Lecture 5 Summary (Chapter 2)

Example 8 Data: 4 2 3 3 6 3

<table>
<thead>
<tr>
<th>Observation</th>
<th>$x_i$</th>
<th>$x_i^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>36</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>9</td>
</tr>
</tbody>
</table>

Total $\sum x_i = 21 \quad \sum x_i^2 = 83$

\[ s^2 = \frac{1}{n-1} \left[ \sum x_i^2 - \left( \frac{\sum x_i}{n} \right)^2 \right] = 1.9 \]

\[ s = \sqrt{1.9} = 1.38 \]

(B) Quartiles and Percentiles

Sample $100p^{th}$ percentile: value such that at least $100p\%$ of the observations are at or below this value and at least $100(1-p)\%$ are at or above this value

Calculating the sample $100p^{th}$ percentile

1. Order the $n$ observations from the smallest to the largest.
2. Find $np$.
3. If $np$ is not an integer, round it up to the next integer and find the corresponding ordered value. eg: $np = 3.5 \implies x(4)$
   If $np$ is an integer, say $k$, calculate $\left( x(k) + x(k+1) \right)/2$.

Quartiles: the points for division into quarters

First (lower) quartile: $Q_1 = 25^{th}$ percentile
Second quartile (median): $Q_2 = 50^{th}$ percentile
Third (upper) quartile: $Q_3 = 75^{th}$ percentile

Boxplots

Sample range: $\text{max} - \text{min} = x(n) - x(1)$

Interquartile range (IQR): $Q_3 - Q_1$ (Length of the middle half)

Outlier: if the observation is $< Q_1 - 1.5 \times \text{IQR}$ or $> Q_3 + 1.5 \times \text{IQR}$