Quiz 08.md

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Attempts	Score
1/1000	9/9

Question 01

What is the dictionary used in JPEG?

Answer

Discrete cosine transform (DCT).

Explanation

Question 02

Consider a 2$\times$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 `alpha`):

Answer

(0,2,0,0)

Explanation

Question 03

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?

Answer

(100!)/((97!)(3!))

Explanation

Question 04

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

Answer

100

Explanation

Question 05

Are sparse modeling and compressed sensing the same?

Answer

No, sparse modeling is about signal models and representations; compressed sensing is about an efficient novel data acquisition protocol.

Explanation

Question 06

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?

Answer

We need to change the data fitting term, relationship with measurements, from a quadratic penalty to a penalty tailored to the noise.

Explanation

Question 07

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?

Answer

No, there will be at least two different possible representations for all signals.

Explanation

Question 08

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

Answer

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.

Explanation

Question 09

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

Answer

This will result in very sparse codes on average.

Explanation