

# STA113: Probability and Statistics in Engineering

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- **Statistics** : the science of data. This involves collecting, classifying, summarizing, organizing, analyzing and interpreting data.
- Two Branches of Statistics
  - **Descriptive statistics**: summarization and description of data set
  - **Inferential statistics**: using sample data to make an inference about a population
    - A **population** is a date set that is the target of our interest.
    - A **sample** is a subset of data selected from a population

## Types of Data

- **Quantitative** data: quantity or amount of something  
e.g. stock price, temperature, ...
- **Qualitative** (or categorical) data: no quantitative interpretation, i.e., they can only be classified into categories  
e.g. gender, country names, ...  
e.g. **rank**s?
- **Nominal**: can NOT be meaningfully ordered
- **Ordinal**: can be ranked from high to low

# Descriptive Statistics

## Qualitative Data

- Visual plots:
  - table,
  - bar graph,
  - pie chart ...
- Numerical measure:
  - frequency (counts),
  - relative frequency

# An Example

Table 2.1 Summary Frequency Table for Largest Nuclear Reactors Worldwide

| Category      | Frequency                  | Relative Frequency |
|---------------|----------------------------|--------------------|
| Country       | Number of Nuclear Reactors | Proportion         |
| Belgium       | 4                          | 0.0408             |
| France        | 22                         | 0.2245             |
| Finland       | 2                          | 0.0204             |
| Germany       | 7                          | 0.0714             |
| Holland       | 1                          | 0.0102             |
| Japan         | 11                         | 0.1123             |
| Sweden        | 3                          | 0.0306             |
| Switzerland   | 1                          | 0.0102             |
| United States | 47                         | 0.4796             |
| TOTALS        | 98                         | 1.0000             |

Figure 1: Vertical Bar Graph showing the number of large nuclear reactors for nine countries

