style>\n","    .colab-df-container {\n","      display:flex;\n","      gap: 12px;\n","    }\n","\n","    .colab-df-convert {\n","      background-color: #E8F0FE;\n","      border: none;\n","      border-radius: 50%;\n","      cursor: pointer;\n","      display: none;\n","      fill: #1967D2;\n","      height: 32px;\n","      padding: 0 0 0 0;\n","      width: 32px;\n","    }\n","\n","    .colab-df-convert:hover {\n","      background-color: #E2EBFA;\n","      box-shadow: 0px 1px 2px rgba(60, 64, 67, 0.3), 0px 1px 3px 1px rgba(60, 64, 67, 0.15);\n","      fill: #174EA6;\n","    }\n","\n","    .colab-df-buttons div {\n","      margin-bottom: 4px;\n","    }\n","\n","    [theme=dark] .colab-df-convert {\n","      background-color: #3B4455;\n","      fill: #D2E3FC;\n","    }\n","\n","    [theme=dark] .colab-df-convert:hover {\n","      background-color: #434B5C;\n","      box-shadow: 0px 1px 3px 1px rgba(0, 0, 0, 0.15);\n","      filter: drop-shadow(0px 1px 2px rgba(0, 0, 0, 0.3));\n","      fill: #FFFFFF;\n","    }\n","  </style>\n","\n","  <script>\n","    const buttonEl =\n","      document.querySelector('#df-ff283266-9ffa-4107-b408-b924107ef5e2 button.colab-df-convert');\n","    buttonEl.style.display =\n","      google.colab.kernel.accessAllowed ? 'block' : 'none';\n","\n","    async function convertToInteractive(key) {\n","      const element = document.querySelector('#df-ff283266-9ffa-4107-b408-b924107ef5e2');\n","      const dataTable =\n","        await google.colab.kernel.invokeFunction('convertToInteractive',\n","                                                 [key], {});\n","      if (!dataTable) return;\n","\n","      const docLinkHtml = 'Like what you see? Visit the ' +\n","        '<a target=\"_blank\" href=https://colab.research.google.com/notebooks/data_table.ipynb>data table notebook</a>'\n","        + ' to learn more about interactive tables.';\n","      element.innerHTML = '';\n","      dataTable['output_type'] = 'display_data';\n","      await google.colab.output.renderOutput(dataTable, element);\n","      const docLink = document.createElement('div');\n","      docLink.innerHTML = docLinkHtml;\n","      element.appendChild(docLink);\n","    }\n","  </script>\n","</div>\n","\n","\n","<div id=\"df-cb4f6424-7bfd-44a2-882b-188f450aa43a\">\n","  <button class=\"colab-df-quickchart\" onclick=\"quickchart('df-cb4f6424-7bfd-44a2-882b-188f450aa43a')\"\n","          title=\"Suggest charts\"\n","          style=\"display:none;\">\n","\n","<svg xmlns=\"http://www.w3.org/2000/svg\" height=\"24px\"viewBox=\"0 0 24 24\"\n","     width=\"24px\">\n","    <g>\n","        <path d=\"M19 3H5c-1.1 0-2 .9-2 2v14c0 1.1.9 2 2 2h14c1.1 0 2-.9 2-2V5c0-1.1-.9-2-2-2zM9 17H7v-7h2v7zm4 0h-2V7h2v10zm4 0h-2v-4h2v4z\"/>\n","    </g>\n","</svg>\n","  </button>\n","\n","<style>\n","  .colab-df-quickchart {\n","      --bg-color: #E8F0FE;\n","      --fill-color: #1967D2;\n","      --hover-bg-color: #E2EBFA;\n","      --hover-fill-color: #174EA6;\n","      --disabled-fill-color: #AAA;\n","      --disabled-bg-color: #DDD;\n","  }\n","\n","  [theme=dark] .colab-df-
```

```
quickchart {\n","      --bg-color: #3B4455;\n","      --fill-color:
#D2E3FC;\n","      --hover-bg-color: #434B5C;\n","      --hover-fill-
color: #FFFFFF;\n","      --disabled-bg-color: #3B4455;\n","      --
disabled-fill-color: #666;\n","  }\n","\n","  .colab-df-quickchart
{\n","    background-color: var(--bg-color);\n","    border:
none;\n","    border-radius: 50%;\n","    cursor: pointer;\n","
display: none;\n","    fill: var(--fill-color);\n","    height:
32px;\n","    padding: 0;\n","    width: 32px;\n","  }\n","\n","
.colab-df-quickchart:hover {\n","    background-color: var(--hover-bg-
color);\n","    box-shadow: 0 1px 2px rgba(60, 64, 67, 0.3), 0 1px 3px
1px rgba(60, 64, 67, 0.15);\n","    fill: var(--button-hover-fill-
color);\n","  }\n","\n","  .colab-df-quickchart-
complete:disabled,\n","  .colab-df-quickchart-complete:disabled:hover
{\n","    background-color: var(--disabled-bg-color);\n","    fill:
var(--disabled-fill-color);\n","    box-shadow: none;\n","
}\n","\n","  .colab-df-spinner {\n","    border: 2px solid var(--fill-
color);\n","    border-color: transparent;\n","    border-bottom-
color: var(--fill-color);\n","    animation:\n","      spin 1s
steps(1) infinite;\n","  }\n","\n","  @keyframes spin {\n","    0%
{\n","      border-color: transparent;\n","      border-bottom-color:
var(--fill-color);\n","      border-left-color: var(--fill-
color);\n","    }\n","    20% {\n","      border-color:
