Indian Instiute of Engineering Science and Technology, Shibpur

Department of Information Technology

Simulation Lab 2020

Assignment – 3

Submission Deadline:17th February, 2020 Date: 10.02.2020

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1. Solve the following system of linear algebraic equations:

$$5x = 3y - 2z + 10$$

$$8y + 4z = 3x + 20$$

$$2x + 4y - 9z = 9$$

Do a `help slash` in MATLAB to explore possible solutions.

2. Obtain the eigenvalues and eigenvecors of the following matrix A using MATLAB:

$$A = \begin{bmatrix} 5 & -3 & 2 \\ -3 & 8 & 4 \\ 4 & 2 & -9 \end{bmatrix}$$

Hence check whether the resultant eigenvalues and eigenvectors obtained are in order. That is, check whether the i-th eigenvalue λ and i-th eigenvector v indeed satisfy the equation:

$$Av = \lambda v$$

3. Perform a Singular Value Decomposition of a given matrix A into orthogonal matrices U and V, and a diagonal matrix D (having singular values of A as its diagonal elements).

Use MATLAB function `svd`.

Also check whether $U * D * V = A$ is indeed satisfied.

4. Curve fitting is a technique of finding an algebraic relationship that "best" fits a given data distribution. You have to have an idea of what kind of relationship might exist between the input data (x_i) and output data (y_i).

   Use the curve fitting tool (`cftool`) of MATLAB to fit possible curves to a given data distribution, say,

$$x = [5\ 10\ 20\ 50\ 100]$$

$$y = [15\ 33\ 53\ 140\ 301]$$

5. Create *x* and *y* data:

```
>> x = 0: pi/30 : pi/3                  % x-data
>> y = sin(x) + rand(size(x))/100   % y-data (corrupted sine)
```

   Now fit appropriate curves to the above data distribution, and compare their fitness.

6. Generate the following vectors, where $y = f(x)$:
   x = [0, 0.785, 1.570, 2.356, 3.141, 3.927, 4.712, 5.497, 6.283]
   y = [0, 0.707, 1.000, 0.707, 0, -0.707, -1, -0.707, 0]

   Plot *y* vs. *x* in MATLAB.

   Now interpolate the above discrete data distribution at 50 equally spaced points, using the `interp1` function of MATLAB.

   Determine the major difference between curve fitting and interpolation.

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