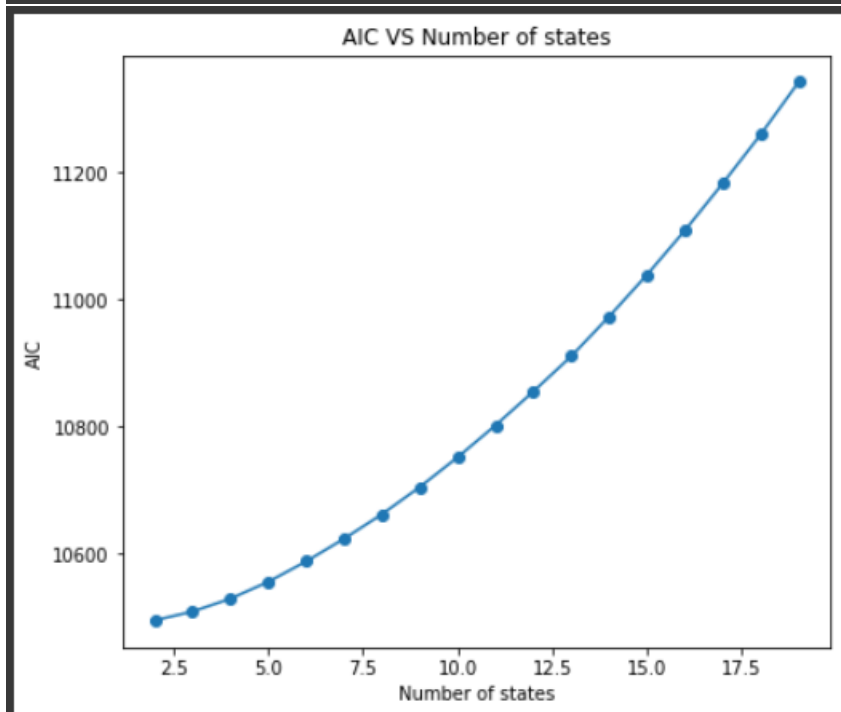
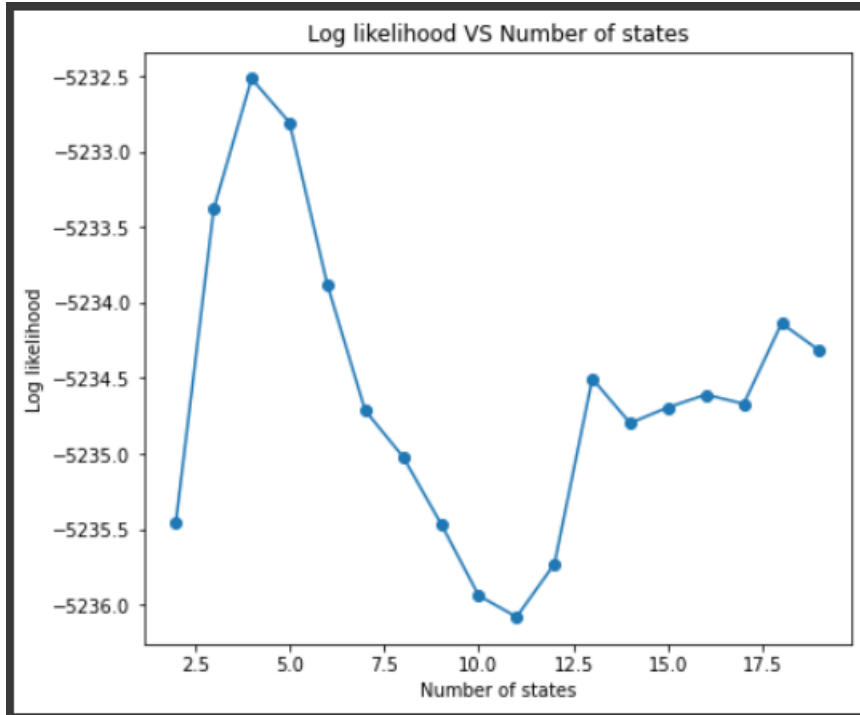
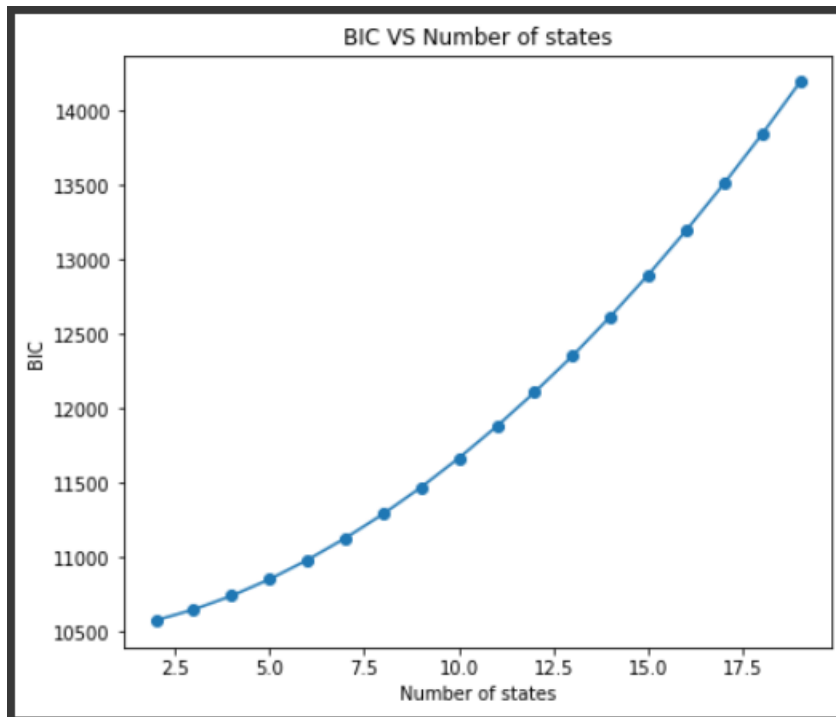


EXTRA CREDIT RESULTS

The number of states is varied from 2 to 20. The number of parameters go beyond 400. Since, each parameter requires at least 10 observations, the total number of observations are increased to 5000.





AIC estimates the relative amount of information lost by a given model. The less information a model loses, the higher the quality of that model. Therefore, we need to have a low AIC and BIC value. AIC and BIC increase as we increase number of states. Both AIC and BIC, depend proportionally on the number of parameters. As the number of states increase, so does the number of parameters (parameters \propto number of states). The score for the model returns the log likelihood for the set of observations. The higher the likelihood the better. The best model, for us would have a low AIC and BIC values, and a high likelihood. We have three good options, number of states equal to 3, 4 or 5. They have the top 3 likelihood score, and very low AIC and BIC. We can go with the middle option, i.e. one with 4 states. From the likelihood graph we can see the highest probability is for a model with 4 states and it has a low AIC and BIC value.

The final model parameters:

```
Transmission probability
[[0.15810744 0.24578016 0.34256823 0.25354417]
 [0.20387676 0.26818477 0.3019051 0.22603338]
 [0.25674207 0.27286132 0.25746396 0.21293265]
 [0.23705144 0.25579728 0.26897755 0.23817374]]
```

```
Emission probability
[[0.64586543 0.02090385 0.33323072]
 [0.4900586 0.41652543 0.09341597]
 [0.1484228 0.76990938 0.08166782]
 [0.05472896 0.56290784 0.3823632 ]]
```

```
Initial probability
[8.76432221e-01 1.23565902e-01 1.87638296e-06 4.86366148e-11]
```