transparent;\n","      border-left-color: var(--fill-color);\n","
border-top-color: var(--fill-color);\n","    }\n","    30% {\n","
border-color: transparent;\n","      border-left-color: var(--fill-
color);\n","      border-top-color: var(--fill-color);\n","
border-right-color: var(--fill-color);\n","    }\n","    40% {\n","
border-color: transparent;\n","      border-right-color: var(--fill-
color);\n","      border-top-color: var(--fill-color);\n","    }\n","
60% {\n","      border-color: transparent;\n","      border-right-
color: var(--fill-color);\n","    }\n","    80% {\n","      border-
color: transparent;\n","      border-right-color: var(--fill-
color);\n","      border-bottom-color: var(--fill-color);\n","
}\n","    90% {\n","      border-color: transparent;\n","      border-
bottom-color: var(--fill-color);\n","    }\n","
}\n","</style>\n","\n","  <script>\n","    async function
quickchart(key) {\n","      const quickchartButtonEl =\n","
document.querySelector('#' + key + ' button');\n","
quickchartButtonEl.disabled = true;  // To prevent multiple
clicks.\n","      quickchartButtonEl.classList.add('colab-df-
spinner');\n","      try {\n","        const charts = await
google.colab.kernel.invokeFunction(\n","            'suggestCharts',
[key], {});\n","      } catch (error) {\n","
console.error('Error during call to suggestCharts:', error);\n","
}\n","      quickchartButtonEl.classList.remove('colab-df-
spinner');\n","      quickchartButtonEl.classList.add('colab-df-
quickchart-complete');\n","    }\n","    (() => {\n","      let
quickchartButtonEl =\n","        document.querySelector('#df-cb4f6424-
7bfd-44a2-882b-188f450aa43a button');\n","
quickchartButtonEl.style.display =\n","
google.colab.kernel.accessAllowed ? 'block' : 'none';\n","
})();\n","  </script>\n","</div>\n","\n","  <div id=\"id_9703d603-
```

```
9d7a-4ab3-824a-6d596bc4cd91\">\n","    <style>\n","      .colab-df-
generate {\n","        background-color: #E8F0FE;\n","        border:
none;\n","        border-radius: 50%;\n","        cursor:
pointer;\n","        display: none;\n","        fill: #1967D2;\n","
height: 32px;\n","        padding: 0 0 0 0;\n","        width:
32px;\n","      }\n","\n","      .colab-df-generate:hover {\n","
background-color: #E2EBFA;\n","        box-shadow: 0px 1px 2px
rgba(60, 64, 67, 0.3), 0px 1px 3px 1px rgba(60, 64, 67, 0.15);\n","
fill: #174EA6;\n","      }\n","\n","      [theme=dark] .colab-df-
generate {\n","        background-color: #3B4455;\n","        fill:
#D2E3FC;\n","      }\n","\n","      [theme=dark] .colab-df-
generate:hover {\n","        background-color: #434B5C;\n","
box-shadow: 0px 1px 3px 1px rgba(0, 0, 0, 0.15);\n","        filter:
drop-shadow(0px 1px 2px rgba(0, 0, 0, 0.3));\n","        fill:
#FFFFFF;\n","      }\n","    </style>\n","    <button class=\"colab-
df-generate\" onclick=\"generateWithVariable('df')\"\n","
title=\"Generate code using this dataframe.\"\n","
style=\"display:none;\">\n","\n","  <svg
xmlns=\"http://www.w3.org/2000/svg\" height=\"24px\"viewBox=\"0 0 24
24\"\n","       width=\"24px\">\n","    <path
d=\"M7,19H8.4L18.45,9,17,7.55,7,17.6ZM5,21V16.75L18.45,3.32a2,2,0,0,1,
2.83,0l1.4,1.43a1.91,1.91,0,0,1,.58,1.4,1.91,1.91,0,0,1-
.58,1.4L9.25,21ZM18.45,9,17,7.55Zm-
12,3A5.31,5.31,0,0,0,4.9,8.1,5.31,5.31,0,0,0,1,6.5,5.31,5.31,0,0,0,4.9
,4.9,5.31,5.31,0,0,0,6.5,1,5.31,5.31,0,0,0,8.1,4.9,5.31,5.31,0,0,0,12,
6.5,5.46,5.46,0,0,0,6.5,12Z\"/>\n","  </svg>\n","    </button>\n","
<script>\n","      (() => {\n","      const buttonEl =\n","
document.querySelector('#id_9703d603-9d7a-4ab3-824a-6d596bc4cd91
button.colab-df-generate');\n","      buttonEl.style.display =\n","
google.colab.kernel.accessAllowed ? 'block' : 'none';\n","\n","
buttonEl.onclick = () => {\n","
google.colab.notebook.generateWithVariable('df');\n","      }\n","
})();\n","    </script>\n","  </div>\n","\n","    </div>\n","
</div>\n"],"application/vnd.google.colaboratory.intrinsic+json":{"type
":"dataframe","variable_name":"df","summary":"{\n  \"name\": \"df\",\n
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],\n        \"semantic_type\": \"\",\n        \"description\": \"\"\n
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4.0,\n          3.5\n        ],\n        \"semantic_type\": \"\",\n
\"description\": \"\"\n      }\n    },\n    {\n      \"column\":
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0.2\n","3              4.6           3.1            1.5
0.2\n","4              5.0           3.6            1.4
0.2\n","..             ...           ...            ...
