UQ 6310 Homework5, Yu Wang

Assuming $E1, E2, E3, E4, N(Noise)$ follow the uniform distribution, where the lower bounds are $34000, 22000, 15000, 15000, 0.01$ and the upper bounds are $35000, 26000, 25000, 17000, 0.04$. There are 5 observation data which will be used separately to update the distribution during each round.

5000 data points are sampled from the uniform distribution. The initial prior distribution for each variable is as follows:

(a) $E1_{Pri}$ (b) $E2_{Pri}$ (c) $E3_{Pri}$
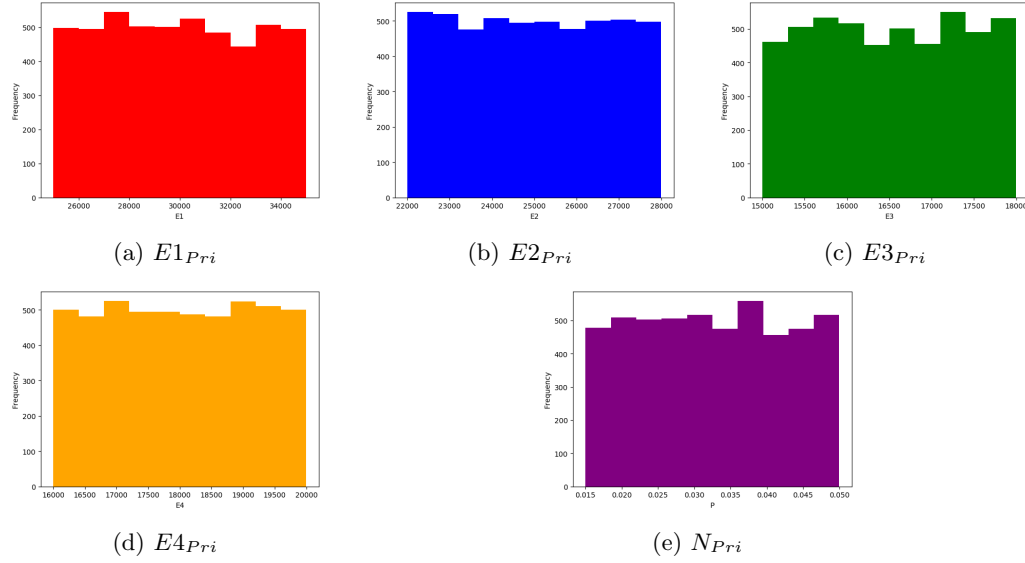
(d) $E4_{Pri}$ (e) N_{Pri}

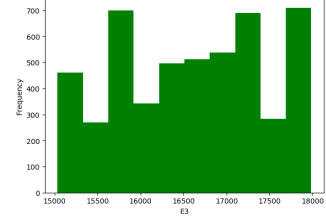Figure 1: Prior distribution for the 5 variables

The prediction elongation for each data point is calculated using the physics model. Setting the observation value as the mean, the σ value from each data point as the standard deviation, the likelihood for each data point is calculated. Since the prior distribution is uniform, the posterior probability can be obtained directly from the likelihood. Treating the posterior probability as PMF, the CDF value for each variable is calculated by summing the PMF value from the first to the current item. This CDF value for each variable can be seen as a new prior from which we can sample another 5000 data points. We perform such iteration 5 rounds. For each rounds, different observation value is used. The final updated distribution is shown as follows:
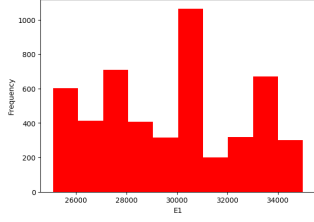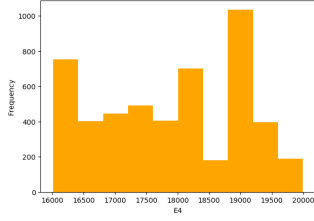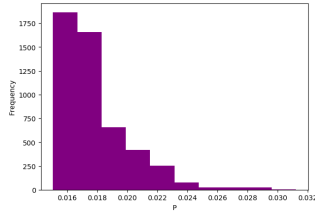
(a) $E1$
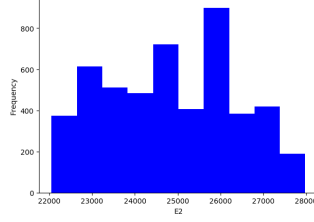
(b) $E2$

(c) $E3$

(d) $E4$

(e) N

Figure 2: Posterior distribution for the 5 variables