Data export

Data as NumPy array:

```
df.values
```

Save data as CSV file:

```
df.to_csv('output.csv', sep=",")
```

Format a data frame as tabular string:

```
df.to_string()
```

Convert a data frame to a dictionary:

```
df.to_dict()
```

Save a data frame as an Excel table:

```
df.to_excel('output.xlsx')
```

(requires package xlwt)

Visualization

Import matplotlib:

```
import pylab as plt
```

Start a new diagram:

```
plt.figure()
```

Scatter plot:

```
df.plot.scatter('col1', 'col2', style='ro')
```

Bar plot:

```
df.plot.bar(x='col1', y='col2', width=0.7)
```

Area plot:

```
df.plot.area(stacked=True, alpha=1.0)
```

Box-and-whisker plot:

```
df.plot.box()
```

Histogram over one column:

```
df['col1'].plot.hist(bins=3)
```

Histogram over all columns:

```
df.plot.hist(bins=3, alpha=0.5)
```

Set tick marks:

```
labels = ['A', 'B', 'C', 'D']
positions = [1.0, 2.0, 3.0, 4.0]
plt.xticks(positions, labels)
plt.yticks(positions, labels)
```

Select area to plot:

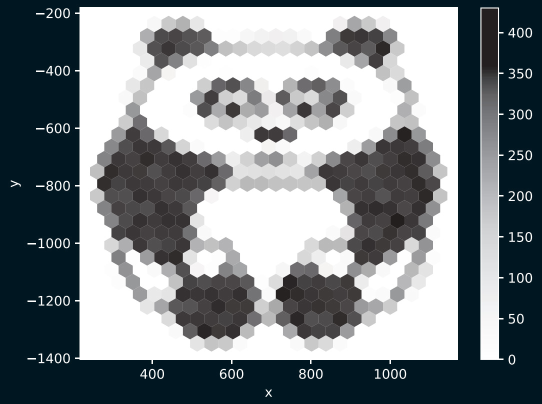
```
plt.axis([0.0, 2.5, 0.0, 10.0])
# [from x, to x, from y, to y]
```

Label diagram and axes:

```
plt.title('Correlation')
plt.xlabel('Nunstück')
plt.ylabel('Slotermeyer')
```

Save most recent diagram:

```
plt.savefig('plot.png')
plt.savefig('plot.png', dpi=300)
plt.savefig('plot.svg')
```



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https://www.cusy.io/de/seminare

Pandas cheat sheet

All of the following code examples refer to this table:

df=

	col1	col2
A	1	4
B	2	5
C	3	6

Getting started

Import pandas:

```
import pandas as pd
```

Create a series:

```
s = pd.Series([1, 2, 3], index=['A', 'B', 'C'],
              name='col1')
```

Create a data frame:

```
data = [[1, 4], [2, 5], [3, 6]]
index = ['A', 'B', 'C']
df = pd.DataFrame(data, index=index,
                  columns=['col1', 'col2'])
```

Load a data frame:

```
df = pd.read_csv('filename.csv',
                 sep=',',
                 names=['col1', 'col2'],
                 index_col=0,
                 encoding='utf-8',
                 nrows=3)
```

Selecting rows and columns

Select single column:

```
df['col1']
```

Select multiple columns:

```
df[['col1', 'col2']]
```

Show first n rows:

```
df.head(2)
```

Show last n rows:

```
df.tail(2)
```

Select rows by index values:

```
df.loc['A']
df.loc[['A', 'B']]
```

Select rows by position:

```
df.loc[1]
df.loc[1:]
```

Data wrangling

Filter by value:

```
df[df['col1'] > 1]
```

Sort by columns:

```
df.sort_values(['col2', 'col2'], ascending=[False, True])
```

Identify duplicate rows:

```
df.duplicated()
```

Identify unique rows:

```
df['col1'].unique()
```

Swap rows and columns:

```
df = df.transpose()
```

Remove a column:

```
del df['col2']
```

Clone a data frame:

```
clone = df.copy()
```

Connect multiple data frames vertically:

```
df2 = df + 10
pd.concat([df, df2])
```

Merge multiple data frames horizontally:

```
df3 = pd.DataFrame([[1, 7], [8, 9]],
                   index=['B', 'D'],
                   columns=['col1', 'col3'])
```

Only merge complete rows (INNER JOIN):

```
df.merge(df3)
```

Left column stays complete (LEFT OUTER JOIN):

```
df.merge(df3, how='left')
```

Right column stays complete (RIGHT OUTER JOIN):

```
df.merge(df3, how='right')
```

Preserve all values (OUTER JOIN):

```
df.merge(df3, how='outer')
```

Merge rows by index:

```
df.merge(df3, left_index=True, right_index=True)
```

Fill NaN values:

```
df.fillna(0.0)
```

Apply your own function:

```
def func(x): return 2**x
df.apply(func)
```

Arithmetics and statistics

Add to all values:

```
df + 10
```

Sum over columns:

```
df.sum()
```

Cumulative sum over columns:

```
df.cumsum()
```

Mean over columns:

```
df.mean()
```

Standard devieation over columns:

```
df.std()
```

Count unique values:

```
df['col1'].value_counts()
```

Summarize descriptive statistics:

```
df.describe()
```

Hierarchical indexing

Create hierarchical index:

```
df.stack()
```

Dissolve hierarchical index:

```
df.unstack()
```

Aggregation

Create group object:

```
g = df.groupby('col1')
```

Iterate over groups:

```
for i, group in g:
    print(i, group)
```

Aggregate groups:

```
g.sum()
g.prod()
g.mean()
g.std()
g.describe()
```

Select columns from groups:

```
g['col2'].sum()
g[['col2', 'col3']].sum()
```

Transform values:

```
import math
g.transform(math.log)
```

Apply a list function on each group:

```
def strsum(group):
    return ''.join([str(x) for x in group.values])
g['col2'].apply(strsum)
```