The University of Melbourne
School of Computing and Information Systems
COMP90086 Computer Vision, 2025 Semester 2

Nutrition challenge

Project type:	Group (teams of 2)
Due:	23:59pm, 26 Oct 2025
Submission:	Source code and written report (as .pdf)
Marks:	The assignment will be marked out of 30 points, and will contribute 30% of your total mark.

Computer Vision is often used to estimate quantities in which we're interested. Examples include using your phone as a virtual 'ruler' to estimate the distance between two points (to measure the size of an object), or to estimate the distance to a car in front of the camera for autonomous driving.

In this project you will develop an algorithm to estimate the number of calories in a meal from colour and depth images. Many existing calorie estimators are available, but the goal of this project is not to see how you can make use of these, but for you to demonstrate your understanding of design processes and to gain some insights into how they are built.

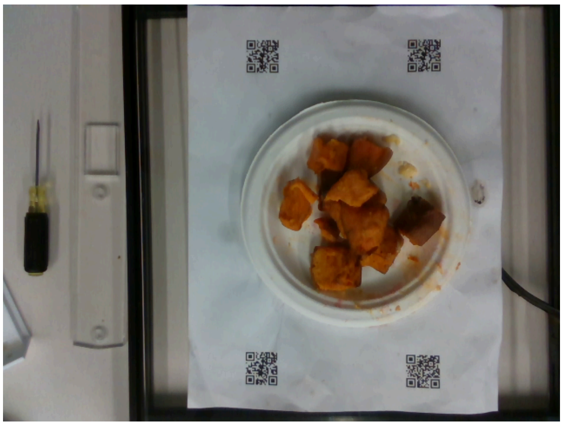
For this reason, you must not make use of any pre-trained networks (including calorie estimators) in your project. All networks you use must be trained from scratch (ie from random initialization).

Marks will be given for how you engage with the design process, so you should give intermediate results for early designs as well as explaining how and why you have modified your designs based on these results. You are not expected to produce state-of-the-art accuracy for this project; it is much more important that you develop an intelligent approach that you can explain in your project report.

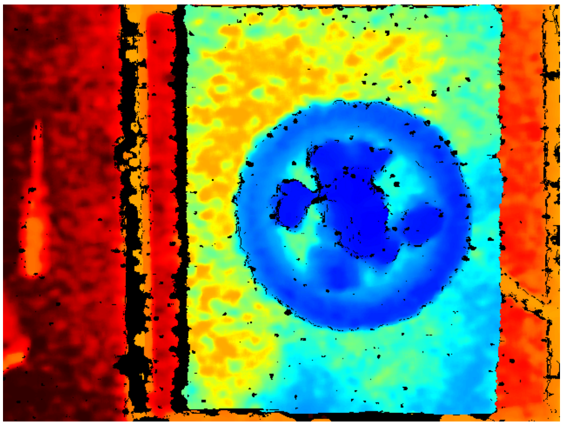
Dataset

The dataset provided is extracted from the Nutrition5K dataset [1]. The dataset consists of three directories - one for the colour images (rgb.png), one for the raw depth images (

one directory per plate of food. In each directory are three overhead images of the plate of food; one in colour, and two depth images (one giving raw depth and one colourised). There is also a csv file (nutrition5k_calories.csv) that gives the calorie ground truth for each plate of food.The rgb colour image and the colorized depth are shown for dish_1557853314 below:



rgb.png



depth_color.png

The file nutrition5k_calories.csv contains the line:

dish_1557853314, 115.413002

This indicates that the ground truth calorie count for this dish is 115.4 calories.

You may use the provided training images however you wish to train your model, along with the ground truth calorie metadata. **Your solution must not use any of following:**

- Additional images, supplemental data, or metadata from the Nutrition5K dataset which were not provided with this assignment
- Any pretrained model weights

This assignment uses a custom train/test split of the dataset, so if you use the full public dataset, your method will be trained, in part, on the Kaggle test set. Any submitted method which involves training on the test set (or simply looking up the ground truth labels for the Kaggle test set) will be considered cheating and will receive 0 marks.

Scoring Predictions

You should submit your predictions for the test images on Kaggle. Your submissions for Kaggle should follow the same format as the nutrition5K_calories.csv file provided on LMS. The file should include 2 columns:

- Id = the image id (e.g., ’dish_3300’)
- Value = a floating point number indicating the calorific content of the food on the plate.

Thus an example submission may look like:

```
ID, Value
dish_3300, 10.1
dish_3301, 20.2
dish_3302, 30.3
etc.
```

The evaluation metric for this competition is mean squared error: correct predictions will score zero penalty, incorrect predictions will incur a penalty in proportion to the square of the error. The score is averaged over the test set. The test set is split into two parts: 100 examples on which you will obtain immediate feedback and 89 examples that will be scored after you submit your project.

