

Singular Values of Random Matrices

February 5, 2020

```
In [1]: using Plots, LinearAlgebra, Statistics
        # plotlyjs() # uncomment to use interactive plots
        pyplot() # this one is better for converting to pdf
```

```
Info: Precompiling PyPlot [d330b81b-6aea-500a-939a-2ce795aea3ee]
@ Base loading.jl:1273
```

```
Out[1]: Plots.PyPlotBackend()
```

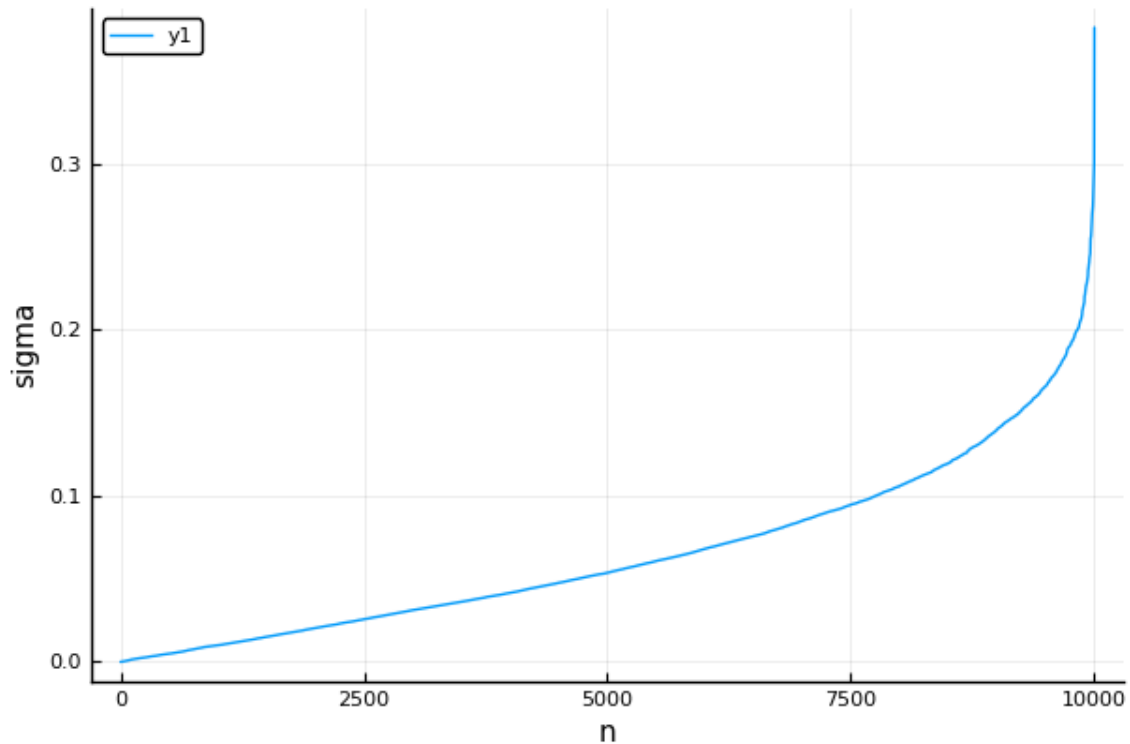
```
In [2]: n = 100
        A = randn(n,n)
        sigma = svdvals(A)
        minimum(sigma)
```

```
Out[2]: 0.09695017328224992
```

```
In [3]: dat = []
        for i in 1:10000
            A = randn(n,n)
            sigma = svdvals(A)
            push!(dat,minimum(sigma))
        end
```

```
In [5]: plot(sort(dat), xlabel="n", ylabel="sigma")
```

```
Out[5]:
```



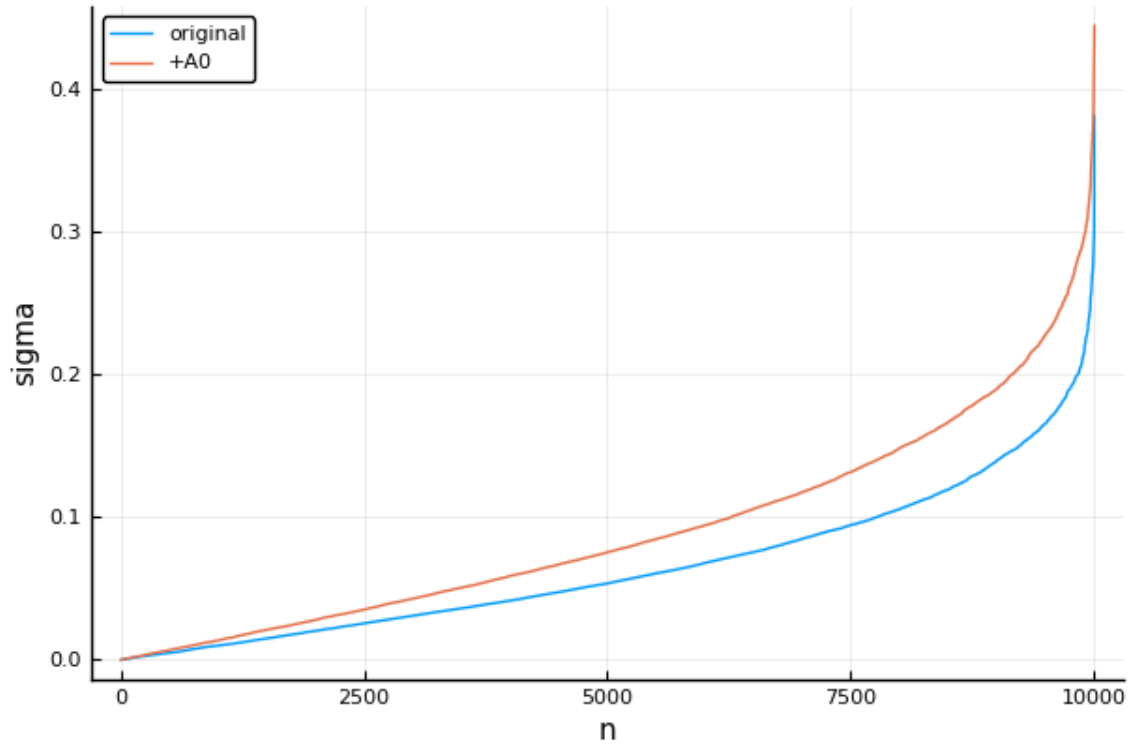
```
In [6]: ep = 0.005
        mean(dat .< ep), ep*sqrt(n)
```

```
Out[6]: (0.0507, 0.05)
```

```
In [7]: A0 = randn(n,n)
        dat1 = []
        for i in 1:10000
            A = randn(n,n)
            sigma = svdvals(A0+A)
            push!(dat1,minimum(sigma))
        end
```

```
In [9]: plot(sort(dat), label="original", xlabel="n", ylabel="sigma")
        plot!(sort(dat1), label="+A0")
```

```
Out[9]:
```



In []: