AMME5710 Computer Vision and Image Processing

THE UNIVERSITY OF SYDNEY

Major Project (50%), 2025

- This assignment contributes 50% to your final mark
- This assignment is a group project: you will work in small teams of three members
- Late assignments will be deducted 5% (5 marks out of a possible 100) for each day late, starting on the day the assignment is due and including weekends. Assignments submitted more than 10 days late will receive zero.
- Any special consideration requires you to go through the Special Consideration form process through Sydney Student.
- Incidences of academic dishonesty or plagiarism will be referred to the academic honesty coordinator and could result in a zero mark being awarded for this assignment, or automatic failure of the entire subject.
- This assignment should take an average of 100 hours to complete, split amongst the members of the team

Objectives

- You will work in small teams of three students and design a solution to a computer vision and image processing problem of your choice
- You will apply theory, algorithms and techniques explored in the course so far to solve real-world problems
- You will explore the computer vision and image processing literature to compare and contrast to other existing solutions
- You will present your work in both an oral presentation and technical/research written report format.

Approach

- During Week 9, you will organise yourself into teams of three members, and within the team decide on your design problem.
- There are several pre-defined problems (see separate pdf for project descriptions) that your team can choose from, or you may propose your own problem of interest. Use the provided project descriptions as a guide to the appropriate scope and style of problem if you select your own. Note that your problem solution should involve only image processing or computer vision techniques, as you will only be assessed on these aspects.
- Your team will submit a one-page proposal outlining (a) the members of your team, (b) your selected problem and (c) you proposed methodology to solving the problem. This proposal must be signed by each of the team members and must be submitted to the lecturer/tutor prior to the Week 9 Friday tutorial (October 10th) and will be discussed with the team and approved/rejected during the tutorial times.
- Any students who do not have a team or do not have a project by Friday 10th October will be assigned into a team and a project during this tutorial.

- During weeks 9 to 12 you will work in teams on your chosen problem. You will perform a detailed literature review of existing approaches and techniques to your problem. You will develop a problem solution using a programming language framework of your choice. You will devise experiments and benchmarks to assess the performance of your approach and provide results that compare and contrast to existing methods.
- Your team will present your work and results in a 10-minute team oral presentation during the Week 13 lecture and tutorial times (Tuesday 4th, Wednesday 5th and Friday 7th November) in front of the lecturer, tutors and other students in the course. You will provide presentation slides (in either Powerpoint or pdf format) to the lecturer which are due (via canvas) by 5pm Monday 3rd November.
- Your team will submit a final team design report, in the 8-page format of a computer vision conference paper, due Sunday 9th November 11:59pm via Turnitin on the Canvas site. You will also submit any code you have developed to implement your approach via canvas (can be a link to your own github repository containing your code).
- Your team will also submit a statement of the contributions to the project made by each team member, which must be signed by each team member.

Submission and Assessment Criteria

Items Due:

- During Week 9 Tutorial (Week 9): One-page proposal
- Monday 3rd November (Week 13): Presentation slides due via canvas
- Tues/Wed/Friday 4th / 5th / 7th Nov (Week 13): Group presentations
- Sunday 9th November (Week 13): Group final report, implementation code and signed statement of contributions

One-page Proposal (due before Friday 10th October, Week 9):

- This is to be submitted via canvas by any one team member prior to your Week 9 tutorial as a pdf or word document.
- Include a list of team members (and email addresses/SIDs), a description of your proposed project (or indicate your chosen project from the list of project descriptions) and a proposed methodology/timeline of activities to perform. Focus on what algorithms and techniques you plan to use/develop and how you intend to evaluate your design solution, i.e. experiments or other benchmark datasets.
- The proposal must be no more than a single page and must be signed by all members of the team.
- This item is not directly assessed, however you will not be approved to begin your project until this is submitted. You will receive zero marks on your final assessment if this is not submitted.
- During the Week 9 tutorial, the lecturer and tutor will discuss your proposal with the team. Students without a team, or teams without a project will be assigned a project/team at the lecturer's discretion during this time.

Group Presentation (due by canvas 5pm Monday 3rd November, to be presented during the Week 13 lecture/tutorials, Tues 4th Wed 5th or Fri 7th November) (40% of Major Project marks):

- You will present the results of your project in a 10-minute presentation (including questions) in front of the lecturer, tutor and other students in the course. All members of the team must be present and each member must talk/present for part of the presentation (i.e. you may not have a "designated" presenter).
- The presentation will be made in either Powerpoint or pdf format (8 slides max.). You may also opt to provide a live demo of your algorithm working in practice (encouraged if applicable) during this time.
- The suggested format for the presentation is:
    - **Slide 1**: Introduction to problem to be examined: a statement of the problem, why it is considered challenging, and why a computer vision/image processing approach might be advantageous
    - **Slide 2:** Literature review: what other approach to this problem exist in the computer vision and image processing literature
    - **Slides 3-5**: Methodology: what approaches were taken to develop a solution to the problem? What algorithms were used? How was the approach implemented in code? What challenges arose during the development and how did the final approach taken differ from that outlined during the week 9 project proposal.
    - **Slide 6**: Experimental setup, benchmarking and results: How was the final performance of the approach taken assessed? Were experimental scenarios and/or other benchmark datasets used to validate the final design solution?
    - **Slides 7:** Presentation of final results: you may choose to use this time to provide a live demo of your solution.
    - **Slides 8:** Discussion, Conclusions and Future Work: Given more time and resources, how would you have approached the problem differently, and how would you further improve the development of your solution?
- Your presentation will have a strict time limit of 8 minutes, followed by 2 minutes of questions by the lecturer and tutors, and questions may be directed at the whole group or to a particular individual in the team to answer.

Presentation Assessment Criteria/Marking Scheme:

Project literature review, methodology, experimental setup and results: Has the project been approached in a logical way? Have appropriate means of assessing the final solution performance been performed and presented? Is the final design solution well thought out and robust to real-world circumstances?	**50%**
Presentation and Communication: Is the presentation logically organised and easy to follow? Has the design process been clearly communicated? Have the project group member adequately addressed questions by the teaching team?	**50%**

Final Design Report, Implementation Code and Statement of Individual Contributions (due via Turnitin and email, 11:59pm Sunday 9th November): (60% of Major Project marks)

- You will submit a final design report for the team in pdf or word format, that follows the structure and formatting guidelines of an 8-page conference paper for the International Conference on Computer Vision and Pattern Recognition (CVPR). LaTeX and Microsoft Word templates for the report are available on the course blackboard site. Note: the report has a strict 8-page limit.
- The report must have the following sections:
    - **Project title and list of authors (project team).** Leave the affiliation details blank.
    - **Abstract**: 300-word limit. Summarise the problem addressed, approach taken and final results achieved.
    - **Introduction**: Discuss the problem tackled, the challenges involved and the motivation for solving this problem using computer vision/image processing methods, in terms of the benefits/advantages of taking a vision-based approach.
    - **Related Work/Literature Review**: Discuss (with citations to a reference section at the end of the report) existing approaches to the problem being solved and the theory and algorithms that form the background for the project.
    - **Methodology/Approach**: Detail the steps you took to design a final solution to your problem. Describe in detail the working of your final approach. Discuss and justify any assumptions made in terms of the problem structure and solution. Use flow charts and other graphical means to describe the workings of your final design in a systematic way.
    - **Experimental Setup/Benchmarking**: Describe and justify your experimental setup/benchmarking image sets used to evaluate the performance of your final approach.
    - **Results**: Present the results of you implemented problem solution using both qualitative (images and figure) and quantitative (graphs and tables) means.
    - **Discussion and Conclusions**: Compare and contrast you results against results for other related work in the literature or against any existing algorithms/approaches you have benchmarked yourself against. Describe the strengths and limitations of your final approach and how your design could be improved.
    - **References**: Include a list of all references cited in the paper, including conference and journal papers and links to any major software libraries/code-bases used.
- The report should be submitted via the Turnitin link provided on the Canvas site and may be submitted by any ONE of the team members.
- Any implementation code developed should be packaged into a single zip file and emailed to the lecturer (mitch.bryson@sydney.edu.au) by Sunday 9th November. You can email a github link to your own code repository if the project code is too large to share via email.
- A one-page statement of contributions should be appended to your report or emailed to the lecturer in either pdf or word document format by Sunday 9th November (one document for the whole team). This document should describe

the individual contributions made by each member in the team in terms of the different aspects of the project (literature review, algorithms/solution implementations, generation of benchmarking datasets, report section writing etc.). This document must be signed by each member of the team.

Final Report Assessment Criteria/Marking Scheme:

Project Quality: Have the authors explored all of the issues associated with their tackled problem? How well does their solution work? How robust is it to errors and other real-world considerations? How sophisticated is their approach in terms of accuracy, repeatability and ability to generalise to small changes in their described operating context, how ambitious was the scope of their project?	**30%**
Introduction and Literature Review: Has the problem addressed been clearly communicated, and have the authors described the specific aims and objectives of their developed solution? Have the authors adequately explored and referenced the literature including background information and related solutions to their problem?	**10%**
Project Methodology: Have the authors clearly communicated their methodology in terms of both their design process and the way in which their final algorithm/solution works?	**20%**
Experimental Setup and Results: Has the developed solution/approach been adequately assessed and analysed in terms of performance, robustness and use in a real-world context? Have adequate image data sets and/or other benchmark data been used to evaluate the approach both qualitatively and quantitatively?	**20%**
Discussion and Conclusions: Have the authors reflected on the strengths and limitations of their approach and described ways to build on and improve their work?	**10%**
Presentation: Is the report well written, logically organised and easy to follow?	**10%**