Kaggle

To join the competition on Kaggle and submit your results, you will need to register at https: //www.kaggle.com/. Please use the "Register with Google" option and use your @student.unimelb.edu.au email address to make an account. Please use only your group member student IDs as your team name (e.g., "1234&5678"). If your team name does not follow this format, we will not be able to identify your Kaggle submissions and you will receive 0 mark for the Kaggle portion of this assignment. Once you have registered for Kaggle, you will be able to join the COMP90086 Final Project competition using the link under Final Project: Code in the Assignments tab on the Canvas LMS. After following that link, you will need to click the "Join Competition" button and agree to the competition rules.

Group Formation

You should complete this project in a group of 2. You are required to register your group membership on Canvas by completing the "Project Group Registration" survey under "Quizzes." You may modify your group membership at any time up until the survey due date, but after the survey closes we will consider the group membership final.

Submission

Submission will be made via the Canvas LMS. Please submit your code and written report separately under the **Final Project: Code** and the **Final Project: Report** links on Canvas.

Your code submission should include your model code, your test predictions (in Kaggle format), a readme file that explains how to run your code, and any additional files we would need to recreate your results. You should not include the provided train/test images in your code submission, but your readme file should explain where your code expects to find these images.

Your written report should be a .pdf that includes the description, analysis, and comparative assessment of the method(s) you developed to solve this problem. The report should follow the style of a short conference paper with no more than four A4 pages of content (excluding references, which can extend to a 5th page). The report should follow the style and format of an IEEE conference short paper. The IEEE Conference Template for Word, LaTeX, and Overleaf is available here: https://www.ieee.org/conferences/publishing/templates.html.

Your report should explain the design choices in your method and justify these based on your understanding of computer vision theory. You should explain the experimentation steps you followed to develop and improve on your basic method, and report your final evaluation result. Your method, experiments, and evaluation results should be explained in sufficient detail for readers to understand them without having to look at your code. You should include an error analysis which assesses where your method performs well and where it fails, provide an explanation of the errors based on your understanding of the method, and give suggestions for future improvements. Your report should include tables, graphs, figures, and/or images as appropriate to explain and illustrate your results.

Evaluation

Your submission will be marked on the following grounds:

Component	Marks	Criteria
Report writing	5	Clarity of writing and report organisation; use of tables, figures, and/or images to illustrate and support results
Report method and justification	10	Correctness of method; motivation and justification of design choices based on computer vision theory
Report experimentation and evaluation	10	Quality of experimentation, evaluation, and error analysis; interpretation of results and experimental conclusions
Kaggle submission	3	Kaggle performance
Team contribution	2	Group self-assessment

The report is marked out of 25 marks, distributed between the writing, method and justification, and experimentation and evaluation as shown above.

In addition to the report marks, up to 3 marks will be given for performance on the Kaggle leaderboard. To obtain the full 3 marks, a team must make a Kaggle submission that performs reasonably above a simple baseline. 1-2 marks will be given for Kaggle submissions which perform at or only marginally above the baseline, and 0 marks will be given for submissions which perform at chance. Teams which do not submit results to Kaggle will receive 0 performance marks.

Up to 2 marks will be given for team contribution. Each group member will be asked to provide a self-assessment of their own and their teammate's contribution to the group project, and to mark themselves and their teammate out of 2 (2 = contributed strongly to the project, 1 = made a small contribution to the project, 0 = minimal or no contribution to the project). Your final team contribution mark will be based on the mark assigned to you by your teammate (and their team contribution mark will be based on the mark you assign to them).

Late submission

The submission mechanism will stay open for one week after the submission deadline. Late submissions will be penalised at 10% of the total possible mark per 24-hour period after the original deadline. Submissions will be closed 7 days (168 hours) after the published assignment deadline, and no further submissions will be accepted after this point.

Updates to the assignment specifications

If any changes or clarifications are made to the project specification, these will be posted on LMS.

Academic misconduct

While it is acceptable to discuss the assignment with others in general terms, excessive collaboration with students outside of your group is considered collusion. Your submissions will be examined for originality and will invoke the University's Academic Misconduct policy (http://academichonesty.unimelb.edu.au) where inappropriate levels of collaboration or plagiarism are deemed to have taken place.

Since Kaggle competition performance contributes to the final mark on this assignment, your submissions to Kaggle must be your own original work and must abide by the rules of the Kaggle competition. Submitting predictions to Kaggle which are not the results of your own models (or allowing another student to submit your model's predictions under their Kaggle account) will be considered a breach of the university's Academic Misconduct policy, as will any attempts to circumvent the rules of the Kaggle competition (for example, exceeding the competition's daily submission limit).

References

[1] Thames, Q., Karpur, A., Norris, W., Xia, F., Panait, L., Weyand, T. and Sim, J., 2021. Nutrition5k: Towards automatic nutritional understanding of generic food. In Proceedings of the IEEE/CVF conference on computer vision and pattern recognition (pp. 8903-8911).