CV192, HW # 3

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1 Part 1

Results Table						
	Exact Sampling		Method 1		Method 2	
Temp	E_{X11X22}	E_{X11X88}	E_{X11X22}	E_{X11X88}	E_{X11X22}	E_{X11X88}
1	0.95	0.90	0.93	0.54	0.95	0.89
1.5	0.75	0.54	0.75	0.36	0.76	0.53
2	0.49	0.13	0.49	0.10	0.50	0.11

Above you can see the table that contains the results of the 2 methods and the exact sampling from HW2 for 3 different temperatures. While the first row correspond to $Temp = 1$, the second row to $Temp = 1.5$ etc. we will discuss on the differences between those methods results:

1.1 Method 1 compare to Exact Sampling

For Method 1 we were asked to perform Gibbs sampling on 10,000 Markov chains while for each iteration consists of 25 sweeps (each sweeps involves 64 calculations). In this type of model every pixel is calculated by its prior which is calculated only by its neighbors. Therefore, at the first iterations the pixel is mostly affected by its neighbors, the more iterations we pass the more the pixel is affected by further pixels.

Hence, this explains our results at the table. We can see that for E_{X11X22} both Method 1 and Exact Sampling got almost the same results and this is because X11 and X22 are neighbors so method 1 converges quickly int that case, where for E_{X11X88} the results are different due to the fact that X11 and X88 are far from one another, therefore they needed more iterations to converge.

Moreover, we can see from the table that as the temperature goes higher the difference between the results of method 1 and exact sampling getting smaller. This phenomenon happens because of the effect the temperature has on the influence of the pixel neighbor's, the higher the temperature the less the pixel

is affected by its neighbors hence the similarity of results. When Temp getting lower the effect is higher and the less likely E_{X11X88} will be similar to the real distribution.

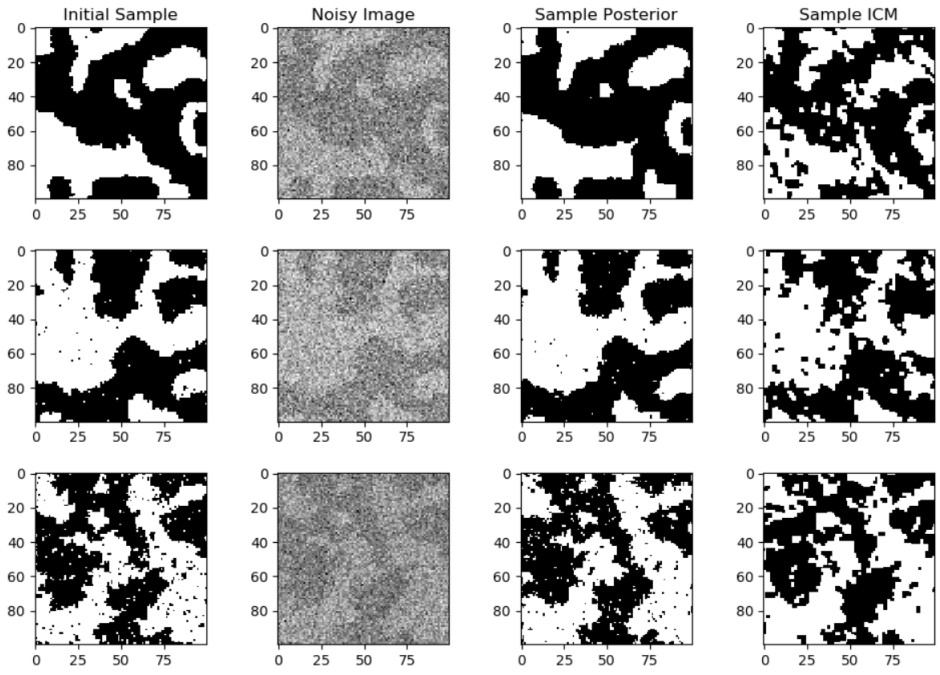
1.2 Method 2 compare to Exact Sampling

It is easy to see that for method 2 the results are almost identical to the exact sampling. This might be explained by the face we used many iterations $(24,000 \times 64)$ with an addition to the burn-in period. We can observe each iteration as a node in a Markov chain, the higher the number of iterations the higher the probability of expectation to be similar to the real distribution.

1.3 Method 1 compare to Method 2

In fact, because we saw that Method 2 and exact sampling is almost identical, the explanation of the comparison of method 1 to method 2 is the same as the explanation for method 1 to exact sampling.

2 Part 2



Above you can see the plot of all of the 4 samples with 3 different temperatures. While the first row correspond to $Temp = 1$, the second row to $Temp = 1.5$ etc.