INDIANINSTITUTE OF INFORMATION TECHNOLOG,

DESIGN AND MANUFACTURING (IIITDM) KANCHEEPURAM

<table>
<tr><td>Course Code</td><td></td><td>Course Title</td><td colspan="4">Computer Vision</td></tr>
<tr><td rowspan="2">Dept./Faculty proposing the course</td><td rowspan="2">Prof. V. Masilamani, CSE</td><td rowspan="2">Structure (LTPC)</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>0</td><td>2</td><td>4</td></tr>
<tr><td rowspan="2">To be offered for</td><td rowspan="2">DD/PG/Ph.D</td><td>Type</td><td colspan="2">Core☐</td><td colspan="2">Elective■</td></tr>
<tr><td>Status</td><td colspan="2">New ☐</td><td colspan="2">Modification ■</td></tr>
<tr><td>Pre-requisite</td><td>--</td><td colspan="3">Submitted for approval</td><td colspan="2">Senate 61</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">• To equip students with knowledge and skills to make computers to "see" and interpret images and videos, much like humans do.<br>• To make students understand image formation, image processing, feature extraction, and various algorithms for tasks like segmentation, object detection, stereo vision and recognition.<br>• To train students to apply of these techniques to solve various real world problems.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">• Students will be able to design their own algorithms to solve real world problems that involve image or video as input.<br>• To be able to apply most efficient computer vision algorithms to solve problems.<br>• To be able to decide for what kind of problems, computer vision techniques can be applied.</td></tr>
<tr><td>Contents of the course (With approximate break-up of hours for L/T/P)</td><td colspan="6">Depth estimation and Multi-camera views: Perspective, Binocular Stereopsis -Camera and Epipolar Geometry, Homography, Rectification,3-D reconstruction framework, Auto-calibration. (L8)<br>Feature Extraction: Corners –Harris and Hessian Affine, Orientation Histogram, SIFT, SURF,HOG, Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT.(L8)<br>Image Segmentation: Graph-Cut, Mean-Shift, MRFs, Texture Segmentation; Object detection. (L8)<br>Lighting and Deformation: Shadows, Lambertian, Harmonic images, deformable part models, fine-grained classification (L9)<br>Motion Analysis: Background Subtraction and Modeling, Optical Flow, Spatio-Temporal Analysis, Dynamic Stereo; Motion parameter estimation. (L9)<br>Practice Component:<br>Compute camera matrix and use it to calibrate camera - Find fundamental matrix, and then compute point correspondence using fundamental matrix, and also find the depth image using the point correspondence - Find Essential matrix, and then compute point correspondence using essential matrix, and also find the depth image using the point correspondence - Given two images, find homography between two images ,and use the holography for image mosaicking - Compute SIFT feature and use it for object detection – Compute SURF feature and use it for object detection- Do image segmentation using Graph Cut – MRF- Compute shape from shadow Do object detection and tracking using optical flow [P28]</td></tr>
<tr><td>Text Books</td><td colspan="6">1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited, 2nd Edition, 2022, 9781848829343<br>2. D.A.Forsyth, J.Ponce: Computer Vision: A Modern Approach, Pearson Education, 2nd Edition, 2012, 9789332550117</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, 2004, 9780521540513<br>2. Marco Alexander Treiber, Optimization for Computer Vision: An Introduction to Core Concepts and Methods, Springer, 2013, 9781447152828<br>3. Alan C. Bovik, Handbook of Image and Video Processing, , Elsevier Academic Press, 2005, 9780123885623</td></tr>
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