COMPUTER VISION (IT524)

Objective:

Broad topics include discussions on approaches to 3D depth estimation using 2D images. Face recognition. Use of deep learning for Super-resolution, Object detection and recognition.

Pre-requisites :
Good Undersatnding of:

- Fundamentals of Digital Image Processing
- Linear Algebra
- Random variables
- Languages – Python/R (any of these)

Topics:

Brief ideas on image processing, Geometric transformation (Affine, Projective), Camera Models: Pin hole Camera model, Real Aperture Camera, Projective Geometry, Image formation, Camera matrix, Camera Calibration, Shape from stereo (stereopsis), correspondence problem, Ideas on estimation techniques LS (least squares), CLS (constrained least squares), Maximum likelihood (ML) estimation, Maximum Aposteriorie (MAP) estimation, Expectation maximization (EM algorithm), super-resolution imaging, Principal Component Analysis (PCA) for face recognition, Motion Field and Optical flow, Concepts of MRF (Markov random fields), depth from defocus (real aperture camera).

Outcome: The course would help the graduate students to understand the basic concepts in computer vision (how the computer can be used to perform the tasks of human vision system). Through lectures, programming assignments and presentations the students are provided with the learning experience of

1. Analysis of images for extracting the 3D coordinates of the object

2. Develop technical presentation skills
3. Solving the problems that are of ill-posed nature.

Text Books:

1. Multiple view geometry in computer vision: R. Hartley and A. Zisserman, Cambridge University Press
2. Robot Vision by BKP Horn, MIT Press
3. Introductory Techniques for 3-D Computer Vision by Trucco and Veri, Prentice Hall
4. Deep Learning: Ian Goodfellow, Yashua Bengio and Aaron Courvillee, MIT Press.

Evaluation Strategy:

Midsemester: 20%
Project: 40%
Attendance, Class participation, Assignments:10%
Endsemester Exam:30%

MAP TO PROGRAM OUTCOMES (POs) OF NBA

P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
X	X	X	X					X	X		X