



How's my data?

Data Analysis

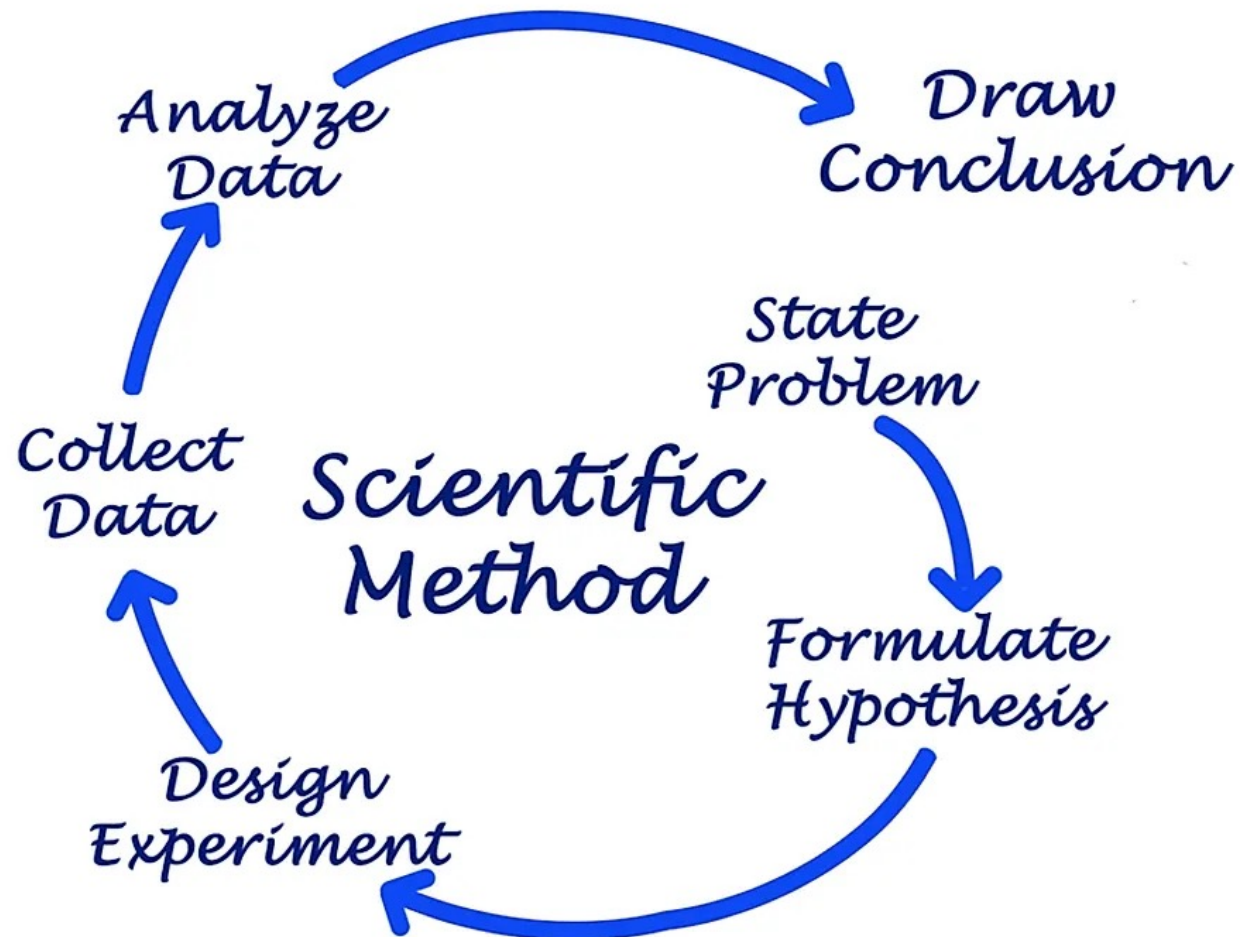


1. Data analysis

Preprocessing, main analysis, visualization

2. Autism dataset

Breakout session



Science as an ongoing process

Preprocessing

```
▶ import pandas as pd

data = pd.DataFrame([[5, 4], [9, 8], [8, 8]],
                    index=['subject1', 'subject2', 'subject3'],
                    columns=['condition1', 'condition2'])

print(data)
```

	condition1	condition2
subject1	5	4
subject2		
subject3		

```
▶ data.to_csv('mydata.csv')
```

```
▶ data = pd.read_csv('mydata.csv')
```

