Monte carlo integration

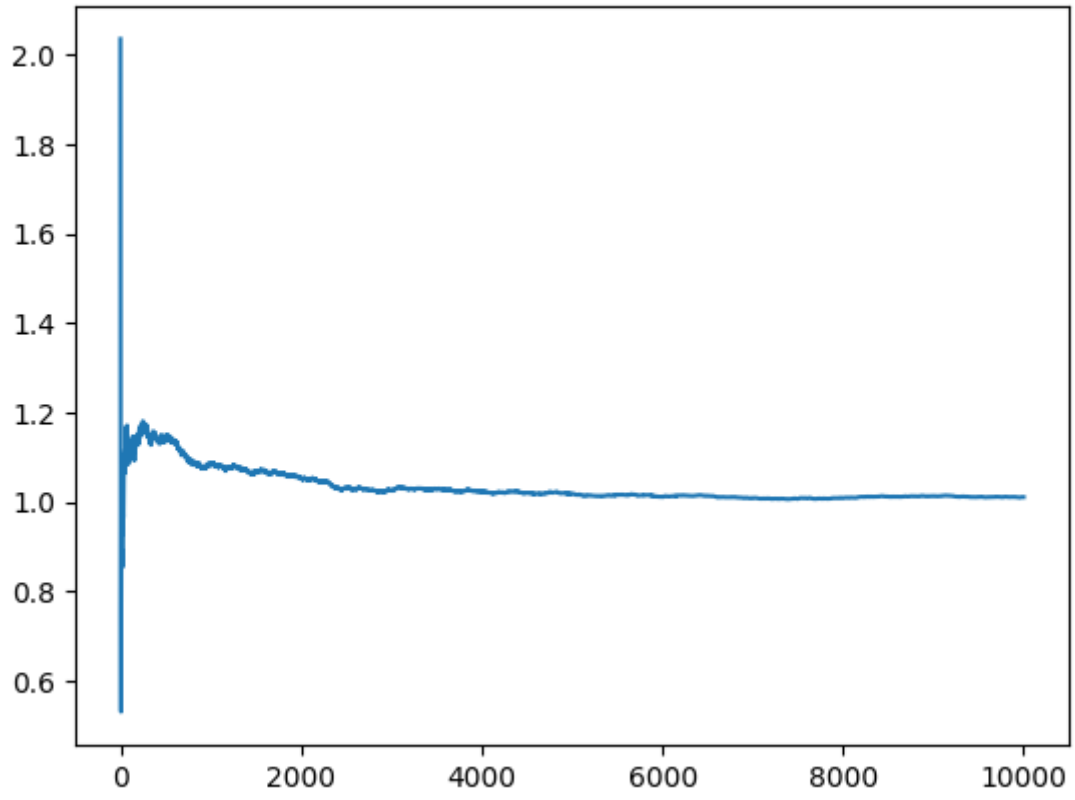
Integral one

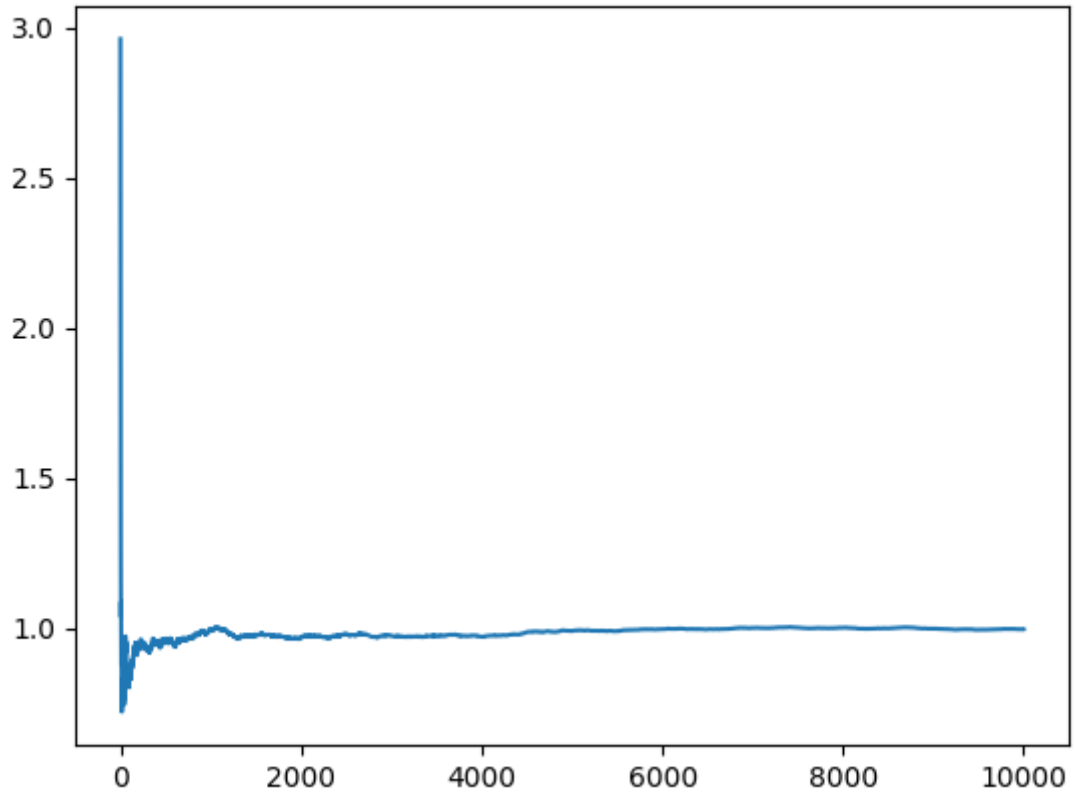
$$I = \int_0^1 3x^2 \, dx$$

Plot I vs Number of pointes (N)

As we increase the number of points, the calculated vaue of the integral approaches the real value

