PURDUE UNIVERSITY · CS 51500
MATRIX COMPUTATIONS

HOMEWORK
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Problem 0: Homework checklist

✓I didn't talk with any one about this homework.
✓Source-code are included at the end of this document.

Problem 1: Operations

1. $\begin{bmatrix} 1 & 1 & 2 \\ 3 & 5 & 8 \\ 13 & 21 & 34 \end{bmatrix} \begin{bmatrix} 1 & -2 & 3 \\ -4 & 5 & -6 \\ 7 & -8 & 9 \end{bmatrix} = \begin{bmatrix} 11 & -13 & 15 \\ 39 & -45 & 51 \\ 167 & -193 & 219 \end{bmatrix}$

2. $\mathbf{x} =$ `ones(1000,1)` $\mathbf{y} =$ `[1:1000]'` $\mathbf{x}^T\mathbf{y} = 500500.0$

Problem 4: Image downsampling

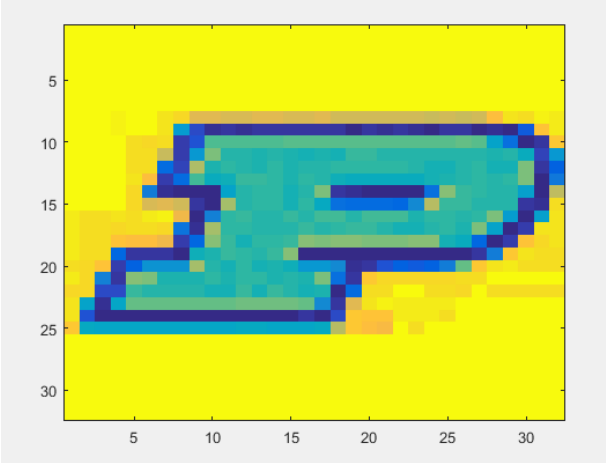
1.$\mathbf{y} = \boldsymbol{A}\mathbf{x}$ so A must be a 4×16 matrix. $y_i = \sum_{j=1}^{16} A_{ij}x_j$
$y_1 = (x_1 + x_2 + x_5 + x_6)/4$
$y_2 = (x_3 + x_4 + x_7 + x_8)/4$
$y_3 = (x_9 + x_{10} + x_{13} + x_{14})/4$
$y_4 = (x_{11} + x_{12} + x_{15} + x_{16})/4.$

Then
$\boldsymbol{A}_{11} = \boldsymbol{A}_{12} = \boldsymbol{A}_{15} = \boldsymbol{A}_{16} = 0.25$
$\boldsymbol{A}_{23} = \boldsymbol{A}_{24} = \boldsymbol{A}_{27} = \boldsymbol{A}_{28} = 0.25$
$\boldsymbol{A}_{39} = \boldsymbol{A}_{3,10} = \boldsymbol{A}_{3,13} = \boldsymbol{A}_{3,14} = 0.25$
$\boldsymbol{A}_{4,11} = \boldsymbol{A}_{4,12} = \boldsymbol{A}_{4,15} = \boldsymbol{A}_{4,16} = 0.25$

$$\boldsymbol{A} = \begin{bmatrix} 0.25 & 0.25 & 0 & 0 & 0.25 & 0.25 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0.25 & 0.25 & 0 & 0 & 0.25 & 0.25 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0.25 & 0.25 & 0 & 0 & 0.25 & 0.25 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0.25 & 0.25 & 0 & 0 & 0.25 & 0.25 \end{bmatrix}$$

2. The sum of diagonal elements of X is 24.2686

3. Color image: Grey image:
4. Resahpe command will reshape the input array into a $m \times n$ matrix, and return the new matrix.
5.
6. The image looks like this: It looks correct.
7. After applying 'interp2' function. The image would be like this:


5
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15
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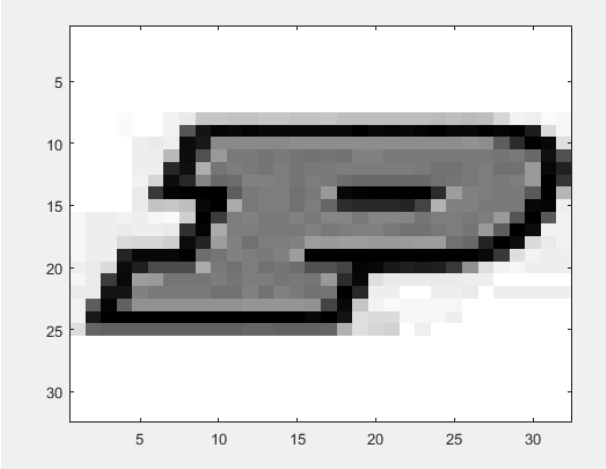
30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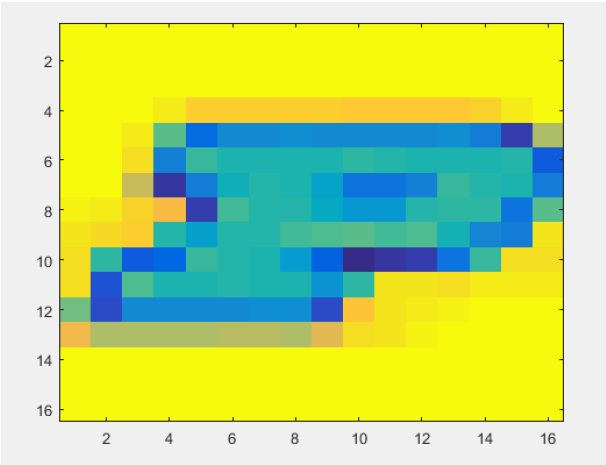
2
4
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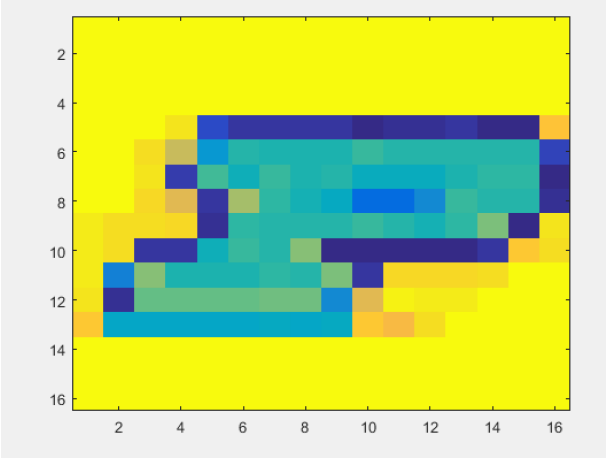
16


2
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