

NUMERICAL DATA FOR THE E8 MATRIX

The E8 matrix can be characterized as a positive definite matrix with integral entries, even entries along the diagonal, and determinant 1. Specifically, it is given as follows:

$$\begin{pmatrix} 2 & -1 & 0 & 0 & 0 & 0 & 0 & 0 \\ -1 & 2 & -1 & 0 & 0 & 0 & 0 & 0 \\ 0 & -1 & 2 & -1 & 0 & 0 & 0 & 0 \\ 0 & 0 & -1 & 2 & -1 & 0 & 0 & 0 \\ 0 & 0 & 0 & -1 & 2 & -1 & 0 & -1 \\ 0 & 0 & 0 & 0 & -1 & 2 & -1 & 0 \\ 0 & 0 & 0 & 0 & 0 & -1 & 2 & 0 \\ 0 & 0 & 0 & 0 & -1 & 0 & 0 & 2 \end{pmatrix}$$

The purpose of this writeup is to give the principal minors, the characteristic polynomial, and the eigenvectors and eigenvalues accurate to several decimal places.

Principal minors. In order of size of the submatrix, these are given as follows:

$$2, 3, 4, 5, 6, 7, 8, 1$$

Characteristic polynomial. This is given as follows:

$$t^8 - 16t^7 + 105t^6 - 364t^5 + 714t^4 - 784t^3 + 440t^2 - 96t + 1$$

Eigenvalues. In decreasing order here are their approximate values:

$$\begin{aligned} &3.98904381 \\ &3.48628966 \\ &2.81347330 \\ &2.41582339 \\ &1.58417662 \\ &1.18652672 \\ &0.513710349 \\ &0.0109562095 \end{aligned}$$

The approximate coordinates of the associated eigenvectors are listed on the next page.

<i>eigenvalue</i>	<i>eigenvalue</i>	<i>eigenvalue</i>	<i>eigenvalue</i>
3.98904381	3.48628966	2.81347330	2.41582339
<i>eigenvector</i>	<i>eigenvector</i>	<i>eigenvector</i>	<i>eigenvector</i>
0.119117703	0.383361327	-0.352147093	-0.463505660
-0.23693029	-0.569785962	0.286462251	0.192736490
0.352147092	0.463505658	0.119117705	0.383361322
-0.463505661	-0.1191177045	-0.383621323	-0.352147092
0.569785964	-0.286462255	0.192736491	-0.236930327
-0.383361320	0.352147096	0.463505646	-0.119117703
0.192736492	-0.23693032	-0.569785965	0.286462253
-0.286462252	0.192736489	-0.236930325	0.569785965
<i>eigenvalue</i>	<i>eigenvalue</i>	<i>eigenvalue</i>	<i>eigenvalue</i>
1.58418	1.18653	0.513711	0.0109562
<i>eigenvector</i>	<i>eigenvector</i>	<i>eigenvector</i>	<i>eigenvector</i>
-0.463505624	0.352147093	0.383361323	0.119117703
-0.19273646	0.286462251	0.569785964	0.236930326
0.38336131	- 0.119117747	0.463505659	0.352147092
0.352147054	- 0.383361356	0.1191177	0.463505661
-0.236930347	-0.192736464	-0.286462250	0.569785964
0.119117749	0.463505646	-0.35147093	0.383361320
0.286462309	0.569785937	-0.236930327	0.192736491
-0.569785989	-0.236930270	-0.192736490	0.286462252