prob and stats HW 1-2

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August 2019

1.5

$$
\begin{aligned}
(\mathbf{s}')^{\mathbf{2}} &= \tfrac{1}{n}\textstyle\sum_{i=1}^{n}(y_i-\bar{y})^2, \text{ expanding} \\
&= \tfrac{1}{n}\textstyle\sum_{i=1}^{n}(y_i^2-2y_i\bar{y}+\bar{y}^2) \\
&= \tfrac{1}{n}(\textstyle\sum_{i=1}^{n}y_i^2-\sum_{i=1}^{n}2y_i\bar{y}+\sum_{i=1}^{n}\bar{y}^2), \text{ using identity (a,b)} \\
&= \tfrac{1}{n}(\textstyle\sum_{i=1}^{n}y_i^2-2\bar{y}\sum_{i=1}^{n}y_i+\sum_{i=1}^{n}\bar{y}^2) \\
&= \tfrac{1}{n}(\textstyle\sum_{i=1}^{n}y_i^2-2\frac{1}{n}\sum_{i=1}^{n}y_i*\sum_{i=1}^{n}y_i+\sum_{i=1}^{n}(\frac{1}{n}\sum_{i=1}^{n}y_i)^2) \\
&\quad Don'texpandhereinsteadkeepusingy(bartosimplify) \\
&= \tfrac{1}{n}(\textstyle\sum_{i=1}^{n}y_i^2-4\frac{1}{n}\sum_{i=1}^{n}y_i+\sum_{i=1}^{n}(\frac{1}{n}\sum_{i=1}^{n}y_i)^2) \\
&= \tfrac{1}{n}\textstyle\sum_{i=1}^{n}(y_i^2-4\frac{1}{n}y_i+(\frac{1}{n}\sum_{i=1}^{n}y_i)^2)
\end{aligned}
$$

