8. Prior, Posterior and Likelihood

Prior, Posterior and Likelihood

Video
Download video file

Transcripts
Download SubRip (.srt) file
Download Text (.txt) file

Prior, Posterior and Likelihood

1/1 point (graded)

Consider a binary classification task with two labels '+' (positive) and '-' (negative).

Let y denote the classification label assigned to a document D by a multinomial generative model M with parameters θ^+ for the positive class and θ^- for the negative class.

Which of the following option(s) is/are true about the prior, posterior or likelihood distributions for this classifier? Choose the correct notations from the statements below:

- [x] $P\left(y=+|D\right)$ is the posterior distribution
- [ ] $P\left(y=+|D\right)$ is the prior distribution
- [ ] $P\left(y=+\right)$ is the posterior distribution
- [x] $P\left(y=+\right)$ is the prior distribution

✔

Solution:

Recall from the lecture that from bayesian rule we have,

$$P\left(y=+|D\right)=\frac{P\left(D|\theta^+\right)\times P\left(y=+\right)}{P\left(D\right)}$$

where $P\left(y=+|D\right)$ is the posterior distribution and $P\left(y=+\right)$ is the prior distribution while $P\left(D|\theta^+\right)$ is the likelihood of document D given parameter θ^+

Submit You have used 1 of 1 attempt

Answers are displayed within the problem

A Numerical Example

2/2 points (graded)

Let's say that the prior for the positive class takes the following value:

$$P(y=+)=0.3$$

Also, say that $P(D|\theta^+)=.3$ and $P(D|\theta^-)=.6$

From the above values of prior and likelihood, calculate the value of $P(D)$, the probability of generating document D. Enter the value below:

0.51 ✔ **Answer:** 0.51

From $P(D)$ also estimate the posterior probability $P(y=+|D)$. Enter your answer as a numerical expression or round it off to two decimal places.

0.18 ✔ **Answer:** 0.1764705882352941

Solution:

From the total probability law, we have that

$$P(D)=P(D|y=+)\,P(y=+)+P(D|y=-)\,P(y=-)$$

Also probability values must sum to 1 across all classes,

$$P(y=+)+P(y=-)=1$$

Therefore,

$$P(D) = P(D|y=+) \times .3 + P(D|y=-) \times .7$$

$$P(D) = .3 \times .3 + .6 \times .7 = 0.51$$

From $P(D)$, we can calculate the posterior value $P(y=+|D)$ using bayes rule as follows:

$$P(y=+|D) = \frac{P(D|\theta^+)\,P(y=+)}{P(D)}$$

$$P(y=+|D) = \frac{.3 \times .3}{0.51} = 0.1764705882352941$$

Submit You have used 1 of 3 attempts

Answers are displayed within the problem

Discussion

Hide Discussion

Topic: Unit 4 Unsupervised Learning (2 weeks) :Lecture 15. Generative Models / 8. Prior, Posterior and Likelihood

Add a Post

Show all posts by recent activity

Did she just say?!?! 2

"this is just a Bayesian rule - there's nothing very special about it" Blasphemy! It's like she just...

Thanks for such a clear articulation of offset concept 1

Thanks Professor i am also taking the other course in this micro master series the 6.36x and ...

? How to interpret P(D|θ+)?

I understand P(θ+|D) as the probability that the document is generated by model θ+, as in: gi... 6