...\n","145            6.7           3.0            5.2
2.3\n","146            6.3           2.5            5.0
1.9\n","147            6.5           3.0            5.2
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<td>3.5</td>\n","      <td>1.4</td>\n","      <td>0.2</td>\n","
</tr>\n","    <tr>\n","      <th>1</th>\n","      <td>4.9</td>\n","
<td>3.0</td>\n","      <td>1.4</td>\n","      <td>0.2</td>\n","
</tr>\n","    <tr>\n","      <th>2</th>\n","      <td>4.7</td>\n","
<td>3.2</td>\n","      <td>1.3</td>\n","      <td>0.2</td>\n","
</tr>\n","    <tr>\n","      <th>3</th>\n","      <td>4.6</td>\n","
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<td>3.1</td>\n","   <td>1.5</td>\n","   <td>0.2</td>\n","
</tr>\n","   <tr>\n","   <th>4</th>\n","   <td>5.0</td>\n","
<td>3.6</td>\n","   <td>1.4</td>\n","   <td>0.2</td>\n","
</tr>\n","   <tr>\n","   <th>...</th>\n","   <td>...</td>\n","
<td>...</td>\n","   <td>...</td>\n","   <td>...</td>\n","
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<td>3.0</td>\n","   <td>5.2</td>\n","   <td>2.3</td>\n","
</tr>\n","   <tr>\n","   <th>146</th>\n","   <td>6.3</td>\n","
<td>2.5</td>\n","   <td>5.0</td>\n","   <td>1.9</td>\n","
</tr>\n","   <tr>\n","   <th>147</th>\n","   <td>6.5</td>\n","
<td>3.0</td>\n","   <td>5.2</td>\n","   <td>2.0</td>\n","
</tr>\n","   <tr>\n","   <th>148</th>\n","   <td>6.2</td>\n","
<td>3.4</td>\n","   <td>5.4</td>\n","   <td>2.3</td>\n","
</tr>\n","   <tr>\n","   <th>149</th>\n","   <td>5.9</td>\n","
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</tr>\n"," </tbody>\n","</table>\n"," 150 rows Ã— 4
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title=\"Convert this dataframe to an interactive table.\"\n","
style=\"display:none;\">\n","\n"," <svg
xmlns=\"http://www.w3.org/2000/svg\" height=\"24px\" viewBox=\"0 -960
960 960\">\n","   <path d=\"M120-120v-720h720v720H120Zm60-500h600v-
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160H180v160Zm440 0h160v-160H620v160Z\"/>\n"," </svg>\n","
</button>\n","\n"," <style>\n","   .colab-df-container {\n","
display:flex;\n","   gap: 12px;\n","   }\n","\n","   .colab-df-
convert {\n","   background-color: #E8F0FE;\n","   border:
none;\n","   border-radius: 50%;\n","   cursor: pointer;\n","
display: none;\n","   fill: #1967D2;\n","   height: 32px;\n","
padding: 0 0 0 0;\n","   width: 32px;\n","   }\n","\n","
.colab-df-convert:hover {\n","   background-color: #E2EBFA;\n","
box-shadow: 0px 1px 2px rgba(60, 64, 67, 0.3), 0px 1px 3px 1px
rgba(60, 64, 67, 0.15);\n","   fill: #174EA6;\n","   }\n","\n","
.colab-df-buttons div {\n","   margin-bottom: 4px;\n","
}\n","\n","   [theme=dark] .colab-df-convert {\n","   background-
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[theme=dark] .colab-df-convert:hover {\n","   background-color:
#434B5C;\n","   box-shadow: 0px 1px 3px 1px rgba(0, 0, 0,
0.15);\n","   filter: drop-shadow(0px 1px 2px rgba(0, 0, 0,
0.3));\n","   fill: #FFFFFF;\n","   }\n"," </style>\n","\n","
<script>\n","   const buttonEl =\n","
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button.colab-df-convert');\n","   buttonEl.style.display =\n","
google.colab.kernel.accessAllowed ? 'block' : 'none';\n","\n","
async function convertToInteractive(key) {\n","   const element =
document.querySelector('#df-b98132df-ff77-4e6b-b3cc-
0730902bf94c');\n","   const dataTable =\n","   await
google.colab.kernel.invokeFunction('convertToInteractive',\n","
[key], {});\n","   if (!dataTable) return;\n","\n","   const

```
docLinkHtml = 'Like what you see? Visit the ' +\n","          '<a
target=\"_blank\"
href=https://colab.research.google.com/notebooks/data_table.ipynb>data
table notebook</a>'\n","          + ' to learn more about interactive
tables.';\n","        element.innerHTML = '';\n","
dataTable['output_type'] = 'display_data';\n","        await
google.colab.output.renderOutput(dataTable, element);\n","
const docLink = document.createElement('div');\n","
docLink.innerHTML = docLinkHtml;\n","
element.appendChild(docLink);\n","      }\n","    </script>\n","
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title=\"Suggest charts\"\n","
style=\"display:none;\">\n","\n","<svg
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2zM9 17H7v-7h2v7zm4 0h-2V7h2v10zm4 0h-2v-4h2v4z\"/>\n","
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display: none;\n","    fill: var(--fill-color);\n","    height:
32px;\n","    padding: 0;\n","    width: 32px;\n","  }\n","\n","
.colab-df-quickchart:hover {\n","    background-color: var(--hover-bg-
color);\n","    box-shadow: 0 1px 2px rgba(60, 64, 67, 0.3), 0 1px 3px
1px rgba(60, 64, 67, 0.15);\n","    fill: var(--button-hover-fill-
