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Initial Loading

Getting a starting image

```
load('../data/assignmentSegmentBrainGmmEmMrf.mat');

Y = imageData;
M = imageMask;
K = 3;
X = getStartingLabel(Y, M, K);
u = zeros(1, K);
s = zeros(1, K);
beta = 0.36;

for label = 1:K
    positions = X == label;
    u(1, label) = mean(Y(positions));
    s(1, label) = std(Y(positions));
end;
```

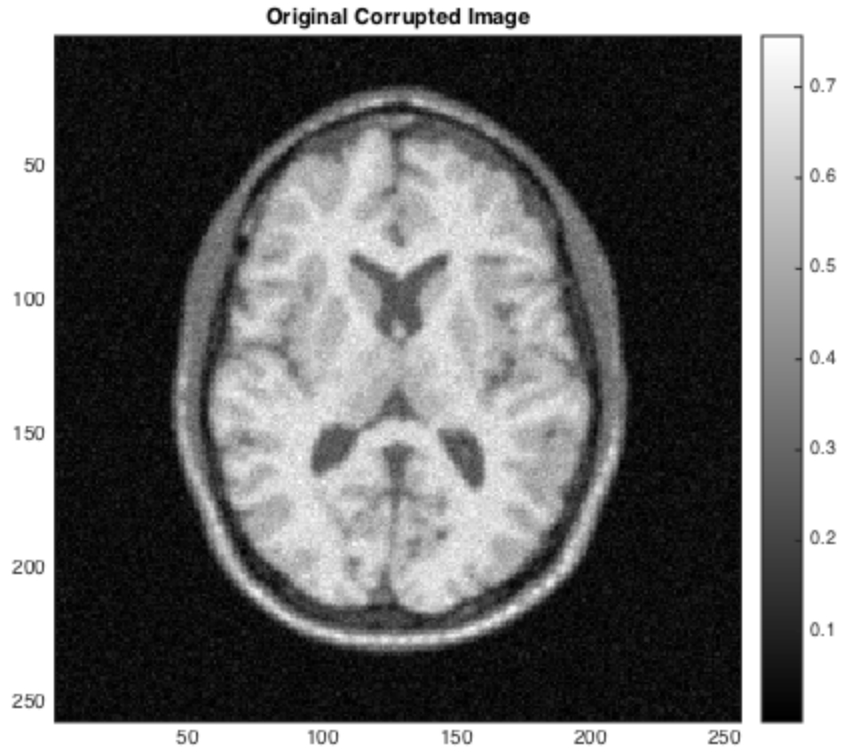
GMM EM MRF With beta = 0.36

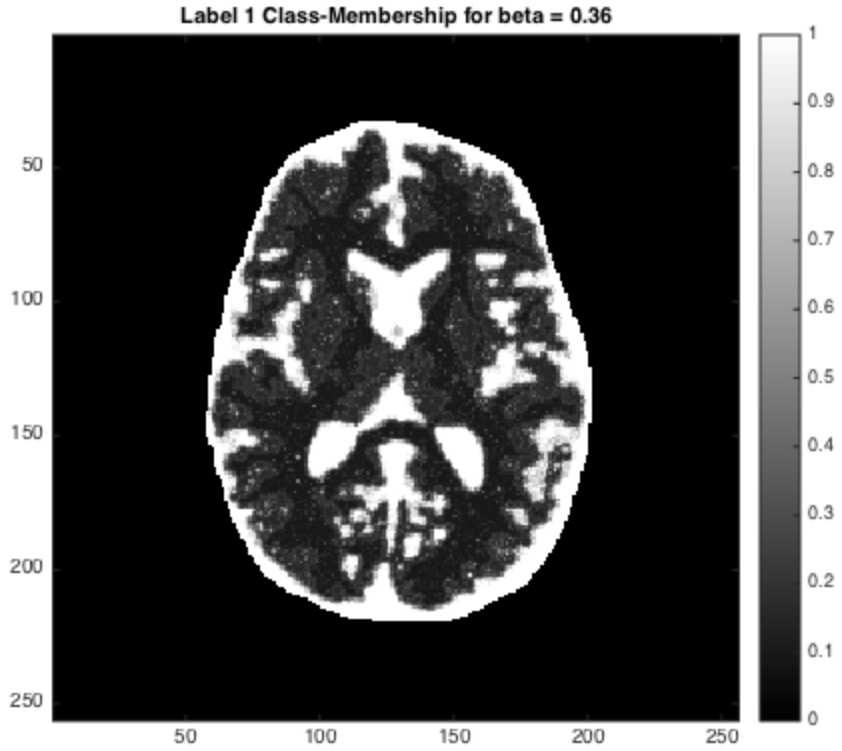
Gaussian Mixture Model, with Expectation Maximisation with potential beta equal to 0.36

