Course Outline



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Course Details

Course Code	COMP9517

Course Title	Computer Vision
Units of Credit	6
Course Website	http://cse.unsw.edu.au/~cs9517 (http://cse.unsw.edu.au/~cs9517)
Handbook Entry	http://www.handbook.unsw.edu.au/postgraduate/courses/current/COMP9517.html (http://www.handbook.unsw.edu.au/postgraduate/courses/current/COMP9517.html)

Course Summary

Computer vision is the interdisciplinary scientific field that develops theories and methods allowing computers to extract high-level information from digital images or videos. From an engineering perspective it seeks to automate perceptual tasks normally performed by the human visual system. Generally, vision is difficult because it is an inverse problem, where only insufficient information is available about the objects of interest in the image data. Physics-based mathematical and statistical models as well as machine-learning methods are used to assist in the task. Current real-world applications are wide-ranging, and include optical character recognition, machine inspection, object recognition in retail, 3D model building in photogrammetry, medical imaging, automotive safety, motion capture, surveillance, fingerprint recognition and biometrics, and others. This course provides an introduction to fundamental concepts and an opportunity to develop a real-world application of computer vision.

Assumed Knowledge

Before commencing this course you should:

- Be able to program well in Python, or be willing to learn it independently.
- Be familiar with data structures and algorithms, and basic statistics.
- Be able to learn to use and integrate software packages, including OpenCV, Scikit-Learn, Keras.
- Be familiar with vector calculus and linear algebra, or be willing to learn them independently.

Student Learning Outcomes

After completing this course you will be able to:

- Explain basic scientific, statistical, and engineering approaches to computer vision.
- Implement and test computer vision algorithms using existing software platforms.
- Build larger computer vision applications by integrating software modules.
- Interpret and comment on articles in the computer vision literature.

This course contributes to the development of the following graduate capabilities:

Graduate Capability	Acquired In
Skills involved in scholarly enquiry	Assignment, Project
In-depth engagement with relevant disciplinary knowledge in its interdisciplinary context	Labs, Project
Capacity for analytical and critical thinking and for creative problem solving	Labs, Project, Exam
Ability to engage in independent and reflective learning	Assignment, Labs, Project

Skills to locate, evaluate, and use relevant information (information literacy)	Project, Exam
Capacity for enterprise, initiative and creativity	Project
Skills required for collaborative and multidisciplinary work	Project
Skills of effective communication	Project Demo & Report

Course Staff

There are two lecturers and two administrators for this course. Details are shown below. Tutors will also be available for consultation via the forum and other online means.

Lecturer	Email	Role
Professor Erik Meijering	erik.meijering@unsw.edu.au (mailto:erik.meijering@unsw.edu.au)	Lecturer in Charge
Dr Yang Song	yang.song1@unsw.edu.au (mailto:yang.song1@unsw.edu.au)	Lecturer
Annette Spooner	cs9517@cse.unsw.edu.au (mailto:cs9517@cse.unsw.edu.au)	Course Administrator
Md Shariful Alam	cs9517@cse.unsw.edu.au (mailto:cs9517@cse.unsw.edu.au)	Course Administrator

Course Timetable

The course timetable is available here (https://webcms3.cse.unsw.edu.au/COMP9517/20T2/timetable) and via the main menu.

Consultation Schedule

The course will be run during 2 x 2-hour time slots per week (see Course Timetable above). The first time slot will be a 2-hour lecture and the second time slot will be a 1-hour lecture followed by a 1-hour consultation session. The latter is intended to provide information about the labs (in the first weeks of the course) and the project (in later weeks) and answer questions about these.

Teaching Rationale and Strategies

The principal mode of teaching is lecturing. Because of the volume of the material available on the subject, lectures are a better means to present high-level overviews as well as in-depth presentations of selected topics. The lectures are complemented by a programming assignment, lab sessions, and a group project. In summary, the course consists of:

- Lectures: To learn about concepts and example applications.
- Assignment: To learn solving a significant problem early and quickly.
- Lab Sessions: To examine algorithms in more detail and provide an opportunity for evaluation and feedback.
- Group Project: To learn working in a team and building a significant application.

Modes of Delivery

The course will be delivered entirely online using the following media:

- Lectures: Echo360 (https://moodle.telt.unsw.edu.au/mod/lti/view.php?id=2862771) (see Timetable (https://webcms3.cse.unsw.edu.au/COMP9517/20T2/timetable) for details)
- Q&A Forum: Piazza (https://piazza.com/class/kai4d4o0qb54l0) (asynchronous throughout the course)
- Lab Consultations: Microsoft Teams (synchronous on Fridays 1-2 PM)
- Group Consultations: Microsoft Teams (synchronous on Fridays 1-2 PM)
- Group Demos: Microsoft Teams (synchronous, to be scheduled)

A roster will be made available so each student knows which tutor to go to for live consultations.

