Q1_Part 1

Features are continuous, so I first need to compute mean & std for each feature based on each class; Then, based on the Pdf (Probability Density function), I can compute each conditional probability:

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2} \rightarrow \text{Normal Distribution}$$

$\mu(A|B)$: μ (mean) of feature A that belong to the B class. (data from)

$\sigma(A|B)$: std

So, I picked up those examples that belong to the B class, and then I computed the mean value for each of its features.

$$\begin{cases} \mu(\text{Local Price} \mid \text{Apartment}) = 7.33 \\ \sigma(\text{Local Price} \mid \text{Apartment}) = 3.62 \end{cases}$$

$$P(\text{Local Price} \mid \text{Apartment}) = \frac{1}{3.62\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-7.33}{3.62}\right)^2}$$

$$\begin{cases} \mu(\text{Local Price} \mid \text{House}) = 5.76 \\ \sigma(\text{Local Price} \mid \text{House}) = 0.57 \end{cases} \Rightarrow$$

$$P(\text{Local Price} \mid \text{House}) = \frac{1}{0.57\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-5.76}{0.57}\right)^2}$$

$$\begin{cases} \mu(\text{Local Price} \mid \text{Condo}) = 7.42 \\ \sigma(\text{Local Price} \mid \text{Condo}) = 4.61 \end{cases} \Rightarrow$$

$$P(\text{Local Price} \mid \text{Condo}) = \frac{1}{4.61\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-7.42}{4.61}\right)^2}$$

Second Feature I chose is the Age of Home (AOH).

(μ): mean →
- $\mu(AOH|Apartment) = 38.71$ ★
- $\mu(AOH|House) = 34.29$ ★
- $\mu(AOH|Condo) = 39.67$ ○

(σ): Std →
- $\sigma(AOH|Apartment) = 14.68$ ★
- $\sigma(AOH|House) = 12.72$ ★
- $\sigma(AOH|Condo) = 13.95$ ○

$$P(AOH|Apartment) = \frac{1}{14.68\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-38.71}{14.68}\right)^2}$$

$$P(AOH|House) = \frac{1}{12.72\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-34.29}{12.72}\right)^2}$$

$$P(AOH|Condo) = \frac{1}{13.95\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-39.67}{13.95}\right)^2}$$

x is the value of the feature in each example of the dataset. → when it is replaced, the conditional probability is achieved!