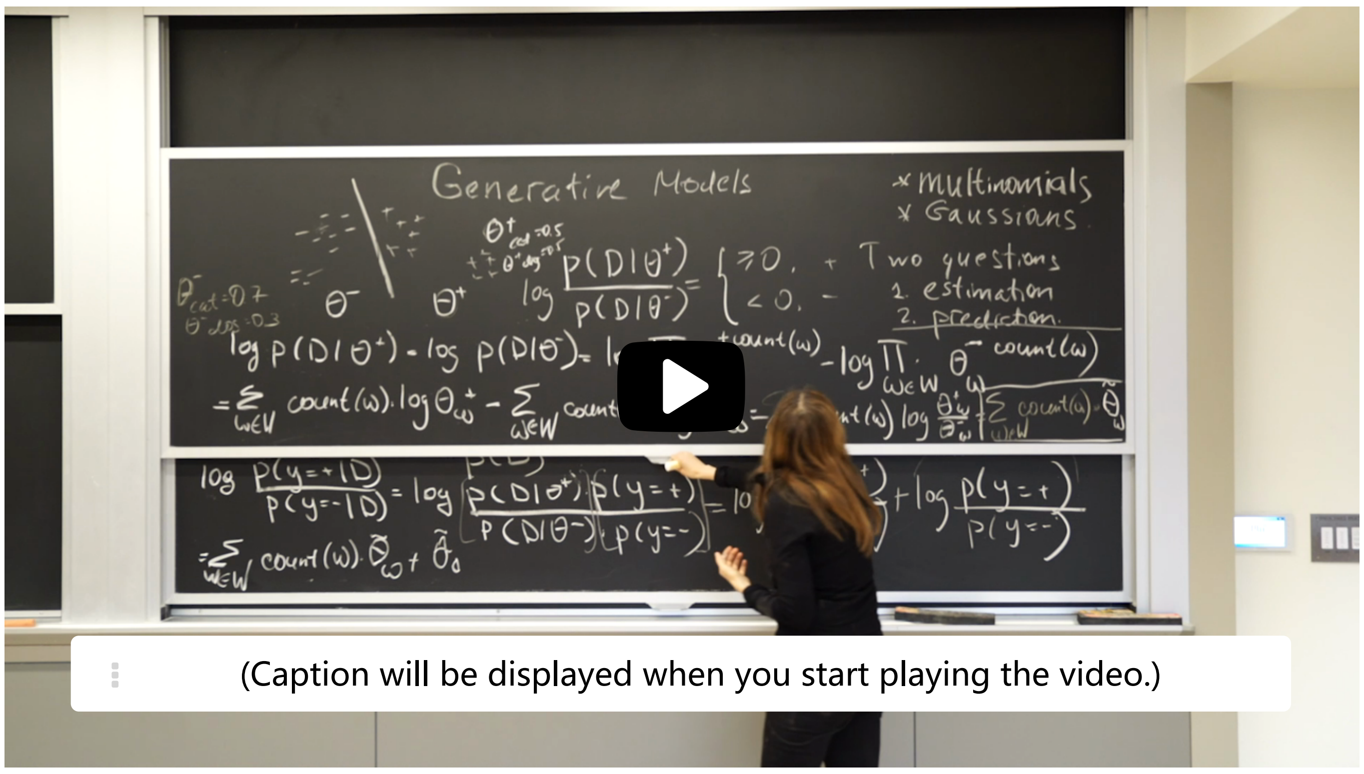
9. Gaussian Generative models

Gaussian Generative models



0:00 / 0:00 1.0x

of all these points.

And sigma squared is just the square of the average distance

of axes from the mu.

OK?

So now, we kind of discussed about what this model

is, roughly speaking, captures.

And we need to write the probabilities

to talk about the parameters of this probability distribution.

And as we can see here, there are just two of them.

So we can write for any point x given the parameters

mu and sigma squared, we can write

the likelihood of x to be generated by these Gaussians.

So in this case, it's going to be 1 divided by sigma

squared d divided by 2.

So this is just the normalization constant.

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Gaussian distribution

1/1 point (graded)

Recall that the likelihood of x being generated from a Gaussian with mean μ and std σ is:

$$P(x|\mu,\sigma^2) = \frac{1}{(2\prod\sigma^2)^{d/2}} exp(-\frac{1}{2\sigma^2}\|x-\mu\|^2)$$

Let $x = \begin{bmatrix} \frac{1}{\sqrt{\prod}} \\ 2 \end{bmatrix}$ be a vector in the two dimensional space.

Let G be a two-dimensional Gaussian distribution with mean μ and standard deviation σ taking values as follows

$$\mu = \begin{bmatrix} 0 \\ 2 \end{bmatrix}, \sigma = \sqrt{\frac{1}{2\prod}}$$

Calculate the probability $p(x|\mu,\sigma^2)$ of x being sampled from the Gaussian distribution G with mean μ and variance σ^2 taking values as given above.

Enter the value of $\log p(x|\mu,\sigma^2)$ below (note that we use log for the natural logarithm, i.e. $\log_e()$

-1 ✔ Answer: -1

Solution:

Note that the probability of vector x being sampled from a Gaussian distribution G with mean μ and variance σ^2 is given as follows

$$P(x|\mu,\sigma^2) = \frac{1}{2\prod\sigma^2} exp(-\frac{1}{2\sigma^2}\|x-\mu\|^2)$$

Substituting the value of $\sigma = \sqrt{\frac{1}{2\prod}}$ from above, we have

$$P(x|\mu,\sigma^2) = \frac{1}{2\prod\frac{1}{2\prod}} exp(-\frac{1}{2\frac{1}{2\prod}}\|x-\mu\|^2)$$

$$P(x|\mu,\sigma^2) = exp(-\prod\|x-\mu\|^2)$$

Substituting the value of $x = \begin{bmatrix} \frac{1}{\sqrt{\prod}} \\ 2 \end{bmatrix}$ and $\mu = \begin{bmatrix} 0 \\ 2 \end{bmatrix}$, we have

$$P(x|\mu,\sigma^2) = exp(-\prod((\frac{1}{\sqrt{\prod}}-0)^2 + (2-2)^2))$$

$$P(x|\mu,\sigma^2) = exp(-\prod\frac{1}{\prod})$$

$$P(x|\mu,\sigma^2) = exp(-1)$$

$$ln(P(x|\mu,\sigma^2)) = ln(exp(-1)) = -1$$

Submit You have used 1 of 2 attempts

Answers are displayed within the problem

Discussion

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