CIS 419/519: Applied Machine Learning Spring 2020

Homework 0

Handed Out: January 22 *Due: January 27*

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1 Multiple Choice & Written Questions

1. a. C

   b. A

2. a. D

   b. A

3. a. D

   b. C

4. a. B

   b. Since
   $$E[x] = \int_{-\infty}^{+\infty} xf(x)\,dx \textit{ and } D[x] = \int_{-\infty}^{+\infty} (x - E[x])^2 f(x)\,dx.$$

   the variance can be expressed as:

   $$D[x] = \int_{-\infty}^{+\infty} (x^2 + E^2[x] - 2xE[x])f(x)\,dx$$

   $$= \int_{-\infty}^{+\infty} x^2 f(x)\,dx \ + E^2[x]\int_{-\infty}^{+\infty} f(x)\,dx \ - 2E[x]\int_{-\infty}^{+\infty} xf(x)\,dx$$

   $$= E[x^2] + E^2[x] * 1 - 2E[x]E[x]$$

   $$= E[x^2] - E^2[x]$$

   QED.

And this can be proved with the properties of *E[x]* :
Since the *D[x]* is defined as:

$$D[x] = E((x - E[x])^2)$$

Thus, we can get the following equations with the properties of *E[x]*:

$$D[x] = E(x^2 - 2xE[x] + (E[x])^2)$$

$$= E[x^2] - 2E[x]E[x] + (E[x])^2$$

$$= E[x^2] - (E[x])^2$$

QED.

2 Python Programming Questions

Complete questions 5 and 6 in the iPython notebook.