color);\n","  }\n","\n","  .colab-df-quickchart-
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{\n","    background-color: var(--disabled-bg-color);\n","    fill:
var(--disabled-fill-color);\n","    box-shadow: none;\n","
}\n","\n","  .colab-df-spinner {\n","    border: 2px solid var(--fill-
color);\n","    border-color: transparent;\n","    border-bottom-
color: var(--fill-color);\n","    animation:\n","      spin 1s
steps(1) infinite;\n","  }\n","\n","  @keyframes spin {\n","    0%
{\n","      border-color: transparent;\n","      border-bottom-color:
var(--fill-color);\n","      border-left-color: var(--fill-
color);\n","    }\n","    20% {\n","      border-color:
transparent;\n","      border-left-color: var(--fill-color);\n","
border-top-color: var(--fill-color);\n","    }\n","    30% {\n","
border-color: transparent;\n","      border-left-color: var(--fill-
color);\n","      border-top-color: var(--fill-color);\n","
border-right-color: var(--fill-color);\n","    }\n","    40% {\n","
border-color: transparent;\n","      border-right-color: var(--fill-
```

```
color);\n","      border-top-color: var(--fill-color);\n","    }\n","
60% {\n","      border-color: transparent;\n","      border-right-
color: var(--fill-color);\n","    }\n","    80% {\n","      border-
color: transparent;\n","      border-right-color: var(--fill-
color);\n","      border-bottom-color: var(--fill-color);\n","
}\n","    90% {\n","      border-color: transparent;\n","      border-
bottom-color: var(--fill-color);\n","    }\n","
}\n","</style>\n","\n","  <script>\n","    async function
quickchart(key) {\n","      const quickchartButtonEl =\n","
document.querySelector('#' + key + ' button');\n","
quickchartButtonEl.disabled = true;  // To prevent multiple
clicks.\n","      quickchartButtonEl.classList.add('colab-df-
spinner');\n","      try {\n","        const charts = await
google.colab.kernel.invokeFunction(\n","            'suggestCharts',
[key], {});\n","      } catch (error) {\n","
console.error('Error during call to suggestCharts:', error);\n","
}\n","      quickchartButtonEl.classList.remove('colab-df-
spinner');\n","      quickchartButtonEl.classList.add('colab-df-
quickchart-complete');\n","    }\n","    (() => {\n","      let
quickchartButtonEl =\n","        document.querySelector('#df-5d8f8f6d-
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google.colab.kernel.accessAllowed ? 'block' : 'none';\n","
})();\n","  </script>\n","</div>\n","\n","  <div id=\"id_f913629a-
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32px;\n","      }\n","\n","      .colab-df-generate:hover {\n","
background-color: #E2EBFA;\n","        box-shadow: 0px 1px 2px
rgba(60, 64, 67, 0.3), 0px 1px 3px 1px rgba(60, 64, 67, 0.15);\n","
fill: #174EA6;\n","      }\n","\n","      [theme=dark] .colab-df-
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#D2E3FC;\n","      }\n","\n","      [theme=dark] .colab-df-
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box-shadow: 0px 1px 3px 1px rgba(0, 0, 0, 0.15);\n","        filter:
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.58,1.4L9.25,21ZM18.45,9,17,7.55Zm-
12,3A5.31,5.31,0,0,0,4.9,8.1,5.31,5.31,0,0,0,1,6.5,5.31,5.31,0,0,0,4.9
,4.9,5.31,5.31,0,0,0,6.5,1,5.31,5.31,0,0,0,8.1,4.9,5.31,5.31,0,0,0,12,
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})();\n","    </script>\n","  </div>\n","\n","    </div>\n","
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\"num_unique_values\": 23,\n        \"samples\": [\n          2.3,\n
4.0,\n          3.5\n        ],\n        \"semantic_type\": \"\",\n
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\"number\",\n        \"std\": 1.7644204199522626,\n        \"min\":
1.0,\n        \"max\": 6.9,\n        \"num_unique_values\": 43,\n
\"samples\": [\n          6.7,\n          3.8,\n          3.7\n
],\n        \"semantic_type\": \"\",\n        \"description\": \"\"\n
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0.7631607417008411,\n        \"min\": 0.1,\n        \"max\": 2.5,\n
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Iris-setosa\n","           ...      \n","145    Iris-
virginica\n","146    Iris-virginica\n","147    Iris-virginica\n","148
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3f6d55c17405"},"execution_count":null,"outputs":[{"output_type":"execu
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0.067797      0.041667\n","1         0.166667      0.416667
0.067797      0.041667\n","2         0.111111      0.500000
0.050847      0.041667\n","3         0.083333      0.458333
0.084746      0.041667\n","4         0.194444      0.666667
0.067797      0.041667\n",".."              ...           ...
