

Recitation Session 4**Problem**

1. *Grizzlies in Yellowstone (Example 3.3.3 continued)* The scientist observes a bear with her binoculars. From their size she estimates that its weight is 180 kg. What is the probability that the bear is male?
2. *Bayesian coin flip (Example 3.3.6 continued)* Your uncle bets you ten dollars that a coin flip will turn out heads. You suspect that the coin is biased, but you are not sure to what extent. To model this uncertainty you represent the bias as a continuous random variable B with the following pdf:

$$f_B(b) = 2b \text{ for } b \in [0, 1].$$

The coin lands on tails. Compute the distribution of the bias conditioned on this information.

3. *Coin Toss* In a large collection of coins, the probability X that a head will be obtained when a coin is tossed varies from one coin to another, and the distribution of X in the collection is specified by the following pdf:

$$f(x) = \begin{cases} 6x(1-x) & \text{for } 0 < x < 1, \\ 0 & \text{otherwise.} \end{cases}$$

Suppose that a coin is selected at random from the collection and tossed once. Let Y be the event that a head is obtained.

- a. What is the conditional pmf of $Y|X = x$?
- b. What is the joint distribution of X and Y ?
- c. Suppose the outcome of the coin flip is heads. What is the conditional distribution of X given that the outcome is heads?

Extra Problem

1. *Normal Distribution* Suppose $X \sim \mathcal{N}(0, 1)$.
 - a. Find the cdf and pdf of $|X|$, i.e., the absolute value of a standard normal random variable. The distribution of $|X|$ is called the folded normal.
 - b. Find the cdf of $X^+ = \max\{X, 0\}$. In particular, find $\Pr(X^+ \leq 0)$. This distribution is a mixture of discrete and continuous random variables.