CIS 419/519: Quiz 1

September 14, 2019

1. Let $f(x) = -6x^2 - 24x$. What value of x will maximize the function $f(x)$? Please input your answer as a decimal number.

2. Here is a table detailing passenger information on a certain flight. Rows group by ticket class and columns by man, woman, or child:

	Man	Woman	Child	Total
First Class	10	15	5	30
Second Class	25	30	10	65
Third Class	30	35	15	80
Total	65	80	30	175

Given that a passenger selected at random was a child, find the probability that the passenger traveled in the third class.

   (a) $\frac{1}{3}$

   (b) $\frac{3}{35}$

   (c) $\frac{3}{16}$

   (d) $\frac{1}{2}$

3. Suppose we have 6 input features, $x_1, x_2, x_3, x_4, x_5, x_6$, and each feature can take on 3 possible values. What is the cardinality of this instance space?

   (a) 18

   (b) 729

   (c) 216

   (d) 9

4. Let x_1, x_2, x_3 be the input features to the model and y be the label determined by the function $f(x_1, x_2, x_3)$ such that $y = f(x_1, x_2, x_3)$.

   Suppose the 3 input features, x_1, x_2, x_3, can each take on 5 possible values and the label y can be either 'Y' or 'N'. What is the total number of possible functions?

   (a) 2^{243}

   (b) 2^{125}

   (c) 3^{32}

   (d) 5^6

5. As seen in question 4 the space of all possible functions is far too large! To deal with this, learners usually consider only a subset of all the possible functions. This is called the **hypothesis space H**.

   Suppose the hypothesis space we are considering is the space of all conjunctions over k Boolean input features, x_1, x_2, x_3, for k=0,1,2,3. For example, $x_1 \wedge x_3$ is an element in the hypothesis space. $x_2 \vee x_3$ is not.

   What is the cardinality of this hypothesis space H?

   (a) 4

   (b) 243

   (c) 16

   (d) 8