Problem 1

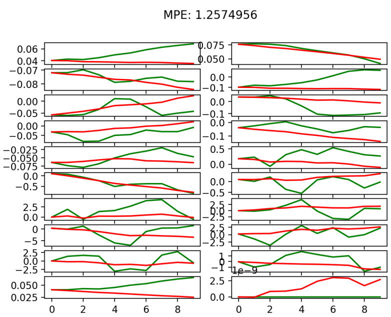

Figure 1: 2 hidden layers, 250 units, 5 iterations

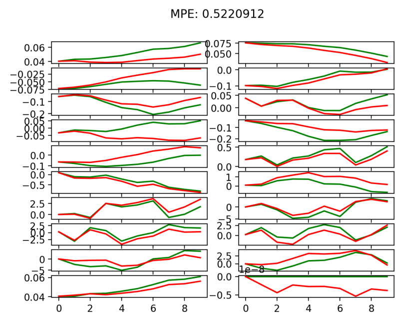

Figure 2: 1 hidden layer, 32 units, 500 iterations

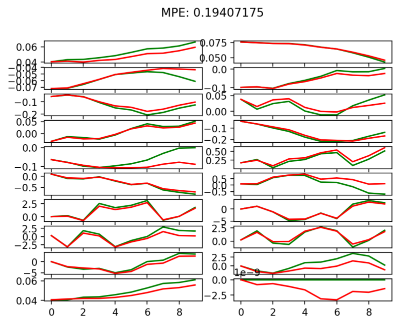

Figure 3: 2 hidden layers, 250 units, 500 iterations

In figure 1, we can see the performance of the neural network architecture with 2 layers, each with 250 hidden units and 5 iterations of training. This model performed the worst with the highest MPE and the clearest deviations from the ground truth. This was likely because despite having a very expressive architecture, it was only trained for 5 iterations, which was not enough training time for the model.

In figure 2, we can see the performance of neural network with only a single layer with 32 hidden units. This model performed the second best and had a much lower MPE than the previous model likely due to the much longer training time of 500 iterations (compared to 5). However, because this was a smaller network that was not as expressive, which may have limited its performance.

In figure 3, we can see the best performing model. This model had both long training time (500 iterations) and was very large (2 layers, 250 hidden units), so the dynamics model was extremely expressive and trained until it was quite accurate. This model had the lowest MPE as well.

Problem 2

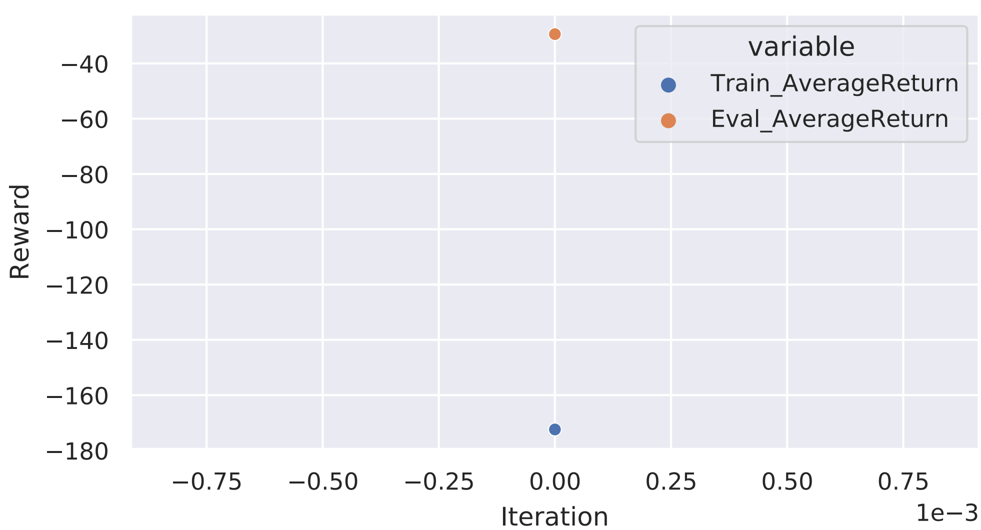

Figure 4: As expected, the `Eval_AverageReturn` is much higher than the `Train_AverageReturn`.

