# Diagonalisation of random real symmetric matrices

Martin Knudsen

March 14, 2018

# Introduction

I am solving problem 27 in [1]. The problem is to implement a function that given an integer makes a $nxn$ random real symmetric matrix with elements chosen uniformly at random in the interval $[0, 1]$. The matrix then has to be diagonalized and in the proces finding the largest eigenvalue which is returned. This proces is repeated for different values of n, which results in data for a plot and a fit.

# Method

To fit the data I have used a simple linear fit without constant offset as in equation (1).

$$y = cx \tag{1}$$

The value of the single fitting parameter as found by $gsl\_fit$ is $c = 0.502276$ which is very close to being 0.5 which we would expect since the entrances of the matrix are random numbers in the range $[0, 1]$ which should converge to 0.5.

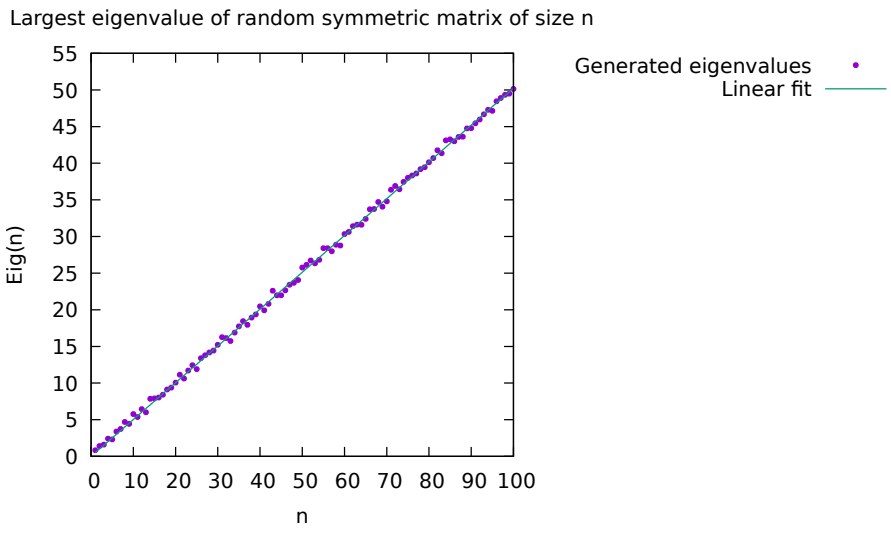


Figure 1: The largest eigenvalue as a function of matrix size n for random symmetric real matrices. The purple dots represent the found eigenvalues while the green line represent a linear fit to the data using equation (1)

# Bibliography

[1] Fedorov, D.V., Retrieved 14.03.2018, from `http://86.52.112.181/~fedorov/prog/ass/sf.pdf`.