Assignment 4: Model-Based RL and Exploration

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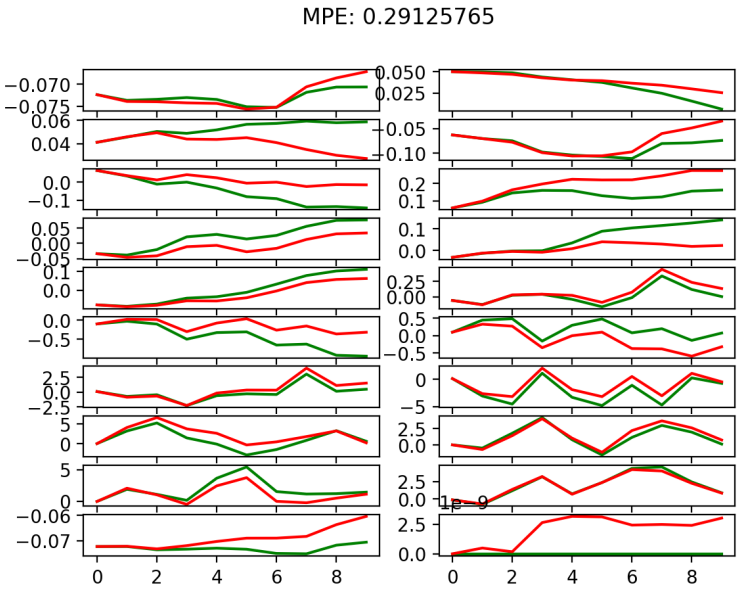
Collaborators: `Write the Andrew IDs of your collaborators here (if any).`
NOTE: Please do **NOT** change the sizes of the answer blocks or plots.

1 Problem 1: Dynamics Model Training – [10 points total]

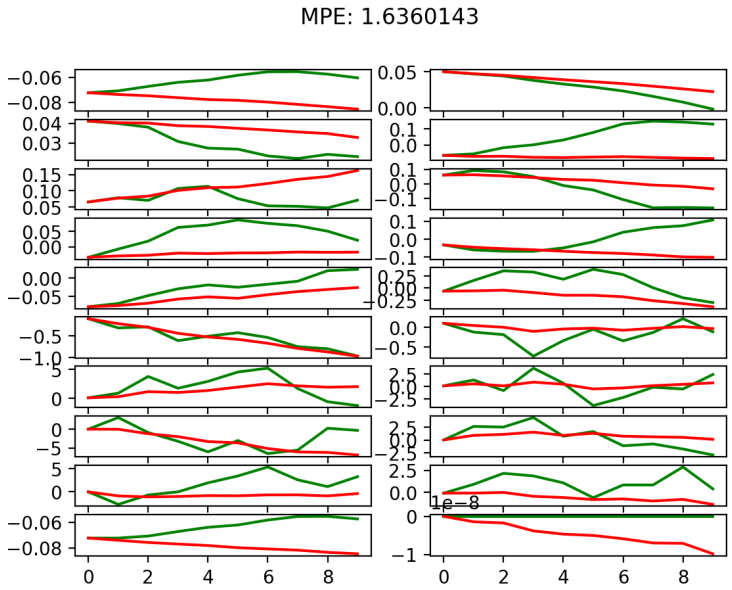
Theory questions

The model with two layers and 250 neurons each performs the best, with the lowest MPE of 0.078. this can be explained by two key factors. Firstly, the enhanced capacity of a more extensive neural network enables it to capture more complex relationships within the data, thus improving its ability to develop an effective dynamics model. Secondly, extending the duration of the training process provides more opportunity for the model to refine its parameters, thereby converging towards a more precise representation of the avtual dynamics involved. Combining a more complex network architecture and increased training iterations is crucial for achieving lower prediction errors.

