COMP34212: Coursework on Deep Learning and Robotics

34212-Lab-S-Report

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Aim and Deliverable

The aim of this coursework is to develop skills on the design, execution and evaluation of deep neural networks experiments for robotics. It also aims at discussing the role of the deep learning approach within the context of the state of the art in robotics. The assignment will in particular address the learning outcome LO1 on the analysis of the methods and software technologies for robotics, and LO3 on applying different machine learning methods for intelligent behaviour.

Your task is to extend the deep learning laboratory exercises (e.g. Multi-Layer Perceptron (MLP) and/or Convolutional Neural Network (CNN) exercises for image datasets) and carry out and analyse new training simulations. This will allow you to evaluate the role of different hyperparameter values and explain and interpret the general pattern of results to optimise the training for robotics (vision) applications. You should also contextualised your work within the state of the art, with a discussion of the role of deep learning and its pros and cons for robotics research and applications.

You can use the standard object recognition datasets (e.g. CIFAR, COCO) or robotics vision datasets (e.g. iCub World[1], RGB-D Object Dataset[2])

The deliverable to submit is a **report** (max 5 pages including figures/tables and references) to describe and discuss the training simulations done and their context within robotics research and applications.

Marking Criteria (out of 30)

1. A clear introductory to the problem and the methodology to be used, with explanation and justification of the network topology and hyperparameters chosen **[4]**
2. Contextualisation and state of the art in robotics and deep learning (marks given for clarity/completeness of the overview of the state of the art, with spectrum of deep learning methods considered in robotics; critical analysis of the deep learning role in robotics; quality of the references cited) **[8]**

[1] https://robotology.github.io/iCubWorld/
[2] https://rgbd-dataset.cs.washington.edu/index.html

3. Complexity of the network(s), hyperparameters and dataset (marks given for complexity and appropriateness of the network topology; hyperparameter exploration approach; data processing and coding requirements) **[6]**
4. Description, interpretation and assessment of the results on the hyperparameter testing simulations, including appropriate figures and tables to support the results (marks given for the clarity of the reporting of the simulations done and the results presented via text/tables/charts; Depth of the interpretation and assessment of the quality of the results; Discussion of alternative/future simulations to complement the results obtained); Marks lost if report longer than the required maximum of 5 pages. **[12]**

Due Date: **18.00 on 5 May 2022**, pdf on BlackBoard. Use standard file name: *34212-Lab-S-Report*