UNIVERSITY OF LIMERICK
OLLSCOIL LUIMNIGH

CS6482 Deep Reinforcement Learning

Assignment 1: Sem2 AY 23/24 – Convolutional Neural Networks (CNNs)

19/Feb/24 (Week 4) – v1.

1. Objectives

- To implement a Convolutional Neural Network (CNN) based on popular CNN architectures such LeNet, AlexNet, GoogleLeNet, VGG, Inception, ResNet, Xception, SENet, FCNs, YOLO, and hybrids.
- Explore the impact of varying hyperparameter(s).

2. Submission

Submit a **pdf** named CS6482-Assign1-ID1-ID2 that include:

  I. Title page with necessary details

 II. Table of Contents

1. The Data Set (2 marks)

    a. Visualisation of some of the key attributes

    b. Feature selection, engineering, etc.

    c. Correlation

2. Any pre-processing such as normalisation applied to the data (1 mark)

3. The network structure and other hyperparameters (3 marks)

4. The Cost / Loss / Error / Objective function (2 marks)

5. The optimiser (1 marks)

6. Cross Fold Validation (1 mark)

7. Results – accuracy and/or precision and/or recall (2 marks)

    a. Include plots.

8. Evaluation of the results (3 marks)

9. Impact of varying a parameters/hyperparameter(s) (3 marks)

    - For example – engineering overfitting and/or underfitting

10. References (2 marks)

Submit a **Jupyter notebook** with the code where:

- The book is named CS6482-Assign1-ID1-ID2
    - Where ID1 and ID2 are the student id numbers of the team members
- The first line in the book is a comment with names and ID numbers of the team members.
- The second line in the book is a comment stating if the code executes to the end without an error.
- The third line in the book should be a comment with a link to the original source where you opted to reuse an existing implementation.
- Every critical line of code MUST be commented by **YOU, and linked back to the relevant section in the report →** to demonstrate a deep understanding of that code.
- Output for code blocks must be included.
- **The notebook is evaluated on a Pass / Fail basis.**

3. Sample Data Repositories

Open Data Repositories
- UC Irvine Machine Learning Data Repository
- Kaggle datasets
- Amazon's AWS datasets

Metaportals that list open data repositories.
- Data Portals
- Open Data Monitor
- Quandl

Other
- Wikipedia's listing of data repositories

4. Notes and Guidelines

- This assignment **constitutes 20%** of the total marks awarded for this module.
- You will work in a team of 2.
- **Submission deadline is 23:59:59 Friday 15th March 2024 (Week 7).**
- NO SUBMISSIONS WILL BE ACCEPTED AFTER THIS DATE!
- Submission is via the Sulis Assignment tool.
- You MAY be required to provide the lecturer with a walk through of your code.
    - Failure to do so will result in the award of an F grade.
- Programming language is Python.

CS6482: Grading Rubric for Assignment 1 – CNNs
Wed 15th February 2023 (Week 4)

	Beginning [0-8]	Developing [9-14]	Accomplished [15-20]	Exemplary [21-25]
Publication Ready	Light years away	Skeleton in place	Getting there	Nearly there
Code	Does not run to completion. Little commentary	Runs to completion. Little commentary	Runs to completion. Commented but not extensively	Runs to completion. Fully commented
Report	Layout does not follow spec. Messy, lacks cohesion, no depth	Layout partially follows spec. Getting there but discussions frequently lacking in depth	Layout follows spec, depth where necessary	Layout follows spec, depth in all discussions.
Prevention of Plagiarism	Sources not cited	Some sources not cited	All sources cited	All sources cited
Data Set	Linear. Noisy, small, and no indication that team recognise these problems. No visualisations.	Could be linear, noisy and small but efforts made to clean, and data augmentation implemented. Only a few dimensions visualised.	Non-Linear. Representative and any inherent biases identified if any. Data cleaned if required and data augmentation implemented where required. Considerable visualisations.	Rich features. Non-Linear. Representative and any inherent biases identified if any. Data cleaned if required and data augmentation implemented where required. Possibly some feature engineering. Considerable visualisations.
Pre-processing	Not done but required	Partially done where required	Done fully where required	Done fully where required and explained
Network and hyperparameters	Did not implement a CNN	Overly complex or excessively simple model	CNN model is appropriate	CNN takes cognisance of the features in the data set, possibly with Receptive Fields
Loos Function and Optimiser	Wrong option selected, not described in the report	Correct options but no explanation provided	Correct option and satisfactory explanation	Indepth discussion of options and reasons for final decision clearly communicated
Results	Screen shot	Screen shot and a little text justifying choice of metric	Plots and satisfactory explanation	Comprehensive presentation with some plots of many metrics
Evaluation	None	One or two paragraphs	Satisfactory	In depth.
Impact of Varying parameters/hyperparameters	None	Minimal, for example, changing learning rate	Significant changes to one or more hyperparameters made and evaluated systematically.	Engineered underfitting and/or overfitting