EM for Gaussian mixtures

9 questions

1 point

1.
(True/False) While the EM algorithm maintains uncertainty about the cluster assignment for each observation via soft assignments, the model assumes that every observation comes from only one cluster.

- True
- False

1 point

2.
(True/False) In high dimensions, the EM algorithm runs the risk of setting component variances to zero.

- True
- False

1 point

3.
In the EM algorithm, what do the E step and M step represent, respectively?

- **E**stimate cluster responsibilities, **M**aximize likelihood over parameters
- **E**stimate likelihood over parameters, **M**aximize cluster responsibilities

- **E**stimate number of parameters, **M**aximize likelihood over parameters
- **E**stimate likelihood over parameters, **M**aximize number of parameters

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1 point

4.
Suppose we have data that come from a mixture of 6 Gaussians (i.e., that is the true data structure). Which model would we expect to have the highest log-likelihood after fitting via the EM algorithm?

- A mixture of Gaussians with 2 components
- A mixture of Gaussians with 4 components
- A mixture of Gaussians with 6 components
- A mixture of Gaussians with 7 components
- A mixture of Gaussians with 10 components

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1 point

5.
Which of the following correctly describes the differences between EM for mixtures of Gaussians and k-means? Choose all that apply.

- [ ] k-means often gets stuck in a local minimum, while EM tends not to
- [ ] EM is better at capturing clusters of different sizes and orientations
- [ ] EM is better at capturing clusters with overlaps
- [ ] EM is less prone to overfitting than k-means
- [ ] k-means is equivalent to running EM with infinitesimally small diagonal covariances.

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1 point

6.

Suppose we have a Gaussian mixture model of 3-dimensional data with 4 components, and we use a model with full covariance matrices. How many parameters are in the model?

~~36~~

1 point

7.

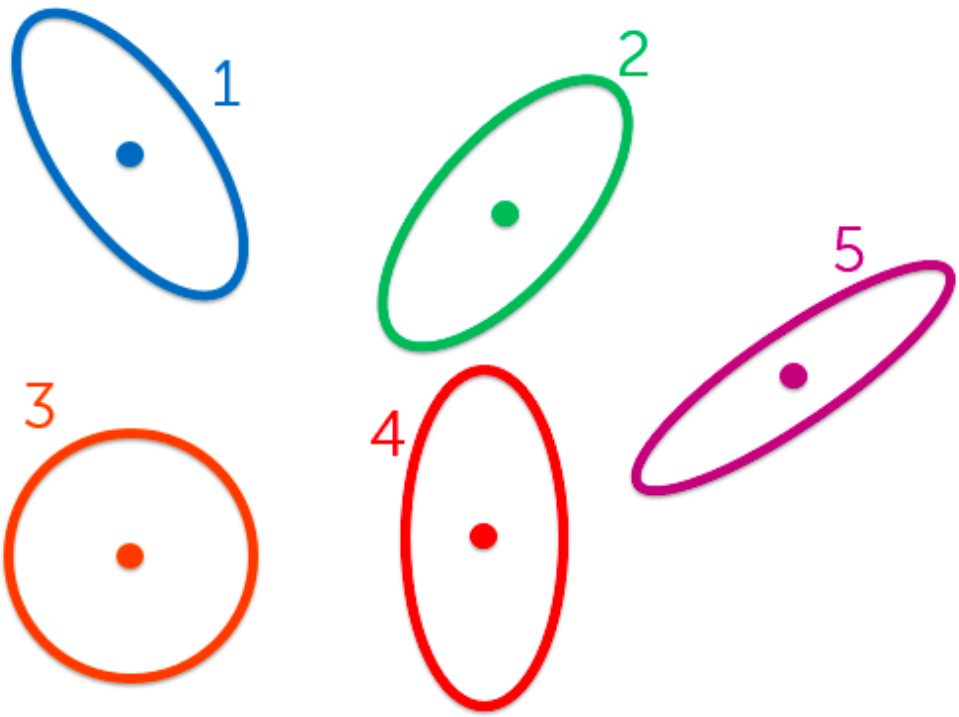
Suppose we have a Gaussian mixture model of 4-dimensional data with 5 components, and we instead assume diagonal covariance matrices. How many parameters are in the model?

~~80~~

1 point

8.

Which of the following contour plots describes a Gaussian distribution with diagonal covariance? Choose all that apply.



