README for Viterbi Algorithm Implementation

This README file contains instructions on how to set up and run the Viterbi algorithm for exploring sequences of dice throws to determine if they are from a fair or loaded die.

Basics

Before running the program make sure you should have Python installed on your system with the following libraries:

- NumPy
- Matplotlib
- scikit-learn

You can install these packages using pip:

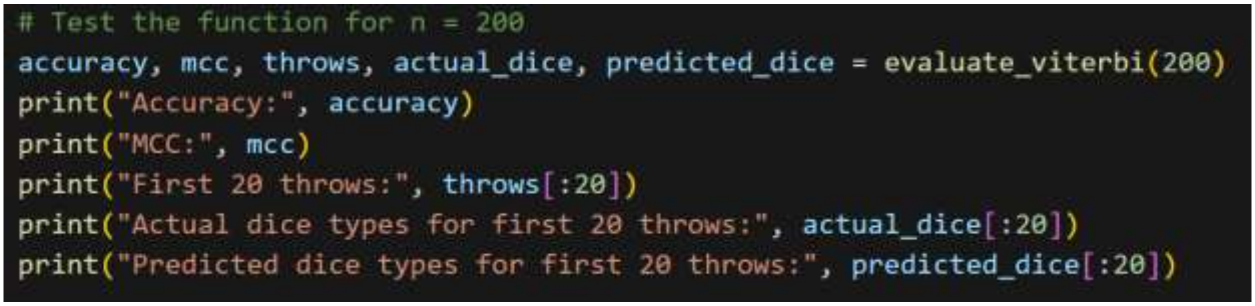
- Pip install Numpy
- Pip install Matplotlib
- Pip install scikit-learn

Methods in Package

- This file or package Contains the main implementation of the Viterbi algorithm along with the functions to generate test data and evaluate the model.

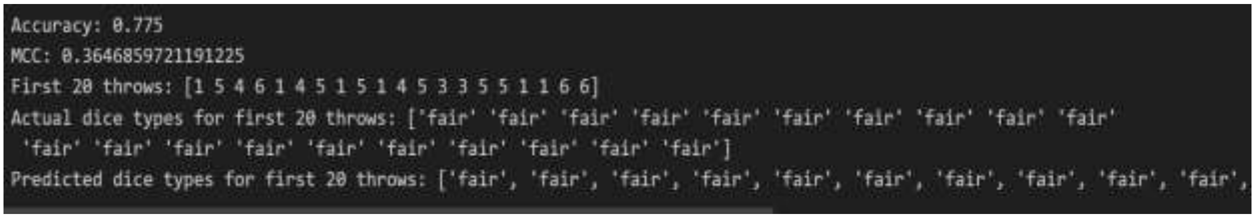
➢ Example that i Used to check Viterbi Algorithm is n=200

Hare is the code & output



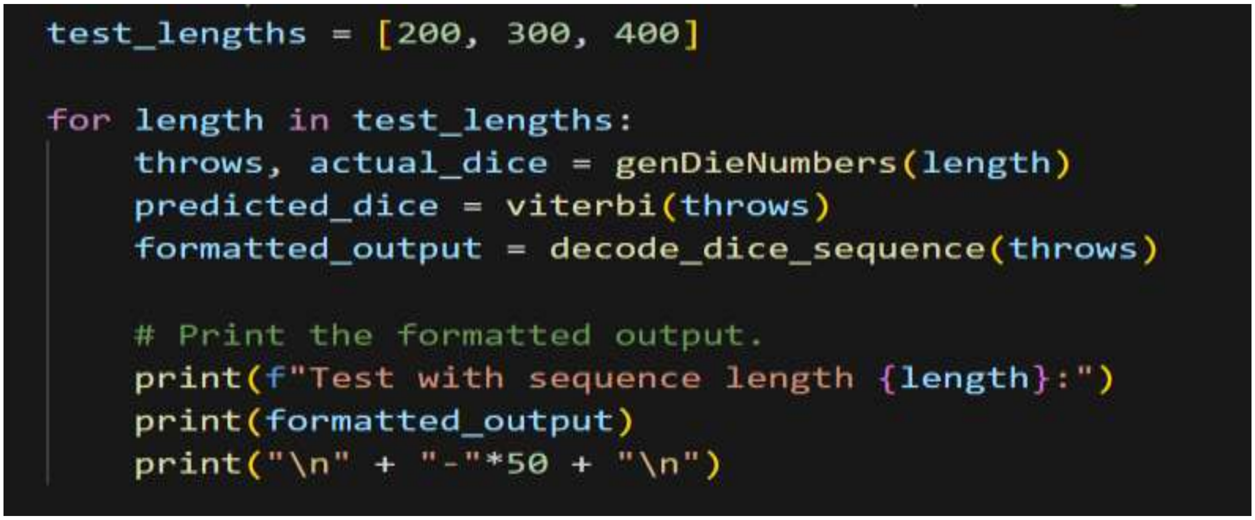
```python
# Test the function for n = 200
accuracy, mcc, throws, actual_dice, predicted_dice = evaluate_viterbi(200)
print("Accuracy:", accuracy)
print("MCC:", mcc)
print("First 20 throws:", throws[:20])
print("Actual dice types for first 20 throws:", actual_dice[:20])
print("Predicted dice types for first 20 throws:", predicted_dice[:20])
```

