Zmh6339
AI & Machine Learning, CS-UH 3260
Professor Keith Ross

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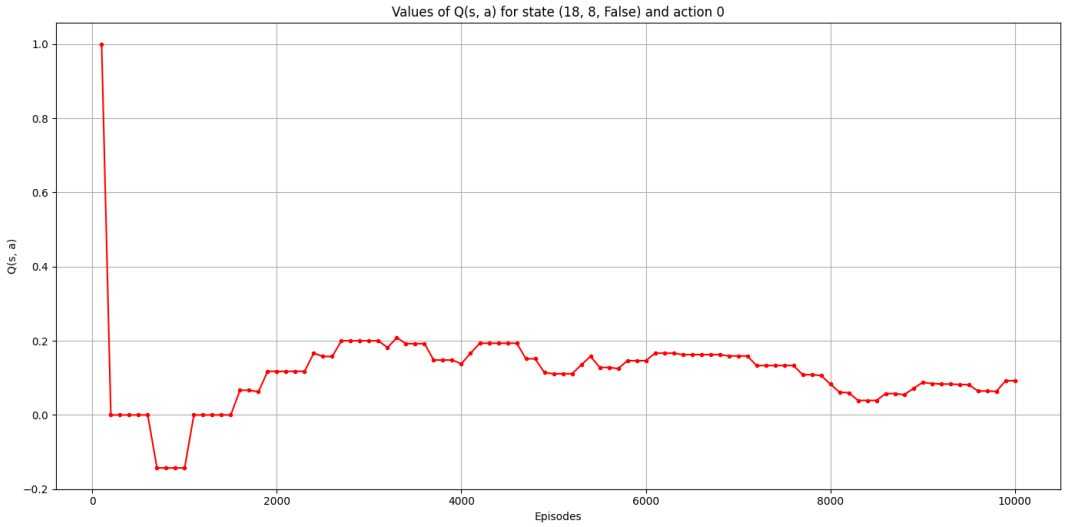
# Assignment 2

## Question 1

Below is the plotting of $Q(\texttt{s,stick})$
where $s \coloneqq (\texttt{player total} = 18, \texttt{dealer showing} = 8, \texttt{no usable ace})$ in the first MCES version of the Blackjack game over 10,000 training epsiodes (where every 100th episode was recorded).




Moreover, here are the winning, drawing, and losing rates of the first MCES version of the Blackjack game after 10,000 training episodes and then 100,000 testing episodes.