Plot



Plot



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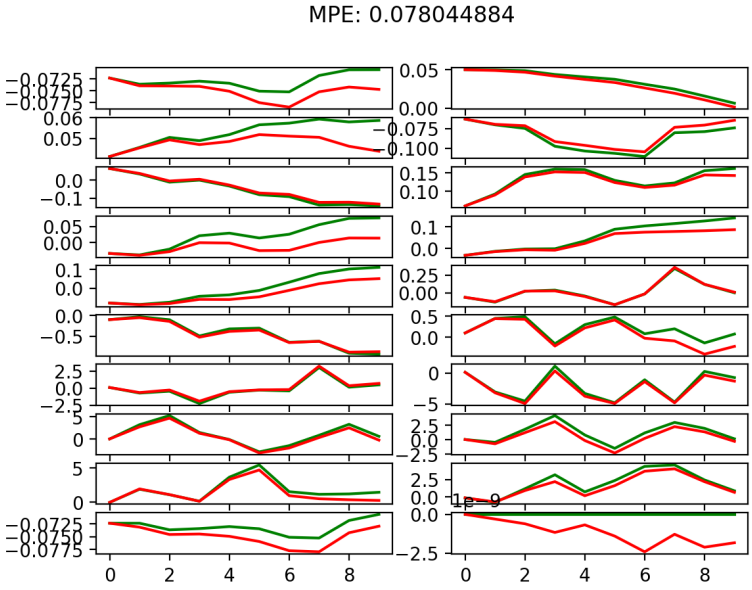
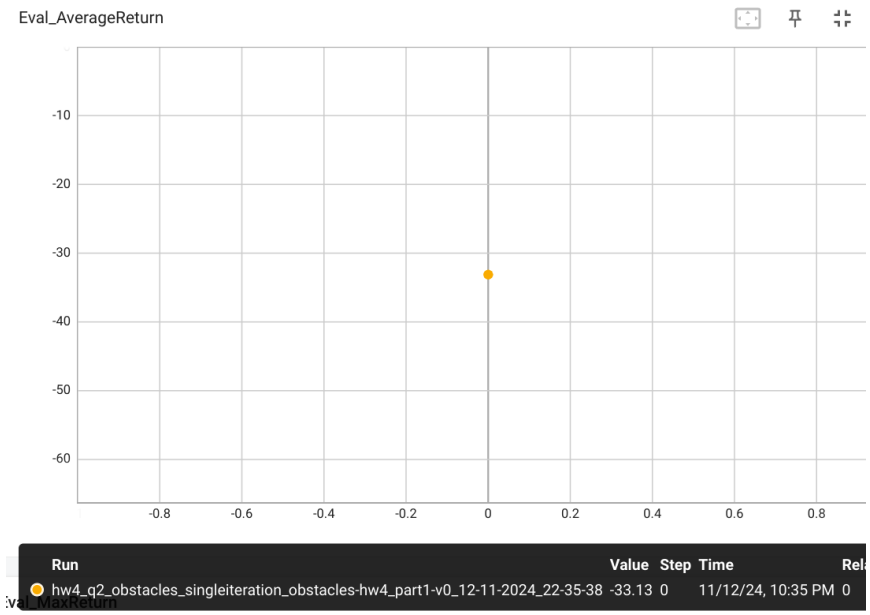


