

Quiz 5

December 3, 2013

Name: _____ NetID: _____

Question 1. (1 point) We say that a concept class C is **PAC-learnable** by learning algorithm L using hypothesis space H and a set S of n samples drawn i.i.d from a fixed distribution $P(X)$ and labeled by a concept $c \in C$, if for all $P(X)$, $c \in C$, $\epsilon > 0$, $\delta > 0$, and sufficiently large n :

L runs in polynomial time and...

- (a) $P(\text{Err}_P(h_{L(S)}) \geq \epsilon) \geq (1 - \delta)$
- (b) $P(\text{Err}_P(h_{L(S)}) \leq \epsilon) \geq (1 - \delta)$
- (c) $P(\text{Err}_S(h_{L(S)}) \leq \epsilon) \geq (1 - \delta)$
- (d) L is a discriminative learning algorithm.

Question 2. (1 point) Consider a hypothesis space H and a **specific set of d points** such that it is **possible to shatter** this specific set of points using hypotheses drawn from H . What can we conclude about the **VC-Dimension** of H ?

- (a) $VCDim(H) \leq d$
- (b) $VCDim(H) = d$
- (c) $VCDim(H) \geq d$
- (d) Not enough information to conclude anything.

Question 3. (1 point) Now consider a hypothesis space H' such that it is **impossible to shatter** our **specific set of d points** using hypotheses drawn from H' . What can we conclude about the relationship between $VCDim(H')$ and $VCDim(H)$ (for H from Question 2)?

- (a) $VCDim(H') \leq VCDim(H)$
- (b) $VCDim(H') = VCDim(H)$
- (c) $VCDim(H') \geq VCDim(H)$
- (d) Not enough information to conclude anything.

Question 4. (1 point) Which of the following clustering algorithms is **most efficient** in terms of big-O runtime complexity?

- (a) k-Means
- (b) HAC with Single Link cluster similarity
- (c) HAC with Complete Link cluster similarity
- (d) HAC with Group Average cluster similarity