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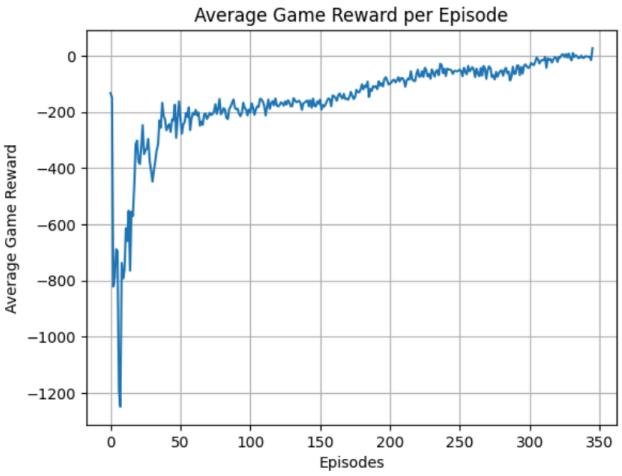
Trial 1: Default

batch_size = 64 # the minibatch size
num_epochs_actor_train = 1 # how many epochs an Agent actor trains before synchronize
num_agents = 4 # how many Agent actors to train in parallel

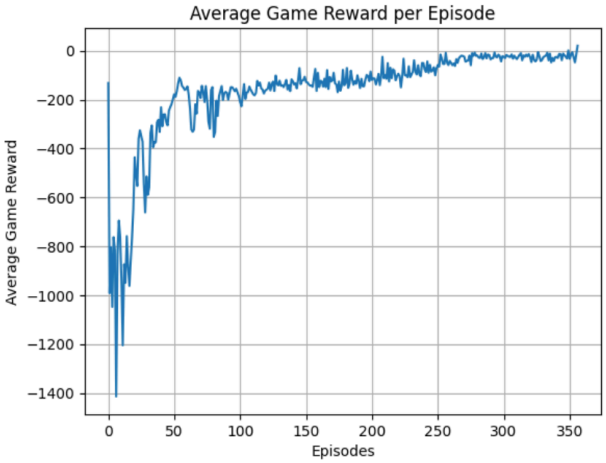
Total duration: 6148.33 seconds
Average time for training: 1.97 seconds
Average time for updating: 0.00 seconds
Average time for synchronizing: 0.05 seconds



Trial 2: Change batch size

batch_size = 32 # the minibatch size
num_epochs_actor_train = 1 # how many epochs an Agent actor trains before synchronize
num_agents = 4 # how many Agent actors to train in parallel

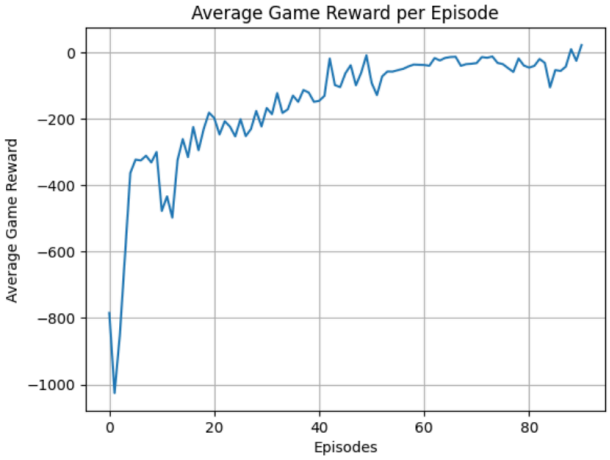
Total duration: 6083.58 seconds
Average time for training: 1.78 seconds
Average time for updating: 0.00 seconds
Average time for synchronizing: 0.05 seconds



Trial 3: Change number of epochs

batch_size = 64 # the minibatch size
num_epochs_actor_train = 4 # how many epochs an Agent actor trains before synchronize
num_agents = 4 # how many Agent actors to train in parallel

