Machine Vision (COMP0137)

**Description**

**Aims:**
The module addresses algorithms for automated computer vision. It focuses on building mathematical models of images and objects and using these to perform inference. Students will learn how to use these models to automatically find, segment and track objects in scenes, perform object recognition and build three-dimensional models from images.

**Learning outcomes:**
On successful completion of the module, a student will be able to:
1. understand and apply a series of probabilistic models of images and objects in machine vision systems;
2. understand the principles behind object recognition, segmentation, super-resolution, scene analysis, tracking, and 3D model building;

**Content:**
Two-dimensional visual geometry:

Three dimensional image geometry:
- The projective camera. Camera calibration. Recovering pose to a plane;

More than one camera:

Vision at a single pixel:
- Background subtraction and colour segmentations problems. Parametric, non-parametric and semi-parametric techniques. Fitting models with hidden variables.

**Key information**

- **Year**: 2019/20
- **Credit value**: 15 (150 study hours)
- **Delivery**: PGT L7, Campus-based
- **Reading List**: [View on UCL website](#)
- **Tutor**: Prof Gabriel Brostow
- **Term**: Term 1
- **Timetable**: [View on UCL website](#)

**Assessment**

- Written examination (departmentally managed): 80%
- Coursework: 10%
- Coursework: 10%

**Find out more**

For more information about the department, programmes, relevant open days and to browse other modules, visit [ucl.ac.uk](http://ucl.ac.uk)
Connecting pixels:
-Dynamic programming for stereo vision. Markov random fields. MCMC methods. Graph cuts;

Texture:
-Texture synthesis, super-resolution and denoising, image inpainting. The epitome of an image;

Dense Object Recognition:
-Modelling covariances of pixel regions. Factor analysis and principle components analysis;

Sparse Object Recognition/Regression:
-Convolutional Neural Networks, Auto-encoders, Adversarial training, Equivariance;

Shape Analysis:
-Point distribution models, active shape models, active appearance models;

Tracking:
-The Kalman filter, the Condensation algorithm;

Requisites:
In order to be eligible to select this module, a student must be registered on a programme for which it is a formally-approved option or elective choice AND must have (i) a UK-equivalent Honours Degree (or higher) in the field of Computer Science, Mathematics, or physical sciences and engineering; and (ii) some familiarity with digital imaging and digital image processing.
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Disclaimer: All information correct as of June 2019. Please note that aspects of the module may be subject to change. UCL will make best efforts to inform applicants of major changes.
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