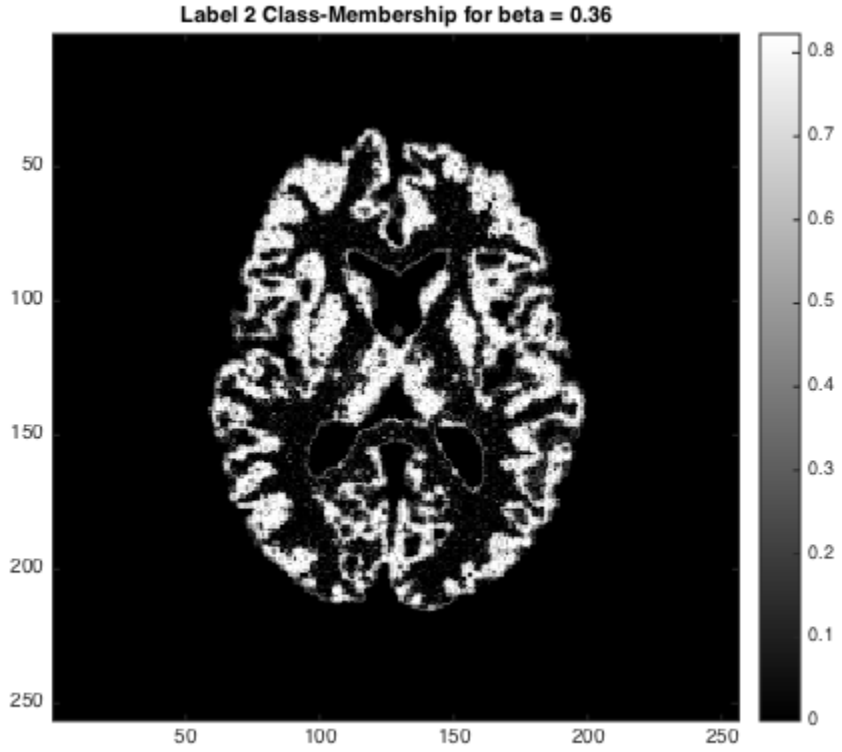
```
[L, G] = getEMLabels(Y, M, K, X, u, s, beta, 1);
showImage(imageData, 'Original Corrupted Image');
showImage(G(:, :, 1), 'Label 1 Class-Membership for beta = 0.36');
showImage(G(:, :, 2), 'Label 2 Class-Membership for beta = 0.36');
showImage(G(:, :, 3), 'Label 3 Class-Membership for beta = 0.36');
showImage(L, 'GMM-MRF-EM Optimised Image Segmentation for beta = 0.36');
```

