

Name:

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Statistical Pattern Recognition (CE-725)
Department of Computer Engineering
Quiz #9 Solution (VC Dimension) - Spring 2011

Q. Find the VC dimension of

1. $F = \{ax^3+bx^2+cx+d \mid a, b, c, d \in \mathbb{R}\}$, where $x \in \mathbb{R}$.
2. $F = \{ax^3+bx^2+cx+d \mid a, b, c, d \in \mathbb{R}, 4b^2-12ac \leq 0\}$, where $x \in \mathbb{R}$.

Sol:

- 1) The VC dim is 4 in this case. For example consider the points $\{-1.5, 0, 1.5, 2.5\}$. It is trivial to see that any labeling of these points can be modeled by a function in F . Because there are functions in f that have 3 zero crossings.
- 2) The VC dim is 2 in this case. Since F contains cubic functions that are monotonically increasing or decreasing (because we have either $f'(x) > 0$ or $f'(x) < 0$ for all x).