Feedback — Quiz #8

Help Center

You submitted this quiz on **Fri 27 Feb 2015 4:10 PM IST**. You got a score of **9.00** out of **9.00**.

Question 1

What is the dictionary used in JPEG?

Your Answer		Score	Explanation
Fourier.			
Learned from data.			
Wavelets.			
Discrete cosine transform (DCT).	✔	1.00	
Total		1.00 / 1.00	

Question 2

Consider a 2×4 dictionary D composed of the transpose of the 2-dimensional atoms $(0, 1)$, $(1, 1)$, $(0, 1)$, and $(2, 1)$ (these form the columns of D). The sparsest representation of the vector $x = (2, 2)$ is given by the transpose of (these are the α):

Your Answer	Score	Explanation
$(0, 1, 0, 0)$		
$(2, 0, 2, 0)$		
$(0, 0, 0, 1)$		

$(0, 2, 0, 0)$ ✔	1.00	
Total	1.00 / 1.00	

Question 3

We want to obtain sparse representations of signals of dimension $N = 64$. We have a dictionary with $k = 100$ atoms. How many possible active sets (subspaces) we have with sparsity $L = 3$?

Your Answer	Score	Explanation
$\frac{100!}{97!3!}$ ✔	1.00	
$100 \cdot 64$		
$\frac{100!}{97!}$		
$100!$		
Total	1.00 / 1.00	

Question 4

Consider the Gaussian Mixture Model in the last video. We want to use it to represent signals in $N = 64$ dimensions. If we have $k = 100$ Gaussians in the mixture, then the number of possible active sets (subspaces) is

Your Answer	Score	Explanation
100 ✔	1.00	
$100!$		
$\frac{100!}{36!64!}$		
100×64		

Total	1.00 / 1.00

Question 5

Are sparse modeling and compressed sensing the same?

Your Answer		Score	Explanation
No, sparse modeling is about signal models and representations; compressed sensing is about an efficient novel data acquisition protocol.	✔	1.00	
Yes, they are both based on sparse representations and therefore are the same.			
Total		1.00 / 1.00	

Question 6

What needs to change in the general expression of image denoising we used for sparse modeling (equation in slide 4 of the 1st video this week) if instead of Gaussian additive noise we consider other types of additive noise?

Your Answer		Score	Explanation
We need to define a new prior G.			
We need to change the data fitting term, relationship with measurements, from a quadratic penalty to a penalty tailored to the noise.	✔	1.00	
We can't use this type of formulation for non-Gaussian noise, even if we modify its basic components.			
We need to work only with small amounts of non-Gaussian noise and linearize the problem.			

Total		1.00 / 1.00	

Question 7

Consider a dictionary D composed of both the complete DCT basis and the complete Fourier basis, a concatenation of both. Will the representation of a signal be unique when using such dictionary?

Your Answer		Score	Explanation
Yes, since both the DCT basis and the Fourier basis uniquely represent a signal.			
No, there will be at least two different possible representations for all signals.	✔	1.00	
Yes, a signal will pick some atoms from the DCT and some from the Fourier.			
Not all signals can be represented by such dictionary.			
Total		1.00 / 1.00	

Question 8

Consider you have a dictionary composed of 100 random 10×10 patches from the given image. If you perform sparse coding with this dictionary:

Your Answer	Score	Explanation
We will never be able to obtain a sparse representation from image patches as dictionary.		
The code will always be sparser in average than the one obtained with a DCT dictionary of the same size.		

The average number of non-zero coefficients will be equal or greater than when using the dictionary of the same size for sparse representations, obtained with $\min_{\mathbf{D},\alpha} \|\alpha\|_0 \quad \text{s.t.} \quad \sum_i \|\mathbf{D}\alpha - \mathbf{y}_i\|_2^2 \leq \varepsilon$ where $\mathbf{y}_i$ is an image patch. ✔	1.00	
Total	1.00 / 1.00	

Question 9

Consider a video and use the patches of the current frame as dictionary for encoding the next frame. For scenes with only static objects:

Your Answer		Score	Explanation
This will result in very sparse codes on average.	✔	1.00	
This is not as good as what MPEG does.			
This will not lead to sparse codes at all.			
Total		1.00 / 1.00	

Question 10

(Optional Programming Exercises)

- Download and experiment with the sparse modeling free software packages linked in the class website.
- Compare the results of sparse modeling image denoising with those of DCT-based image denoising as implemented in ipol.im
- Consider an image and select K patches from it as the dictionary; select those patches at random. With this dictionary perform sparse modeling image denoising and compare with the results obtained when learning the dictionary.
- Pick a particular example of sparse modeling image denoising and experiment with different dictionary sizes. Plot the histogram of atoms usage, meaning the number of times each atom is used considering all image patches.

Your Answer	Score	Explanation
Total	0.00 / 0.00	