...           ...\n","145       0.666667      0.416667       0.711864
0.916667\n","146       0.555556      0.208333       0.677966
0.750000\n","147       0.611111      0.416667       0.711864
0.791667\n","148       0.527778      0.583333       0.745763
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0.708333\n","\n","[150 rows x 4 columns]"],"text/html":["\n","  <div
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align: right;\n","    }\n","</style>\n","<table border=\"1\"
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<th>PetalWidthCm</th>\n","    </tr>\n","  </thead>\n","  <tbody>\n","
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<td>0.041667</td>\n","    </tr>\n","    <tr>\n","      <th>1</th>\n","
<td>0.166667</td>\n","      <td>0.416667</td>\n","
<td>0.067797</td>\n","      <td>0.041667</td>\n","    </tr>\n","
<tr>\n","      <th>2</th>\n","      <td>0.111111</td>\n","
<td>0.500000</td>\n","      <td>0.050847</td>\n","
<td>0.041667</td>\n","    </tr>\n","    <tr>\n","      <th>3</th>\n","
<td>0.083333</td>\n","      <td>0.458333</td>\n","
<td>0.084746</td>\n","      <td>0.041667</td>\n","    </tr>\n","
<tr>\n","      <th>4</th>\n","      <td>0.194444</td>\n","
<td>0.666667</td>\n","      <td>0.067797</td>\n","
<td>0.041667</td>\n","    </tr>\n","    <tr>\n","
<th>...</th>\n","      <td>...</td>\n","      <td>...</td>\n","
<td>...</td>\n","      <td>...</td>\n","    </tr>\n","    <tr>\n","
<th>145</th>\n","      <td>0.666667</td>\n","
<td>0.416667</td>\n","      <td>0.711864</td>\n","
<td>0.916667</td>\n","    </tr>\n","    <tr>\n","
<th>146</th>\n","      <td>0.555556</td>\n","
<td>0.208333</td>\n","      <td>0.677966</td>\n","
```

```
<td>0.750000</td>\n","    </tr>\n","    <tr>\n","
<th>147</th>\n","      <td>0.611111</td>\n","
<td>0.416667</td>\n","      <td>0.711864</td>\n","
<td>0.791667</td>\n","    </tr>\n","    <tr>\n","
<th>148</th>\n","      <td>0.527778</td>\n","
<td>0.583333</td>\n","      <td>0.745763</td>\n","
<td>0.916667</td>\n","    </tr>\n","    <tr>\n","
<th>149</th>\n","      <td>0.444444</td>\n","
<td>0.416667</td>\n","      <td>0.694915</td>\n","
<td>0.708333</td>\n","    </tr>\n","  </tbody>\n","</table>\n","<p>150
rows Ã— 4 columns</p>\n","</div>\n","    <div class=\"colab-df-
buttons\">\n","\n","  <div class=\"colab-df-container\">\n","
<button class=\"colab-df-convert\" onclick=\"convertToInteractive('df-
6faca57d-81db-4738-bbaa-d04afca98447')\"\n","
title=\"Convert this dataframe to an interactive table.\"\n","
style=\"display:none;\">\n","\n","  <svg
xmlns=\"http://www.w3.org/2000/svg\" height=\"24px\" viewBox=\"0 -960
960 960\">\n","    <path d=\"M120-120v-720h720v720H120Zm60-500h600v-
160H180v160Zm220 220h160v-160H400v160Zm0 220h160v-160H400v160ZM180-
400h160v-160H180v160Zm440 0h160v-160H620v160ZM180-180h160v-
160H180v160Zm440 0h160v-160H620v160Z\"/>\n","  </svg>\n","
</button>\n","\n","  <style>\n","    .colab-df-container {\n","
display:flex;\n","      gap: 12px;\n","    }\n","\n","    .colab-df-
convert {\n","      background-color: #E8F0FE;\n","      border:
none;\n","      border-radius: 50%;\n","      cursor: pointer;\n","
display: none;\n","      fill: #1967D2;\n","      height: 32px;\n","
padding: 0 0 0 0;\n","      width: 32px;\n","    }\n","\n","
.colab-df-convert:hover {\n","      background-color: #E2EBFA;\n","
box-shadow: 0px 1px 2px rgba(60, 64, 67, 0.3), 0px 1px 3px 1px
rgba(60, 64, 67, 0.15);\n","      fill: #174EA6;\n","    }\n","\n","
.colab-df-buttons div {\n","      margin-bottom: 4px;\n","
}\n","\n","    [theme=dark] .colab-df-convert {\n","      background-
color: #3B4455;\n","      fill: #D2E3FC;\n","    }\n","\n","
[theme=dark] .colab-df-convert:hover {\n","      background-color:
#434B5C;\n","      box-shadow: 0px 1px 3px 1px rgba(0, 0, 0,
0.15);\n","      filter: drop-shadow(0px 1px 2px rgba(0, 0, 0,
0.3));\n","      fill: #FFFFFF;\n","    }\n","  </style>\n","\n","
<script>\n","      const buttonEl =\n","
document.querySelector('#df-6faca57d-81db-4738-bbaa-d04afca98447
button.colab-df-convert');\n","      buttonEl.style.display =\n","
google.colab.kernel.accessAllowed ? 'block' : 'none';\n","\n","
async function convertToInteractive(key) {\n","        const element =
document.querySelector('#df-6faca57d-81db-4738-bbaa-
d04afca98447');\n","        const dataTable =\n","          await
google.colab.kernel.invokeFunction('convertToInteractive',\n","
