

Image processing with MATLAB® (25 hours)

This course deals with using MATLAB® Image Processing toolbox for image processing, analysis, visualization, and algorithm development. The training covers various topics such as importing and exporting images, pre- and post-processing of images, analysis and visualization of images, and spatial transformations and image registration.

COURSE CONTENT :

Introduction (1 hour)

- A quick overview of MATLAB® computing environment
- Overview of MATLAB® Image Processing toolbox
- Course content and material discussion

Acquiring and handling images in MATLAB® (6 hours)

- Connecting the hardware
- Retrieving hardware information
- Acquiring and viewing the image data
- Image file I/O
- Exploring image types (RGB, binary, intensity, and indexed images)
- Image type conversions
- The concept of color space and image color space conversions
- Finding pixel value information
- Computing mean and standard deviation of images
- Measuring properties of image regions

Image enhancement techniques (4 hours)

- Adjusting image intensity
- Image histogram operations: adjustment, equalization, and stretching
- multidimensional arrays
- Image arithmetic operations
- Cropping and resizing images
- Image alignment correction: rotating images

Image filtering (5 hours)

- Neighborhood and block processing of images
- Distinct block operations
- Sliding neighborhood operations
- Performing image convolution and correlation
- Averaging filters
- Region of interest processing
- Introduction to spatial and frequency domain filtering

**Image restoration techniques
(2 hours)**

- Reducing noise from images
 - De-blurring images
 - Correcting background illumination
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**Edge detection related operations
(2 hours)**

- Edges in an image
 - Detecting edges with various methods: Sobel, Prewitt, Roberts, Laplacian of Gaussian, zero cross and Canny.
 - Computing edge directive histogram
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**Image morphological operations
(2 hour)**

- Bridging unconnected pixels, cleaning, closing, and opening
 - Dilation and erosion
 - Identifying and labeling connected components
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**Image transforms
(3 hours)**

- Forward and inverse Discrete cosine transform
- Forward and inverse Fast Fourier transform
- Forward and inverse Radon transform
- Applying wavelet transform to images