Assignment-2

2021101113

Science - II

Q1

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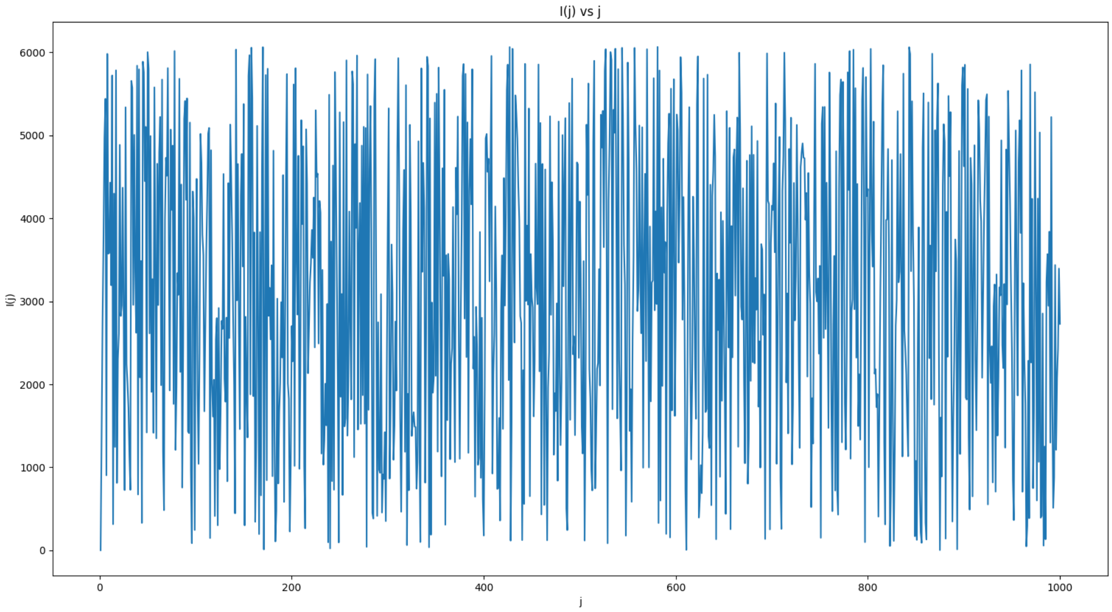
> **All these commands are tested on Ubuntu Version 20.04.3 LTS (Focal Fossa)**

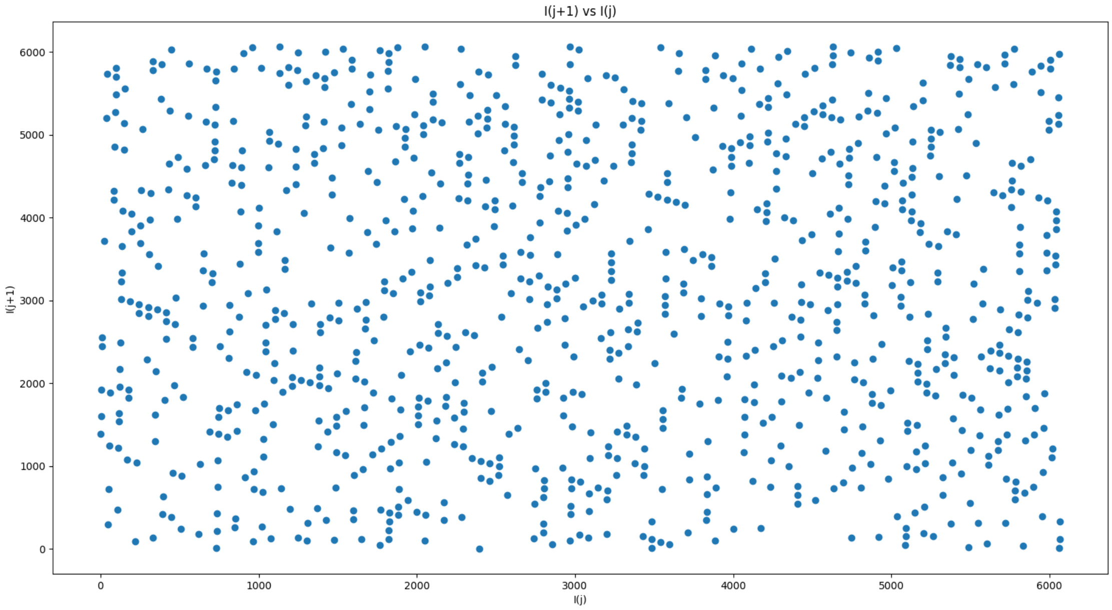
```
Q1
├── Q1a.py
├── Q1b.py
├── Q1c.py
└── Q1.pdf
```