The real value of the integral is **1**

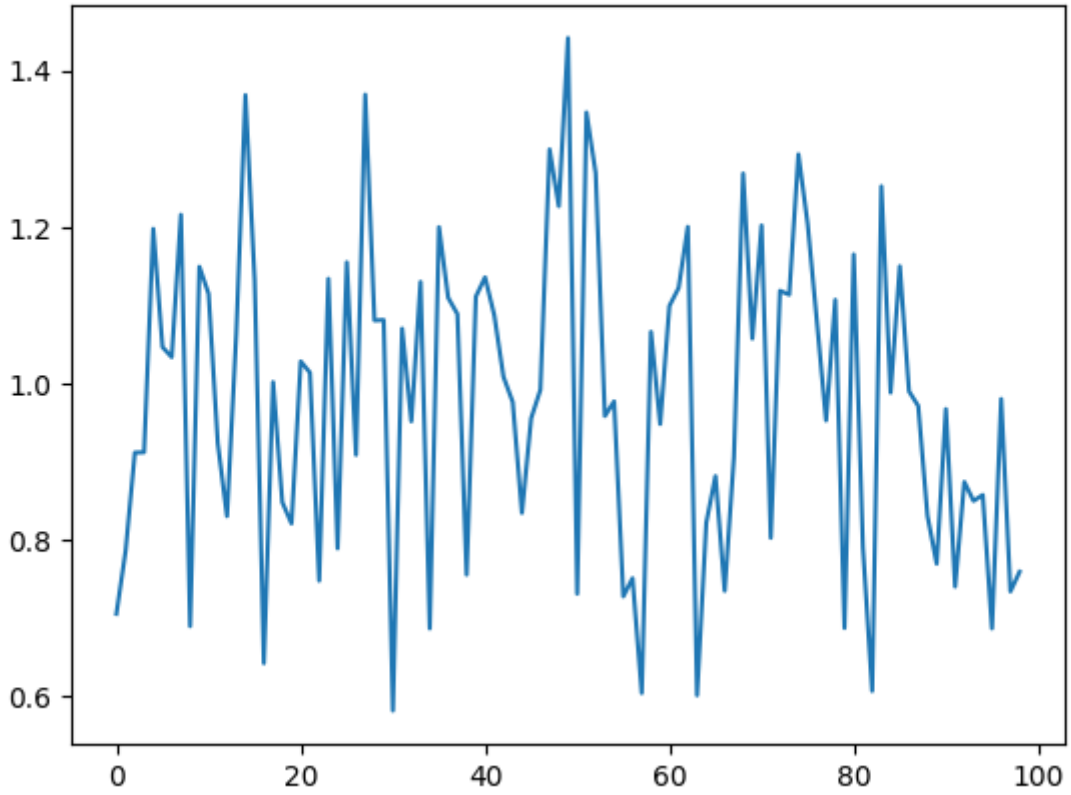




Fix N=20; 100 trials; Plot I vs trials; calculate std deviation.

The standard deviation came out to be **0.19**

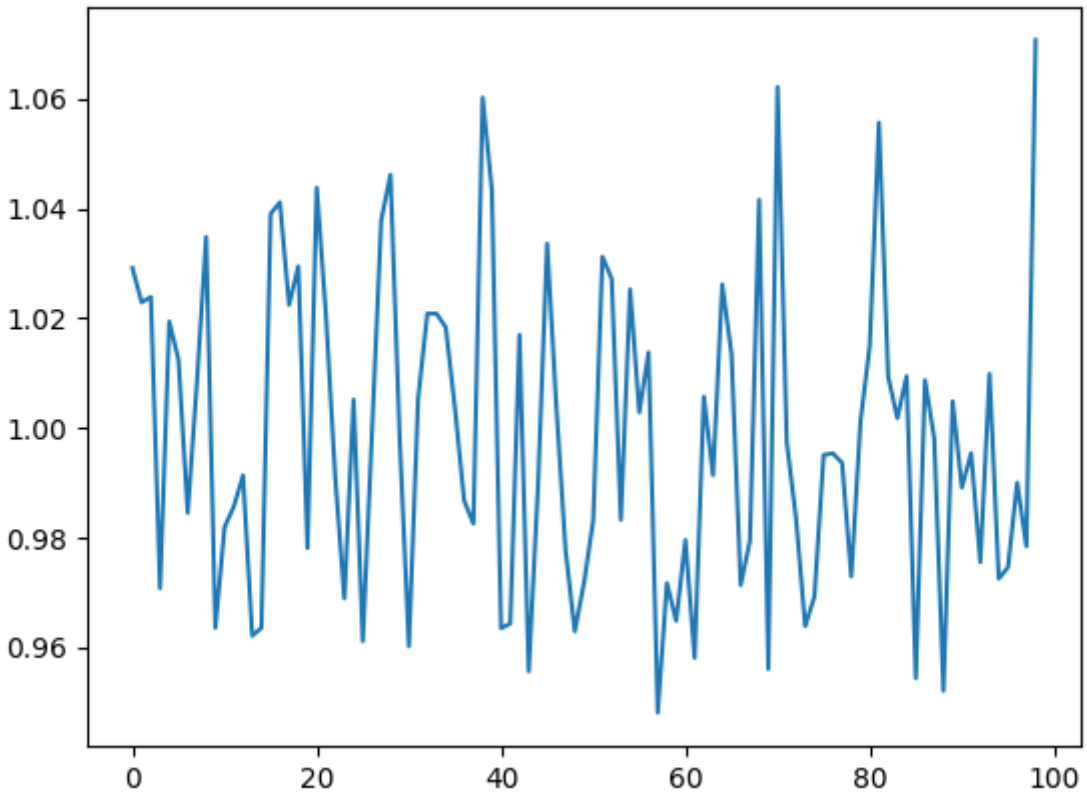
The plot is



Fix N=1000; 100 trials; Plot I vs trials; calculate std deviation.