2 Problem 2: Action Selection

Plot



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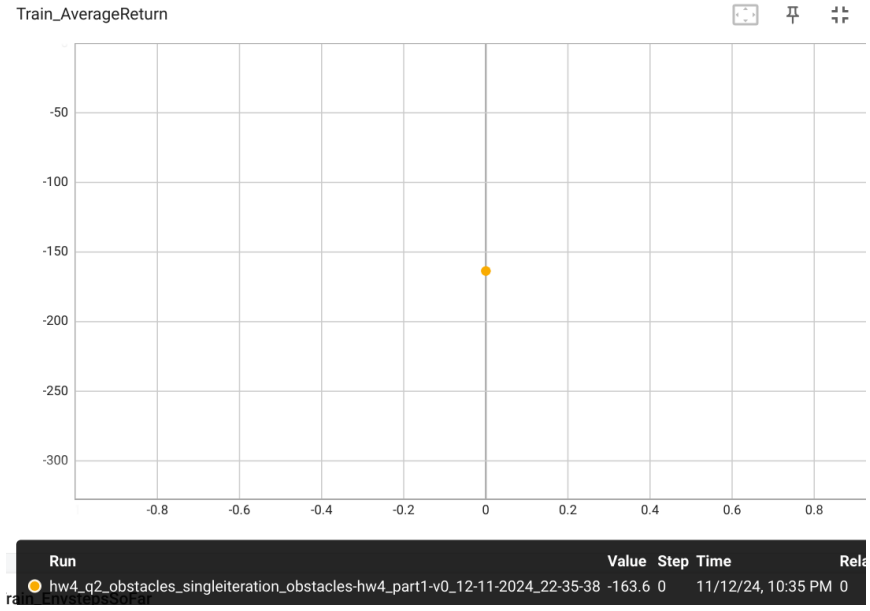
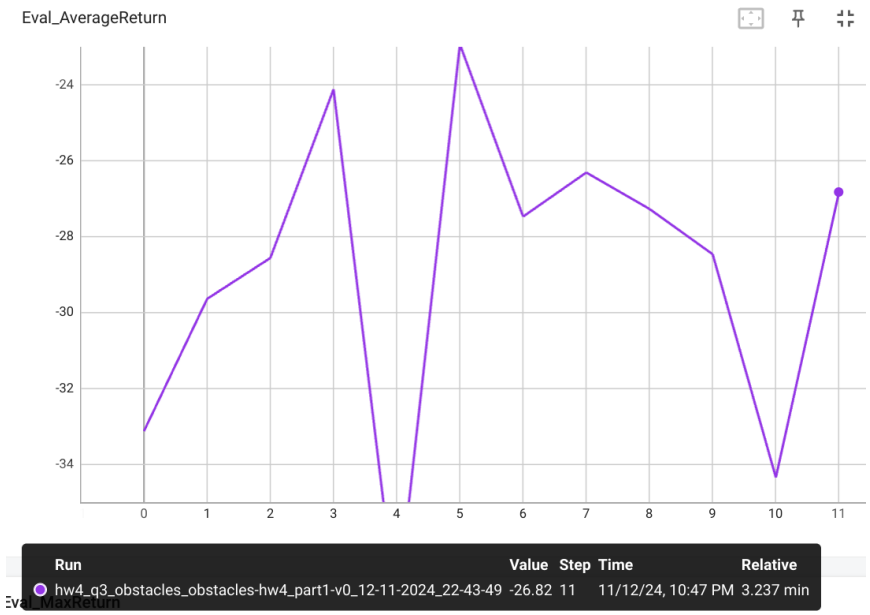


3 Problem 3: Iterative Model Training

Plot



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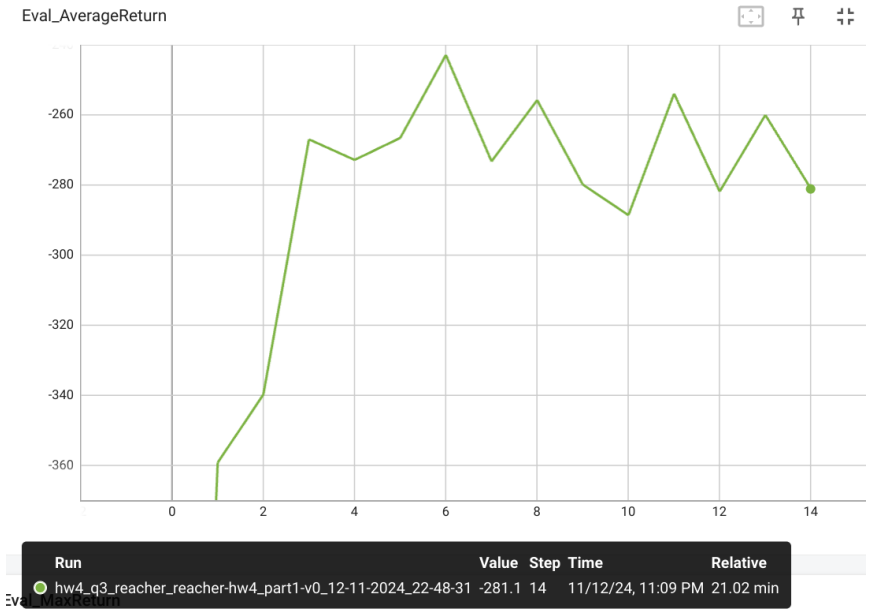

