Assignment:

1)(**5 points)** Select on gym environment from the following lists:

Classic Control

These environments often mimic problems encountered in reinforcement learning literature:

- **CartPole-v1**: Balance a pole on a moving cart.
- **MountainCar-v0**: Drive up a steep hill using momentum.
- **Acrobot-v1**: Swing up a double-jointed pendulum.
- **Pendulum-v1**: Swing and balance a pendulum.

Algorithmic

Algorithmic environments focus on learning computational tasks:

- **Copy-v0**
- **RepeatCopy-v0**
- **Reverse-v0**
- **DuplicatedInput-v0**

explain its action space, observation shape, reward signals

2)**(20 points)** Implement the DQN algorithm in pytorch and train it for the chosen environment:
Plot the rewards per epoch.
2) **(10 points)** Sensitivity study: Select 4 implementation parameters and conduct sensitivity analysis on each one. Present your results in a single page pdf
3)**(20 points)** Advanced algorithms: Improve the simple DQN algorithm by implementing one of the following:

a)Prioritized experience replay
b)Dueling architecture
c)Double DQN
d)Noisy networks for exploration

Redo the plots of 2, and present your conclusions in a single page.
4)(**30 points)** Investigate the effects of other neural network structures. Choose one of the following

a)LSTM
b)GRU
c)Transformer

Re-implement the DQN algorithm with one of these networks and repeat the plots of 2.
4)(**25 points)** Use the PPO and A2C algorithms from Stable baselines 3 or Tianshou.
Train them on the same environment. Assess the algorithm performance on your selected environment. Present your findings in a single page

Total points 110/100 (small bonus to account for minor mistakes)

Final deliverable:

One zip file titled sdixxx.zip your source code.
One pdf file titled sdixx.pdf split into 4 sections for each question with your plots/reports e.t.c.