Output



```
Accuracy: 0.775
MCC: 0.3646859721191225
First 20 throws: [1 5 4 6 1 4 5 1 5 1 4 5 3 3 5 5 1 1 6 6]
Actual dice types for first 20 throws: ['fair' 'fair' 'fair' 'fair' 'fair' 'fair' 'fair' 'fair' 'fair' 'fair'
 'fair' 'fair' 'fair' 'fair' 'fair' 'fair' 'fair' 'fair' 'fair' 'fair']
Predicted dice types for first 20 throws: ['fair', 'fair', 'fair', 'fair', 'fair', 'fair', 'fair', 'fair', 'fair', 'fair',
```

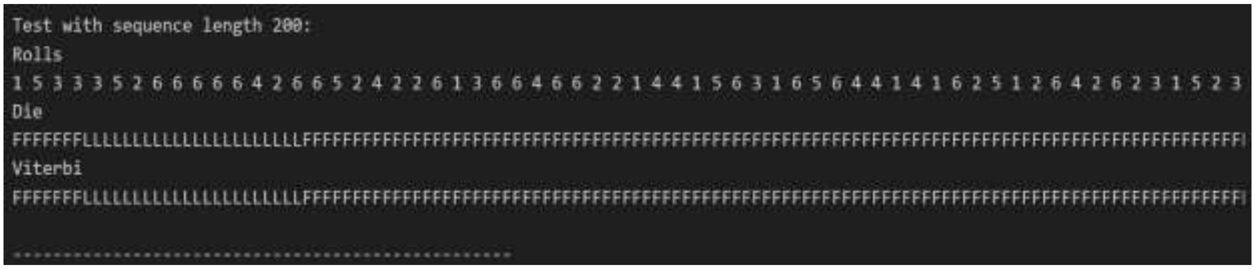
- Test Viterbi algorithm performance over a range of sequence lengths and plot the results:



```python
test_lengths = [200, 300, 400]

for length in test_lengths:
    throws, actual_dice = genDieNumbers(length)
    predicted_dice = viterbi(throws)
    formatted_output = decode_dice_sequence(throws)

    # Print the formatted output.
    print(f"Test with sequence length {length}:")
    print(formatted_output)
    print("\n" + "-"*50 + "\n")
```

