Machine Learning Assignment 36

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Problem 36-1

First, you need the likelihood. Knowing that this is a discrete uniform distribution, the chance of seeing any number is $\frac{1}{n}$. With this you can find the likelihood.

$$P(\{52, 30, 68, 7\} \mid n) = \begin{cases} \frac{1}{n^4} & n \geq 68 \\ 0 & n < 68 \end{cases}$$

As you now have the likelihood, you can use that to find the posterior distribution, the needed function to calculate the max number of tanks to a 95% certainty.

$$\begin{aligned} P(n \mid \{52, 30, 68, 7\}) &= \sum_{n=1}^{\infty} c \cdot P(\{52, 30, 68, 7\} \mid n) \\ &= c \cdot \sum_{n=68}^{\infty} \frac{1}{n^4} \\ c \cdot \sum_{n=68}^{\infty} \frac{1}{n^4} &= 1 \\ c &\approx 9.22742 \cdot 10^5 \\ P(n \mid \{52, 30, 68, 7\}) &= \begin{cases} \frac{9.22742 \cdot 10^5}{k^5} & k \geq 68 \\ 0 & k < 68 \end{cases} \end{aligned}$$

Now that we have the posterior distribution, we can use the handy-dandy python function that was made for this purpose. That tells us with *roughly* 95% certainty that there are a maximum of 185 tanks.