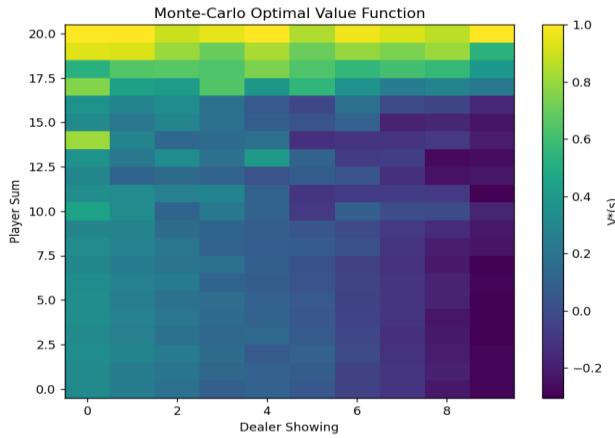


Reinforcement Learning Assignment

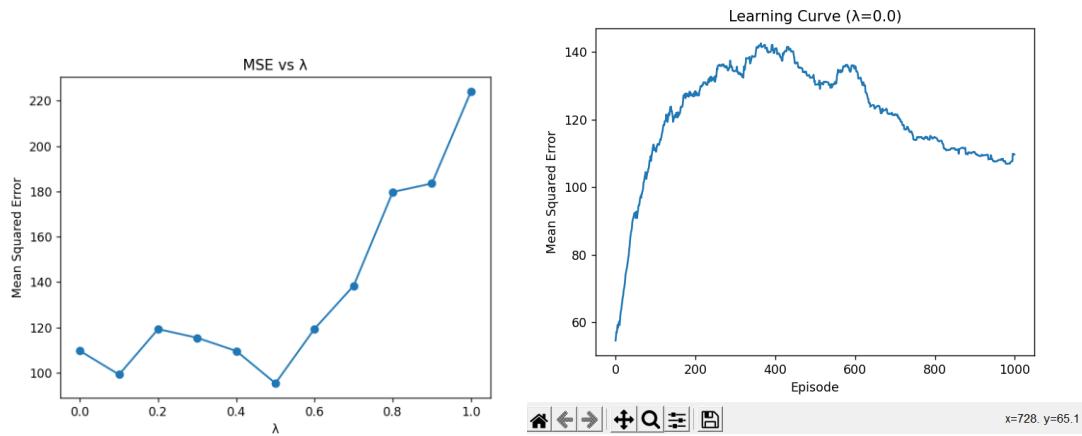
Chinthala Mahathi Reddy

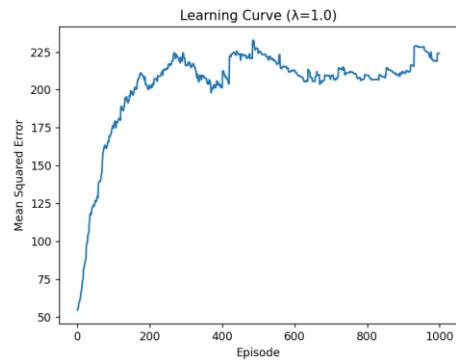
24B1097

Open the project folder and run the command **python run_all.py**, which includes all the plots and outputs for Monte Carlo control, SARSA lambda, and linear approximation plots. The plots are attached below:

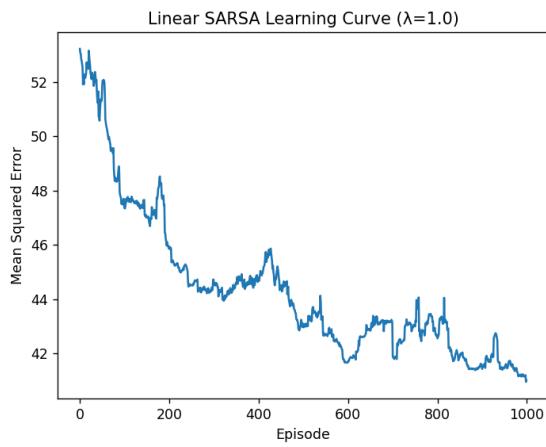
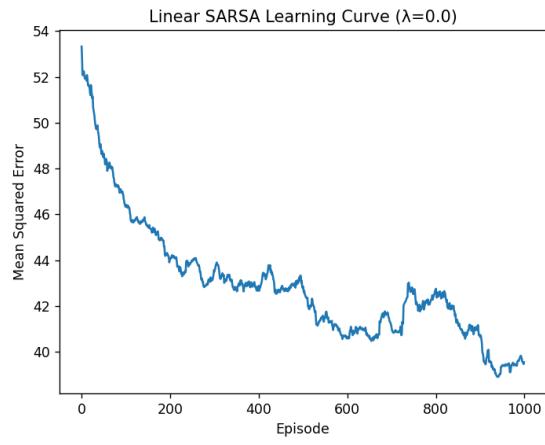
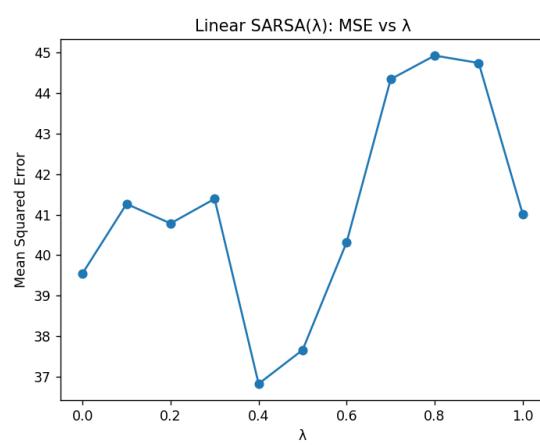


Sarsa Lambda:





Linear Function Approximation:



Discussions:

- What are the pros and cons of bootstrapping in Easy21?

Pros:

1. Enables faster learning by updating values at each step rather than waiting for episode termination.
2. It generally produces lower variance estimates compared to Monte Carlo methods

3. It would be more data efficient.

Cons:

1. It introduces bias, and it can lead to instability when combined with function approximation.
 2. Sensitive to learning rate.
- **Would you expect bootstrapping to help more in blackjack or Easy21? Why?**
Bootstrapping may help more in Easy21 than in blackjack. Easy21 has a large state space, making Monte Carlo updates slower and less efficient. Bootstrapping allows learning from intermediate steps, which significantly improves learning speed.
 - **What are the pros and cons of function approximation in Easy21?**

Pros:

1. Reduces memory requirements compared to tabular methods.
2. Improves learning speed in large states.
3. Allows generalisation across similar states.

Cons:

1. Introduces approximation errors.
 2. Performance depends heavily on feature design.
 3. Instability arises during bootstrapping.
- **How would you modify the function approximator suggested in this section to get better results in Easy21?**

The performance of the function approximator can be improved by using finer or multiple overlapping tilings, increasing the number of features, or employing non-linear models such as neural networks to better capture the structure of the value function.