

Course Name: Introduction to Computer Vision

Course code: EE-511

Credits: 3-1-0-4 (Lectures-Assignments-Practicals-Total)

Prerequisites:

Elective/Core: Elective

Semester: Even

Preamble: The course covers some fundamental aspects and ideas of computer vision and some well-known application areas. It is a specialized course useful for post-graduate students or for high-level undergraduate, particularly who want to work in computer vision, image analysis, visual pattern recognition etc.

Course Outline:

- Mathematical preamble on relevant linear algebra and probability theory concepts.
 - Basics of image modelling and formation
 - Low-level vision: Feature detection, segmentation
 - 3D shape estimation using various visual depth cues
 - High-level vision: Recognition and scene analysis
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Modules:

1. Mathematical foundations: 5 lectures

Basics concepts in linear algebra, Variational calculus, singular value decomposition, principal component analysis, Bayesian theory, MAP and ML estimation, inverse and ill-posed problems.

2. Optics: 3 lectures

Camera models and Image formation models

3. Feature detection and matching: 8 lectures

Detecting point, edge and line features, Establishing feature correspondences, Applications involving geometric features

4. Shape from X: 13 lectures

Shape from shading, defocus. Stereo, Epipolar geometry, Optical flow, Feature tracking.

5. Recognition: 13 lectures

Object/face detection and recognition, instance recognition, category recognition, context and scene understanding.

Textbook

Computer Vision: Algorithms and Applications, Richard Szeliski, Springer 2010.

References

1. Multiple View Geometry in Computer Vision, 2/e, A. Zisserman and R. Hartley, Cambridge University Press, 2004.

2. Robot Vision, B.K.P. Horn, MIT Press, 1986.
3. Computer Vision: A Modern Approach, 2/e, David A. Forsyth and Jean Ponce, Prentice Hall, 2011.