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Statistics in Engineering
STAT133: Probability and
A sample is a subset of data selected from a population of interest.

A population is a data set that is the target of our inference about a population.

Inferential statistics: using sample data to make an inference about a population.

Descriptive statistics: summarizing and describing data.

Two branches of statistics:
- Interpreting data: classifying, summarizing, analyzing, and visualizing data.
- Statistics: the science of data. This involves collecting, analyzing, and interpreting data.
Types of Data

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

Qualitative Data

- Visual plots:
- table,
- bar graph,
- pie chart ...

Numerical measure:

- frequency (counts),
- relative frequency
<table>
<thead>
<tr>
<th>Country</th>
<th>Number of Nuclear Reactors</th>
<th>Reliability Frequency</th>
<th>Relative Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>47</td>
<td>0.4796</td>
<td>1.0000</td>
</tr>
<tr>
<td>Switzerland</td>
<td>1</td>
<td>0.0202</td>
<td>1.0000</td>
</tr>
<tr>
<td>Sweden</td>
<td>3</td>
<td>0.0306</td>
<td>1.0000</td>
</tr>
<tr>
<td>Japan</td>
<td>11</td>
<td>0.1123</td>
<td>1.0000</td>
</tr>
<tr>
<td>Holland</td>
<td>1</td>
<td>0.0202</td>
<td>1.0000</td>
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<tr>
<td>Germany</td>
<td>7</td>
<td>0.0714</td>
<td>1.0000</td>
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<td>0.0204</td>
<td>1.0000</td>
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<tr>
<td>France</td>
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<td>0.2245</td>
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</tr>
<tr>
<td>Belgium</td>
<td>4</td>
<td>0.0408</td>
<td>1.0000</td>
</tr>
</tbody>
</table>

An Example

Table 2.1 Summary Frequency Table for Largest Nuclear Reactors Worldwide
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.

- Belgium
- France
- Finland
- Germany
- Holland
- Japan
- Sweden
- Switzerland
- United States
Figure 3: Pareto diagram for the nuclear reactor data