[key], {});\n","        if (!dataTable) return;\n","\n","        const
docLinkHtml = 'Like what you see? Visit the ' +\n","          '<a
target=\"_blank\"
href=https://colab.research.google.com/notebooks/data_table.ipynb>data
table notebook</a>'\n","          + ' to learn more about interactive
tables.';\n","        element.innerHTML = '';\n","
dataTable['output_type'] = 'display_data';\n","        await
```

```
google.colab.output.renderOutput(dataTable, element);\n","
const docLink = document.createElement('div');\n","
docLink.innerHTML = docLinkHtml;\n","
element.appendChild(docLink);\n","      }\n","    </script>\n","
</div>\n","\n","\n","<div id=\"df-8fa790cf-1452-4380-ace5-
9c941baabb50\">\n","  <button class=\"colab-df-quickchart\"
onclick=\"quickchart('df-8fa790cf-1452-4380-ace5-9c941baabb50')\"\n","
title=\"Suggest charts\"\n","
style=\"display:none;\">\n","\n","<svg
xmlns=\"http://www.w3.org/2000/svg\" height=\"24px\"viewBox=\"0 0 24
24\"\n","     width=\"24px\">\n","    <g>\n","        <path d=\"M19
3H5c-1.1 0-2 .9-2 2v14c0 1.1.9 2 2 2h14c1.1 0 2-.9 2-2V5c0-1.1-.9-2-2-
2zM9 17H7v-7h2v7zm4 0h-2V7h2v10zm4 0h-2v-4h2v4z\"/>\n","
</g>\n","</svg>\n","  </button>\n","\n","<style>\n","  .colab-df-
quickchart {\n","      --bg-color: #E8F0FE;\n","      --fill-color:
#1967D2;\n","      --hover-bg-color: #E2EBFA;\n","      --hover-fill-
color: #174EA6;\n","      --disabled-fill-color: #AAA;\n","      --
disabled-bg-color: #DDD;\n","  }\n","\n","  [theme=dark] .colab-df-
quickchart {\n","      --bg-color: #3B4455;\n","      --fill-color:
#D2E3FC;\n","      --hover-bg-color: #434B5C;\n","      --hover-fill-
color: #FFFFFF;\n","      --disabled-bg-color: #3B4455;\n","      --
disabled-fill-color: #666;\n","  }\n","\n","  .colab-df-quickchart
{\n","    background-color: var(--bg-color);\n","    border:
none;\n","    border-radius: 50%;\n","    cursor: pointer;\n","
display: none;\n","    fill: var(--fill-color);\n","    height:
32px;\n","    padding: 0;\n","    width: 32px;\n","  }\n","\n","
.colab-df-quickchart:hover {\n","    background-color: var(--hover-bg-
color);\n","    box-shadow: 0 1px 2px rgba(60, 64, 67, 0.3), 0 1px 3px
1px rgba(60, 64, 67, 0.15);\n","    fill: var(--button-hover-fill-
color);\n","  }\n","\n","  .colab-df-quickchart-
complete:disabled,\n","  .colab-df-quickchart-complete:disabled:hover
{\n","    background-color: var(--disabled-bg-color);\n","    fill:
var(--disabled-fill-color);\n","    box-shadow: none;\n","
}\n","\n","  .colab-df-spinner {\n","    border: 2px solid var(--fill-
color);\n","    border-color: transparent;\n","    border-bottom-
color: var(--fill-color);\n","    animation:\n","      spin 1s
steps(1) infinite;\n","  }\n","\n","  @keyframes spin {\n","    0%
{\n","      border-color: transparent;\n","      border-bottom-color:
var(--fill-color);\n","      border-left-color: var(--fill-
color);\n","    }\n","    20% {\n","      border-color:
transparent;\n","      border-left-color: var(--fill-color);\n","
border-top-color: var(--fill-color);\n","    }\n","    30% {\n","
border-color: transparent;\n","      border-left-color: var(--fill-
color);\n","      border-top-color: var(--fill-color);\n","
border-right-color: var(--fill-color);\n","    }\n","    40% {\n","
border-color: transparent;\n","      border-right-color: var(--fill-
color);\n","      border-top-color: var(--fill-color);\n","    }\n","
60% {\n","      border-color: transparent;\n","      border-right-
color: var(--fill-color);\n","    }\n","    80% {\n","      border-
color: transparent;\n","      border-right-color: var(--fill-
color);\n","      border-bottom-color: var(--fill-color);\n","
}\n","    90% {\n","      border-color: transparent;\n","      border-
```

```
bottom-color: var(--fill-color);\n","    }\n","
}\n","</style>\n","\n","  <script>\n","    async function
quickchart(key) {\n","      const quickchartButtonEl =\n","
document.querySelector('#' + key + ' button');\n","
quickchartButtonEl.disabled = true;  // To prevent multiple
clicks.\n","      quickchartButtonEl.classList.add('colab-df-
spinner');\n","      try {\n","        const charts = await
google.colab.kernel.invokeFunction(\n","            'suggestCharts',
[key], {});\n","      } catch (error) {\n","
console.error('Error during call to suggestCharts:', error);\n","
}\n","      quickchartButtonEl.classList.remove('colab-df-
spinner');\n","      quickchartButtonEl.classList.add('colab-df-