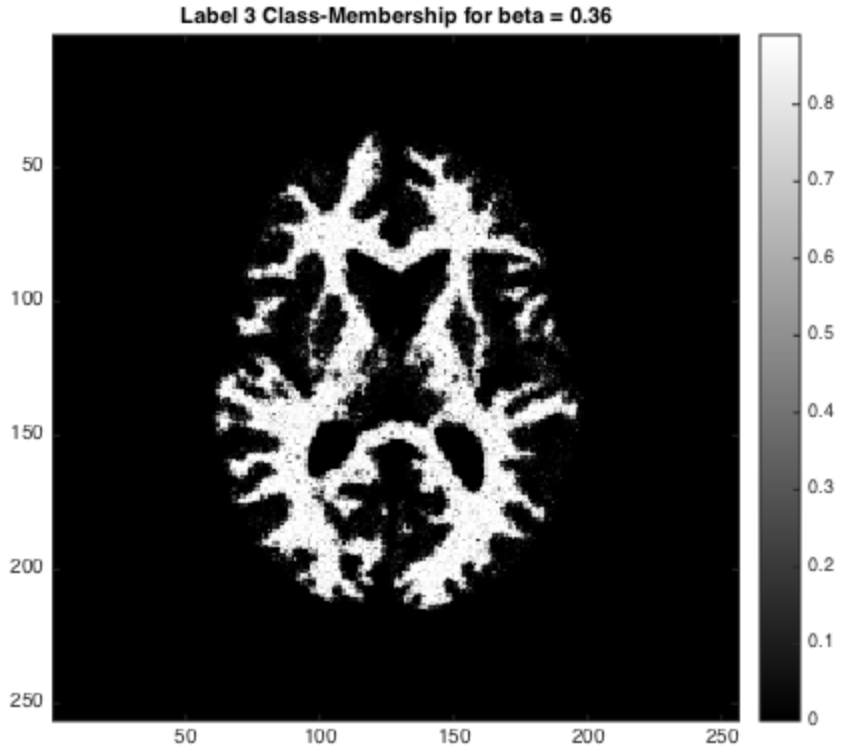
```
ICM : P(x | y, beta, theta) : 1.419277e+05 => 1.026771e+05
ICM : P(x | y, beta, theta) : 1.505713e+05 => 8.570159e+04
ICM : P(x | y, beta, theta) : 1.554472e+05 => 7.837572e+04
ICM : P(x | y, beta, theta) : 1.581625e+05 => 7.546548e+04
ICM : P(x | y, beta, theta) : 1.589156e+05 => 7.505116e+04
ICM : P(x | y, beta, theta) : 1.581310e+05 => 7.642055e+04
ICM : P(x | y, beta, theta) : 1.569812e+05 => 7.784852e+04
ICM : P(x | y, beta, theta) : 1.554663e+05 => 7.967969e+04
ICM : P(x | y, beta, theta) : 1.538101e+05 => 8.193528e+04
ICM : P(x | y, beta, theta) : 1.519760e+05 => 8.478754e+04
```

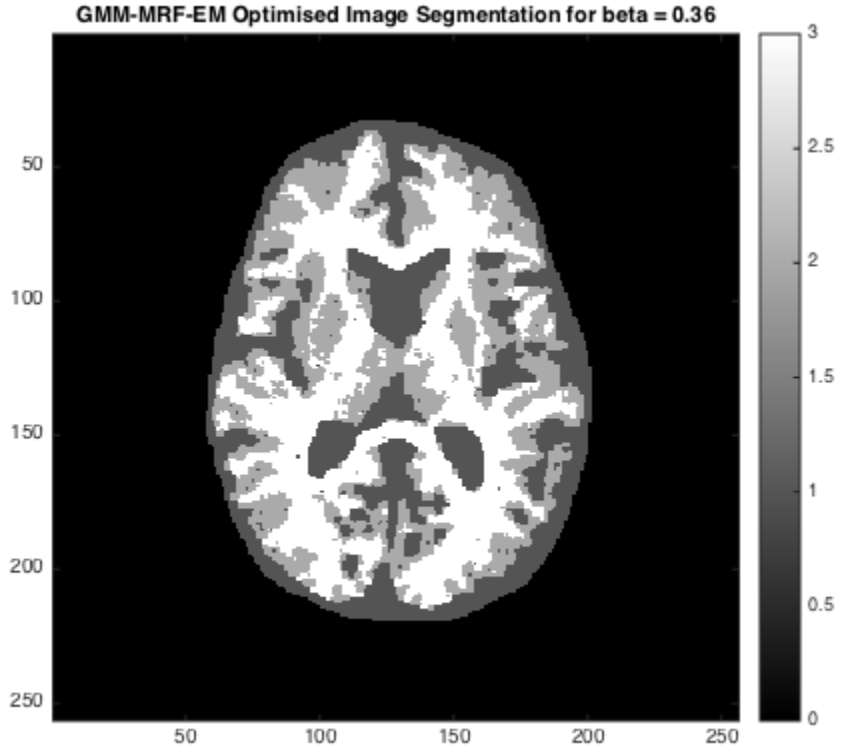
```
ICM : P(x | y, beta, theta) : 1.505492e+05 => 8.724422e+04
ICM : P(x | y, beta, theta) : 1.493941e+05 => 8.924541e+04
ICM : P(x | y, beta, theta) : 1.486629e+05 => 9.060513e+04
ICM : P(x | y, beta, theta) : 1.482439e+05 => 9.144165e+04
ICM : P(x | y, beta, theta) : 1.480747e+05 => 9.178758e+04
ICM : P(x | y, beta, theta) : 1.479040e+05 => 9.212759e+04
ICM : P(x | y, beta, theta) : 1.478269e+05 => 9.230496e+04
ICM : P(x | y, beta, theta) : 1.478146e+05 => 9.235627e+04
ICM : P(x | y, beta, theta) : 1.478095e+05 => 9.238744e+04
ICM : P(x | y, beta, theta) : 1.477734e+05 => 9.245687e+04
ICM : P(x | y, beta, theta) : 1.478252e+05 => 9.238860e+04
ICM : P(x | y, beta, theta) : 1.478061e+05 => 9.244655e+04
ICM : P(x | y, beta, theta) : 1.478264e+05 => 9.242367e+04
ICM : P(x | y, beta, theta) : 1.478326e+05 => 9.243043e+04
ICM : P(x | y, beta, theta) : 1.478064e+05 => 9.247801e+04
```




