

Hong Kong University of Science and Technology
CSIT 6000M: Recent Advances in Deep Learning
Spring 2023

Project 2

Proposal due: 5 April 2023, Wednesday, 11:59pm

Report and source code due: 27 April 2023, Thursday, 11:59pm

Presentation slides due: 1 May 2023, Monday, 11:59pm

1 Preamble

The objective of this project is to practise the hands-on skills needed for solving more realistic machine learning tasks through pursuing a proposed study that involves one or more deep learning topics studied in this course.

The project is expected to be substantial and hence is intended to be a group project, with each project group consisting of two students.

You may form your own project group. If you need help, we can also form a group for you. More information about this will be announced in Piazza.

Note that this project should not be used for earning credits in a different course to avoid double-dipping.

The project will be counted towards 30% of the final course grade.

2 Project Ideas and Considerations

Your proposed project must involve one or more deep learning topics covered in this course. One example is to apply a deep learning model learned in this course to solve a real-world problem. While you do not have to strive for developing a new model or a new algorithm, novelty of the application in terms of applying the model to solve it will be a major criterion in the grading guidelines to be detailed later.

For inspiration, you may take a look at the Kaggle website (<https://www.kaggle.com>) and other online resources. Publicly available datasets may be used for the project. Note that sometimes a dataset originally used for one task may be used in a very different way for another task that has not been studied by others before. Try to think out of the box to explore novel applications of deep learning. It may even help you start a business in the future.

In case you plan to use some more advanced deep learning methods not covered in the course, please make sure that you also include the related methods covered in the course as baselines for comparison. Among other things, including the baselines will help you justify using more advanced methods.

One important thing that you should keep in mind is to ensure that the computing resources needed for the proposed project are not exceedingly high. For example, you need to judge whether it is feasible to carry out the proposed project using only a subset of a large dataset, instead of the full set.

3 Project Proposal

You are expected to clearly describe at least the following in the proposal:

- Background information about the application, preferably explained and articulated using a simplified example for illustration that can appeal to a general audience

- Formulation of the application as a machine learning problem, which includes but is not limited to describing the problem type as well as the model input and output
- Description of related applications of deep learning in the literature, if any, with citation of relevant references
- Description of the dataset, which includes but is not limited to its size and features
- Expected computing resources needed, within the limit of what will be available to your group

The proposal should be no more than three pages in length. You should name the file as **proposal.pdf** in your submission.

The proposal is worth 5% of the final course grade. The breakdown of this part according to different grading criteria is as follows:

- Novelty of the application (40%)
- Clarity of the machine learning problem formulation (20%)
- Feasibility of the proposed work (20%)
- Organization and presentation (20%)

4 Project Report and Source Code

The report should cover at least the following aspects of the project:

- Project title
- Students with full names, student IDs, and HKUST email addresses
- Description of the dataset and any preprocessing
- Description of the machine learning task(s) performed on the dataset
- Deep learning method(s) used for solving the task(s)
- Experiments and results
- Division of labor

The project report should be self-contained in the sense that readers can understand what you do just by reading the report without having to refer to the proposal. As such, some materials in the proposal are expected to be included in the report as well.

In case it is deemed necessary for you to deviate from what you plan to do as described in the proposal, you should provide strong justification for doing so in the report. While a slight deviation from the proposed work is generally fine, a significant change should only be made as the last resort with sound justification.

You should state clearly the division of labor between the two group members by listing the main duties and contributions of each member. In addition, the overall contribution of each member to the project should also be given in percentage (e.g., 55% by A and 45% by B). You should try your best to ensure that the workload is shared evenly (i.e., 50% each). Grading will be done individually according to the workload distribution.

All the source code that you have written and used for this project should be submitted for grading. In case your code is modified from another source, you should acknowledge it clearly in your report and point out which parts are yours. Failure to do so is considered plagiarism.

Data files should not be submitted to keep the submission file size small.

You should name the report as **report.pdf** and the compressed source code as **code.zip**.

The report and source code are worth 20% of the final course grade. The breakdown is as follows:

- Description of the dataset and any preprocessing (15%)
- Description of the machine learning task(s) performed on the dataset (10%)
- Description of the computing environment, deep learning method(s), and parameter settings (10%)
- Good programming practices in the source code (10%)
- Description of the experiments (30%)
- Visualization and discussion of the results obtained (25%)

An important general criterion is clarity, to the extent that others can replicate your experiments based on the information provided in the report.

It is noted that achieving better performance for a model often requires extensive hyperparameter tuning. To save your time and the need for substantial computing resources, the grading criteria will not put too much emphasis on achieving superior performance as long as it is reasonably good. As said above, more emphasis should instead be put on novelty of the application itself. Moreover, you may regard this as a proof-of-concept study and focus more on analyzing the pros and cons of a certain model design for the dataset used.

5 Slides and Oral Presentation

You will be required to give an oral presentation of your project during the last two weeks of classes. Each presentation should be about 15 minutes long. Due to the tight presentation schedule, exceeding the time allotted is strictly prohibited.

The target audience of your presentation should be students immediately after taking CSIT 6000M, i.e., students who have learned the deep learning topics in the course. In other words, in your presentation, you may refer to concepts and techniques covered in the course without having to review them again.

You are expected to present informative slides that summarize the key aspects of the project. If some of your slides are modified from another source, you are expected to acknowledge it clearly. Failure to do so is considered plagiarism.

You should name the file as `slides.pdf` or `slides.pptx` in your submission.

The slides and oral presentation are worth 5% of the final course grade. Here is the breakdown:

- Good time management in the presentation (20%)
- Clarity and good organization of content in the slides (30%)
- Clarity of the oral presentation (30%)
- Effective use of examples and visual aids (20%)

6 Computing Facilities

While you may also use free cloud computing services such as Google Colab as in Project 1, please note that they usually have restrictions on the use of GPU resources. Temporary suspension of GPU usage may be imposed by the cloud service providers if extended use is detected.

Alternatively, you may subscribe for paid service plans such as Colab Pro/Pro+.

You may also use other computing facilities available to you.

7 Submission

All assessment components of the project must be submitted electronically in the Canvas course site, with three separate deadlines as listed on the first page.

Only one member of each project group will submit all the assessment components on behalf of the group, but the names of both members should be listed clearly in all the assessment components.

When multiple versions with the same filename are submitted, only the latest version according to the timestamp will be used for grading. Files not adhering to the naming convention above will be ignored.

Late submission will be accepted but with penalty. The late penalty is deduction of one point (out of a maximum of 100 points) for every minute late after 11:59pm. Being late for a fraction of a minute is considered a full minute. For example, two points will be deducted if the submission time is 00:00:34.

8 Grading

This project is intended to be more open-ended. As such, much room is left for you to explore according to your interests.

Grading will be based on rubrics with five levels of achievement (excellent, good, satisfactory, unsatisfactory, poor) for each of the assessment items.

9 Academic Integrity

Please refer to the regulations for student conduct and academic integrity on this webpage: <https://registry.hkust.edu.hk/resource-library/academic-standards>.