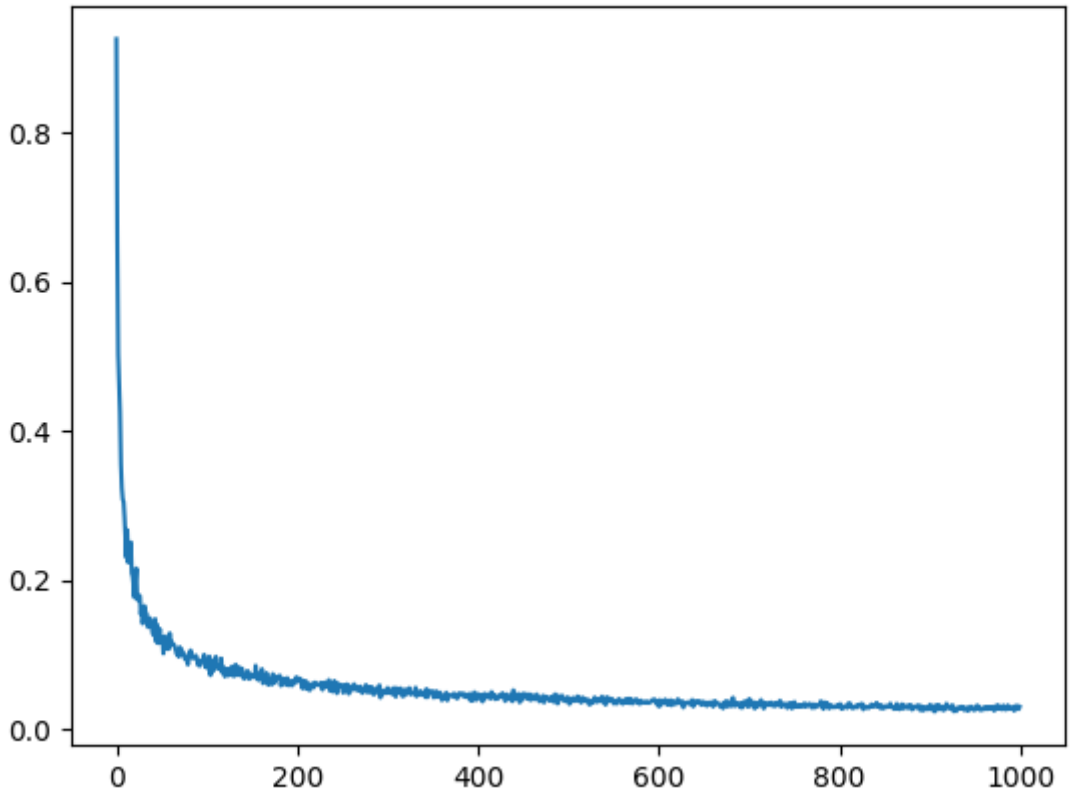
The standard deviation came out to be **0.028**

The plot is



Plot standard deviation (Of I vs trials) vs N for a fixed number of trials;Check if STD is proportional to sqrt(N)

