CS-474 Computer Vision

Course Contents

Course Code CS-474

Title Computer Vision

Credit hours 3 (2+1)

Objectives

i. Develop an understanding of the human visual system.

ii. Impart knowledge about current approaches to image formation, and image modeling.

iii. Understand basic image processing and feature extraction (mid-level vision)

iv. Understand basics of deep learning and its application to computer vision

Outcomes

i. The students will be able to understand how to make computers see and interpret like humans.

ii. The students will be able to understand low- mid- and high level vision tasks and execute them.

iii. The students should be able to relate various mathematical models to vision tasks.

iv. The students should get hands on experience on one the most useful languages: python.

Details of Course

i. Introduction on applications of vision.

ii. The basic understanding of pin hole camera.

iii. Mathematical modeling of camera.

iv. Transform domain.

v. Feature and corner detection.

vi. Feature descriptors.

vii. 2D Image transformations.

viii. Image segmentation.

ix. Linear regression.

x. Basics of pattern recognition.

xi. Convolutional Neural Networks.

Details of lab work

i. Processing in transform domain.

ii. Harris corners.

iii. Scale-space pyramid.

iv. Scale invariant feature transform.

v. Statistical feature extraction (GLCM, LBP).

vi. Directional filters (HoG).

vii. Linear regression.

viii. Bag-of-words.

ix. 2D transformations applied to images.

x. Image segmentation - Watershed/Meanshift.

xi. Image segmentation - Graph clustering.

xii. Linear regression.

xiii. Convolutional Neural Networks.

xiv. Reinforcement topic 1.

xv. Reinforcement topic 2.

Recommended Readings / Text Books:

i. Forsyth, David A., and Jean Ponce. Computer vision: a modern approach. Prentice Hall Professional Technical Reference, 2002. ii. Szeliski, Richard. Computer vision: algorithms and applications. Springer Science & Business Media, 2010.

References

i. Forsyth, David A., and Jean Ponce. Computer vision: a modern approach. Prentice Hall Professional Technical Reference, 2002. H. Szeliski, Richard. Computer vision: algorithms and applications. Springer Science & Business Media, 2010.

iii. Hau, Chen Chi, ed. Handbook ofp attern recognition and computer vision. World Scientific, 2015.

iv. Bradski, Gary, and Adrian Kaehler. Learning OpenCV: Computer vision with the OpenCV library. " O'Reilly Media, Inc.", 2008.

v. Granlund, Gosta H., and Hans Knutsson. Signal processing for computer vision. Springer Science & Business Media, 2013.