4. Likelihood function

Likelihood function

Similarly, for the second model, again, we have the document, D,

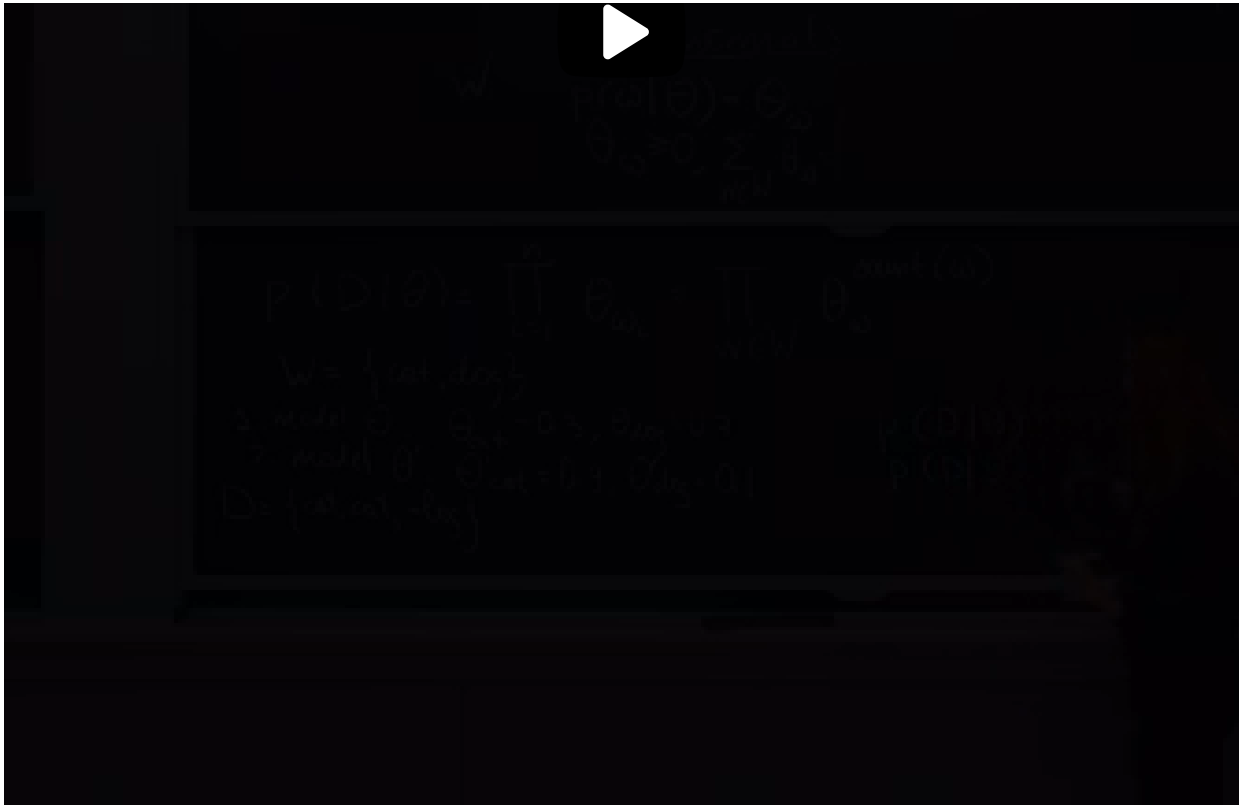
but now our parameters, theta prime, the cats,

are going to have 0.9 squared multiplied by 0.1.

And even though I didn't complete the whole computation,

it's quite easy to see that this document would

have higher probability when generated by the second model.



End of transcript. Skip to the start.

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Likelihood of the first model

1/1 point (graded)

Note that a multinomial distribution is a generalization of a binomial distribution (vocabulary consists of just two classes). As a simple exercise for the following set of problems, we consider generating documents using a multinomial distributions with only two parameters

As an example for such a multinomial generative model, let us assume that our vocabulary W consists of just two symbols 0 and 1. So, $W = \{0, 1\}$.

We want to estimate a multinomial model to generate a document $D =$"0101".

For this task, we consider two multinomial models M_1 and M_2 with parameters, $\theta^{(1)}$ and $\theta^{(2)}$ respectively. First consider a multinomial model M_1 with parameters $\theta^{(1)}$ given as follows:

$$\theta_0^{(1)} = \frac{1}{2}, \theta_1^{(1)} = \frac{1}{2}$$

Let the probability of model M_1 generating the document D be denoted by $P\left(D|\theta^{(1)}\right)$.

Enter the value of $P\left(D|\theta^{(1)}\right)$ given that $\theta^{(1)}$ takes the values as described above. Enter your answer below as a numerical expression or round it off to four decimal places.

1/16 ✔ **Answer:** 0.0625

Solution:

Recall from the lecture that,

$$P(D|\theta) = \Pi_{w \in W} \theta_w^{count(w)}$$

$$P(D|\theta^{(1)}) = .5^2 * .5^2 = .0625$$

Hence, the probability of model M_1 generating the document D is 0.0625.

Submit You have used 1 of 3 attempts

Answers are displayed within the problem

Likelihood of the second model

1/1 point (graded)

Now consider another multinomial model M_2 with different parameters θ_2 given as follows:

$$\theta_0^{(2)} = \frac{1}{5}, \theta_1^{(2)} = \frac{4}{5}$$

The document $D =$"0101" remains the same as that from the previous problem.

Enter the value of $P(D|\theta^{(2)})$ given that $\theta^{(2)}$ takes the values above. Enter below your answer as a numerical expression or round it off to four decimal places.

16/625 ✔ **Answer:** 0.0256

Solution:

Recall from the lecture that,

$$P(D|\theta) = \Pi_{w \in W} \theta_w^{count(w)}$$

$$P(D|\theta^{(2)}) = .2^2 * .8^2 = .0256$$

Hence, the probability of model M_2 generating the document D is 0.0256

Submit You have used 2 of 3 attempts

Answers are displayed within the problem

Better fitting model

1/1 point (graded)

Based on your answers for the above two questions, which model between M_1 and M_2 is more likely to generate the document D?

- (●) M_1 ✔
- ( ) M_2

Solution:

From the above two questions it is clear that,

$$P\left(D|\theta^{(1)}\right) > P\left(D|\theta^{(2)}\right)$$

Therefore, model M_1 is more likely to generate the document D than M_2.

Submit You have used 1 of 1 attempt

Answers are displayed within the problem

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