If given Poisson distribution:

The total likelihood

Assume , which means the prob of x(i) belongs to jth Poisson distribution with given **.**

We can add in to the likelihood by:

according to the Jensen’s theory.

Then for E step, still, we calculate the prob:

In M step, we should maximize the likelihood by choose the , means that:

Then we can have the minimum by chose the where it’s derivative equals 0

(1)

First, assuming

(2)

By solving equation (1), we can have

By solving equation (2), we need to add normalization term

Then we should simplify the origin function with only terms has :

then use Lagrangian function

And

So