DATE Formative 2, Part 2 Manzi Terry

$\lambda_2 = -5.6$, finding the respective eigen vector

Replacing in matrix A, $(A - \lambda I)\vec{v} = 0$, $A - (-5.6)I = A + 5.6I$

$$\begin{bmatrix} (4-\lambda) & 8 & -1 & -2 \\ -2 & (-\lambda-9) & -2 & -4 \\ 0 & 10 & (5-\lambda) & -10 \\ -1 & -13 & -14 & (-\lambda-13) \end{bmatrix} = \begin{bmatrix} 9.6 & 8 & -1 & -2 \\ -2 & -3.3 & -2 & -4 \\ 0 & 10 & 10.6 & -10 \\ -1 & -13 & -14 & -7.3 \end{bmatrix}$$

Now $(A + 5.6I)\vec{v} = 0$

$$\begin{bmatrix} 9.6 & 8 & -1 & -2 \\ -2 & -3.3 & -2 & -4 \\ 0 & 10 & 10.6 & -10 \\ -1 & -13 & -14 & -7.3 \end{bmatrix} \rightarrow V = 0$$

$$\begin{bmatrix} 9.6 & 8 & -1 & -2 \\ -2 & -3.3 & -2 & -4 \\ 0 & 10 & 10.6 & -10 \\ -1 & -13 & -14 & -7.3 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix} \Leftrightarrow$$

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Solving $(A - \lambda I)V = 0$

let's $V = \begin{bmatrix} V_1 \\ V_2 \\ V_3 \\ V_4 \end{bmatrix}$

$$\begin{bmatrix} 9.6 & 8 & -1 & -2 \\ -2 & -3.4 & -2 & -4 \\ 0 & 10 & 10.6 & -10 \\ -1 & -13 & -14 & +7.3 \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \\ V_3 \\ V_4 \end{bmatrix} = 0$$

$$\begin{cases} 9.6V_1 + 8V_2 - V_3 - 2V_4 = 0 & (1) \\ -2V_1 - 3.4V_2 - 2V_3 - 4V_4 = 0 & (2) \\ 10V_2 + 10.6V_3 - 10V_4 = 0 & (3) \\ -V_1 - 13V_2 - 14V_3 - 7.4V_4 = 0 & (4) \end{cases}$$

from (3) $10V_2 + 10.6V_3 = 10V_4$

$$V_4 = V_2 + 1.06V_3 \quad (3a)$$

from (1) $9.6V_1 + 8V_2 - V_3 - 2(V_2 + 1.06V_3) = 0$

$$9.6V_1 + 8V_2 - V_3 - 2V_2 - 2.12V_3 = 0$$

$$9.6V_1 + 6V_2 - 3.12V_3 = 0 \quad (1a)$$

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from (2) $-2V_1 - 3.4V_2 - 2V_3 - 4(V_2 + 1.06V_3) = 0$

$-2V_1 - 3.4V_2 - 2V_3 - 4V_2 - 4.24V_3 = 0$

$-2V_1 - 7.4V_2 - 6.24V_3 = 0$ (2a)

from (4) $-V_1 - 13V_2 - 14V_3 - 7.4(V_2 + 1.06V_3) = 0$

$-V_1 - 13V_2 - 14V_3 - 7.4V_2 - 7.8V_3 = 0$

$-V_1 - 20.4V_2 - 21.8V_3 = 0$ (4a)

Solving (1a) and (2a) for V_1 and V_2 in terms of V_3

from (1a) $9.6V_1 = -6V_2 + 3.12V_3$

$V_1 = -0.625V_2 + 0.325V_3$ (1b)

From (2a) $-2V_1 = 7.4V_2 + 6.24V_3$

$V_1 = -3.7V_2 - 3.12V_3$ (2b)

(1b = 2b) $-0.625V_2 + 0.325V_3 = -3.7V_2 - 3.12V_3$

$3.075V_2 + 3.445V_3 = 0$

$\boxed{V_2 = -1.12V_3}$

putting V_2 into (1b)

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$V_1 = -0.625(-1.12V_3) + 0.325V_3 = 0.7V_3 + 0.325V_3$

$V_1 = 1.025V_3$

from (3a) $V_4 = V_2 + 1.06V_3 = -1.12V_3 + 1.06V_3$

$V_4 = -0.06V_3$

Let,

$V_3 = 1$, Then $V_1 = 1.025$

$V_2 = -1.12$

$V_3 = 1$

$V_4 = -0.06$

$$V = \begin{bmatrix} 1.025 \\ -1.12 \\ 1 \\ -0.06 \end{bmatrix}$$

Eigen vector for Eigen value -5.6