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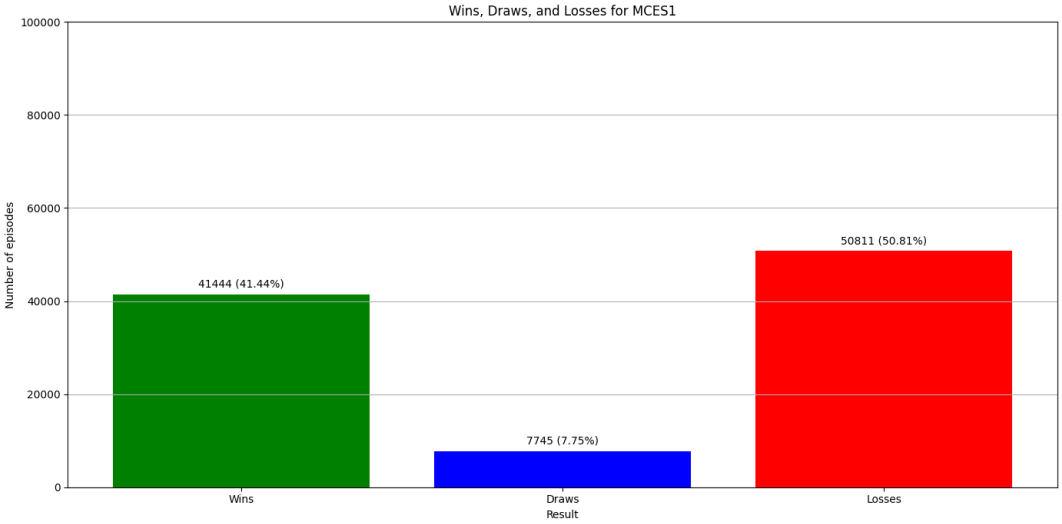
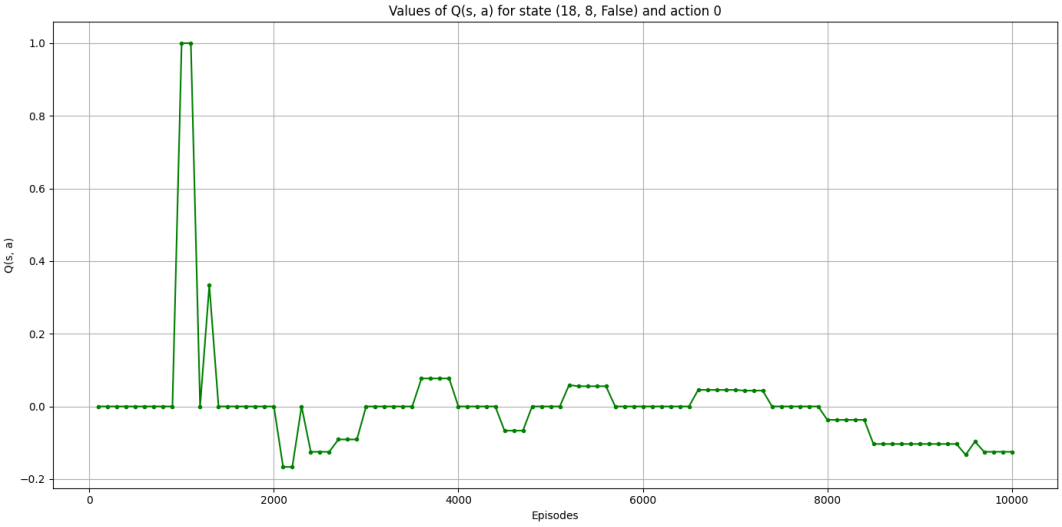



# Question 2

Below is the plotting of $Q(\texttt{s,stick})$
where $s := (\texttt{player total} = 18, \texttt{dealer showing} = 8, \texttt{no usable ace})$ in the second MCES version of the Blackjack game over 10,000 training epsiodes (where every 100th episode was recorded).




Moreover, here are the winning, drawing, and losing rates of the second MCES version of the Blackjack game after 10,000 training episodes and then 100,000 testing episodes.

