Week-2 Questions

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1. In a Vanilla GAN, the objective of the discriminator D is to maximize :

$$V(D,G) = \mathbb{E}_{x\sim p_{\mathrm{x}}}[\log D(x)] + \mathbb{E}_{z\sim N(0,I)}[\log(1 - D(G(z)))]$$

   Which of the following best describes this objective?

   (A) Minimize the probability of real data being classified as real.

   (B) Maximize the log-likelihood of the generator distribution.

   (C) Maximize the correct classification of real and generated samples.

   (D) Minimize Jensen-Shannon divergence between p_{x} and p_θ.

   Correct Answer: (C)

2. When the discriminator is optimal, minimizing the generator loss is equivalent to minimizing which divergence?

   (A) KL divergence $\mathrm{KL}(p_\theta \| p_x)$

   (B) Jensen-Shannon divergence $\mathrm{JS}(p_x \| p_\theta)$

   (C) Total variation distance

   (D) Wasserstein distance

   Correct Answer: (B)

3. In GAN optimization, the training can be viewed as a minimax game. Which of the following best describes the goal?

   (A) Both the generator and discriminator minimize the same objective.

   (B) The generator maximizes the same objective that the discriminator minimizes.

   (C) The generator and discriminator jointly minimize a loss function.

   (D) The discriminator maximizes and the generator minimizes the adversarial loss function.

   Correct Answer: (D)

4. What is the domain of the $f^*(t)$ which is the conjugate of $f(u)$?

   (A) $\Re^+$

   (B) $\Re^-$

   (C) $\Re$

   (D) $\Re - \{0\}$

   Correct Answer: (B)

5. In the GAN implementation what is the activation function we are using for the $f - Divergence$ under consideration ?

   (A) $-log(1 + e^{-v})$

   (B) $-log(1 + e^{v})$

   (C) $log(1 + e^{-v})$

   (D) $log(1 + e^{v})$

   Correct Answer: (A)

6. The Discriminator in GAN Architecture can be viewed as a

   (A) Binary Classifier to predict Real and Generated Images

   (B) Multiclass Classifier to predict the label of the generated images.

   (C) Multiclass Classifier to predict the label of the real images.

   (D) None of the Above

   Correct Answer: (A)

7. In practice can we use different learning rates for Generator and Discriminator ?

   (A) No

   (B) Yes

   (C) Depends on the real data dimension.

   (D) Depends on number of classes in the real data.

   Correct Answer: (B)

8. What happens to $D^*(x)$ when the generator distribution perfectly matches the real data distribution, i.e., $p_\theta(x) = p_x(x)$?

   (A) $D^*(x) = 1$

   (B) $D^*(x) = 0$

   (C) $D^*(x) = \frac{1}{2}$

   (D) $D^*(x) = \infty$

Correct Answer: (C)

9. The original GAN objective (minimax form) is:

$$\min_G \max_D \ \mathbb{E}_{x\sim p_x}[\log D(x)] + \mathbb{E}_{z\sim N(0,I)}[\log(1 - D(G(z)))]$$

Which of the following is true at the global optimum?

(A) $p_\theta = p_x$ and discriminator loss is 0
(B) $p_\theta = p_x$ and generator loss is 0
(C) $p_\theta = p_x$ and total value is $-\log 4$
(D) $p_\theta = p_x$ and total value is 0

Correct Answer: (C)

10. The minimax GAN objective at its optimum corresponds to minimizing:

$$\mathrm{JS}(p_x \| p_\theta)$$

What is the value of this divergence when $p_\theta = p_x$?

(A) $\log 2$
(B) 0
(C) 1
(D) Undefined

Correct Answer: (B)