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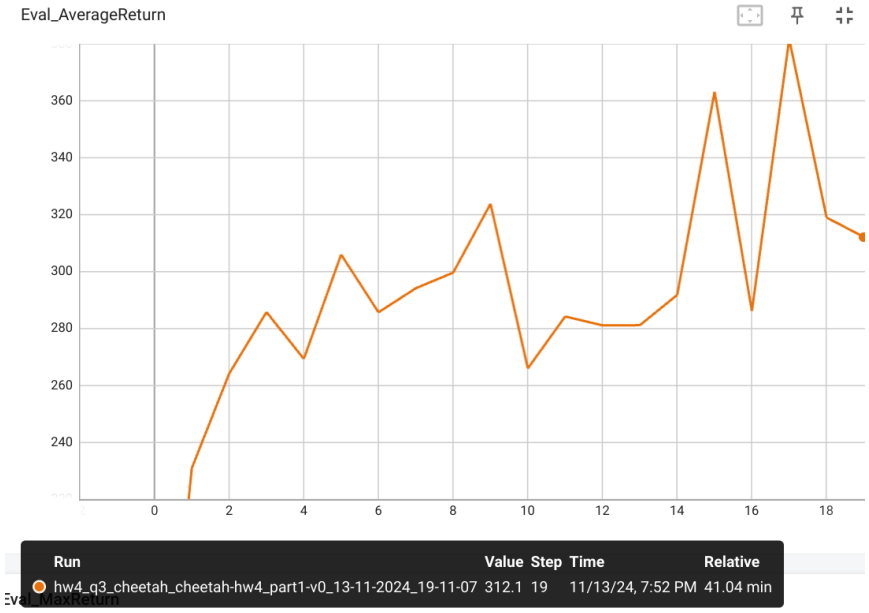
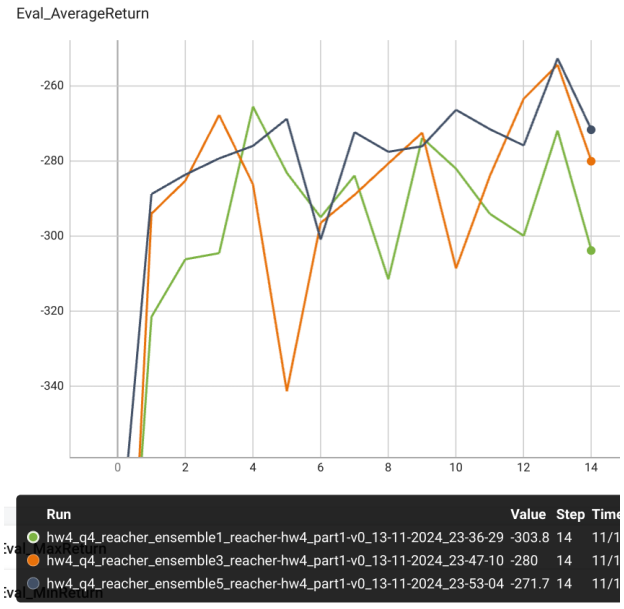


4 Problem 4: Hyper-parameter Comparison

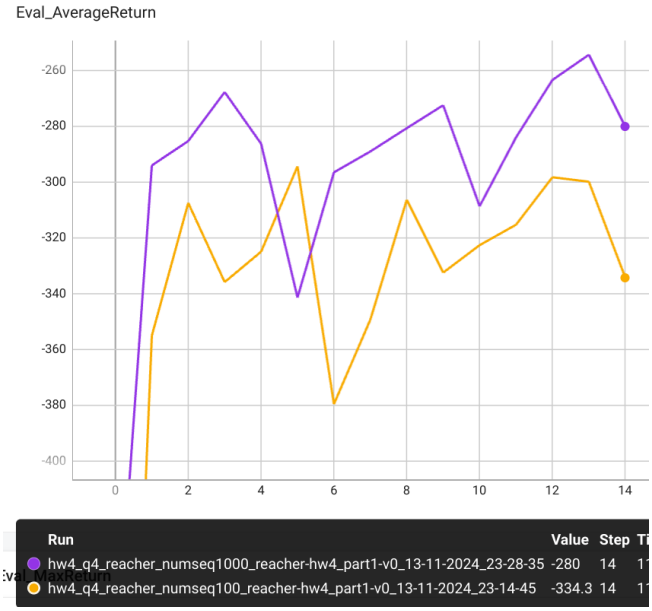
Effect of Ensemble size



Your Answer

A larger ensemble size of 5 enabled the agent to achieve a higher reward sooner. For all the other cases, the reward gradually increases to the desired value.