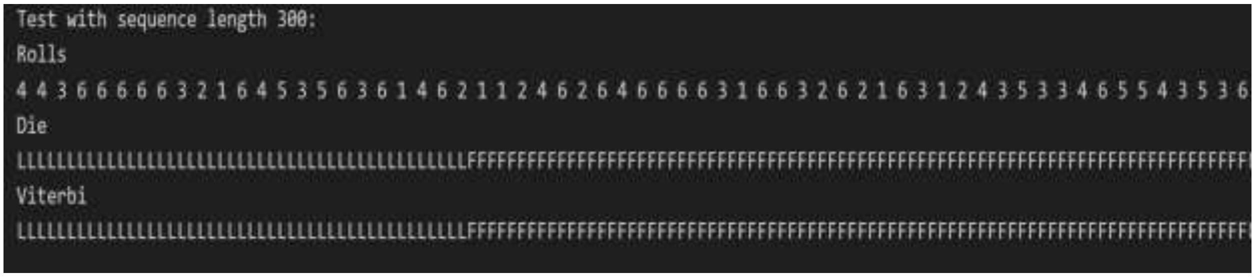
Output

- Length=200



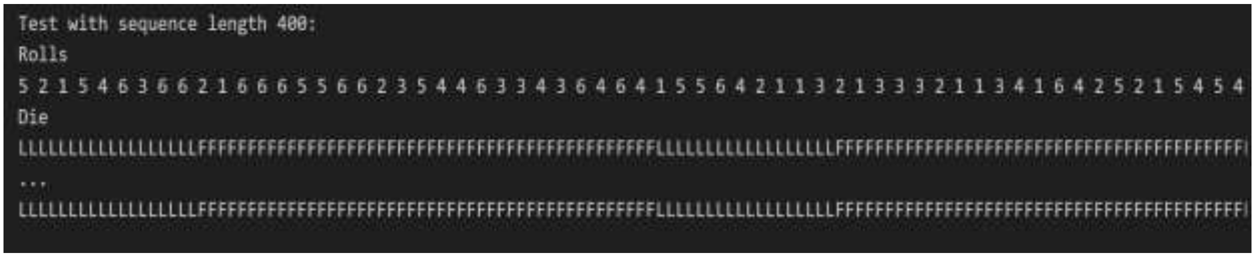
```
Test with sequence length 200:
Rolls
1 5 3 3 3 5 2 6 6 6 6 6 4 2 6 6 5 2 4 2 2 6 1 3 6 6 4 6 6 2 2 1 4 4 1 5 6 3 1 6 5 6 4 4 1 4 1 6 2 5 1 2 6 4 2 6 2 3 1 5 2 3
Die
FFFFFFLLLLLLLLLLLLLLLLLLLLLLFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
Viterbi
FFFFFFLLLLLLLLLLLLLLLLLLLLLLFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF

--------------------------------------------------
```

- Length=300



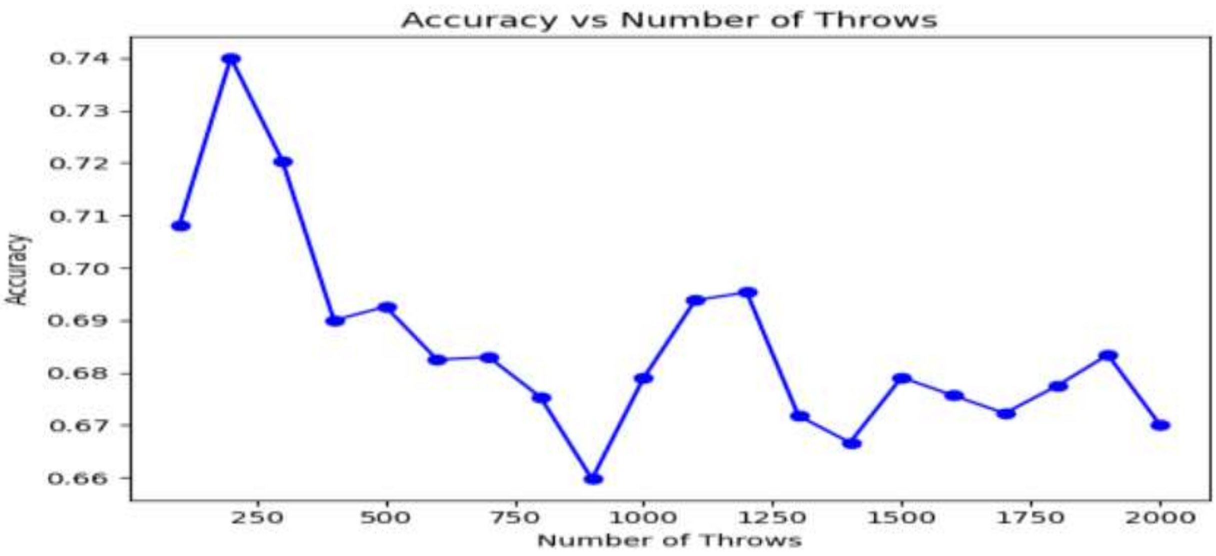
```
Test with sequence length 300:
Rolls
4 4 3 6 6 6 6 6 3 2 1 6 4 5 3 5 6 3 6 1 4 6 2 1 1 2 4 6 2 6 4 6 6 6 6 3 1 6 6 3 2 6 2 1 6 3 1 2 4 3 5 3 3 4 6 5 5 4 3 5 3 6
Die
LLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
Viterbi
LLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLLFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
```

