Some more results - MoG denoising

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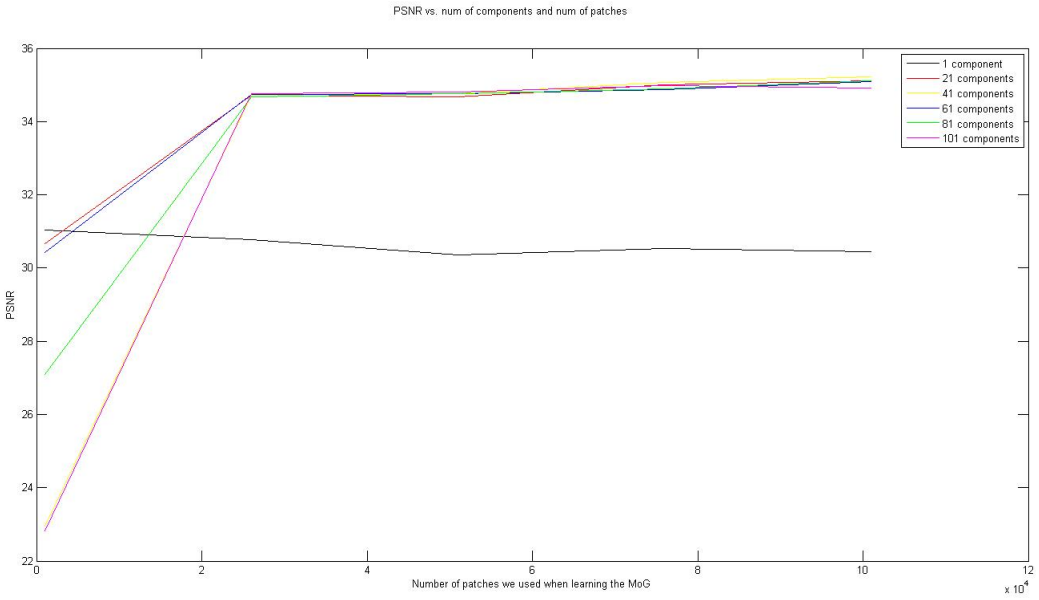
Checking the relation between number of patches, number of components and denoising results

In order to see what is the relation between the denoising ability of MMSE estimation using MoG prior on 8×8 patches, and the learning parameters [number of Guassians in the mixture, number of patches we use when learning], we ran a test in which we vary this parameters and check the denoising on the same image. The patches where taken form the Berkeley segmentation database.

Results

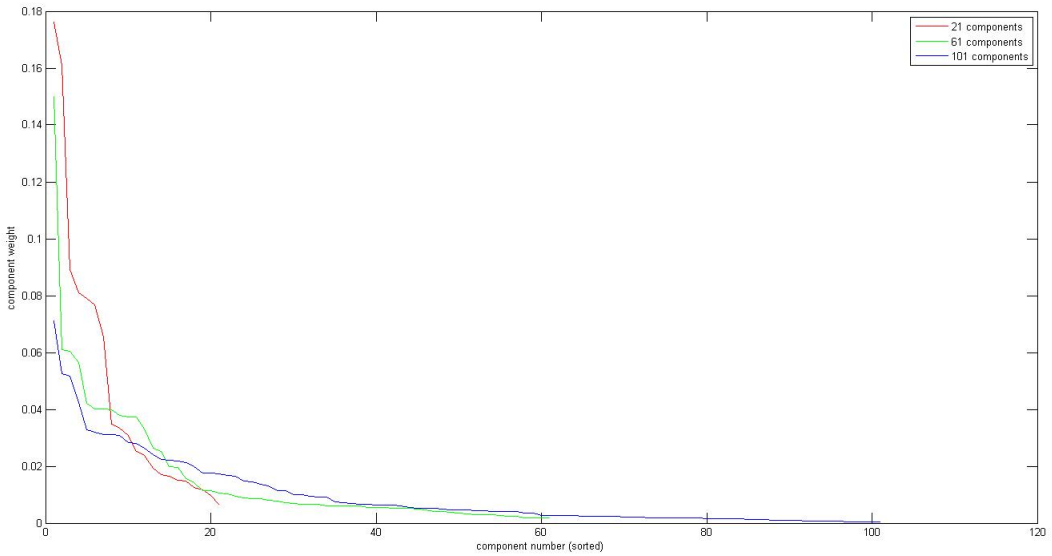
The following results were obtained:



It is clear that when we learn only one component [i.e. a single Gaussian prior] the denoising results are not good and are not affected by the change in the number of patches. The interesting fact we can see in the graph above is that in case we have more then 20 components and more than $2.5 \cdot 10^4$ patches the results are practically the same.

Component weights vs. number of components

A possible explanation to the phenomenon we saw above [i.e. the fact that there is no significant difference between 20 components and 100 components when we use a large data set for learning] is that maybe when we use more then 20 components, we will get components with weight that is practically zero. The following plot shows that it is not true and when we use more then 20 components we learn something meaningful, or in other words the weight of the extra components is not so small.

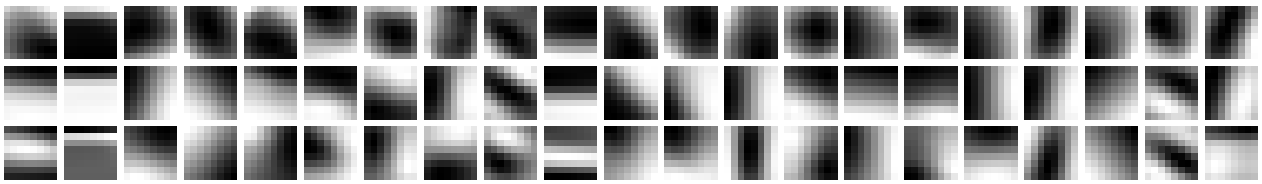


The difference between samples from a MoG and the strongest singular vectors of the strongest components

As a sanity check we visualize both the strongest singular vectors of the strongest components in the mixture, and in addition, we sample and visualize 16 samples from the mixture. We would like to see if indeed the singular vectors are a similar to the samples. We tried 2 mixtures and, at least for us, it seems like there is a similarity.

21 components mixture that was trained on 100K patches

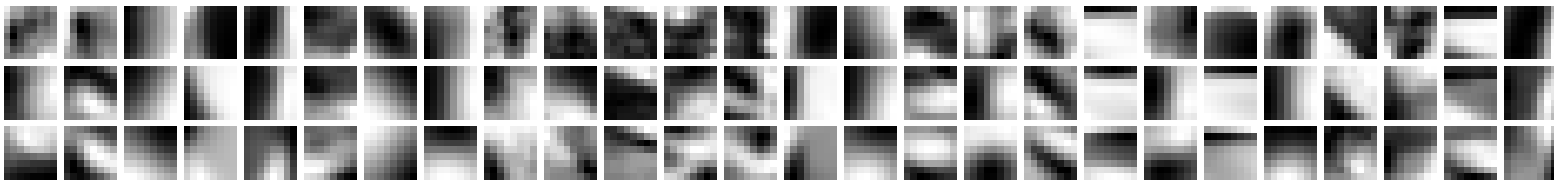
singular vector visualization



samples

101 components mixture that was trained on 100K patches

singular vector visualization



samples