Label 1 Class-Membership for beta = 0.36
50
100
150
200
250
50
100
150
200
250
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0


Label 2 Class-Membership for beta = 0.36
50
100
150
200
250
50
100
150
200
250
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0


Label 3 Class-Membership for beta = 0.36
50
100
150
200
250
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0

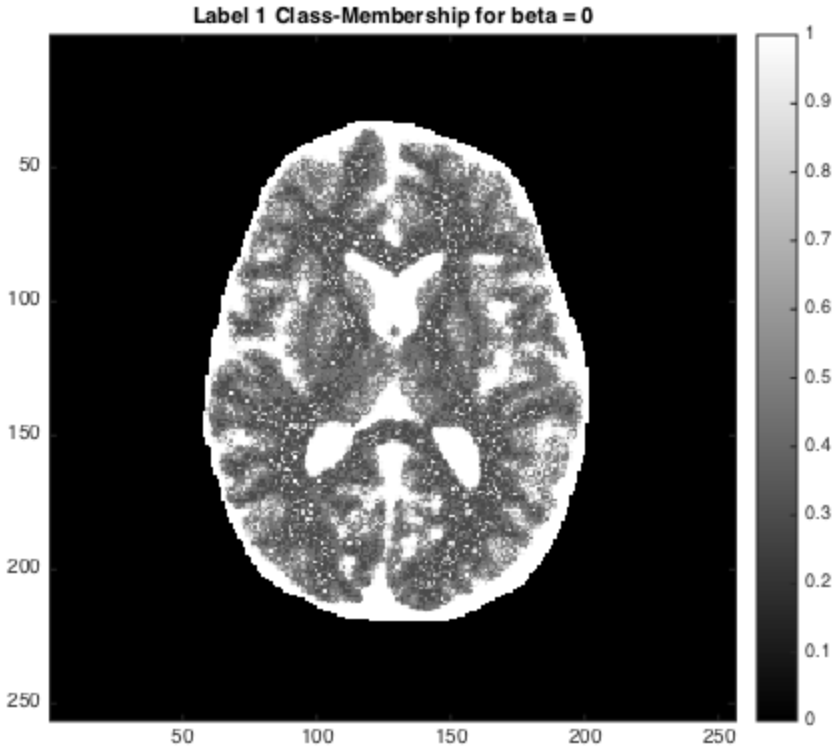

GMM-MRF-EM Optimised Image Segmentation for beta = 0.36
50
100
150
200
250
3
2.5
2
1.5
1
0.5
0

