E9 206 Aug. 3:0

Digital Video: Perception and Algorithms

Instructor

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Teaching Assistant

None
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Department: ECE

Course Time: MW 11-12:30

Lecture venue: ECE 107

Detailed Course Page: http://www.ece.iisc.ernet.in/~rajivs/#/teaching/dvideo2017

Announcements

Brief description of the course

The course will cover algorithms for digital video processing from the point of view of human visual

perception. The course can be taken by masters and doctoral students from their first year onwards.

Prerequisites

Digital signal processing or digital image processing, probability and statistics. The course can be taken

concurrently with Digital Image Processing if students have a background in Digital Signal Processing.

Syllabus

Video sampling, frequency response of human visual systems, color perception, video transforms (DFT, DCT,

DWT), retinal and cortical filters (difference of Gaussians, Laplacian of Gaussians, center-surround responses,

3D Gabor filterbanks, steerable pyramids), motion detection, Reichardt detector, optical flow algorithms

(Horn-Schunck, Black-Anandan, Fleet-Jepson, non-linear methods, optical flow in the brain) block motion,

video compression, statistical video models (spectrum power law, principal components, sparse coding,

Generalized Gaussian models, divisive normalization, Gaussian scale mixtures, optical flow statistics, spatial

and temporal masking, Weber-Fechner law), video quality assessment (MOVIE, ST-RRED, BLIINDS),

denoising, and saliency.

Course outcomes

Students are expected to be able to interpret video processing algorithms from the point of view of their

perceptual relevance, know what kind of signal processing models explain processing along the human visual

pathway and even try to incorporate such ideas in video processing algorithms such as compression, quality

assessment, denoising, saliency, and so on.

Grading policy

30% - Assignments

20% - Mid term exam

20% - Final (project)

30% - Final (exam)

Assignments

Resources

1. A. C. Bovik, Al Bovik's Lecture Notes on Digital Video, The University of Texas at Austin, 2017

2. M. Tekalp, Digital Video Processing, Prentice Hall, 1995

3. A. C. Bovik, The Essential Guide to Video Processing, Academic Press, 2009