> - Q1-part-a

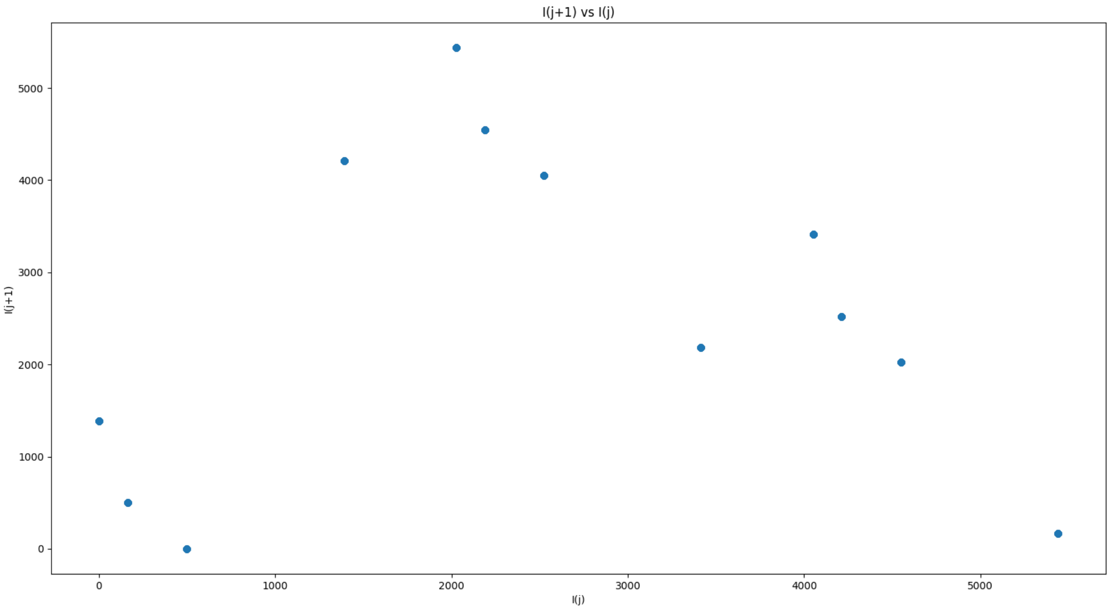


> - Q1-part-b

```
Now if I is truly random then there should be no correlation between
successive values of I. Thus, a good way of testing our random number
generator is to plot I_j versus I_{j+1} (where I_j corresponds to the jth
number in the psuedo-random sequence) for many different values of j. For a
good random number generator, the plotted points should densely fill the
unit square. Moreover, there should be no discernible pattern in the
distribution of points.
```




```
Above Figure shows a correlation plot for the first 1000 I_j-I_{j+1} pairs
generated using a linear congruental psuedo-random number generator
characterized by A=106, C=1283, and M=6075. It can be seen that this is a
far better choice of values for A, C, and M, since the pseudo-random
sequence is of maximal length, yielding I_j values which are fairly evenly
distributed in the range 0 to 1. However, if we look carefully at above
Figure, we can see that there is a slight tendency for the dots to line up
in the horizontal and vertical directions. This indicates that the I_j are
not quite randomly distributed: i.e., there is some correlation between
successive I_j values. The problem is that M is too low: i.e., there is not
a sufficiently wide selection of different I_j values in the interval 0 to
1.
The simple linear congruential method on the eIhibits a regular lattice
structure where all points lie on parallel hyperplanes.
```




```
Above Figure shows a correlation plot for the first 1000 I_j-I_{j+1} pairs
generated using a linear congruental psuedo-random number generator
characterized by A=107, C=1283, and M=6075. It can be seen that this is a
poor choice of values for A, C, and M, since the pseudo-random sequence
repeats after a few iterations, yielding I_j values which do not densely
fill the interval 0 to 1.
```

> - Q1-part-c