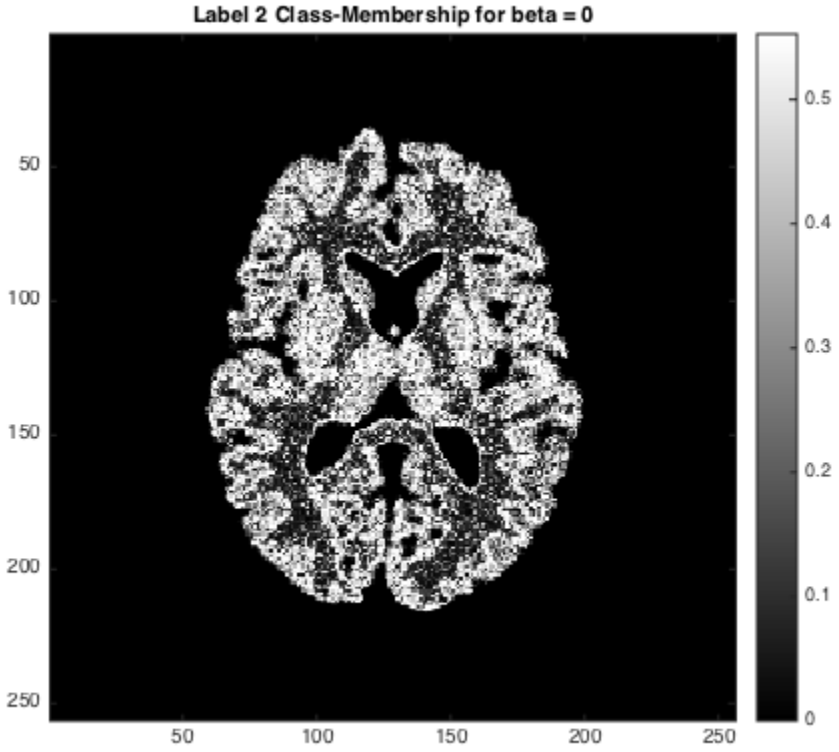
GMM EM MRF With beta = 0

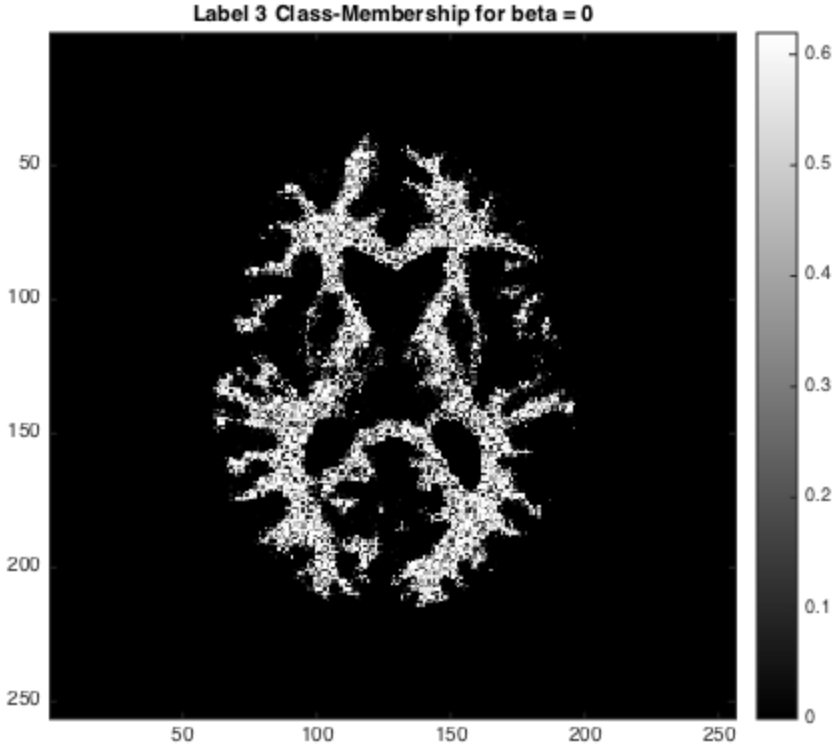
Gaussian Mixture Model, with Expectation Maximisation with no MRF

