ML HW2 Report

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1. Why we take log when implement the Bayesian classifier?

Since log can turn multiply and division into addition and subtraction, and that would be easier for computer to calculate the answer.

2. Difference between Naïve Bayesian and Gaussian Naïve Bayesian classifier.

The condition probability function is different, and I think what cause to that is the relationship between X and y. In basic part, X and y may have no something special distribution way; but in advanced part, X and y are normally distributed, that's why we use Gaussian PDF to calculate the probability.

3. Difficulty I encountered.

In advanced part, I've met a weird thing that all the predicted result of train set are 0, which makes me very confused.

4. How I solved the difficulty and my reflections.

Since none of the value in train_predictions is 1, I have no choice but need to check where my prediction functions go wrong. After debugging for a while and then discuss with my classmate, we fixed two bugs of my code.

One is that when calculating likelihood, we have to give the function 'mean' and 'var', and then return the result of $\frac{\exp\left(-\frac{(x-\mu)^2}{2\sigma^2}\right)}{\sqrt{2\pi\sigma^2}}$, but I think the σ is var, so I wrote

"return math.exp(-((x - mean) ** 2 / (2 * var ** 2))) / (2 * math.pi * var ** 2) ** (1 / 2)"
in my '_calculate_likelihood()' function, which is very funny after we found this error.

The other bug is that after we calculate the likelihood, we have to take log of the likelihood, and add the result to 'log_likelihood', but I thought that we need to add all the likelihood into 'log_likelihood' and then take log of it. I quickly fixed the bug by change the order of adding and taking log while I found that.

My reflection is that I need to double, or even triple check my code, or it will happen again someday.