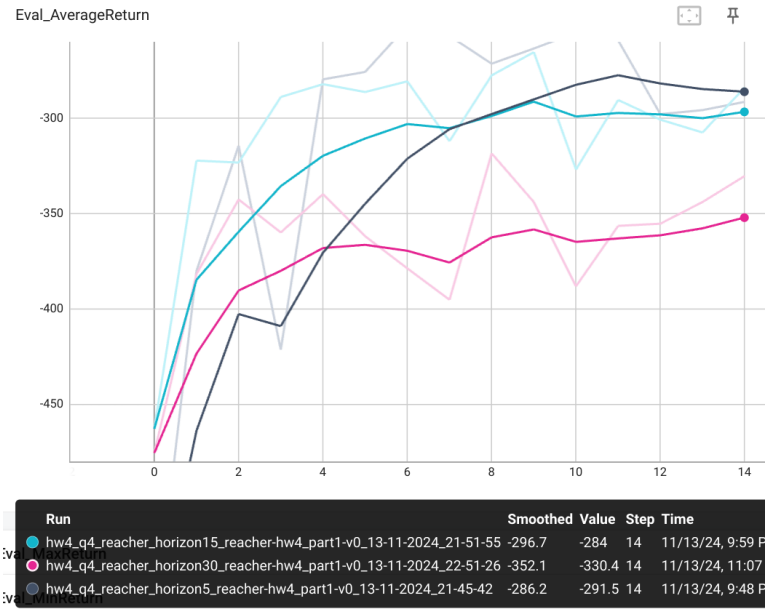
Effect of the number of candidate action sequences



Your Answer

We can see a similar trend in this too, where larger number of candidate sequences (1000 in this case) resulted in a better final reward.

Effect of planning horizon

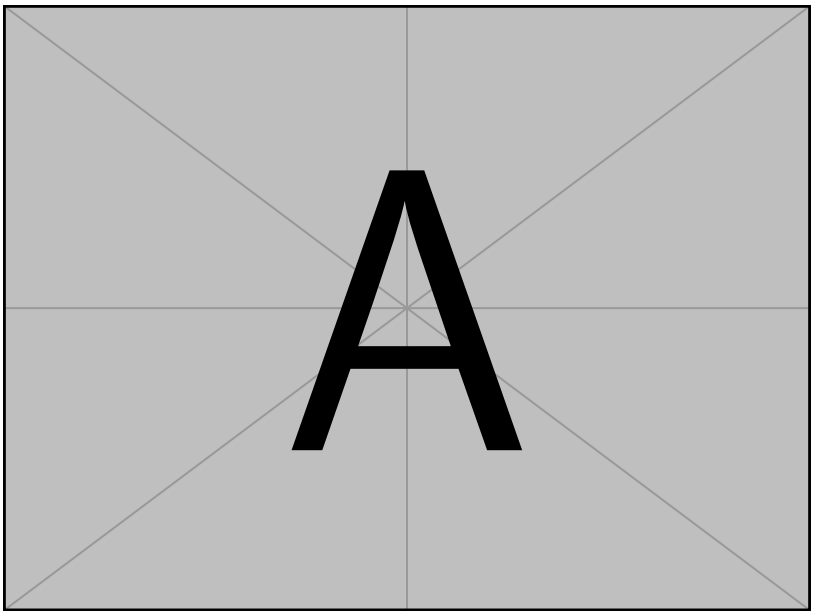


Your Answer

The agent achieved its best reward when the horizon was set to 5. Conversely, the agent received a lower reward when the horizon was 30, indicating that a lower horizon size resulted in better performance.

