The Hong Kong University of Science and Technology (Guangzhou)

UG Course Syllabus

[Course Title] Introduction to Computer Vision

[Course Code] AIAA 3201

[No. of Credits] 3 credits

[Any pre-/co-requisites] UFUG 1601, UFUG 2601 OR UFUG 2602

Instructor Name: WANG Hao

Email: haowang@hkust-gz.edu.cn

GTAs: Feng Yu (yfeng986@connect.hkust-gz.edu.cn) & Sicheng Yu (syu605@connect.hkust-gz.edu.cn)

Office Hours: Thu 10-11 am

Course Description

This course aims to provide a solid understanding of modern Computer Vision. It starts with essential backgrounds in image processing and classical vision methods, then transitions to contemporary learning-based techniques. Students will master core architectures including CNNs, Transformers, and generative models like GANs and Diffusion. Advanced modules explore detection, segmentation, and learning-based 3D vision. The course emphasizes problem-solving through a practical mini-project, encouraging students to apply these algorithms to real-world needs such as biomedical analysis or AR/VR. Students will finish the course ready to conduct independent research and develop innovative vision solutions.

Intended Learning Outcomes (ILOs)

By the end of this course, students should be able to:

1. Implement fundamental image processing algorithms, including linear filtering, edge detection, and feature matching, to extract geometric information.
2. Construct and train Convolutional Neural Networks (CNNs) for image classification using modern deep learning frameworks (e.g., PyTorch).
3. Apply state-of-the-art models (such as YOLO or U-Net) to solve high-level vision tasks like object detection and image segmentation.
4. Design and integrate a complete computer vision system to solve a real-world problem through a final team project.

Weekly Schedule

Week	Topic	ILOs
1	Intro & Image Basics	ILO 1

2	Image Filtering & Processing	ILO 1
3	Edges & Contours	ILO 1
4	Features & Matching	ILO 1
5	Machine Learning Basics for Vision	ILO 1, ILO 2
6	Neural Networks (MLP) & CNN Basics	ILO 1, ILO 2
7	Training Strategies & Data	ILO 1, ILO 2, ILO 4
8	Object Detection & Segmentation	ILO 1, ILO 2, ILO 3
9	Vision Transformers (ViT)	ILO 1, ILO 2, ILO 3
10	Generative AI & Frontiers	ILO 1, ILO 2, ILO 3
11	Project Presentation	ILO 1, ILO 2, ILO 3, ILO 4
12	Project Presentation	ILO 1, ILO 2, ILO 3, ILO 4
13	Course Review	ILO 1, ILO 2, ILO 3, ILO 4
	Final exam	ILO 1, ILO 2, ILO 3, ILO 4

Assessment and Grading

Detailed assessment schemes and grading rubrics are provided below.

Assessments:

Assessment Task	Contribution to Overall Course grade (%)	Due date
In-class Test	35%	Regular class & lab tests
Group Project	25%	Last teaching week
Final Exam	40%	Final exam week

* Assessment marks for individual assessed tasks will be released within two weeks of the due date.

Mapping of Course ILOs to Assessment Tasks

Assessed Task	Mapped ILOs	Explanation
In-class Test	ILO1, ILO2, ILO3	This task assesses students' understanding of foundational concepts in computer vision (ILO 1) and the ability to apply basic and advanced deep learning methods (ILO 2 & 3).
Group Project	ILO1, ILO2, ILO3, ILO4	The group project evaluates students' ability to integrate and apply concepts from computer vision to real-world scenarios. It also emphasizes teamwork, collaboration, and communication skills as students work together to develop and present a

		comprehensive solution, demonstrating synthesis, critical evaluation, and effective team dynamics (ILO 4).
Final Exam	ILO1, ILO2, ILO3	The final exam assesses the full range of learning outcomes, including students' knowledge of computer vision principles, and their ability to apply, evaluate, and synthesize these concepts in different scenarios (ILO 1, ILO 2, ILO 3, ILO 4).

Grading Rubrics

1. In-class Test (35%):

- Class Quizzes (10%): Class quizzes are designed to evaluate students' comprehension of the essential subjects. Absences from quizzes will only be excused with a valid medical certificate due to illness.
- Lab Assignments (25%): Lab assignments must be submitted at the beginning of the next lab session. These tasks are vital for complementing the concepts discussed in lectures.

2. Group Project(25%):

- Team Formation: It is recommended to form teams of 2 members each.
- Project Focus: The project should explore the application of computer vision techniques to real-world problems.
- Project Topic Selection: Each team may choose a topic from the list provided by the course lecturer or propose their own topic, subject to the lecturer’s approval.
- Presentation: Each team is required to prepare an oral presentation and a project report.

3. Exams (40%):

- Exams in this course are closed book and will include a combination of multiple-choice, short-answer, and long-answer questions. These questions are crafted to assess the comprehension of the course material.

Final Grade Descriptors:

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	Demonstrates a comprehensive grasp of subject matter, expertise in problem-solving, and significant creativity in thinking. Exhibits a high capacity for scholarship and collaboration, going beyond core requirements to achieve learning goals.
B	Good Performance	Shows good knowledge and understanding of the main subject matter, competence in problem-solving, and the ability to analyze and evaluate issues. Displays high motivation to learn and the ability to work effectively with others.
C	Satisfactory Performance	Possesses adequate knowledge of core subject matter, competence in dealing with familiar problems, and some capacity for analysis and critical thinking. Shows persistence and effort to achieve broadly defined learning goals.
D	Marginal Pass	Has threshold knowledge of core subject matter, potential to achieve key professional skills, and the ability to make basic judgments. Benefits from the course and has the potential to develop in the discipline.

F	Fail	Demonstrates insufficient understanding of the subject matter and lacks the necessary problem-solving skills. Shows limited ability to think critically or analytically and exhibits minimal effort towards achieving learning goals. Does not meet the threshold requirements for professional practice or development in the discipline.

Course AI Policy

Allowed and encouraged with proper citations and prompt list.

Communication and Feedback

Students can provide informal feedback to the instructor and/or teaching assistant(s) through various channels, including face-to-face conversations, phone calls, emails, group discussions, or the course website. Students are encouraged to give feedback during the week of SFQ

Resubmission Policy

Late resubmissions will be penalized. We will deduct 10% of the overall score for every 24 hours after the deadline.

Required Texts and Materials

Not Required. Recommended reading materials will be introduced during classes.

Academic Integrity

Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST(GZ)'s Academic Honor Code and to maintain the highest standards of academic integrity. The University has zero tolerance of academic misconduct. Please refer to Regulations for Academic Integrity and Student Conduct for the University's definition of plagiarism and ways to avoid cheating and plagiarism.