Learning from Data
Homework # 2

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Hoeffding Inequality

My code for running the experiments to answer question number $1 - 2$ is uploaded here.

1. Answer: [b]

2. Answer: [d]

Error and Noise

3. As h makes an error with probability μ in approximating f, we have $P(h(x) \neq f(x)) = \mu$. The probability of error that h makes in approximating y is:

$$\begin{aligned} P(h(x) \neq y(x)) &= P(h(x) \neq y(x) \cap y(x) = f(x)) + P(h(x) \neq y(x) \cap y(x) \neq f(x)) \\ &= P(h(x) \neq y(x) \mid y(x) = f(x))P(y(x) = f(x)) \\ &+ P(h(x) \neq y(x) \mid y(x) \neq f(x))P(y(x) \neq f(x)) \\ &= \mu * \lambda + (1 - \mu)(1 - \lambda) \\ &= 2\mu\lambda - \mu - \lambda + 1 \end{aligned}$$

Answer: [e]

4. When $\lambda = 0.5$ (noisy target is completely random), the above probability in (3) will be equal to $2 * 0.5 * \mu - \mu - 0.5 + 1 = \mu - \mu + 0.5 = 0.5$, which is independent of μ.

Answer: [b]

Linear Regression

My code for running the experiments to answer question number $5 - 7$ is uploaded here.

5. Answer: [c]

6. Answer: [c]

7. Answer: [a]

Nonlinear Transformation

My code for running the experiments to answer question number $8 - 10$ is uploaded here.

8. Answer: [d]

9. Answer: [a]

10. Answer: [b]