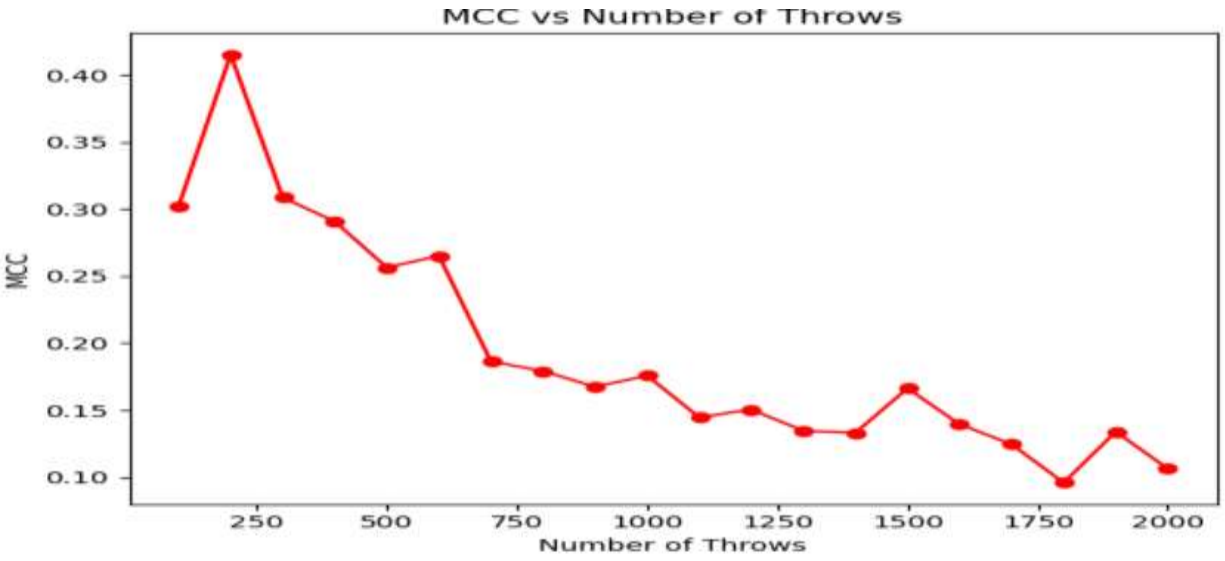
- Length=400



```
Test with sequence length 400:
Rolls
5 2 1 5 4 6 3 6 6 2 1 6 6 6 5 5 6 6 2 3 5 4 4 6 3 3 4 3 6 4 6 4 1 5 5 6 4 2 1 1 3 2 1 3 3 3 2 1 1 3 4 1 6 4 2 5 2 1 5 4 5 4
Die
LLLLLLLLLLLLLLLLLLFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFLLLLLLLLLLLLLLLLLLFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
...
LLLLLLLLLLLLLLLLLLFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFLLLLLLLLLLLLLLLLLLFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
```

- This package also generate the plots of accuracy vs number of throws /or Size and MCC vs number of throws. Here is the following graphs





Note

Make sure all necessary libraries are installed in your machine carefully . If you further meet errors or other library-related issues, double-check that each library has been installed nad import properly.

Thanks