Transforming the raw data into an understandable format

Preprocessing

- **Data cleaning**
(removing incorrect and incomplete data, replacing missing values)
- **Data integration**
(combining multiple sources into a single dataset)
- **Data reduction**
(making the analysis easier, e.g., dimensionality reduction)
- **Data transformation**
(changing the format or structure, e.g., smoothing, normalization)

Transforming the raw data into an understandable format

Main analysis

- Type: Inferential analysis, where conclusions drawn from the sample are inferred to apply to the larger population
- Methods: *comparison* tests (e.g., *t*-test, ANOVA), *correlation* tests (e.g., Pearson), and *regression* tests (e.g., multiple linear regression)
- Focus: Reliability and validity (consistency and accuracy of observations)

Visualization

- Python libraries, including Matplotlib, Seaborn, Plotly, etc.

```
▶ import numpy as np
import matplotlib.pyplot as plt

avg_cond = np.mean(data, axis=0) # average
std_cond = np.std(data, axis=0) # standard deviation

fig = plt.figure()
plt.bar(['condition 1', 'condition 2'], avg_cond,
        yerr=std_cond)
```

```
▶ from scipy import stats

stats.ttest_rel(data['condition1'], data['condition2'])

Ttest_relResult(statistic=1.9999999999999998, pvalue=0.1835034190722739)
```

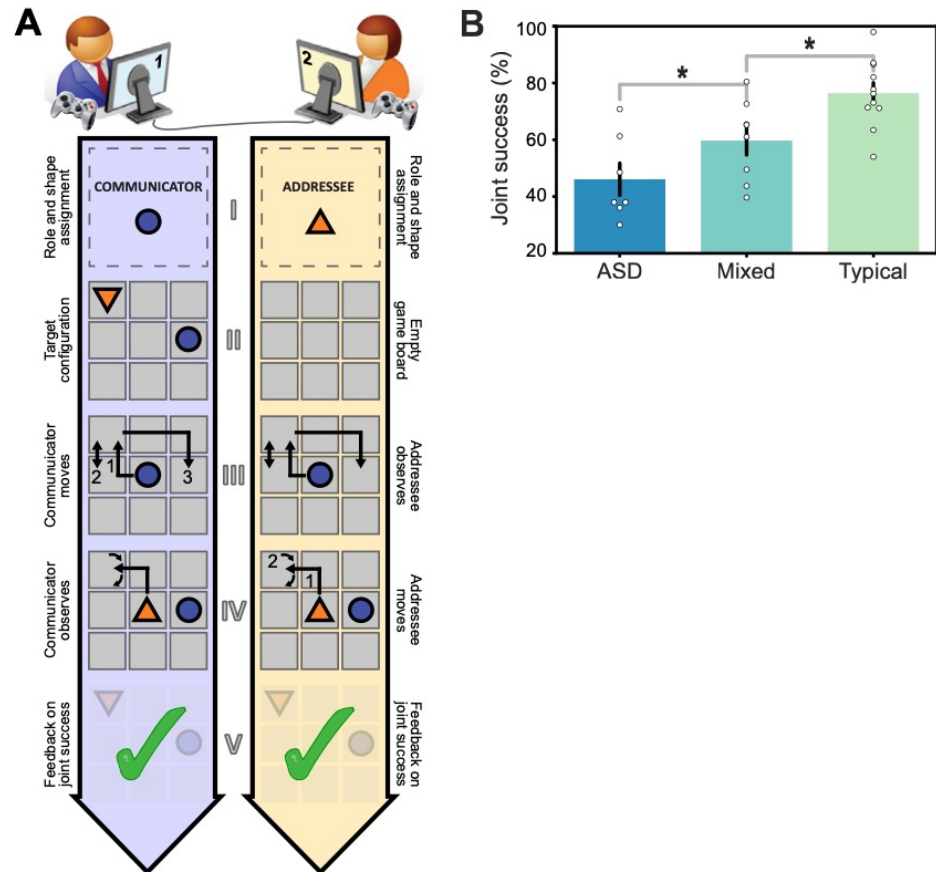

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• Lab7_TCG_ASD.ipynb



- Data analysis is about applying statistical and/or logical techniques to describe, illustrate, and evaluate observations

- Decoding