Lecture Schedule

Week	Topic	Lecturer
1	Introduction & Image Formation	Professor Erik Meijering
2	Image Processing	Dr Yang Song
3	Feature Representation	Professor Erik Meijering
4	Image Segmentation	Professor Erik Meijering
5	Pattern Recognition	Dr Yang Song
6	Flexible Week (No Lectures)	
7	Motion and Tracking	Professor Erik Meijering
8	Deep Learning	Dr Yang Song
9	Example Applications	Professor Erik Meijering
10	Project Demos	Professor Erik Meijering and Dr Yang Song
11	Revision	Professor Erik Meijering

Student Assessment

Your performance in this course will be assessed as shown in the table below, which specifies planned release and due dates for all assessment components and their assigned marks. The mentioned release and due dates are indicative at this stage. Please refer to the course announcements around the indicated dates for more details.

Assessment	Marks	Release	Due
Assignment	10%	Week 1	Week 3
Lab Work	20%	Weeks 2-5,7	Weeks 3-6,8
Group Project *	30%	Week 5	Week 10
Exam	40%	Exam Period	Exam Period

* Qualitative feedback will be provided for this assessment component where applicable. The group project is a significant part of the assessment for this course. A project group consists of 5 students working as a team to solve a given problem and build an application. In the end, each group receives a single mark for their performance.

Late Submission Penalty

Unless you have received special dispensation from the Lecturer in Charge, work that is submitted after the deadline will incur a penalty of 10% per day, up to a maximum of 100%.

Resources for Students

This course will be held entirely online and all course materials will be provided online as well. There is no need to buy a book. In the lectures we will be referring to various resources for further reading, many of which are freely available online:

- Richard Szeliski. Computer Vision: Algorithms and Applications. (http://szeliski.org/Book) Springer, 2011.
- Dana H. Ballard and Christopher M. Brown. Computer Vision. (http://homepages.inf.ed.ac.uk/rbf/BOOKS/BANDB/bandb.htm) Prentice Hall, 1982.
- Ian Goodfellow, Yoshua Bengio, Aaron Courville. Deep Learning. (https://www.deeplearningbook.org/) MIT Press, 2016.
- David A. Forsyth and Jean Ponce. Computer Vision: A Modern Approach. (https://github.com/yihui-he/computer-vision-tutorial/blob/master/Computer%20Vision%20A%20Modern%20Approach%202nd%20Edition.pdf) Prentice Hall, 2011.
- Simon J. D. Prince. Computer Vision: Models, Learning and Inference. (http://www.computervisionmodels.com/) Cambridge University Press, 2012. (http://www.computervisionmodels.com/)

Other resources of interest (available from the library or perhaps online as well) include:

- Linda G. Shapiro and George C. Stockman. Computer Vision. Prentice Hall, 2001.
- Rafael C. Gonzalez and Richard E. Woods. Digital Image Processing. Addison Wesley, 2008.
- Milan Sonka, Vaclav Hlavac, Roger Boyle. Image Processing, Analysis and Machine Vision. Chapman and Hall, 2007.
- Richard O. Duda, Peter E. Hart, David G. Stork. Pattern Classification. John Wiley and Sons, 2000.
- Gérard Medioni and Sing Bing Kang. Emerging Topics in Computer Vision. Prentice Hall, 2005.

Course Evaluation & Development

This course is evaluated each term using the myExperience system. Based on student feedback in 2020 T1 and the transition to online teaching, the following changes have been introduced in the 2020 T2 offering:

1. All course components, including the exam, are entirely online.
2. Total marks for the lab work have been increased from 5% to 20%.
3. A new lab has been introduced to help prepare for the new form of examination.
4. The group project no longer has an individual component but is now entirely a team effort.
5. Consequently the total marks for the group project have been reduced from 45% to 30%.
6. The exam will consist of critiquing a paper from literature based on what has been learned in the course.

Communication Etiquette

Piazza is your first port of call (see link to the forum in the main menu). Please post any query there that may be of wider interest to fellow students, for example general questions on lectures, labs, project, assessments.

For more personal questions please contact (see Course Staff for contact details):

- Lecturer in Charge for late submissions, absence, special considerations, deadlines, lab and assessment content.
- Course Administration for issues with enrolment, file submission, group enrolment, or other admin matter.

While every effort will be made to respond quickly to queries, please allow 24 hours before posting or emailing reminders.

You are reminded to observe standards of equity and respect in dealing with students and staff, whether in person, by email, via forum posts, and any other means of communication (see Student Conduct below).

Special Consideration

If your work in this course is affected by unforeseen adverse circumstances, you should apply for Special Consideration. If your request is reasonable and your work has clearly been impacted, then:

- For an assignment, you may be granted an extension.
- For the final exam, you may be offered a supplementary exam.

Notice the use of the word "may". None of the above is guaranteed. It depends on your making a convincing case that the circumstances have clearly impacted your ability to work.

