

**City University of Hong Kong  
Course Syllabus**

**offered by Department of Computer Science  
with effect from Semester A 2017/18**

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**Part I Course Overview**

**Course Title:** Computer Vision for Interactivity

**Course Code:** CS4187

**Course Duration:** One semester

**Credit Units:** 3 credits

**Level:** B4

Arts and Humanities

**Proposed Area:**  
*(for GE courses only)*

Study of Societies, Social and Business Organisations

Science and Technology

**Medium of Instruction:** English

**Medium of Assessment:** English

**Prerequisites:** CS2303 Data Structures for Media or  
(Course Code and Title) CS3334 Data structures

**Precursors:** NIL  
*(Course Code and Title)*

**Equivalent Courses:** NIL  
*(Course Code and Title)*

**Exclusive Courses:** NIL  
*(Course Code and Title)*

## Part II Course Details

### 1. Abstract

(A 150-word description about the course)

The elective course introduces students to computer vision technologies to support human computer interactions, such as face, hand or body tracking. The focus of the class is three-fold: 1) to learn about existing computer vision technologies; 2) to develop skills using these algorithms through hands-on experience; 3) to design and create a computer vision system for a real-world interactive program. Topics will focus on image processing, feature detection, segmentation, face and object recognition, and motion estimation and tracking. Advanced topics may include real-time face detection and object detection. This course will use open source software libraries (e.g., OpenCV and openFrameworks) to create interactive programs with computer vision.

### 2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs <sup>#</sup>	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	A2	A3
1.	Understand and explain the main characteristics of different computer vision techniques.		✓		
2.	Develop skills implementing computer vision algorithms to create interactive programs.		✓	✓	
3.	Analyze and evaluate the effectiveness of different computer vision approaches, and assess their relative merits.			✓	
4.	Create and design a computer vision system for a real-world application.		✓	✓	

\* If weighting is assigned to CILOs, they should add up to 100%.

<sup>#</sup> Please specify the alignment of CILOs to the Gateway Education Programme Intended Learning outcomes (PILOs) in Section A of Annex.

A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to self-life problems.

A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

### 3. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

Teaching pattern:

Suggested lecture/laboratory mix: 2 hrs. lecture; 2 hrs. laboratory.

TLA	Brief Description	CILO No.				Hours/week (if applicable)
		1	2	3	4	
Lecture	The lecture will present selected computer vision techniques and algorithms, and the intuition behind them. Each technique will be illustrated with examples from real-world applications to motivate the students understanding. Implementation details will also be discussed.	✓		✓		
Laboratory	Students will develop skills implementing and testing the computer vision algorithms introduced in lecture. Students will observe the characteristics and evaluate the performance of these different algorithms. Students will report their findings in weekly lab reports.	✓	✓	✓		
Project	The students design and create a computer vision system for a real-world application. The students will apply the principles they have learnt from the course for their design. Students will present their projects at the end of the class in a live-demo session.		✓	✓	✓	

### 4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.				Weighting*	Remarks
	1	2	3	4		
Continuous Assessment: <u>60%</u>						
Quiz	✓	✓			10%	
Programming Assignments		✓	✓	✓	50%	
Examination	✓	✓	✓	✓	40%	
Examination <sup>^</sup> : 40% (duration: 2 hours)						
* The weightings should add up to 100%.					100%	

<sup>^</sup> For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained.

## 5. Assessment Rubrics

*(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)*

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Course Projects	QUALITY of the implemented computer vision algorithms/systems	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Examination	ABILITY to evaluate and compare the results of different computer vision algorithms	High	Significant	Moderate	Basic	Not even reaching marginal levels

**Part III Other Information** (more details can be provided separately in the teaching plan)

**1. Keyword Syllabus**

*(An indication of the key topics of the course.)*

Face and object recognition, motion estimation and tracking, and face and object detection.

**2. Reading List**

**2.1 Compulsory Readings**

*(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)*

**2.2 Additional Readings**

*(Additional references for students to learn to expand their knowledge about the subject.)*

1.	Gary Bradski and Adrian Kaehler. <i>Learning OpenCV: Computer Vision with the OpenCV Library.</i>
2.	Richard Szeliski. <i>Computer Vision: Algorithms and Applications.</i>