

EM applied to gaussian mixture model

Source: <http://sci.tech-archive.net/Archive/sci.stat.math/2007-04/msg00466.html>

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Hi,

i'm implementing the EM algorithm for gaussian mixtures (in R^2) but i'm having serious problem with it.

I will do an example.

In R^2 we have three data points

$x_1=(1,2), x_2=(1,1), x_3=(-2,1)$

I use 2 components, with mean $m_1 = x_1=(1,2)$, $m_2=x_3=(-2,1)$ with weights $w_1=1/2$, $w_2=1/2$ (generally speaking, every component's mean will be set to one of the dataPoints, chosen in a random way).

Now i must initialize the covariance matrixes, but i don't know how to do it.

I have read that i can "select the covariance matrix of the whole data set for each of the initial K covariance matrices", where K is the number of components, but i don't know how the covariance matrix for the whole data set is defined.

Finally, in the M-step, there is the update of the covariance matrices. I'm referring to

<http://www.stat.wisc.edu/~mchung/teaching/stat992/lec33.pdf>

In that formula, the author write

$$(x(i) - m_k)(x(i) - m_k)^t$$

where m_k is the updated mean of the component k, $x(i)$ is the i-th data component (this is only a part of the formula). I think that this vector operation is the Kronecker vector product (see http://en.wikipedia.org/wiki/Tensor_product).

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Is this right?!

What if the determinant of one of the covariance matrices becomes 0? I know that they are positive definite (so their determinant should be always > 0), but i have this problem.

There are two reason:

1. maybe i setup the covariance matrices in the wrong way
2. maybe i update the covariance matrices in the wrong way

I think that all the other step are implemented in the right way.

Help please!!!

Source code, web sites, books, suggestions are all welcomed!!
Thank you.

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