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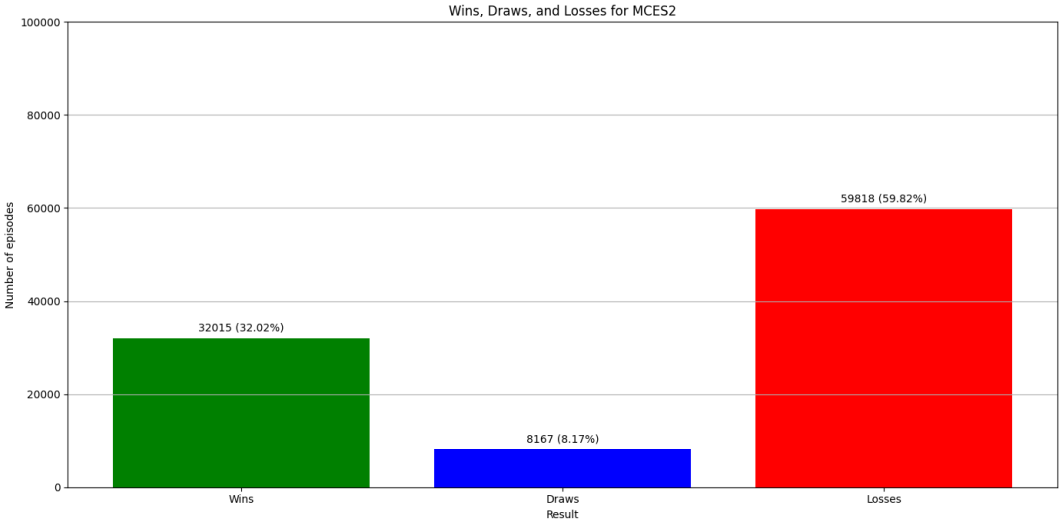
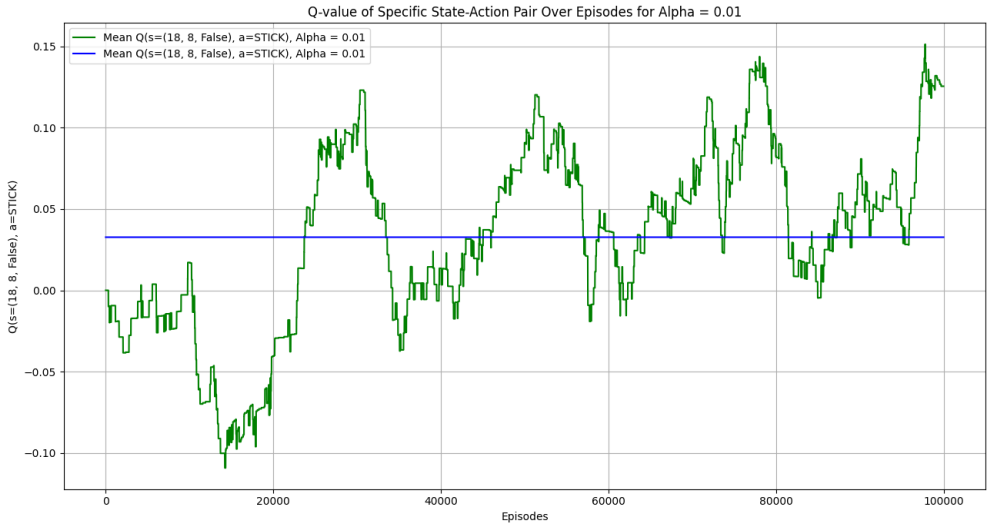



# Question 3

Below is the plotting of $Q(\texttt{s,stick})$
where $s := (\texttt{player total} = 18, \texttt{dealer showing} = 8, \texttt{no usable ace})$ in the Q-learning version of the Blackjack game with $\alpha = 0.01$ and $\alpha = 0.1$ over all 100,000 training epsiodes.



