



MODERN COMPUTER VISION

PROF. A. N. RAJAGOPALAN

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PRE-REQUISITES : Familiarity with image processing, linear algebra and probability is desirable but is not a must.

INDUSTRY SUPPORT : Google, Amazon, Facebook, Qualcomm, TI, KLA-Tencor, Siemens, GE, Philips etc

COURSE OUTLINE :

This course explores both classical and deep learning-based approaches to computer vision. Starting from introduction to deep learning, it goes on to discuss traditional approaches as well as deep networks for a variety of vision tasks including low-level vision, 3D geometry, mid-level vision and high-level vision.

ABOUT INSTRUCTOR :

Prof. A.N. Rajagopalan is a Chair Professor of Electrical Engineering at IIT Madras and specializes in the areas of Image Processing and Computer Vision. He is a Fellow of INAE and Humboldt Foundation Germany, and Editorial Board member of flagship journals of IEEE in the above areas. He has co-authored two books.

COURSE PLAN :

Week 1: Course introduction, Introduction to deep learning, Introduction to neuron

Week 2: Multilayer perceptron (MLP), Gradient descent, Backpropagation in MLP

Week 3: Optimization and regularization, Regularization and preprocessing, Convolutional neural network (CNN)

Week 4: CNN properties, CNN architectures, Introduction to recurrent neural network (RNN), Encoder-Decoder models in RNN

Week 5: Low-level vision, Spatial and frequency domain filtering, Edge detection

Week 6: Line detection, Feature detectors, Harris corner detector

Week 7: Blob detection, SIFT, Feature descriptors, SURF

Week 8: Single-view geometry, 2D Geometric transformations, Camera intrinsics and extrinsics

Week 9: Two-view stereo, Algebraic representation of epipolar geometry, Fundamental matrix computation

Week 10: Structure from motion, Batch processing in SFM, Dense 3D reconstruction

Week 11: Deepnets for stereo and SFM, Mid-level vision, Image segmentation

Week 12: Deepnets for segmentation, High-level vision, Deepnets for object detection