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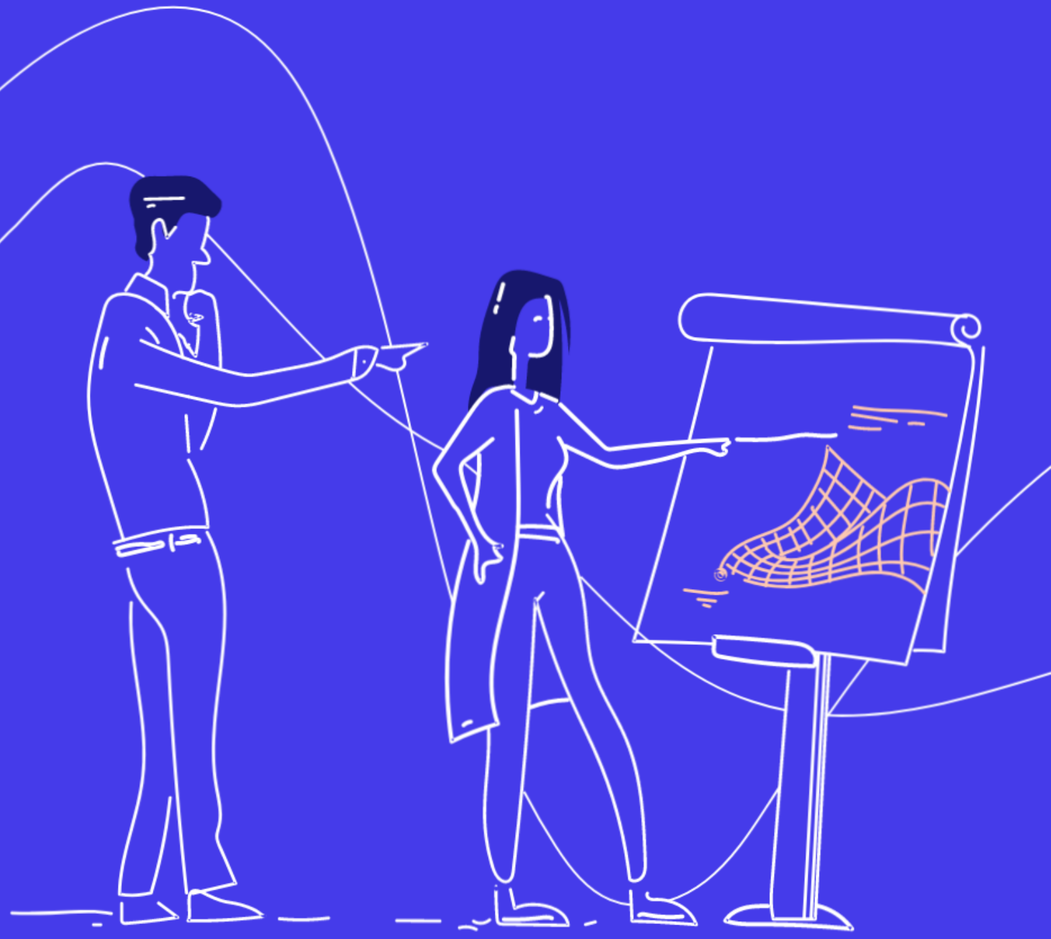
Image Processing with MATLAB



SciEngineer's training courses are designed to help organizations and individuals close skills gaps, keep up-to-date with the industry-accepted best practices and achieve the greatest value from MathWorks® and COMSOL® Products.

Image Processing with MATLAB

This two-day course provides a comprehensive introduction of reference-standard algorithms and workflow for image processing, analysis, visualization and algorithm development. Examples and exercises demonstrate the use of appropriate MATLAB and Image Processing Toolbox functionality throughout the analysis process.

Prerequisites

- MATLAB Fundamentals or equivalent experience using MATLAB.
- Basic knowledge of image processing concepts is strongly recommended.

TOPICS

Day 1

- Importing and Visualizing Images
- Preprocessing Images
- Color and Texture Segmentation
- Improving Segmentation

Day 2

- Finding and Analyzing Objects
- Detecting Edges and Shapes
- Spatial Transformation and Image Registration
- Automating Image Registration with Image Features

Importing and Visualizing Images

OBJECTIVE: Import and visualize different image types in MATLAB. Manipulate images for streamlining subsequent analysis steps.

- Importing, inspecting, and displaying images
- Converting between image types
- Visualizing results of processing
- Exporting images

Preprocessing Images

OBJECTIVE: Enhance images for analysis by using common preprocessing techniques such as contrast adjustment and noise filtering.

- Adjusting contrast
- Reducing noise with spatial filtering
- Equalizing inhomogeneous background
- Processing images in distinct blocks
- Measuring image quality

Color and Texture Segmentation

OBJECTIVE: Segment objects from an image based on color and texture. Use statistical measures to characterize texture features and measure texture similarity between images.

- Transforming between image color spaces
- Segmenting objects based on color attributes and color difference
- Segmenting objects based on texture using nonlinear filters
- Analyzing image texture using statistical measures like contrast and correlation

Improving Segmentation

OBJECTIVE: Improve binary segmentation results by refining the segmentation mask. Use interactive and iterative techniques to segment image regions.

- Using morphological operations to refine segmentation masks
- Segmenting images and refining results interactively
- Using iterative techniques to evolve segmentation from a see

Finding and Analyzing Objects

OBJECTIVE: Count and label objects detected in a segmentation. Measure object properties like area, perimeter, and centroids.

- Extracting and labeling objects in a segmentation mask
- Measuring shape properties
- Separating adjacent and overlapping objects with watershed transform

Detecting Edges and Shapes

OBJECTIVE: Detect edges of objects and extract boundary pixel locations. Detect objects by shapes such as lines and circles.

- Detecting object edges
- Identifying objects by detecting lines and circles
- Performing batch analysis over sets of images

Spatial Transformation and Image Registration

OBJECTIVE: Compare images with different scales and orientations by geometrically aligning them.

- Applying geometric transformations to images
- Aligning images using phase correlation
- Aligning images using point mapping

Automating Image Registration with Image Features

OBJECTIVE: Detect, extract, and match image features to automate image registration.

- Detecting and extracting features
- Matching features to estimate geometric transformation between two images

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