# Problem Set 2

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**I. Short Answer Problems**

1. The mean-shift algorithm would be appropriate to recover the model parameter hypotheses from the continuous vote space.

For k-means algorithm, it needs evaluation of the distance between the hypothesized center to all bins, which is impossible to do with a continuous vote space.

For graph-cuts algorithm, it is applied to the situation where the space has been discretized into single units like pixels in an image rather than the case mentioned above.

For mean-shift algorithm, it only needs one parameter describing the window size and unnecessarily to calculate all votes placed in the vote space. Hence in this case, mean-shift algorithm is the most appropriate one.

2. K-means algorithm, utilizing Euclidian distance as distinguishing criteria, it may have unexpected clustering. If the given dataset is two circles, the results would be two half circles for each cluster rather than two circles by human clustering. And k-means plays poor in clusters within clusters. It attempts to find the center of clusters and then try to minimize the sum of squared differences among all the points near the cluster centers. Therefore, it cannot make the image given, it can only split the circles in half cleanly.

3. First, find the center of mass point for each blob.

Then, extract radius invariant circularity feature.

Finally, cluster the blobs according to their circularity feature.

1) Find the center of mass point for each blob:

for each pixel in blob:

sum\_of\_pos += pos(pixel)

center\_of\_mass = sum\_of\_pos/size(blob)

return center\_of\_mass

2) Extract radius invariant circularity feature:

radius\_mean = size(blob)

for each pixel in boundary(blob):

sum\_square\_distance += (center\_of\_mass-position(pixel))^2

circularity = sum\_square\_distance/size(boundry(blob))

return circularity

3) Clusters k-means(circularity[],k)

return k-means = circularity[]

**II. Programming**