

1. First 18 examples (training data) in contact_lenses:

young,myope,no,reduced,none
young,myope,no,normal,soft
young,myope,yes,reduced,none
young,myope,yes,normal,hard
young,hypermetrope,no,reduced,none
young,hypermetrope,no,normal,soft
young,hypermetrope,yes,reduced,none
young,hypermetrope,yes,normal,hard
pre-presbyopic,myope,no,reduced,none
pre-presbyopic,myope,no,normal,soft
pre-presbyopic,myope,yes,reduced,none
pre-presbyopic,myope,yes,normal,hard
pre-presbyopic,hypermetrope,no,reduced,none
pre-presbyopic,hypermetrope,no,normal,soft
pre-presbyopic,hypermetrope,yes,reduced,none
pre-presbyopic,hypermetrope,yes,normal,none
presbyopic,myope,no,reduced,none
presbyopic,myope,no,normal,none

The 19th example (test data) in contact_lenses:

presbyopic,myope,yes,reduced,none

$$\begin{aligned} & p(\text{none} \mid \text{presbyopic,myope,yes,reduced}) \\ &= \frac{p(\text{presbyopic,myope,yes,reduced} \mid \text{none})p(\text{none})}{p(\text{presbyopic,myope,yes,reduced})} \\ &\propto p(\text{presbyopic,myope,yes,reduced} \mid \text{none})p(\text{none}) \\ &= p(\text{presbyopic} \mid \text{none})p(\text{myope} \mid \text{none})p(\text{yes} \mid \text{none})p(\text{reduced} \mid \text{none})p(\text{none}) \\ &= (2/11) * (6/11) * (5/11) * (9/11) * (11/18) \\ &= 0.0225 \end{aligned}$$

Note: $A \propto B$ means A is proportional to B.

Given $p(\text{presbyopic,myope,yes,reduced})$ being a constant, we can therefore have

$$\frac{p(\text{presbyopic,myope,yes,reduced} \mid \text{none})p(\text{none})}{p(\text{presbyopic,myope,yes,reduced})}$$

$$\propto p(\text{presbyopic,myope,yes,reduced} \mid \text{none})p(\text{none})$$

Similarly,

$$p(\text{soft} \mid \text{presbyopic,myope,yes,reduced}) = 0$$

$$p(\text{hard} \mid \text{presbyopic,myope,yes,reduced}) = 0$$

The 19th example will be labelled as “none” by naïve Bayes.