**CS542 Machine Learning**

**Homework 5**

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**8.3**

But for and

By the summation rule:

,

The rule of conditional probability applying the product:

Use similar technique:

and

**8.4**

The value of and were computed as follow:

|  |  |
| --- | --- |
|  |  |
| 0 | 0.600 |
| 1 | 0.400 |

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 0 | 0 | 0.800 |
| 0 | 1 | 0.400 |
| 1 | 0 | 0.200 |
| 1 | 1 | 0.600 |

Use the rule of product:

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 0 | 0 | 0.400 |
| 0 | 1 | 0.600 |
| 1 | 0 | 0.600 |
| 1 | 1 | 0.400 |

Multiply all the value

Corresponding directed graph:

b

c

a

**8.11**

and

Use Bayse Theorem and marginalizing:

**8.14**

The energy function is where and

Set

When the energy is the lowest, the probable configuration will be the most.

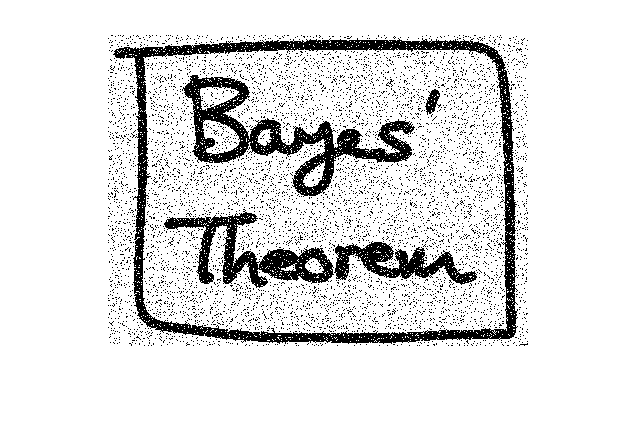
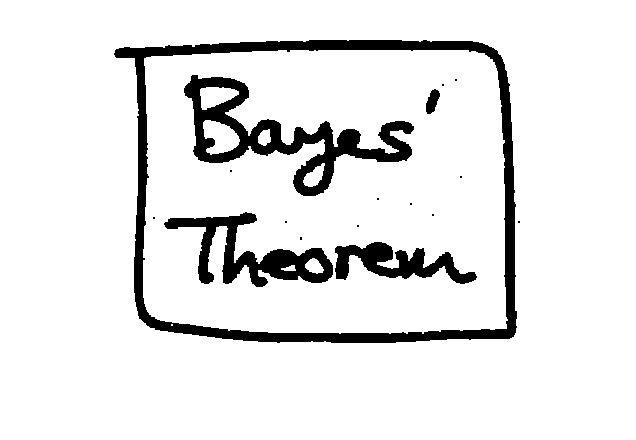
When the negative sign in form of stays, can only happen if and are both 1 or both negative.

for all

**Programming**

1. First change the image to gray scale, then do the calculation.

**Before: After:**

When , and , the accuracy I got is 99.38%

1. For this part, I incremented the pixel, decremented the pixel, or left the pixel the same. And from the pictures below, it’s obvious that the picture of the after one is much more better.

**Before: After:**

