Week-1 Questions

Prof . Prathosh AP and Chandan J

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1. Consider the random experiment of rolling two fair dice. (We assume all 36 outcomes are equally likely). The probability that the sum of the two numbers on the two dice is greater than 10.5 is

   (a) $\frac{1}{36}$
   (b) $\frac{2}{36}$
   (c) $\frac{3}{36}$
   (d) $\frac{4}{36}$

2. There are four letters and the corresponding four addresses are typed on four envelopes. Then the four letters are put in the four envelopes randomly. What is the probability that exactly three letters are in correct envelopes.

   (a) 0
   (b) $\frac{1}{4}$
   (c) $\frac{1}{2}$
   (d) 1

3. You toss two fair six-sided dice. What is the probability that at least one die shows a 6?

   (a) $\frac{1}{6}$
   (b) $\frac{1}{36}$
   (c) $\frac{11}{36}$
   (d) $\frac{25}{36}$

4. $f-Divergence$ between 2 distributions is defined as (P_x and P_θ are the distribution functions and p_x and p_θ are the density functions)

   (a) $D_f(P_x||P_\theta) = \int p_\theta(x) f\frac{p_x(x)}{p_\theta(x)}dx$
   (b) $D_f(P_x||P_\theta) = \int p_x(x) f\frac{p_x(x)}{p_\theta(x)}dx$
   (c) $D_f(P_x||P_\theta) = \int p_\theta(x) f\frac{p_\theta(x)}{p_x(x)}dx$

(d) $D_f(P_x||P_\theta) = \int p_x(x) f \frac{p_\theta(x)}{p_x(x)} dx$

5. The f function used in the divergence function should be at-least

   (a) Left Continuous

   (b) Right Continuous

   (c) Left Semi Continuous

   (d) Right Semi Continuous

6. What will be the f function for $KL - Divergence$?

   (a) $log(u+1)$

   (b) $u * log(u)$

   (c) $0.5 * |u-1|$

   (d) $(u+1) * log(u+1)$

7. Is Forward KL same as Reverse KL ?

   (a) Yes

   (b) No

8. if $f(u)$ is a convex function, then there exists a conjugate function $f^*(t)$ which is a

   (a) Concave function

   (b) Convex function

   (c) Quasi-Convex function

   (d) Quasi-Concave function

9. If the Divergence under consideration is $JS - Divergence$ the what is the f function used?

   (a) $0.5 * (u \cdot log(u+1) - (u+1) \cdot log(0.5 \cdot (u+1)))$

   (b) $0.5 * (u \cdot log(u) - (u-1) \cdot log(0.5 \cdot (u-1)))$

   (c) $0.5 * (u \cdot log(u-1) - (u+1) \cdot log(0.5 \cdot (u+1)))$

   (d) $0.5 * (u \cdot log(u) - (u+1) \cdot log(0.5 \cdot (u+1)))$

10. There exists a f function using which the divergence metric which is obtained can take negative values. Is the above statement True?

    (a) Maybe for some values

    (b) Yes

    (c) No

Answers to the Questions

- 1 - c
- 2 - a
- 3 - c
- 4 - a
- 5 - c
- 6 - b
- 7 - b
- 8 - b
- 9 - d
- 10 - c