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MA-INF 4111 - Intelligent Learning and Analysis Systems: Machine Learning
Exercise Sheet 4

1. Confidence Intervals

(a) given: $\text{error}_S(h) = \frac{10}{65}, n = 65$

$$\begin{aligned}\text{error}_{\text{D}}^{95\%}(h) &\leq \text{error}_S(h) + z_N\sqrt{\frac{\text{error}_S(h)(1-\text{error}_S(h))}{n}} \\ &= \frac{10}{65} + 1.96\sqrt{\frac{\frac{10}{65}(1-\frac{10}{65})}{65}} \\ &\approx 0.24\end{aligned}$$

(b)

$$\begin{aligned}\text{error}_{\text{D}}^{90\%}(h) &\leq \frac{10}{65} + 1.64\sqrt{\frac{\frac{10}{65}(1-\frac{10}{65})}{65}} \\ &\approx 0.23\end{aligned}$$

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2. Sample Size

given: $\text{error}_D(h) \in [0.2, 0.6] \Rightarrow \sigma = 0.2$
wanted: bound on error $E < 0.1$

$$\begin{aligned}E &= z_N\frac{\sigma}{\sqrt{n}} \Rightarrow \\ n &= \left(z_N\frac{\sigma}{E}\right)^2\end{aligned}$$

$$\begin{aligned}n &= \left(1.96\frac{0.2}{0.1}\right)^2 \\ &= \lceil 15.3664 \rceil = 16\end{aligned}$$

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