1130-EMARO-MSA-1004# Signal Processing

T1: Introduction to MATLAB

Task 1

Create two vectors: $\mathbf{v_1} = [\ 0,0.1,0.2,0.3,.\ \ .\ .\ ,1]$ $\mathbf{v_2} = [1, 1.1, 1.2, 1.3, \ldots, 2]$

- Compute element-per-element product of the vectors.
- Compute dot product of the vectors.
- Compute cross product of the first three elements of the vectors (use function).`cross`

Task 2

Create the following matrix:

$$\mathbf{A} = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 10 & 6 \\ 7 & 8 & -2 \end{bmatrix}$$

Create a vector $\mathbf{b} = [1,5,8\ ]$ Solve the set of linear equations: $\mathbf{Ax} = \mathbf{b}^\mathsf{T}$.

Task 3

Using matrix $\mathbf{A}$ create a new matrix $\mathbf{B}$ (use vertical concatenation):;

$$\mathbf{B} = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 10 & 6 \\ 7 & 8 & -2 \\ 3 & 12 & -5 \end{bmatrix}$$

Create a vector $\mathbf{c} = [1,5,8,6\ \ ]$ using the previously defined vector $\mathbf{b}$ (use horizontal concatenation operator).,

Solve the set of linear equations: $\mathbf{Bx} = \mathbf{c}^\mathsf{T}$ using the least-squares method:

$$\mathbf{x} = (\mathbf{B}^\mathsf{T}\mathbf{B})^{-1}\mathbf{B}^\mathsf{T}\mathbf{c}^\mathsf{T}$$

Additional resources

- Quickly learn the essentials of MATLAB - official Matlab introduction and tutorial
- Getting started with MATLAB - documentation

Points will be cut for:

- repetitive code fragments - instead use loops (e.g. for, while)
- hardcoded values like vector lengths - instead use variables or function parameters
- bad code style - for every task create a Matlab function making all the computations, if necessary use more functions for doing internal computations,
- lack of comments in code