



Dottorato di Ricerca in Ingegneria dell'Informazione

PhD Program in Information Engineering

DRII courses 2017

Visual perception and visual information processing (14 hours starting June 9)

Professor Vasudevan Lakshminarayanan (Vengu)

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This short course will deal with the theory and practice of visual perception, with emphasis on techniques used in vision research and in visual information processing. Central areas of vision research including spatial vision, motion perception, color and binocular vision will be covered. Emphasis will be put on psychophysical methods. Anatomy and physiology, light and optics, convolutions and Fourier methods, and network theory and systems will also be examined when appropriate.

This course will begin with an overview of language and processes underlying specific areas of vision such as measures of neural activity, feature specificity, and individual cells and psychophysics. The student will be systematically introduced to the more essential properties of light and optics relevant to visual perception; the use of convolutions, Fourier series, and Fourier transform to model processes in visual perception; and network theory and systems. Psychophysical methods play a valuable and important role in vision research and will be discussed in depth. Subsequent topics will deal with the geometry of visual perception; spatial vision; the perception of motion; and some specific issues in visual perception, including color perception, binocular vision, and stereopsis. This course will be of interest to biophysicists and bioengineers, electronics and telecommunications engineers, computer/artificial vision students and researchers, ophthalmologists who desire some basic vision science.

June 9 (14.30-16.30). Aula Consiliare di Ingegneria.

Lecture 1: Introduction; anatomy and physiology of eye – neurons, receptive fields, visual cortex, etc. and basic optics including photometry and radiometry

Lecture 2: Tools of visual psychophysics and signal detection theory (June 12, 14:30-16:30)

Lecture 3: Photon detection and various psychophysical laws of sensory science (June 14, 14:30-16:30)

Lecture 4: Spatial and temporal vision – Fourier processing by the visual system (June 20, 14:30-16:30)

Lecture 5: Motion perception – real and apparent motion; optic flow, Reichardt detectors (July 10, 14:30-16:30)

Lecture 6: Color – basic neurophysiology, color spaces – CIE, models (July 12, 14:30-16:30)

Lecture 7: Elementary introduction to binocular vision – visual space, horopter, stereopsis. Some aspects of eye movements and summary, applications to HMDs,AR,VR devices (July 17, 14:30-16:30)

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