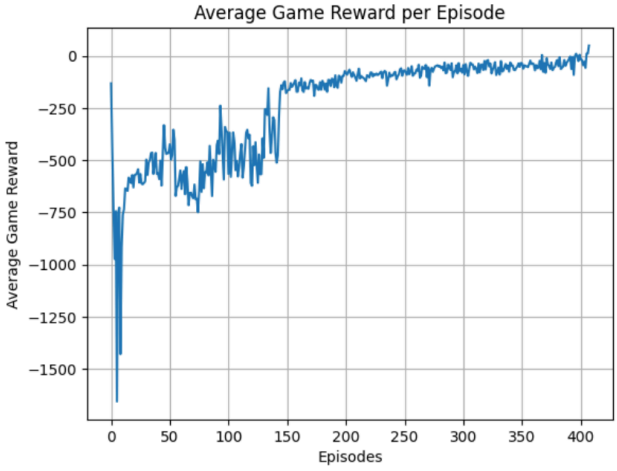
Total duration: 1822.22 seconds
Average time for training: 7.14 seconds
Average time for updating: 0.00 seconds
Average time for synchronizing: 0.05 seconds



Trial 4: Change number of agents

batch_size = 64 # the minibatch size
num_epochs_actor_train = 1 # how many epochs an Agent actor trains before synchronize
num_agents = 1 # how many Agent actors to train in parallel

Total duration: 5887.50 seconds
Average time for training: 1.48 seconds
Average time for updating: 0.00 seconds
Average time for synchronizing: 0.03 seconds



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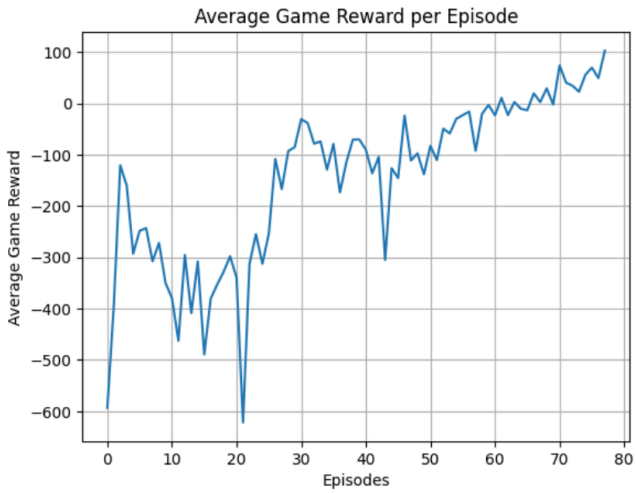
Trial 5: Change everything based on previous trials

batch_size = 128 # the minibatch size
num_epochs_actor_train = 4 # how many epochs an Agent actor trains before synchronize
num_agents = 4 # how many Agent actors to train in parallel

Total duration: 1800.18 seconds
Average time for training: 9.99 seconds
Average time for updating: 0.00 seconds
Average time for synchronizing: 0.04 seconds



Report

The experimental setup encompassed five trials with variations in hyperparameters. The first trial was the default hyperparameters, the next three involved changing each parameter individually, and the last one involved changing all three parameters based on the previous 3 trials.

Changing the batch size (Trial 2) exhibited minimal impact on training time and duration compared to the default trial. Increasing epochs per actor train cycle (Trial 3) resulted in longer training times but significantly reduced the total duration, probably because the number of times things were synchronized decreased (improved resource utilization). Decreasing the number of agents (Trial 4) led to increased training time and total duration since there was a reduction in agents to process things in tandem. Changing multiple hyperparameters simultaneously (Trial 5) resulted in longer training times but reduced total duration.

Throughout this assignment, a few experiences stood out to me. For example, the proper usage of ray.get() after trial and error, which enhanced understanding of distributed computing. Hands-on experience with debugging code and recognizing the importance of print statements for effective debugging was also something that I was reminded of, making me aware of how reliant I am of ChatGPT that I forgot what I was taught in CS101. Moreover, I am interested in implementing a Deep Q-Network (DQN) in PyTorch, which is something that we didn't get to do. I think it would've been helpful to implement a DQN on my own to increase proficiency in deep learning concepts (though realistically, we wouldn't have had the time).

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