Histograms

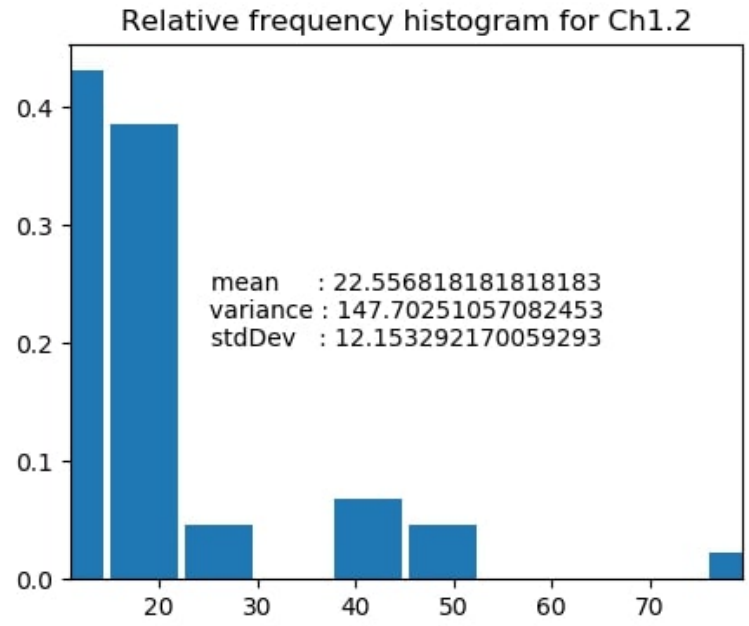

Figure 1: The Histogram for 1.2

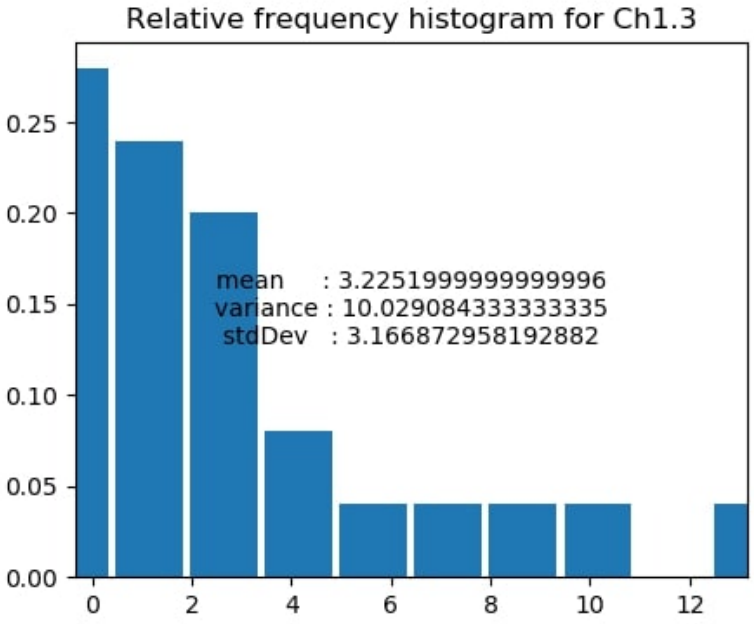

Figure 2: The Histogram for 1.3

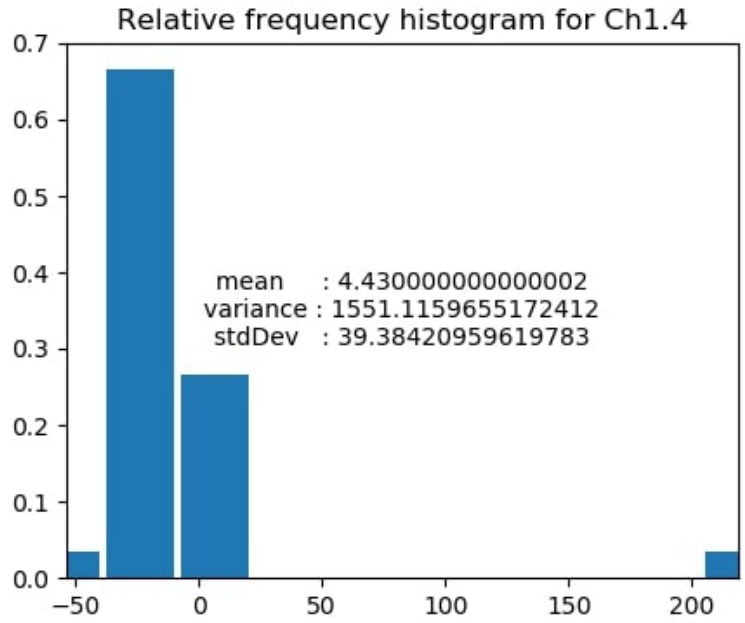

Figure 3: The Histogram for 1.4

Section 2.3

1. 2.1

   - $A = \{ff\}$
   - $B = \{mm\}$
   - $C = \{mf, fm\}$
   - $A \cap B = \varnothing$
   - $A \cup B = \{ff, mm\}$
   - $A \cap C = \varnothing$
   - $A \cup C = \{ff, mf, fm\}$
   - $B \cap C = \varnothing$
   - $B \cup C = \{mm, mf, fm\}$
   - $C \cap \bar{B} = \{mf, fm\}$

2. 2.2

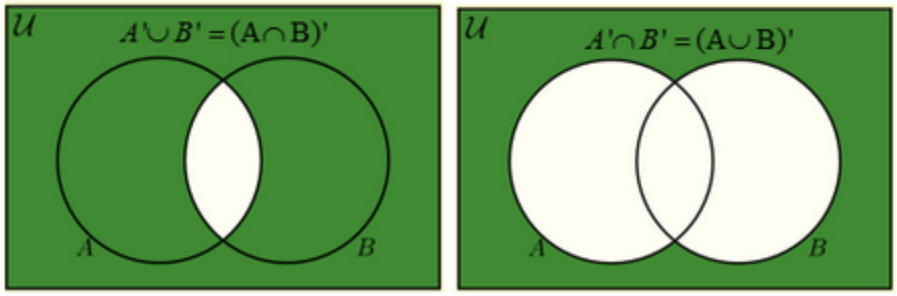

Figure 4: Venn Diagrams

3. 2.4

- A = $\{(M_1, M_2), (M_1, M_3), (M_2, M_3)\}$
- $B^c = A$
- $A \cup B = S$
- $A \cap B = \varnothing$
- $A \cap B = A$

4. 2.5

- $(36 - 3) + (9 - 3) = 39$
- $(36 - 3) = 33$
- $(24 - (9 - 3) = 18$