

1 Environments and instructions

1. Python version **3.8** required
2. Run with `python rbc.py`
3. The terminal will show the results of final predication for this classification problem and the precision of my model.

2 Implementation Details

I followed the assignment instructions and set the initial probability to `0.5` for both classes and the probability of transition between the same classes to `0.9`. Since the model may underflow during the probability calculation, I used the **log - sum - exp** trick to get around this problem. However, this makes the final probability not interpretable, but only the relative size for binary classification. But I haven't come up with a better way yet, so I have to take this approach.

At the same time, noting that the velocity variation during the flight of an airplane is much less than that of most birds, I introduced the standard deviation of the velocity data as a correction to the model, which eliminates some of the noise interference and makes the model improve in accuracy.

The final result is:

```
1 #1: Bird
2 #2: Airplane
3 #3: Bird
4 #4: Bird
5 #5: Bird
6 #6: Airplane
7 #7: Airplane
8 #8: Bird
9 #9: Airplane
10 #10: Bird
11 The precision is 90%
```

Our classification is correct except for the 8th dataset. This may be caused by overcorrection of the model after we introduced the feature of standard deviation.