Problem 3

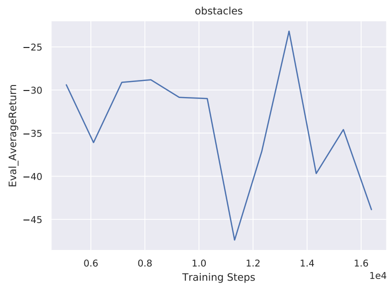

Figure 5: Obstacles Average Return

Figure 6: Reacher Average Return

Figure 7: Cheetah Average Return

Problem 4

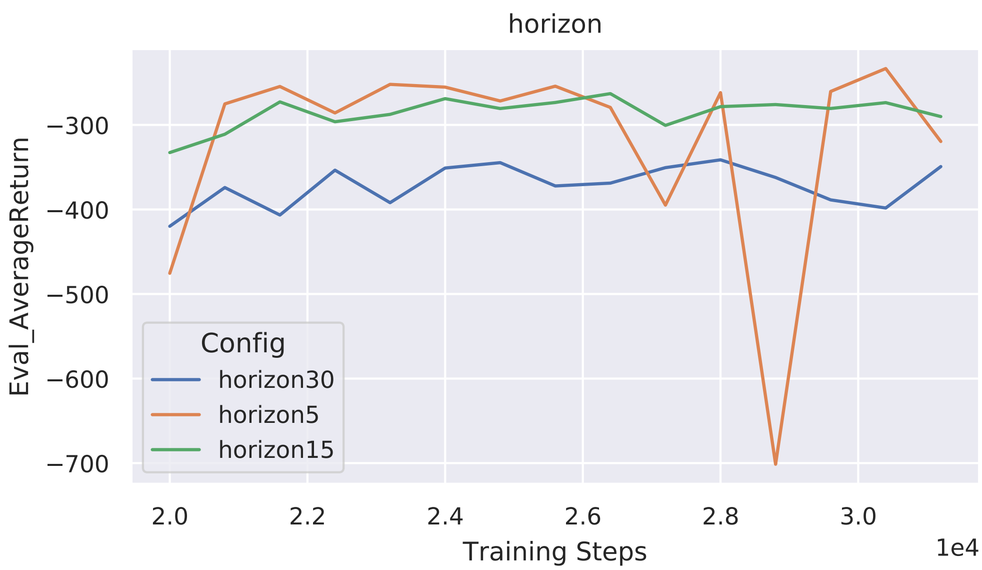

Figure 8: The shorter planning horizons (5 or 15) have similar performance, hovering around the same value. The longer planning horizon (30) has noticably lower performance, likely due to the accumulation of error in the dynamics model. The use of MPC may be the reason behind the little difference between 5 and 15 timestep planning horizon, since only the first action in each sequence is executed.

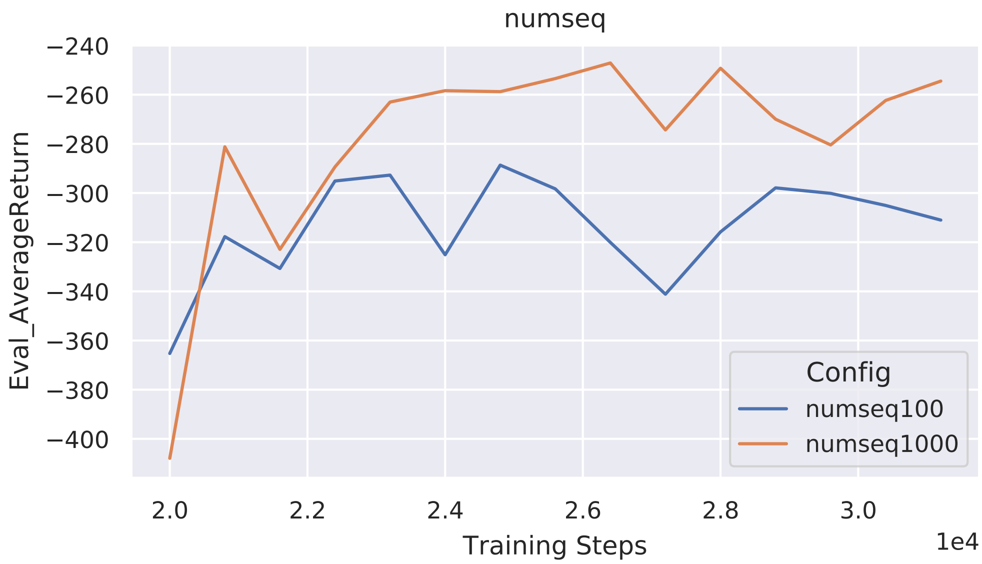

Figure 9: Having a higher number of candidate action sequences performs better than a lower number of action sequences. With a higher number of candidate sequences, the random shooting method is more likely to produce a high return action sequence.

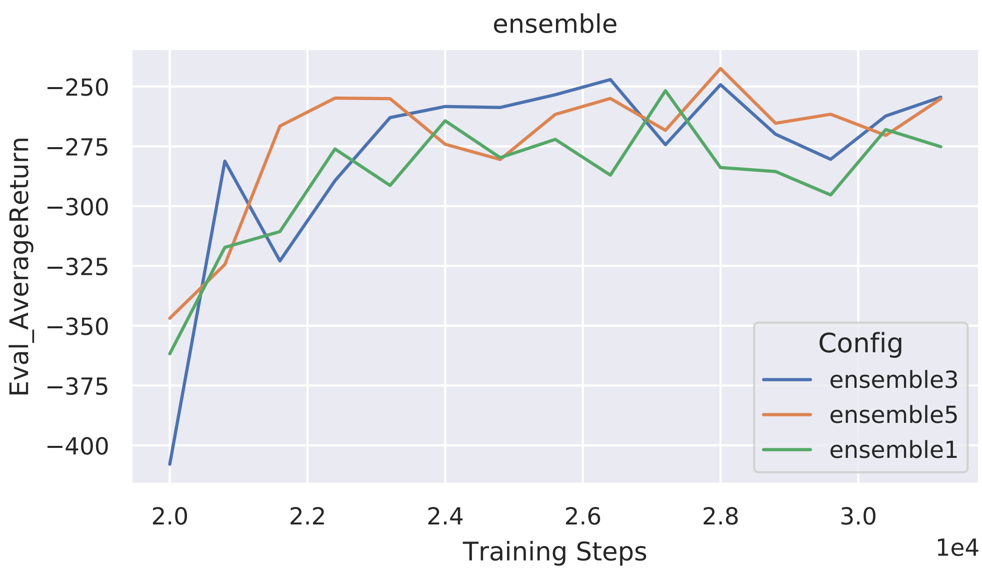

Figure 10: Ensemble size does not appear to have noticable effect on the performance of the model.