quickchart-complete');\n","    }\n","    (() => {\n","      let
quickchartButtonEl =\n","        document.querySelector('#df-8fa790cf-
1452-4380-ace5-9c941baabb50 button');\n","
quickchartButtonEl.style.display =\n","
google.colab.kernel.accessAllowed ? 'block' : 'none';\n","
})();\n","  </script>\n","</div>\n","\n","  <div id=\"id_fdb680d5-
0e8c-467a-8b4f-3af6423bdb33\">\n","    <style>\n","      .colab-df-
generate {\n","        background-color: #E8F0FE;\n","        border:
none;\n","        border-radius: 50%;\n","        cursor:
pointer;\n","        display: none;\n","        fill: #1967D2;\n","
height: 32px;\n","        padding: 0 0 0 0;\n","        width:
32px;\n","      }\n","\n","      .colab-df-generate:hover {\n","
background-color: #E2EBFA;\n","        box-shadow: 0px 1px 2px
rgba(60, 64, 67, 0.3), 0px 1px 3px 1px rgba(60, 64, 67, 0.15);\n","
fill: #174EA6;\n","      }\n","\n","      [theme=dark] .colab-df-
generate {\n","        background-color: #3B4455;\n","        fill:
#D2E3FC;\n","      }\n","\n","      [theme=dark] .colab-df-
generate:hover {\n","        background-color: #434B5C;\n","
box-shadow: 0px 1px 3px 1px rgba(0, 0, 0, 0.15);\n","        filter:
drop-shadow(0px 1px 2px rgba(0, 0, 0, 0.3));\n","        fill:
#FFFFFF;\n","      }\n","    </style>\n","    <button class=\"colab-
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24\"\n","       width=\"24px\">\n","    <path
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.58,1.4L9.25,21ZM18.45,9,17,7.55Zm-
12,3A5.31,5.31,0,0,0,4.9,8.1,5.31,5.31,0,0,0,1,6.5,5.31,5.31,0,0,0,4.9
,4.9,5.31,5.31,0,0,0,6.5,1,5.31,5.31,0,0,0,8.1,4.9,5.31,5.31,0,0,0,12,
6.5,5.46,5.46,0,0,0,6.5,12Z\"/>\n","  </svg>\n","    </button>\n","
<script>\n","      (() => {\n","      const buttonEl =\n","
document.querySelector('#id_fdb680d5-0e8c-467a-8b4f-3af6423bdb33
button.colab-df-generate');\n","      buttonEl.style.display =\n","
google.colab.kernel.accessAllowed ? 'block' : 'none';\n","\n","
buttonEl.onclick = () => {\n","
google.colab.notebook.generateWithVariable('Scaled_x');\n","
}\n","      })();\n","    </script>\n","  </div>\n","\n","
</div>\n","
```

```
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0.05555555555555558,\n          0.36111111111111094\n        ],\n
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],\n        \"semantic_type\": \"\",\n        \"description\": \"\"\n
}\n    },\n    {\n      \"column\": \"PetalLengthCm\",\n
\"properties\": {\n        \"dtype\": \"number\",\n        \"std\":
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0.4576271186440678\n        ],\n        \"semantic_type\": \"\",\n
\"description\": \"\"\n      }\n    },\n    {\n      \"column\":
\"PetalWidthCm\",\n      \"properties\": {\n        \"dtype\":
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\"samples\": [\n          0.0416666666666667,\n
0.4583333333333333,\n          0.5000000000000001\n        ],\n
\"semantic_type\": \"\",\n        \"description\": \"\"\n      }\n
}\n
]\n}"}},"metadata":{},"execution_count":39}]},{"cell_type":"code","sou
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```

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container-id-1 pre{padding: 0;}#sk-container-id-1 div.sk-toggleable
{background-color: white;}#sk-container-id-1 label.sk-
toggleable__label {cursor: pointer;display: block;width: 100%;margin-
bottom: 0;padding: 0.3em;box-sizing: border-box;text-align:
center;}#sk-container-id-1 label.sk-toggleable__label-arrow:before
{content: \"â–¸\";float: left;margin-right: 0.25em;color:
#696969;}#sk-container-id-1 label.sk-toggleable__label-
arrow:hover:before {color: black;}#sk-container-id-1 div.sk-
estimator:hover label.sk-toggleable__label-arrow:before {color:
black;}#sk-container-id-1 div.sk-toggleable__content {max-height:
0;max-width: 0;overflow: hidden;text-align: left;background-color:
#f0f8ff;}#sk-container-id-1 div.sk-toggleable__content pre {margin:
0.2em;color: black;border-radius: 0.25em;background-color:
#f0f8ff;}#sk-container-id-1 input.sk-
toggleable__control:checked~div.sk-toggleable__content {max-height:
200px;max-width: 100%;overflow: auto;}#sk-container-id-1 input.sk-
toggleable__control:checked~label.sk-toggleable__label-arrow:before
{content: \"â–¾\";}#sk-container-id-1 div.sk-estimator input.sk-
toggleable__control:checked~label.sk-toggleable__label {background-