The plot is for trials = 100 and N = 1000



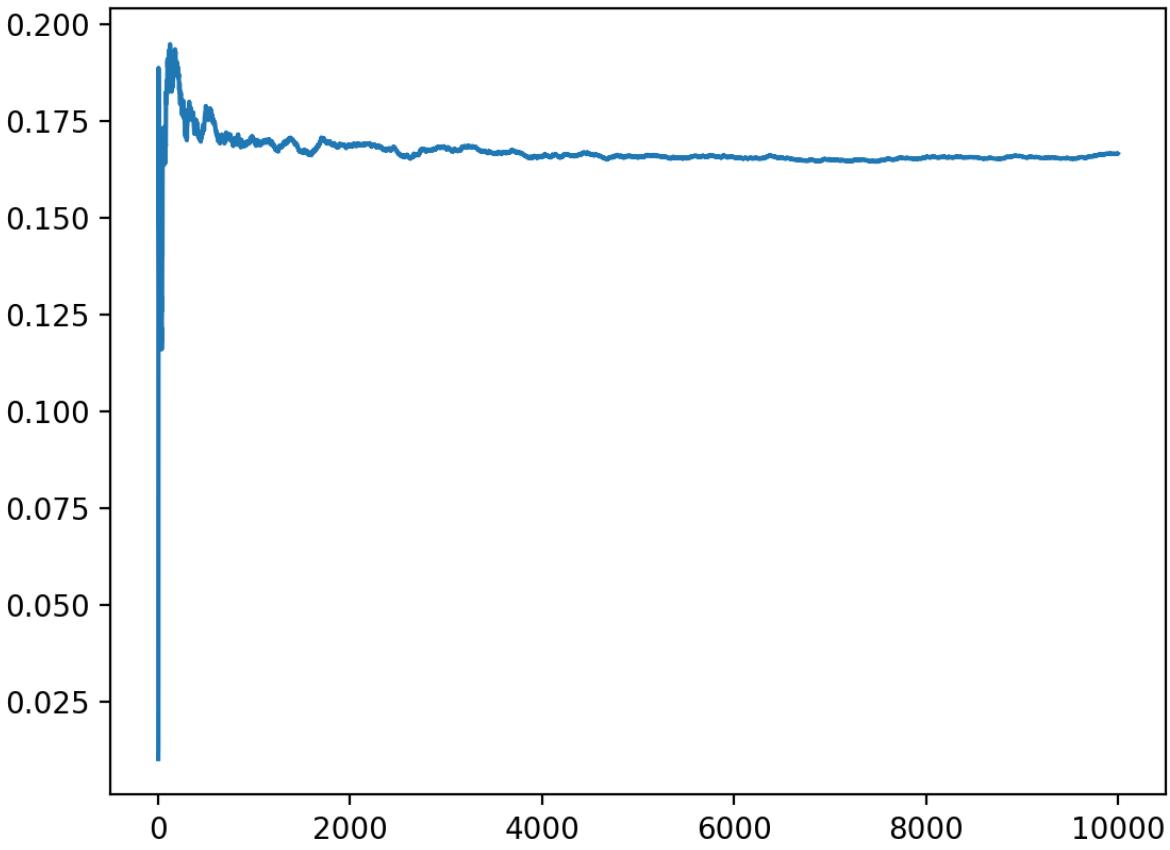
Integral two

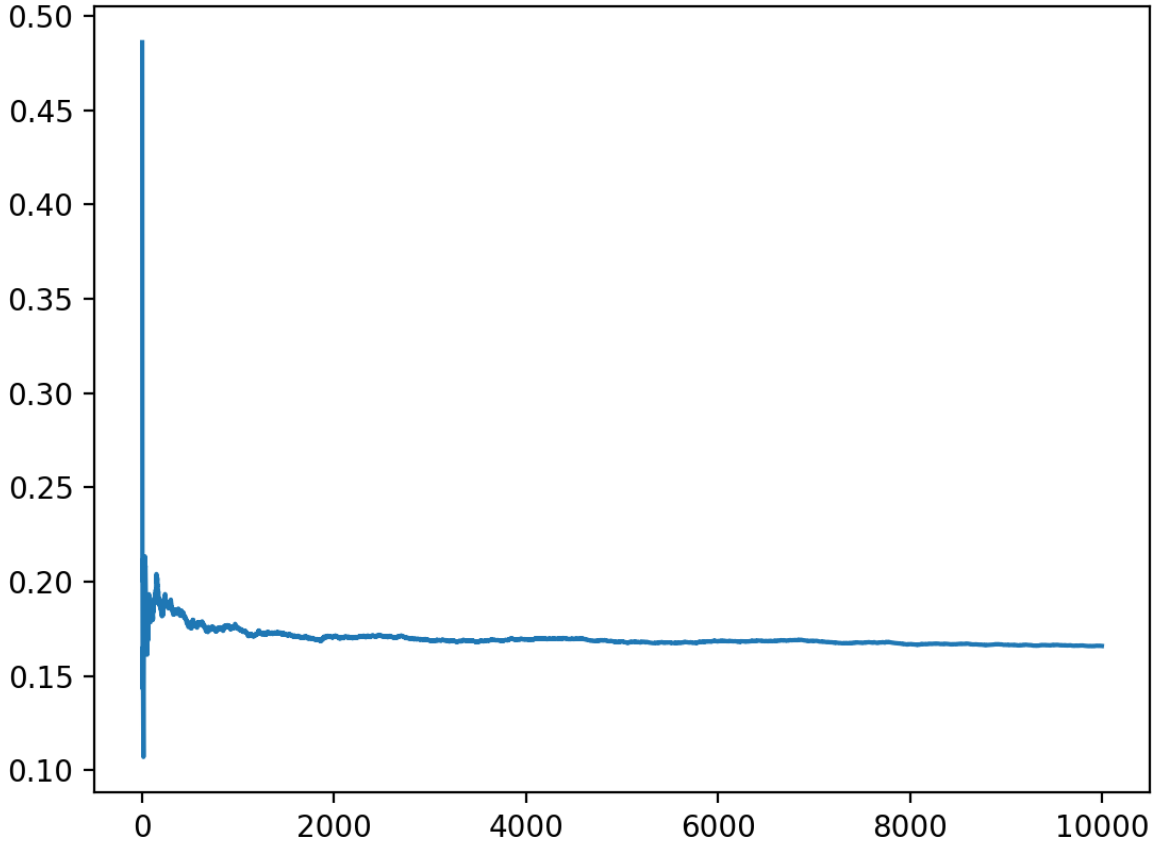
$$I = \int_0^1 \int_0^1 x^2 y \; dxdy$$

Plot I vs Number of pointes (N)

As we increase the number of points, the calculated vaue of the integral approaches the real value

