Time Table of Human Vision Course — Jan 8-Feb. 8, 2008, Taught by Prof. Zhaoping Li
Course information see http://www.cs.ucl.ac.uk/staff/Zhaoping.Li/MyCS_Teaching2007.html

1. Week 1: Introduction

   - What we know about human vision from physiology, anatomy, and behavior
   - Brief introduction to Information Theory — information bits, channels, mutual information, redundancy, signal-to-noise, Gaussian signals
   - Simple linear receptive field models for neurons in retina and the primary visual cortex (V1)

2. Week 2: Efficient coding principle for early visual coding

   - Formulation of the efficient coding principle
   - Application of effficient coding in stereo vision — correlation, independent channels, ocularity, de-correlation, whitening, input smoothing, adaptation

3. Week 3: Application of Efficient coding in other input feature dimensions

   - Spatial coding in the retina — center-surround receptive fields, contrast sensitivity curves in behavior and single neurons
   - Color coding — luminance and chromatic channels, and interaction with spatial coding
   - Temporal coding — temporal frequency tuning, transient and sustained responses, motion direction selectivity
   - Visual coding in V1 — orientation selectivity, multi-scale coding
   - Correlations between visual coding in different feature dimensions — conjunctively feature tuned cells in V1

4. Week 4: Introduction to the Theory of a Bottom-up Saliency Map in V1

   - Inconsistency between efficient coding and V1 physiology — overcompleteness of visual coding in V1, intra-cortical interactions in V1, and contextual influences on V1's neural responses
   - What is known experimentally about visual attention, selection, and saliency — top-down and bottom-up attention, visual search, pop-out, feature and conjunction search, visual search asymmetry
   - Formulation of the V1 saliency hypothesis
   - A recurrent network model of V1 of intra-cortical interactions for contextual influences

5. Week 5: Testing the V1 saliency hypothesis, and beyond V1 and bottom-up vision

   - Relating the V1 model's responses to visual inputs to visual bottom-up saliency behavior — pop out, feature search, conjunction search, visual search asymmetry, contour enhancement, texture segmentation
   - Behavioral experiments to test the hypothesis — the MAX experiment, and fingerprints of V1 in saliency behavior
   - Higher visual cortical areas, visual decoding and inference, object recognition, top-down visual attention