Quiz: Chapter 1+2 definitions

Definition 1. Let $\mathbf{x}_1, ..., \mathbf{x}_N \in \mathcal{X}$. The *dichotomies* generated by a hypothesis class $\mathcal{H}$ on these points are defined by

Definition 2. The *growth function* for a hypothesis class $\mathcal{H}$ is defined to be

Definition 3. We say that a hypothesis class $\mathcal{H}$ can *shatter* a dataset $\mathbf{x}_1, ..., \mathbf{x}_N$ if any of the following equivalent statements are true:

Definition 4. The integer k is said to be a *break point* for hypothesis class $\mathcal{H}$ if

Definition 5. The *Vapnik-Chervonenkis dimension* (VC dimension) of a hypothesis class $\mathcal{H}$, denoted by $d_{\text{VC}}(\mathcal{H})$ or simply d_{VC}, is

Theorem 1 (VC generalization bound)**.** For any tolerance $\delta > 0$, we have that with probability at least $1 - \delta$,

Theorem 2 (Finite Hypothesis Class Generalization Theorem)**.** For any tolerance $\delta > 0$, we have that with probability at least $1 - \delta$,

Theorem 3 (Hoeffding Inequality)**.** Let $a_1, ..., a_N$ be N independent and identically distributed random variables satisfying $0 \leq a_i \leq 1$. Let $\nu = \frac{1}{n} \sum_{i=1}^{N} a_i$ be the empirical average and $\mu = \mathbb{E}\nu$ be the true mean of the underlying distribution.