The real value of the integral is **0.166**

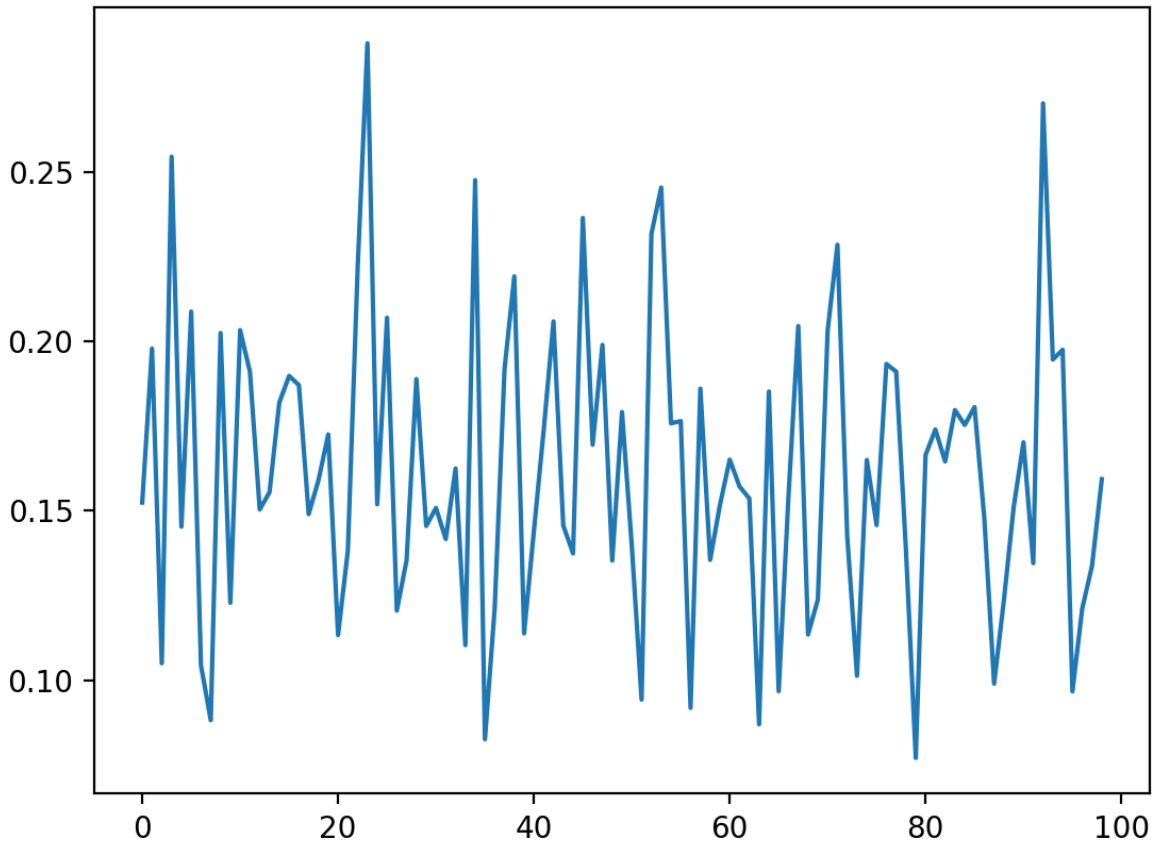

0.200
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0
2000
4000
6000
8000
10000


0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0
2000
4000
6000