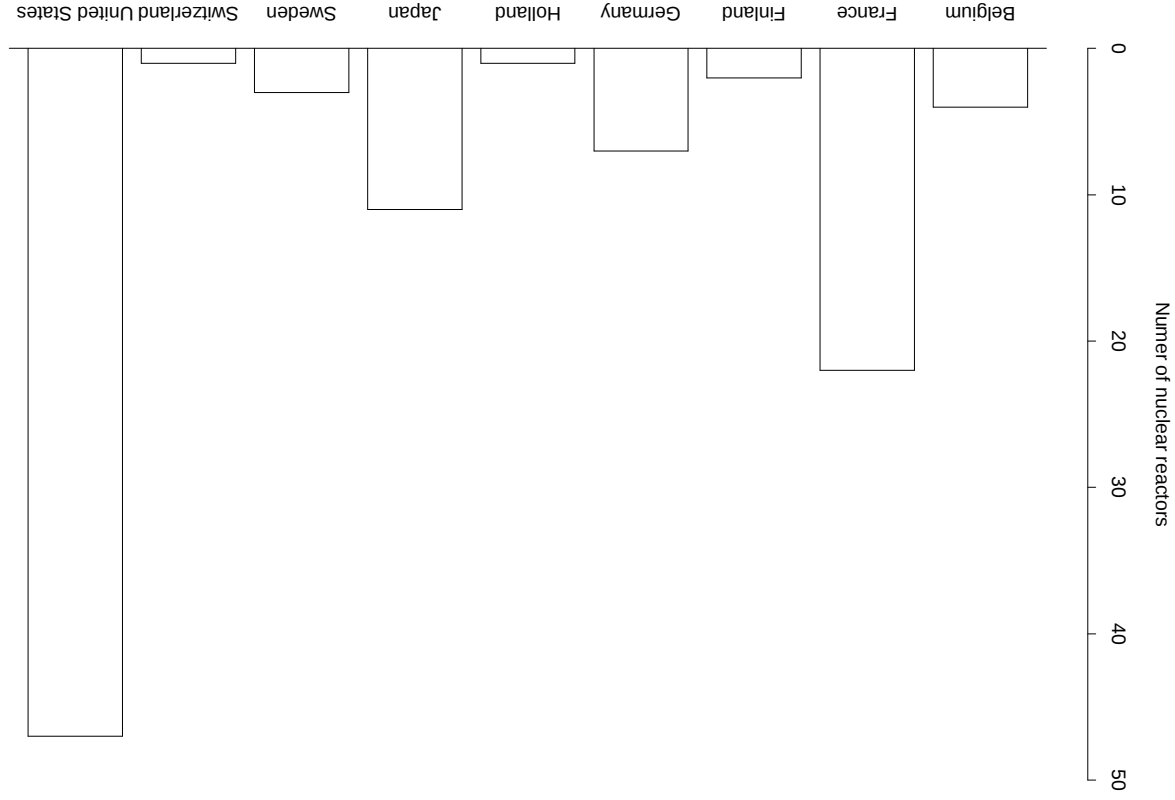


Figure 2: Horizontal Bar Graph showing the relative frequency of large nuclear reactors for nine countries

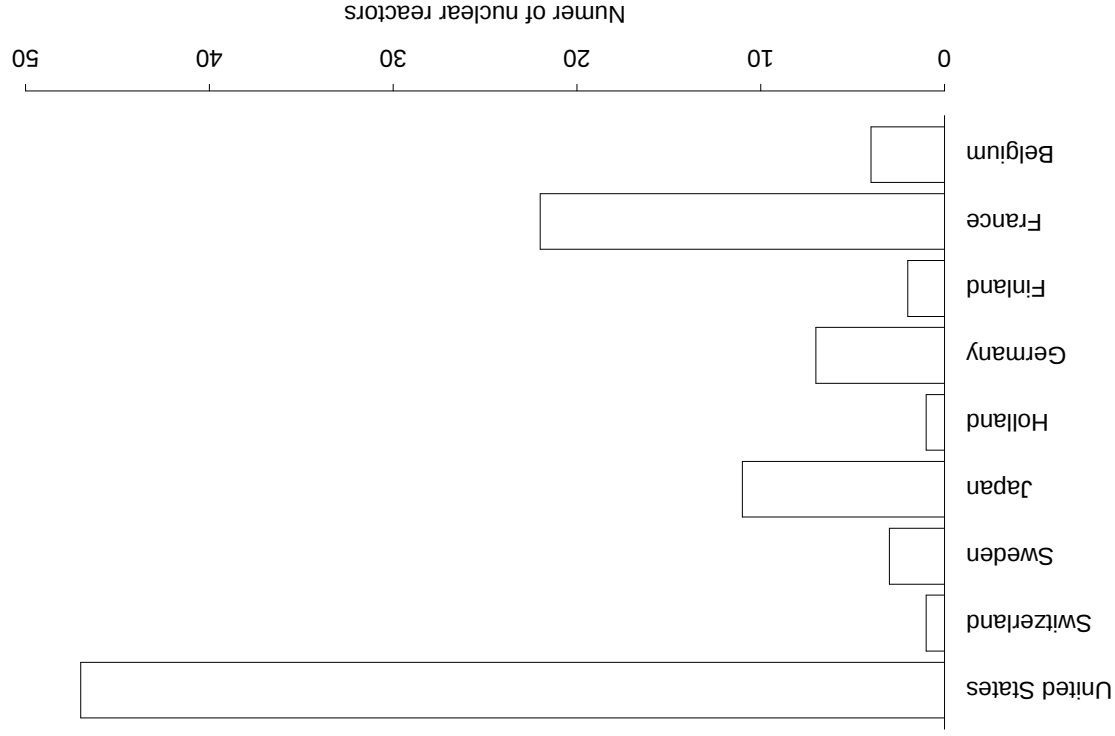


Figure 3: Pareto diagram for the nuclear reactor data

