**Assignment: Probability**

**Instructions:**

* Solve the questions with pen and paper.
* State your assumptions and provide explanations for your answers.
* Scan the solutions and convert them to pdf.
* Upload the pdf document on Github.
* Share the link to your solution on Github.

1. A bag contains fifteen balls distinguishable only by their colours; ten are blue and five are red. I reach into the bag with both hands and pull out two balls (one with each hand) and record their colours.
2. What is the *random phenomenon*?
3. What is the *sample space*?
4. Express the *event* that the ball in my left hand is red as a subset of the sample space.
5. Three unbiased coins are tossed. What is the probability of getting at most two heads?
6. Throw two dice. A and B events are defined below. A = {max is 2}, B = {min is 2} Are A and B independent? Provide answer with explanation.
7. You call 2 Uber and 3 Ola cars. If the time that each takes to reach you is IID, what is the probability that Uber arrives first?
8. By using NLP, I can detect spam e-mails in my inbox. Assume that the word ‘offer’ occurs in 80% of the spam messages in my account. Also, let’s assume ‘offer’ occurs in 10% of my desired e-mails. If 30% of the received e-mails are considered as a scam, and I will receive a new message which contains ‘offer’, what is the probability that it is spam?
9. Facebook has a content team that labels pieces of content on the platform as spam or not spam. 90% of them are diligent raters and will correctly label 95% of the time. The remaining 10% are non-diligent raters and will label 50% of the content incorrectly. Assume the pieces of content are labeled independently from one another, for every rater. Given that a piece has been rated as non-spam, what is the probability that it is non-spam?
10. A salesperson from an automobile firm XYZ believes that the probability of making a sale is 38%. If he talks to five customers on a particular day, what is the probability that he will make exactly 2 sales? (Please assume independence)
11. A machine produces items of which 1% at random are defective. How many items can be packed in a box while keeping the chance of one or more defectives in the box to be no more than 0.5? What are the expected value and standard deviation of the number of defectives in a box of that size?