University of Denver
COMP4531 Deep Learning: Model Design and Application
Final Group Project

I. Introduction

Welcome to the final project of our course! This is an opportunity for you to showcase your problem-solving and analytical skills by applying data-driven techniques and utilizing neural networks to address a specific problem of your choice **in a group of two**. Before you proceed with your final project submission, you must have submitted your final project draft by Week 7, through Google Form, and the instructor must have approved your proposal.

Avoid the temptation to solely rely on brute-force model tuning. Instead, engage in analytical analysis at some point before exploring potential solutions. For example, analyze your models to detect underfitting and overfitting, and explore error patterns while proposing effective solutions.

Throughout your project, remember to leverage data science methodology. For instance, consider that accuracy may not always be the most suitable metric, especially in cases like predicting rare diseases. Demonstrate your ability to frame and investigate problems, and choose the appropriate tools accordingly. For example, deep learning might not be the right approach if you have only a handful of training examples.

II. Timeline

Week # and Date	**Deliverables**
Week 6 (02/13/2024)	Email the instructor your group members (one email per group)
Week 7 (02/20/2024)	Submit your final project proposal through Google Form https://forms.gle/uJAiPJRrNfmpiUyt7
Week 10 (03/12/2024)	Submit your final project including the video recordings Selected projects to be presented in class

Your video presentation must be submitted before the Week 10 live session. All other project materials can be submitted by the end of the term, i.e., March 15.

III. Grading Rubric

The final project contributes to 45% of the final grade. The following rubric weighting is quoted with respect to 100%.

Criteria	**Key questions (not exhaustive)**
Problem Statement	• Explain what problem you are solving • Why do you think deep learning could be useful and related?

Explain the problem set up	• Your inputs and outputs of your deep learning model • Need a table showing input/output variable types, range, and how it is encoded
Problem exploration	• Need insights – the reason behind the steps • Are the data biased? • What data cleaning have you done? Why do you think your data cleaning improves data quality? • Build some baseline models
Neural Network Implementation	• Build your deep learning model and show the performance of the model
Refining your models	• Your model should have room for improvement (if not, then your problem is probably too simple) • You need to iterate but not just dump the final models

The weighting differs across the type of problems you are picking, here are three different classes of problem.

	Predictive Modeling Problems	**Image Recognition Problem (CNN)**	**Text sequence Problems (RNN/LSTM)**
Problem Statement	10%	10%	10%
Explain the problem set up	20%	10%	20%
Problem exploration	20%	15%	20%
Neural Network Implementation	25%	25%	25%
Refining your models	25%	40%	25%

IV. Submission

You must submit <u>three</u> key deliverables to complete your final project:

1. Written Report:

   Your written report should provide a detailed account of all the essential steps you took during your project. Please note that this is not a code walkthrough; instead, it is meant to showcase the steps you followed and explain key insights. Ensure that your report is self-contained and does not require references to the Jupyter notebook or presentation for details. Additionally, make sure to give proper credit to any references or code that you have used.

2. Presentation:

Record your presentation and upload it to a video sharing platform such as YouTube. Send the video link to the instructor, unless you presented your project in class. In that case, you do not need to upload a video.

3. Jupyter Notebook:

   Submit your Jupyter notebook along with an HTML or PDF file that demonstrates your complete run.

For your convenience, upload all project materials (excluding the recorded presentation) to a file sharing platform of your choice, such as Google Drive, One Drive, or Dropbox. Share the folder containing your materials with the instructor at William.li@du.edu.

Furthermore, you must make a formal submission through 2U website, which includes:

1. The link to the shared folder containing your project materials.
2. The link to your recorded presentation video.

V. Comments and Pitfalls

- Please be advised that your evaluation is primarily based on the process employed to address a given problem, rather than solely on the performance of the model itself. For instance, while submitting an exceptional model may demonstrate proficiency, failing to articulate the methodology employed to attain such results may result in a lower grade. Conversely, exhibiting thorough diligence in the problem-solving process, even if the model's performance is lacking, may yield higher scores.

- It is strongly advised against revisiting a problem tackled in a previous class. Should there be a strong inclination to address a previously explored problem, it is imperative to inform the instructor and ensure that substantial advancements are made in the ensuing project compared to previous iterations. Both the current and prior projects will be requested for comprehensive evaluation. Failure to disclose and submit a prior project will be construed as academic dishonesty and will result in a zero grade for the final project.

- The instructor is there to offer guidance and advice, but ultimately, the decisions lie in your hands as you navigate through the project. For instance, if your initial exploration is already delivering an almost perfect performance, it might not be worth investing additional time to build a neural network model further.

We look forward to seeing your final projects and witnessing the impressive work you have accomplished. If you have any questions or need guidance along the way, please feel free to reach out to me at William.li@du.edu. Good luck with your final project!