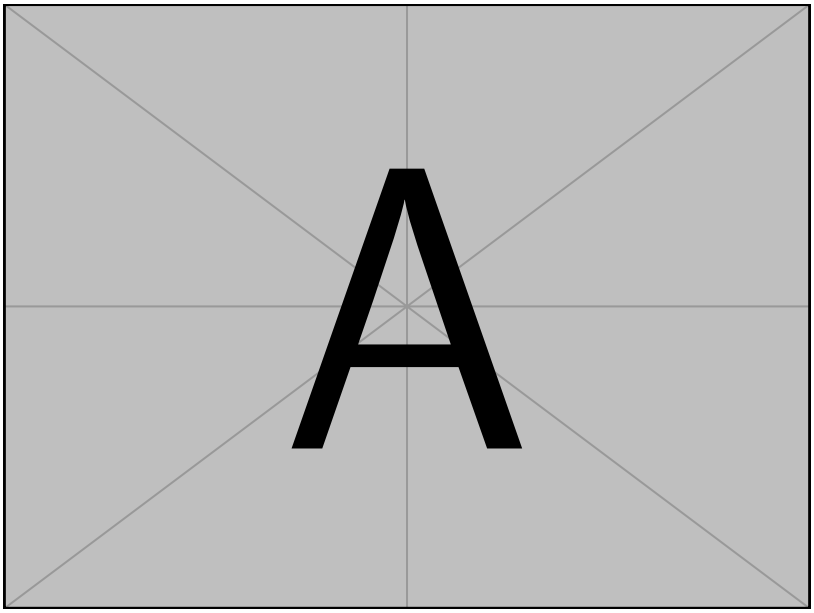
5 Problem 5: Hyper-parameter Comparison (Bonus)

Plot



6 Problem 6: Exploration (Bonus)

Plot



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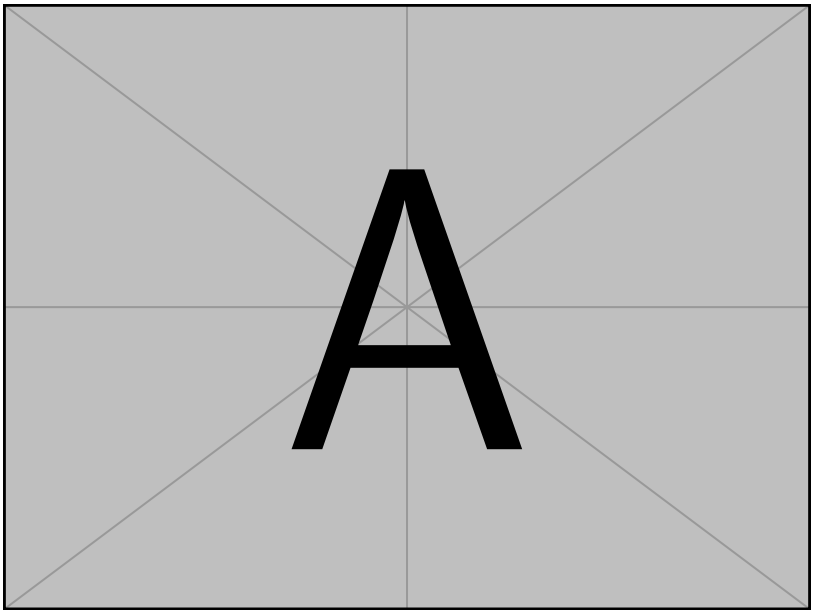

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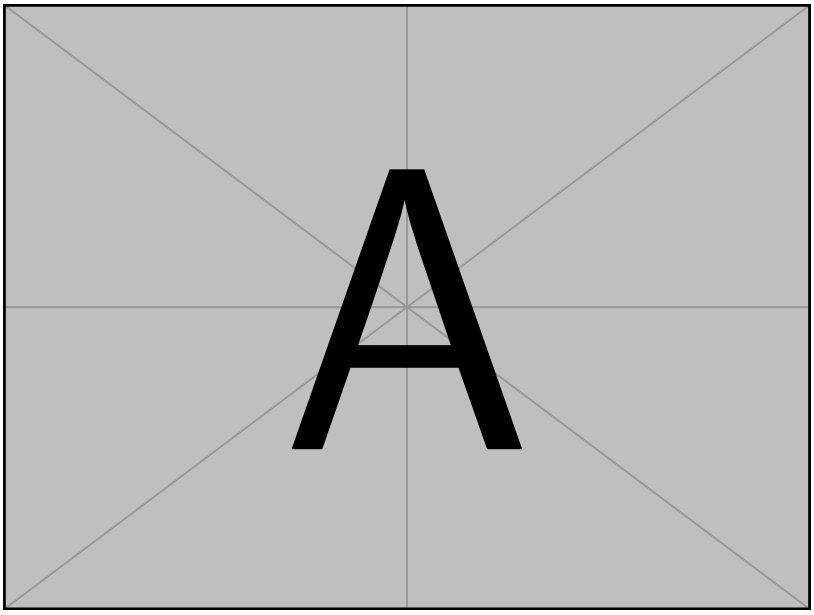

Plot