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THE CHINESE UNIVERSITY OF HONG KONG
**Print Course Catalog Details**

May 10, 2023
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Academic Org: Dept of Computer Sci & Engg – Subject: Computer Science

**Course:** CSCI3290    **Course ID:** 002599    **Eff Date:** 2022-07-01    **Crse Status: Active**    **Apprv. Status:** Approved    【Course Rev】

Computational Imaging and Vision 計算影像和視覺

It is an emerging new field created by the convergence of computer graphics, computer vision and machine learning. Its main purpose is to overcome the limitations of the traditional camera by using computational techniques to produce a richer, more vivid, perhaps more perceptually meaningful representation of our visual world. The content of this course is to study ways in which samples from the real world (images and video) can be used to generate compelling computer imagery. We will learn how to acquire, represent, and render scenes from digitized photographs. The following topics will be covered: cameras, image formation and models; image manipulation (warping, morphing, mosaicing, matting, compositing); data-driven synthesis; visual perception; high dynamic range imaging and tone mapping; image-based lighting; non-photorealistic rendering; and other applications in machine vision.

這是一種集計算機視覺，圖像學和傳統攝影技術於一體的新領域。它的主要目的是利用計算方法來克服傳統影像設備的不足，從而生成內容更加豐富，生動和具有更多感知上有意義表示的視覺世界。本科的內容是真實世界（圖像和視頻）的採樣方法從而構建更有效的計算機成像。我們將會學習如何獲取、表示和從數字圖像渲染場景。本科包括以下的主題：照相機光學，圖像構成和模型，圖像操作（變形、過渡、無縫銜接、提取、合成）；數據驅動合成；視覺感知；高動態範圍圖像及色調映射；基於圖像照明；非傳統影像渲染和其他機器視覺應用。

**Grade Descriptor:**

A

EXCELLENT – exceptionally good performance and far exceeding expectation in all or most of the course learning outcomes; demonstration of superior understanding of the subject matter, the ability to analyze problems and apply extensive knowledge, and skillful use of concepts and materials to derive proper solutions.

有關等級說明的資料，請參閱英文版本。

B

GOOD – good performance in all course learning outcomes and exceeding expectation in some of them; demonstration of good understanding of the subject matter and the ability to use proper concepts and materials to solve most of the problems encountered.

有關等級說明的資料，請參閱英文版本。

C

FAIR – adequate performance and meeting expectation in all course learning outcomes; demonstration of adequate understanding of the subject matter and the ability to solve simple problems.

有關等級說明的資料，請參閱英文版本。

D

MARGINAL – performance barely meets the expectation in the essential course learning outcomes; demonstration of partial understanding of the subject matter and the ability to solve simple problems.

有關等級說明的資料,請參閱英文版本。

F

FAILURE – performance does not meet the expectation in the essential course learning outcomes; demonstration of serious deficiencies and the need to retake the course.

有關等級說明的資料,請參閱英文版本。

**Equivalent Offering:**
**Units:**                3 (Min) / 3 (Max) / 3 (Acad Progress)
**Grading Basis:**        Graded
**Repeat for Credit:**    N
**Multiple Enroll:**      N
**Course Attributes:**

**Topics:**

## COURSE OUTCOMES

**Learning Outcomes:**

At the end of the course of studies, students will have acquired the ability to
1. understand the problem and emerging techniques of computational photography.
2. know the methods for generating compelling pictures and understanding images in computer vision.
3. use software packages, such as Python, C++, or Matlab.

**Course Syllabus:**

It is an emerging new field created by the convergence of computer graphics, computer vision and machine learning. Its main purpose is to overcome the limitations of the traditional camera by using computational techniques to produce a richer, more vivid, perhaps more perceptually meaningful representation of our visual world. The content of this course is to study ways in which samples from the real world (images and video) can be used to generate compelling computer imagery. We will learn how to acquire, represent, and render scenes from digitized photographs. The following topics will be covered: cameras, image formation and models; image manipulation (warping, morphing, mosaicing, matting, compositing); data-driven

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synthesis; visual perception; high dynamic range imaging and tone mapping; image-based lighting; non-photorealistic rendering; and other applications in machine vision.

**Assessment Type:**

| | |
|---|---|
| Essay test or exam | : 30% |
| Others | : 70% |

**Feedback for Evaluation:**

1. Quiz and examinations
2. Course evaluation and questionnaire
3. Question-and-answer sessions during class
4. Student consultation during office hours or online

**Required Readings:**

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**Recommended Readings:**

1. Computer Vision: The Modern Approach, Forsyth and Ponce, Prentice-Hall, 2002.
2. Photography, 8th edition, London and Upton, Prentice Hall, 2004.
3. Vision Science: Photons to Phenomenology, Stephen Palmer, The MIT Press, 1999.
4. Digital Image Processing, 2nd edition, Gonzalez and Woods, Prentice-Hall, 2002.
5. Multiple View Geometry in Computer Vision, Hartley & Zisserman, Cambridge University Press, 2004.

## OFFERINGS

1. CSCI3290          Acad Organization=CSD; Acad Career=UG

## COMPONENTS

LEC : Size=30; Final Exam=Y; Contact=3
TUT : Size=30; Final Exam=N; Contact=1

## ENROLMENT REQUIREMENTS

1. CSCI3290          **Enrollment Requirement Group:**
Prerequisite: CSCI2100 or ESTR2102.

**New Enrollment Requirement(s):**
Pre-requisite = no change

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**CAF**

| | |
|---|---|
| eLearning hrs for blended cls | 0 |
| No. of micro-modules | 0 |
| Research components (UG) | 50%-74% |

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