color: #d4ebff;}#sk-container-id-1 div.sk-label input.sk-
toggleable__control:checked~label.sk-toggleable__label {background-
color: #d4ebff;}#sk-container-id-1 input.sk-hidden--visually {border:
0;clip: rect(1px 1px 1px 1px);clip: rect(1px, 1px, 1px, 1px);height:
1px;margin: -1px;overflow: hidden;padding: 0;position: absolute;width:
1px;}#sk-container-id-1 div.sk-estimator {font-family:
monospace;background-color: #f0f8ff;border: 1px dotted black;border-
radius: 0.25em;box-sizing: border-box;margin-bottom: 0.5em;}#sk-
container-id-1 div.sk-estimator:hover {background-color: #d4ebff;}#sk-
container-id-1 div.sk-parallel-item::after {content: \"\";width:
100%;border-bottom: 1px solid gray;flex-grow: 1;}#sk-container-id-1
div.sk-label:hover label.sk-toggleable__label {background-color:
#d4ebff;}#sk-container-id-1 div.sk-serial::before {content:
\"\";position: absolute;border-left: 1px solid gray;box-sizing:
border-box;top: 0;bottom: 0;left: 50%;z-index: 0;}#sk-container-id-1
div.sk-serial {display: flex;flex-direction: column;align-items:
center;background-color: white;padding-right: 0.2em;padding-left:
0.2em;position: relative;}#sk-container-id-1 div.sk-item {position:

relative;z-index: 1;}#sk-container-id-1 div.sk-parallel {display: flex;align-items: stretch;justify-content: center;background-color: white;position: relative;}#sk-container-id-1 div.sk-item::before, #sk-container-id-1 div.sk-parallel-item::before {content: \"\";position: absolute;border-left: 1px solid gray;box-sizing: border-box;top: 0;bottom: 0;left: 50%;z-index: -1;}#sk-container-id-1 div.sk-parallel-item {display: flex;flex-direction: column;z-index: 1;position: relative;background-color: white;}#sk-container-id-1 div.sk-parallel-item:first-child::after {align-self: flex-end;width: 50%;}#sk-container-id-1 div.sk-parallel-item:last-child::after {align-self: flex-start;width: 50%;}#sk-container-id-1 div.sk-parallel-item:only-child::after {width: 0;}#sk-container-id-1 div.sk-dashed-wrapped {border: 1px dashed gray;margin: 0 0.4em 0.5em 0.4em;box-sizing: border-box;padding-bottom: 0.4em;background-color: white;}#sk-container-id-1 div.sk-label label {font-family: monospace;font-weight: bold;display: inline-block;line-height: 1.2em;}#sk-container-id-1 div.sk-label-container {text-align: center;}#sk-container-id-1 div.sk-container {/* jupyter's `normalize.less` sets `[hidden] { display: none; }` but bootstrap.min.css set `[hidden] { display: none !important; }` so we also need the `!important` here to be able to override the default hidden behavior on the sphinx rendered scikit-learn.org. See: https://github.com/scikit-learn/scikit-learn/issues/21755 */display: inline-block !important;position: relative;}#sk-container-id-1 div.sk-text-repr-fallback {display: none;}</style><div id=\"sk-container-id-1\" class=\"sk-top-container\"><div class=\"sk-text-repr-fallback\"><pre>LogisticRegression()</pre>In a Jupyter environment, please rerun this cell to show the HTML representation or trust the notebook.
On GitHub, the HTML representation is unable to render, please try loading this page with nbviewer.org. <div class=\"sk-container\" hidden><div class=\"sk-item\"><div class=\"sk-estimator sk-toggleable\"><input class=\"sk-toggleable__control sk-hidden--visually\" id=\"sk-estimator-id-1\" type=\"checkbox\" checked><label for=\"sk-estimator-id-1\" class=\"sk-toggleable__label sk-toggleable__label-arrow\">LogisticRegression</label><div class=\"sk-toggleable__content\"><pre>LogisticRegression()</pre> "]},"metadata":{},"execution_count":46}]},{"cell_type":"code","source":["pred=model.predict(x_test)"],"metadata":{"id":"fN2CEXM7hGwd"},"execution_count":null,"outputs":[]},{"cell_type":"code","source":["pred"],"metadata":{"colab":{"base_uri":"https://localhost:8080/"},"id":"Ha1jGoU1hOcg","executionInfo":{"status":"ok","timestamp":1716552794839,"user_tz":-330,"elapsed":500,"user":{"displayName":"Rishipriya Deekonda","userId":"04973586206988207807"}},"outputId":"85970dbd-5b9a-4bd0-e778-8fac717ac3f0"},"execution_count":null,"outputs":[{"output_type":"execute_result","data":{"text/plain":["array(['Iris-setosa', 'Iris-virginica', 'Iris-setosa', 'Iris-versicolor',\n","   'Iris-virginica', 'Iris-virginica', 'Iris-virginica',\n","   'Iris-setosa', 'Iris-virginica', 'Iris-setosa', 'Iris-versicolor',\n","   'Iris-setosa', 'Iris-setosa', 'Iris-setosa', 'Iris-versicolor',\n","

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