

Learning outcomes: Chapter 4

1. You should understand the difference between a *point estimate* and an *interval estimate*.
2. You should be able to define a *frequentist confidence interval*, a *Bayesian confidence interval* and a *highest density interval*, and you should understand the differences in interpretation between these intervals.
3. You should be able to determine a highest density interval for θ in the following simple situations:
 - When the posterior for θ is a beta distribution and the lower/upper bounds of the interval are clearly 0/1;
 - When the posterior for θ is symmetric, e.g. a Normal distribution.
4. You should be able to write simple functions in R to obtain a highest density interval for any unimodal posterior distribution.
5. You should memorise, and be able to use, the following result to obtain the predictive probability density function for a future observation y :

$$f(y|\mathbf{x}) = \int_{\Theta} f(y|\theta) \pi(\theta|\mathbf{x}) d\theta.$$

6. You should be able to obtain prediction intervals in simple examples for discrete θ , or when the predictive distribution is of known form.
7. You should be able to state, and prove, the following result for the predictive distribution for Y when \mathbf{X} and Y are independent:

$$f(y|\mathbf{x}) = \frac{f(y|\theta)\pi(\theta|\mathbf{x})}{\pi(\theta|\mathbf{x}, y)}.$$