Draft Design

Logical Model

#1 **Region Matrix**

- List <Region>

#2 **Region**

- imageID
- regionID
- label_vector (label histogram, hashset <label_ID, count>, label_ID can be seen from label file, it's -1 to 7, default value is same with image label histogram)
- feature_Vector (histogram, List<double>)
- region size percentage - β

File Handling - Setup Region Matrix

#1 **Parse Mask File**

Image_id

Region_id

region size percentage - β in the paper

#2 **Parse Histogram File**

Region Feature Vector

#3 **Parse Label File**

Region label vector

Main Process For Label Propagation

loop J from 1 to RegionMatrix.size

1. Pick RegionMatrix[J] as re-constructed Region
2. generate Y' from RegionMatrix[J].FeatureVector

$$y' = \begin{bmatrix} y \\ 0_{N\times 1} \end{bmatrix}$$

3. generate A'
   - Use all remaining regions as candidates, select regions by looping Matrix & RegionIndex != J)
   - Use FeatureVector and region size percentage – **β** to generate A'

$$B = \begin{bmatrix} \beta_{1,1} & \dots & \beta_{1,n_1} & \dots & 0 & \dots & 0 \\ 0 & \dots & 0 & \dots & 0 & \dots & 0 \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ 0 & \dots & 0 & \dots & \beta_{N,1} & \dots & \beta_{N,n_N} \end{bmatrix},$$

$$, A' = \begin{bmatrix} A, I_{m\times m}, 0_{m\times N} \\ B, 0_{N\times m}, -I_{N\times N} \end{bmatrix},$$

4. Send Y' , A' to SLEP, to get sparse code vector (**α'** in the paper).

5. Use α' to get selected Regions (SR)

   solve α'.

Loop i =1 to RegionMatrix.size -1 (all but re-constructed region),

When i < J, α'[i] != 0, then RegionMatrix [i] is one of selected Region.

When i>= J, α'[i] != 0, then RegionMatrix [i+1] is one of selected Region.

$$, \alpha' = \begin{bmatrix} \alpha \\ \epsilon \\ \gamma \end{bmatrix},$$

Note: I think we just care about the α in α', that's the first (RegionMatrix.size -1) items in the array a'.

6. label propagation

get common labels between RegionMatrix[J] and selected Regions (SR) generated from Step 5, update label histogram of RegionMatrix[J] as well as Selected Regions (SR)

Main Process For Label Selection for Region

1. Just pick the highest rank label from label histogram of each region.
2. If highest rank has more than 1 label, calculate other regions of the same image, then decide with information what label left for this image.