- [ ] (1)
- [ ] (2)
- [ ] (3)
- [ ] (4)
- [ ] (5)

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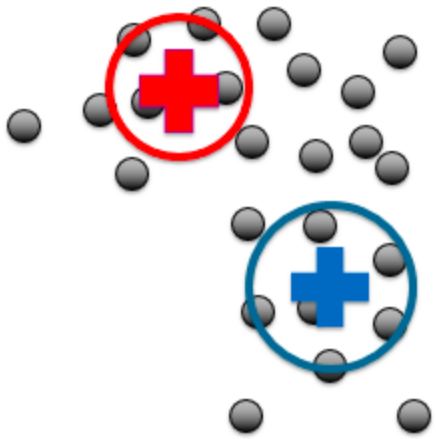
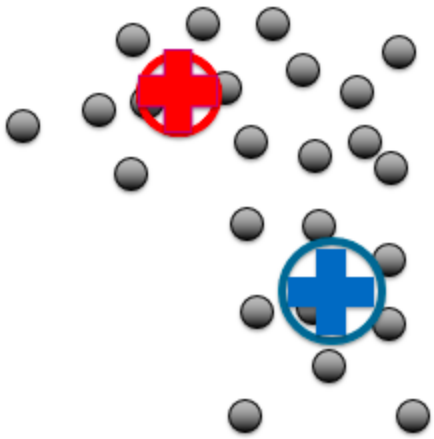
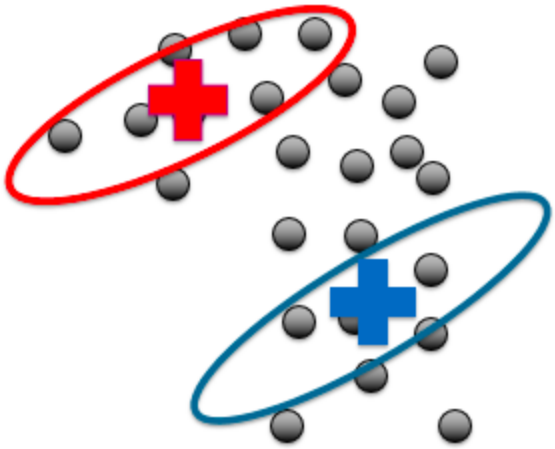
2 points

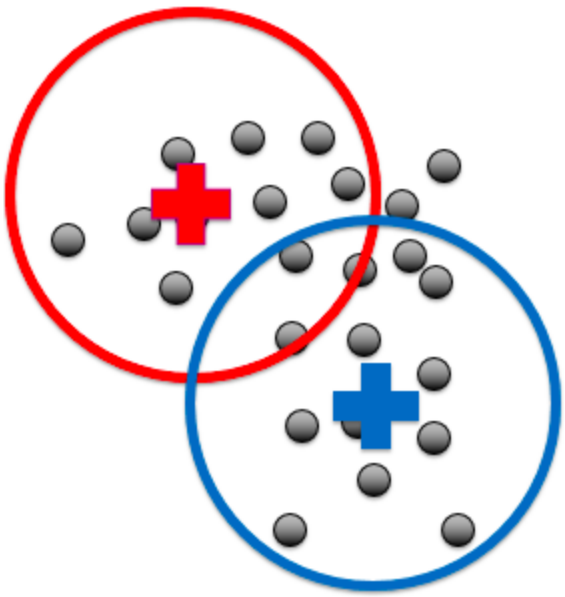
9.
Suppose we initialize EM for mixtures of Gaussians (using full covariance matrices) with the following clusters:

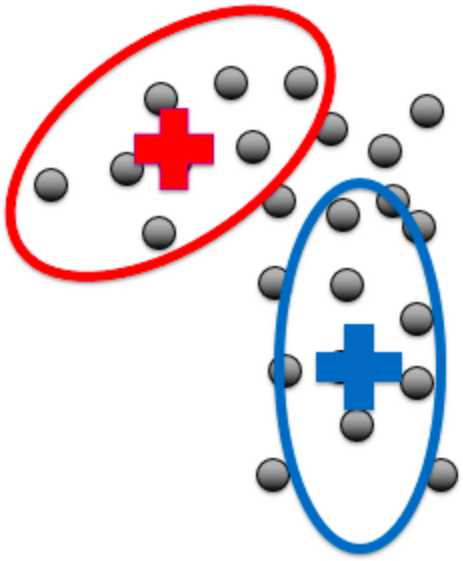


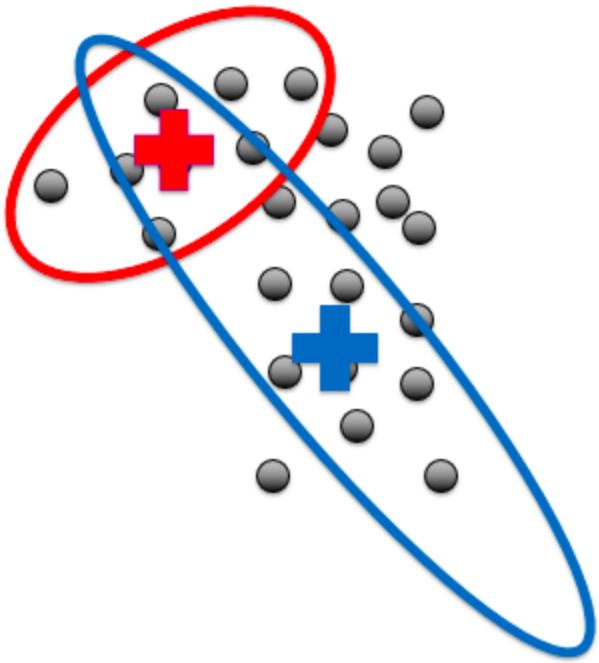
Which of the following best describes the updated clusters after the first iteration of EM?











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