Feedback — Homework 12

Help

You submitted this quiz on **Mon 30 Jun 2014 2:11 PM UTC**. You got a score of **9.00** out of **10.00**. However, you will not get credit for it, since it was submitted past the deadline.

Question 1

Check all the problem(s) that admit sparse solution(s):

Your Answer		Score	Explanation
☑ $\min_{\mathbf{x}} \|\mathbf{x}\|_0 \ subject\,to\ A\mathbf{x} = \mathbf{b}$	✔	0.25	
☑ $\min_{\mathbf{x}} \|\mathbf{x}\|_p \ subject\,to\ A\mathbf{x} = \mathbf{b}$ (p is between 0 and 1)	✔	0.25	
☑ $\min_{\mathbf{x}} \|\mathbf{x}\|_1 \ subject\,to\ A\mathbf{x} = \mathbf{b}$	✔	0.25	
☐ $\min_{\mathbf{x}} \|\mathbf{x}\|_2 \ subject\,to\ A\mathbf{x} = \mathbf{b}$	✔	0.25	
Total		1.00 / 1.00	

Question 2

Natural image patches (unlike random noise) cannot be sparsely represented over a DCT dictionary.

Your Answer		Score	Explanation
○ True			
◉ False	✔	1.00	
Total		1.00 / 1.00	

Question 3

In video surveillance applications, background is modeled as a ______ matrix and moving parts are modeled via a ______ matrix.

Your Answer		Score	Explanation
○ low-rank, sparse			
◉ low-rank, low-rank	✖	0.00	
○ sparse, sparse			
○ sparse, low-rank			
Total		0.00 / 1.00	

Question 4

Which one of the greedy algorithms discussed in class is designed to solve the following problem?

$$\min_{A,X} \|AX - B\|_F$$
$$subject\ to\ \|X(:,i)\|_0 \leq k\ \forall i$$

Your Answer		Score	Explanation
◉ Method of Optimal Directions	✔	1.00	
○ This problem has a closed form solution and hence doesn't need to be solved in a greedy fashion.			
○ Matching Pursuit			
○ Orthogonal Matching Pursuit			
Total		1.00 / 1.00	

Question 5

Check all the norms that are convex functions.

Your Answer		Score	Explanation
☐ The L0 norm ($f(\mathbf{x}) = \|\mathbf{x}\|_0$)	✔	0.25	

The Lp norm ($f(\mathbf{x}) = \|\mathbf{x}\|_p$ where p is between 0 and 1.	✔	0.25
The L1 norm ($f(\mathbf{x}) = \|\mathbf{x}\|_1$)	✔	0.25
The L2 norm ($f(\mathbf{x}) = \|\mathbf{x}\|_2$)	✔	0.25
Total		1.00 / 1.00

Question 6

Which one of the following statements is true regarding the basis pursuit problem given by $\mathbf{x}^* = \underset{\mathbf{x}}{argmin} \|\mathbf{x}\|_1 \; subject\,to\, A\mathbf{x} = \mathbf{b}$?

Your Answer		Score	Explanation
If one of the columns in A is identical to $\mathbf{b} \neq \mathbf{0}$, then $\|\mathbf{x}^*\|_1 = 1$.			
If $\mathbf{b} = \mathbf{0}$ and A is full rank, then the problem has no solution since the constraint set becomes empty.			
$\mathbf{x}^*$ also minimizes the corresponding LASSO problem given by $\underset{\mathbf{x}}{min} \|A\mathbf{x} - \mathbf{b}\|_2^2 + \lambda\|\mathbf{x}\|_1$.			
none of the above.	✔	1.00	
Total		1.00 / 1.00	

Question 7

The singular value decomposition of the $n \times n$ square matrix A is given by $A = U\Sigma V^T$. Check all correct statements.

Your Answer		Score	Explanation
The nuclear norm of A (given by the sum of absolute values of entries on the diagonal of Σ) is an upper bound on the rank of A.	✔	0.25	
Only square matrices (such as A) have singular value decomposition.	✔	0.25	

☑ Matrices U and V are orthonormal bases for the n-dimensional space.	✔	0.25
☑ If Σ has only one non-zero entry, then A is definitely a rank-1 matrix.	✔	0.25
Total		1.00 / 1.00

Question 8

In this MATLAB assignment you will code-up the orthogonal matching pursuit (OMP) algorithm, as discussed in the lecture, to solve the following optimization problem: $\min_{\mathbf{x}} \|A\mathbf{x} - \mathbf{b}\|_2 \ subject\,to \ \|\mathbf{x}\|_0 \leq S.$ In this exercise $A = D + I$, where $D_{ij} = sin(i+j)$ for $1 \leq i, j \leq 10$ and I is the 10×10 identity matrix. Use A along with $\mathbf{b} = [-2, -6, -9, 1, 8, 10, 1, -9, -4, -3]^T$, and $S = 3$ to find the solution to the problem given above. Your solution $\mathbf{x}^*$ uses three columns of A in order to approximate $\mathbf{b}$. Type in the indices of these columns in ascending order separated by spaces. (Hint: $normc(A)$ normalizes the columns of A to a length of 1 in MATLAB.)

You entered:

2
5

Your Answer		Score	Explanation
2	✔	1.00	
5	✔	1.00	
9	✔	1.00	
Total		3.00 / 3.00	