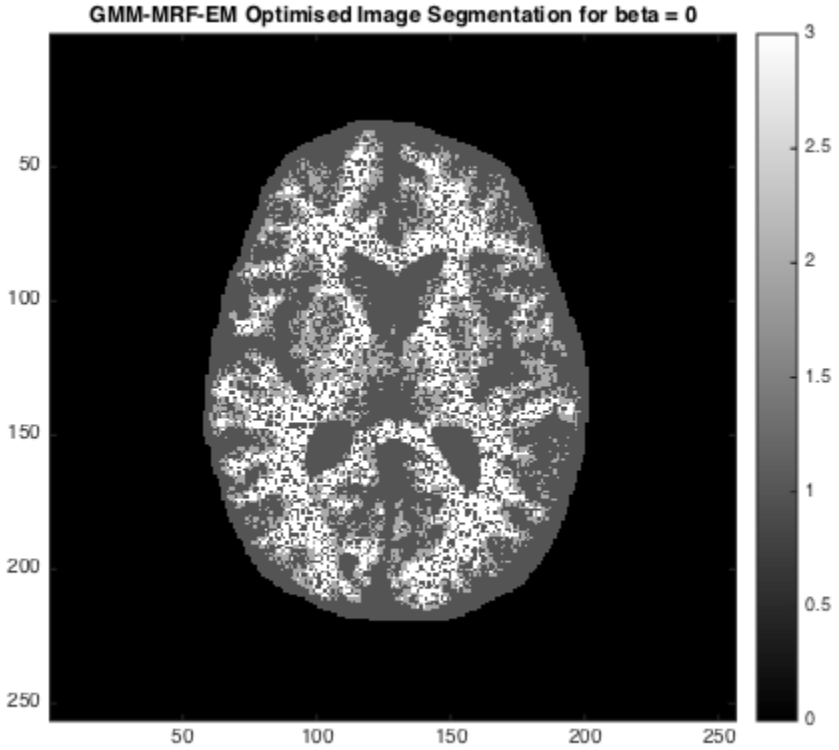
```
[L, G] = getEMLabels(Y, M, K, X, u, s, 0, 1);
showImage(G(:, :, 1), 'Label 1 Class-Membership for beta = 0');
showImage(G(:, :, 2), 'Label 2 Class-Membership for beta = 0');
showImage(G(:, :, 3), 'Label 3 Class-Membership for beta = 0');
showImage(L, 'GMM-MRF-EM Optimised Image Segmentation for beta = 0');
```

```
ICM : P(x | y, beta, theta) : 1.435754e+05 => 1.014720e+05
ICM : P(x | y, beta, theta) : 1.579995e+05 => 7.563005e+04
ICM : P(x | y, beta, theta) : 1.677809e+05 => 6.274537e+04
ICM : P(x | y, beta, theta) : 1.710243e+05 => 5.993031e+04
ICM : P(x | y, beta, theta) : 1.710912e+05 => 6.013437e+04
ICM : P(x | y, beta, theta) : 1.712094e+05 => 5.909322e+04
ICM : P(x | y, beta, theta) : 1.719222e+05 => 5.686855e+04
ICM : P(x | y, beta, theta) : 1.731992e+05 => 5.444063e+04
ICM : P(x | y, beta, theta) : 1.748066e+05 => 5.323053e+04
ICM : P(x | y, beta, theta) : 1.754483e+05 => 5.490718e+04
ICM : P(x | y, beta, theta) : 1.748218e+05 => 5.801548e+04
ICM : P(x | y, beta, theta) : 1.739007e+05 => 6.044417e+04
ICM : P(x | y, beta, theta) : 1.730242e+05 => 6.220000e+04
ICM : P(x | y, beta, theta) : 1.721453e+05 => 6.372952e+04
ICM : P(x | y, beta, theta) : 1.712360e+05 => 6.522482e+04
ICM : P(x | y, beta, theta) : 1.703325e+05 => 6.669486e+04
ICM : P(x | y, beta, theta) : 1.695194e+05 => 6.802342e+04
ICM : P(x | y, beta, theta) : 1.688440e+05 => 6.914973e+04
ICM : P(x | y, beta, theta) : 1.682950e+05 => 7.008594e+04
ICM : P(x | y, beta, theta) : 1.678601e+05 => 7.084555e+04
ICM : P(x | y, beta, theta) : 1.675169e+05 => 7.145995e+04
ICM : P(x | y, beta, theta) : 1.672535e+05 => 7.194363e+04
ICM : P(x | y, beta, theta) : 1.670554e+05 => 7.231754e+04
ICM : P(x | y, beta, theta) : 1.669096e+05 => 7.260149e+04
ICM : P(x | y, beta, theta) : 1.668059e+05 => 7.281173e+04
```


Label 1 Class-Membership for beta = 0
50
100
150
200
250
50
100
150
200
250
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0


Label 2 Class-Membership for beta = 0
50
100
150
200
250
50
100
150
200
250
0.5
0.4
0.3
0.2
0.1
0


Label 3 Class-Membership for beta = 0
50
100
150
200
250
0.6
0.5
0.4
0.3
0.2
0.1
0


GMM-MRF-EM Optimised Image Segmentation for beta = 0
50
100
150
200
250
3
2.5
2
1.5
1
0.5
0

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