UNSW handles Special Consideration requests centrally (in the Student Lifecycle division), so all requests must be submitted via the UNSW Special Consideration (https://iaro.online.unsw.edu.au/special_consideration/home.login) website.

Special Consideration requests must be accompanied by documentation, which will be verified by Student Lifecycle. **Do not contact the course convenor (Lecturer in Charge) directly about Special Consideration.**

Extensions on the project will be awarded only if the majority of the team is affected. You will get a mark calculated in the same way as other students who sat the original assessment.

If you cannot attend the final exam because of illness or misadventure, then you must submit a Special Consideration request, with documentation, through MyUNSW within 24 hours of the exam. If your request is reasonable, you will be awarded a Supplementary Exam (also known as "Supp").

Notice that UNSW expects you to be available to sit Supplementary Exams if required. If you are awarded a Supp and do not attend, then your exam mark will be zero.

For further details on Special Consideration, see the UNSW Student (https://student.unsw.edu.au/special-consideration) website.

If you are registered with Disability Services, please forward your documentation to the Lecturer in Charge (mailto:yang.song1@unsw.edu.au) within the first two weeks of term.

Student Conduct

The **Student Code of Conduct** (see Information (https://student.unsw.edu.au/conduct) and Policy (https://www.gs.unsw.edu.au/policy/documents/studentcodepolicy.pdf) for more details) sets out what the University expects from students as members of the UNSW community. In addition to the learning, teaching, and research environment, the University aims to provide an environment that enables students to achieve their full potential and to provide an experience consistent with the University's values and guiding principles. A condition of enrolment is that students *inform themselves* of the University's rules and policies affecting them, and conduct themselves accordingly.

In particular, students have the responsibility to observe standards of equity and respect in dealing with every member of the University community. This applies to all activities on UNSW premises and all external activities related to study and research. This includes behaviour in person as well as behaviour on social media, for example Facebook groups set up for the purpose of discussing UNSW courses or course work. Behaviour that is considered in breach of the Student Code of Conduct as discriminatory, sexually inappropriate, bullying, harassing, invading another's privacy, or causing any person to fear for their personal safety, is serious misconduct and can lead to severe penalties, including suspension or exclusion from UNSW.

If you have any concerns, you may raise them with the Lecturer in Charge, or approach the School Ethics Officer (mailto:ethics-officer@cse.unsw.edu.au) or Grievance Officer (mailto:grievance-officer@cse.unsw.edu.au) or one of the student representatives.

Plagiarism Policy

Plagiarism is defined as (https://student.unsw.edu.au/plagiarism) using the words or ideas of others and presenting them as your own. UNSW and CSE treat plagiarism as academic misconduct, which means that it carries penalties as severe as being excluded from further study at UNSW. There are several on-line sources to help you understand what plagiarism is and how it is dealt with at UNSW:

- Plagiarism and Academic Integrity (https://student.unsw.edu.au/plagiarism)
- UNSW Plagiarism Procedure (https://www.gs.unsw.edu.au/policy/documents/plagiarismprocedure.pdf)

Make sure you read and understand these. Ignorance is not accepted as an excuse for plagiarism. In particular, you are also responsible if your assignment files are not accessible by anyone but you. Where applicable, make sure to set the correct permissions in your CSE directory and code repository. Notice also that plagiarism includes paying or asking another person to do a piece of work for you and then submitting it as your own work.

For the purposes of COMP9517 , plagiarism includes copying or obtaining all, or a substantial part, of the material for your assignment, whether written or graphical report material or software code, **without written acknowledgement** in your assignment, from:

1. A location on the Internet;
2. A book, article, or other document (whether published or unpublished) in whatever form.
3. Another student, whether in your class or another class.
4. Any other person (for example someone who writes assignments for money).

Notice that if you copy material from another student or non-student **with acknowledgement,** you will not be penalised for plagiarism, but the marks you get for this will be at the marker’s discretion.

The assessments provide opportunities for you to develop important skills. Use these opportunities!

Academic Integrity

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW staff and students have a responsibility to adhere to this principle of academic integrity.

If you have not done so yet, please take the time to read the following in full:

- Academic Integrity and Plagiarism (https://student.unsw.edu.au/plagiarism)

The pages below describe the policies and procedures in more detail:

- Student Code Policy (https://www.gs.unsw.edu.au/policy/documents/studentcodepolicy.pdf)
- Student Misconduct Procedure (https://www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf)
- Plagiarism Policy Statement (https://www.gs.unsw.edu.au/policy/documents/plagiarismpolicy.pdf)
- Plagiarism Management Procedure (https://www.gs.unsw.edu.au/policy/documents/plagiarismprocedure.pdf)

You should also read the following page which describes your rights and responsibilities in the CSE context:

- Essential Advice for CSE Students (https://www.engineering.unsw.edu.au/computer-science-engineering/about-us/organisational-structure/student-services/policies/essential-advice-for-cse-students)

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Comments

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