8000
10000

Fix N=20; 100 trials; Plot I vs trials; calculate std deviation.

The standard deviation came out to be **0.04**

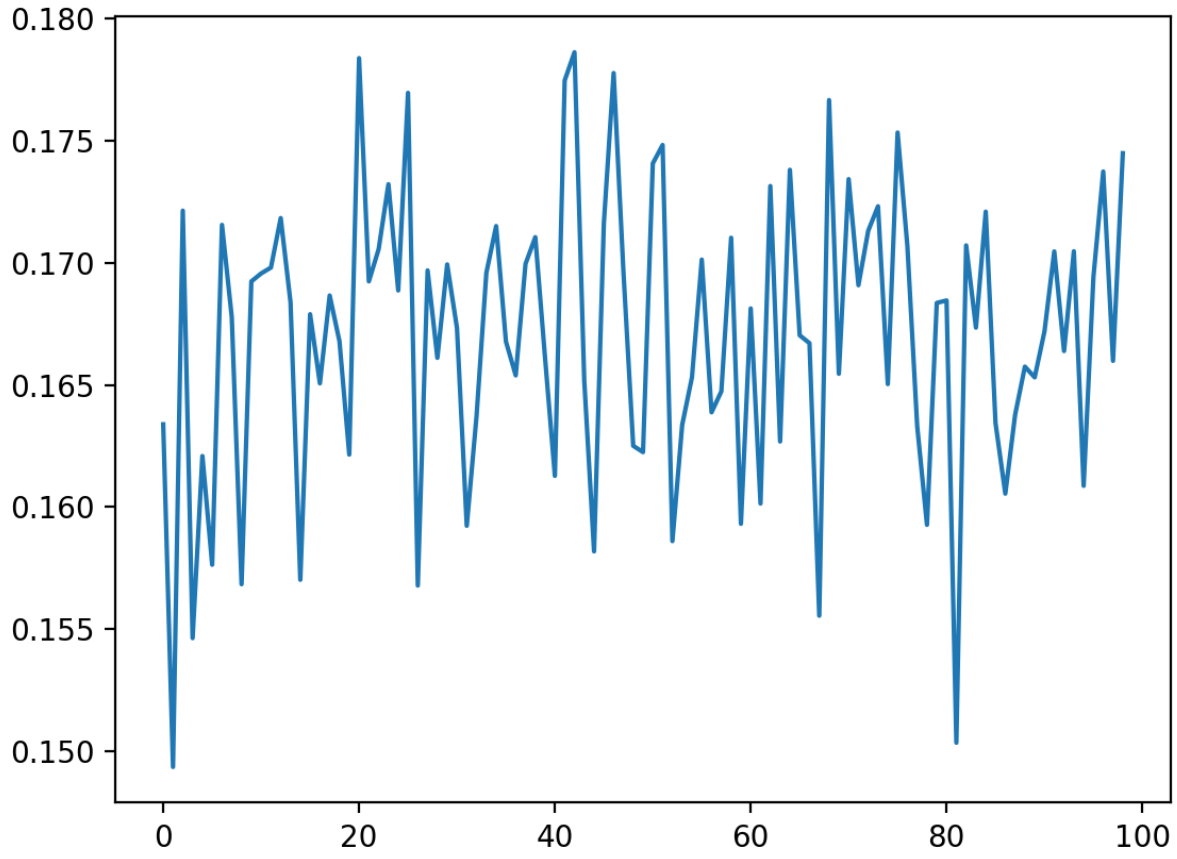
The plot is



Fix N=1000; 100 trials; Plot I vs trials; calculate std deviation.