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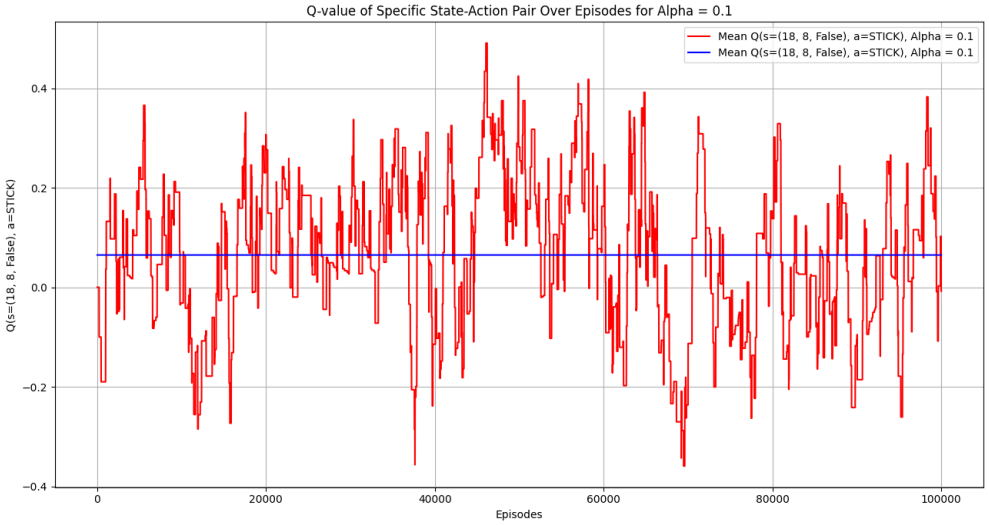
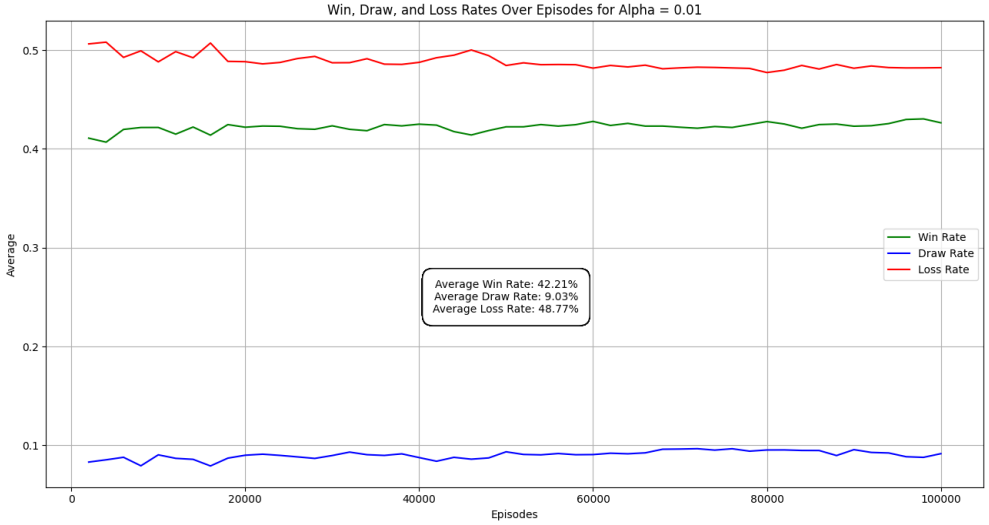



Moreover, here are the winning, drawing, and losing rates of the Q-learning version of the Blackjack game with $\alpha = 0.01$ and $\alpha = 0.1$ after 100,000 testing episodes with each 2000th training episode (total of 50 averages).



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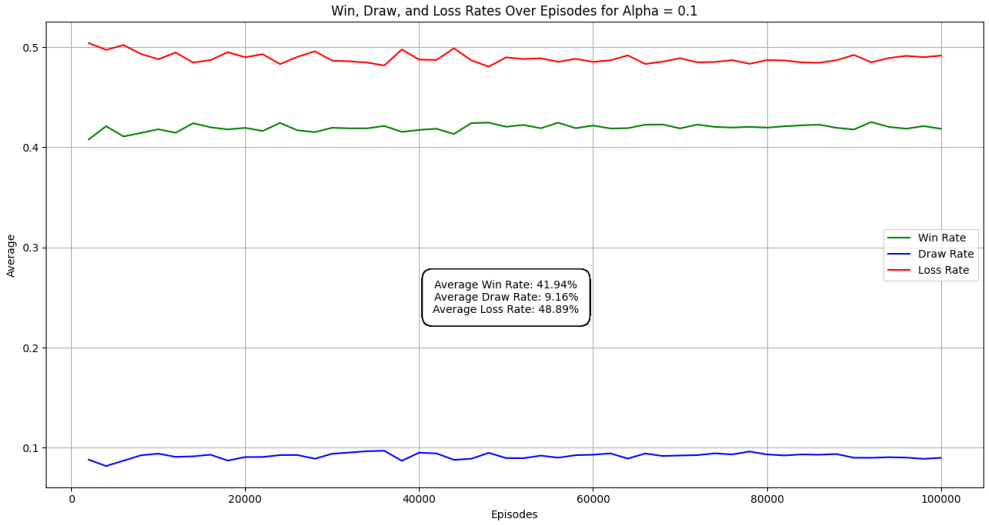
Win, Draw, and Loss Rates Over Episodes for Alpha = 0.1
Average
Episodes
0.5
0.4
0.3
0.2
0.1
0
20000
40000
60000
80000
100000
Win Rate
Draw Rate
Loss Rate
Average Win Rate: 41.94%
Average Draw Rate: 9.16%
Average Loss Rate: 48.89%