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| **Format for Assessment:**  **TASK 1:**  You are required to use Machine Learning techniques to tackle the problem of “**Detection of Pneumonia in Medical Images**”. According to NHS records ([https://aqua.nhs.uk/wpcontent/uploads/2020/11/Respiratory-thematic-report-revised-20201130.pdf)](https://aqua.nhs.uk/wp-content/uploads/2020/11/Respiratory-thematic-report-revised-20201130.pdf), there were 272 thousand hospitalisations of Pneumonia in England in 2019. In the USA, it is one of the top 10 causes of death [(https://www.medicalnewstoday.com/articles/282929#heart-disease)](https://www.medicalnewstoday.com/articles/282929#heart-disease). Diagnosing Pneumonia requires careful analyses of chest radiographs by highly trained specialists exposed to large amounts of images every day. Solutions to automate early diagnoses would help in diagnosing such a disease. This task consists of creating image classifiers to predict whether there is pneumonia (see image on the right) or not (see image on the left) in an input image.      The dataset used in this task is from the following Kaggle competition:  <https://www.kaggle.com/c/rsna-pneumonia-detection-challenge>    You are expected to explore a range of machine learning classifiers, inspired by the various models and categories explored within the module and beyond (i.e. from reading and literature). At least two of the deep learning classifiers discussed in the lectures and/or workshops should be included as baselines. In addition, at least one of your proposed classifiers should attempt to go beyond the module in terms of architectural, approach, and/or algorithmic details.    You will then investigate their performance, compare and critique them to justify your  recommended classifier(s). This should include metrics such as TP/FP rates, Precision-Recall, F-measure, and any other relevant metrics. In this assignment you are free to train any classifier, to do any pre-processing of the data, and to implement your own algorithm(s) instead of only using libraries. While you are encouraged to make your own implementations, you can use libraries (such as Tensorflow or Pytorch) to train your your deep neural networks. But you should clearly mention your resources, acknowledge appropriately, and compare between classifiers and their results in your report.  **TASK 2:**  You are required to use Machine Learning to tackle the problem of “**Game Learning**”. Your goal in this task is to train Deep Reinforcement Learning (DRL) agents that receive image-inputs from a game simulator, and that output game actions to play the game autonomously. The following simulator will be used to play the game of SuperMarioBros 1-1-v0: <https://github.com/Kautenja/gym-super-mario-bros> |

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| You are required to use your knowledge acquired in the module regarding DRL agents, and knowledge acquired from additional recommended readings. This will be useful for investigating the performance of those agents, and for comparing and criticising them so you can recommend your best agent. You are expected to evaluate your agents using metrics sush as Avg. Reward, Avg. Q-Value, Avg. Game Score, Avg. Steps Per Episode, and Training and Test Times.    You are expected to train at least three different agents (in addition to any baseline provided in the module), which can differ in their state representation (CNN, CNN-RNN, CNN-Transformer) and/or different learning algorithms. Once you have decided the agents that you want to report, you should train them with three different seeds and average their results. If you report learning curves, they should be based on those average results instead of using a single seed (run). You are expected to justify your choices in terms of architectures, hyperparameters and algorithms.    In this assignment, you are free to train any DRL agent, in any programming language, to preprocess the data, and to implement your own solutions whenever possible. While you are free to use libraries, you should not use fully available solutions. So please mention your resources used, acknowledge appropriately, and compare between agents in your report. |