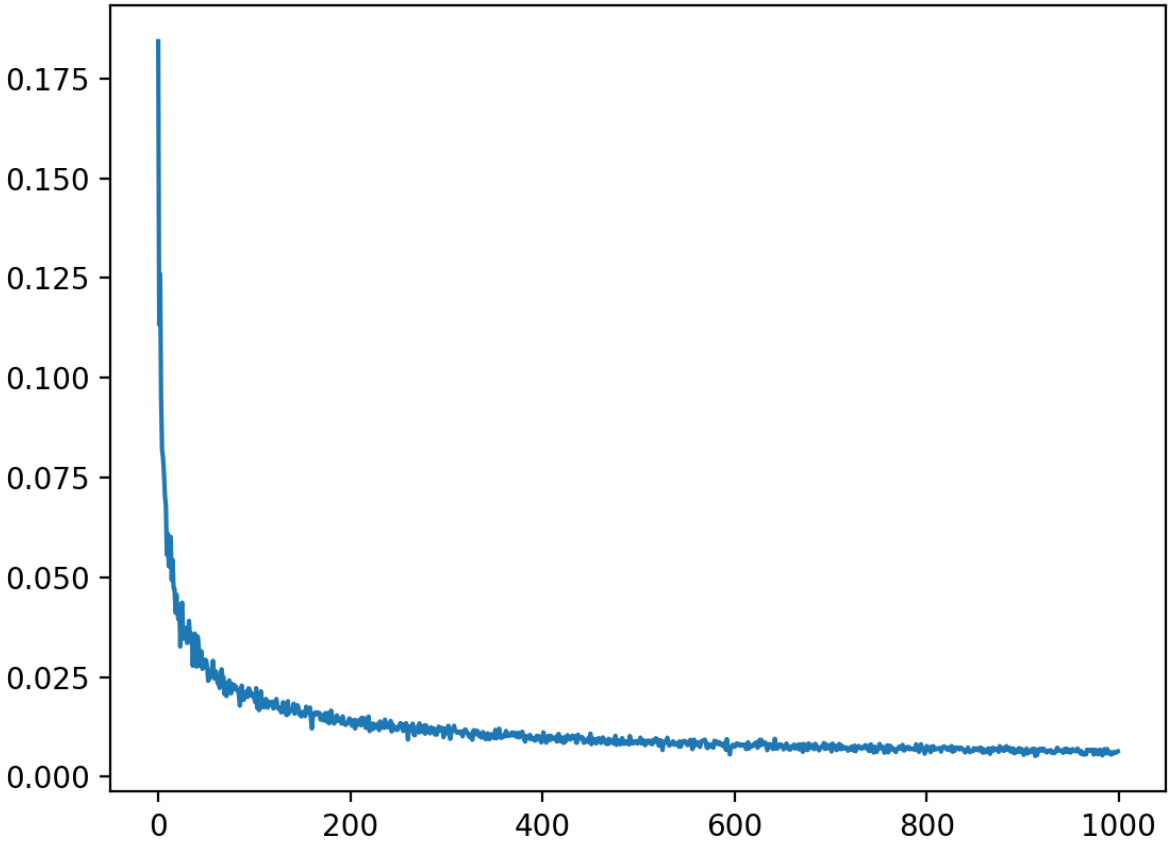
The standard deviation came out to be **0.0059**

The plot is



Plot standard deviation (Of I vs trials) vs N for a fixed number of trials;Check if STD is proportional to sqrt(N)

The plot is for trials = 100 and N = 1000


0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
0
200
400
600
800
1000