

$$\begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 2 & 1 & 2 \end{bmatrix} = \lambda \begin{bmatrix} x \\ y \\ 2 \end{bmatrix}$$

$$x + y + 2 = \lambda x$$

$$x = 0 \Rightarrow x + y + 2 = 0$$

$$x + y + 2 = \lambda x$$

$$\frac{1}{\sqrt{1-x}} = \frac{1}{\sqrt{1-x}} = \frac{1}{\sqrt{1-x}}$$

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$$V_{1} = \begin{bmatrix} x \\ y \\ -x-y \end{bmatrix}$$

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$$V_{2} = \begin{bmatrix} -1 \\ -1 \\ y \end{bmatrix}$$

$$V_{2} = \begin{bmatrix} -1 \\ -1 \\ y \end{bmatrix}$$

$$V_{3} = \begin{bmatrix} -1 \\ 0 \\ 1 \end{bmatrix}$$

$$A - \lambda I V_{2} = V_{1}$$

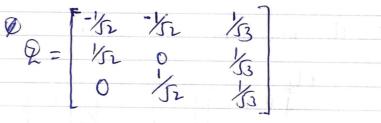
$$X + y = -2$$

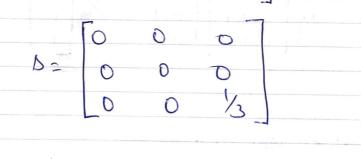
$$1f = 0, \quad \Rightarrow x = -y \quad \Rightarrow 1f y = 1, x = -1$$

$$V_{2} = \begin{bmatrix} -1 \\ 1 \\ 0 \end{bmatrix} \quad \Rightarrow V_{2} = \frac{1}{52} \begin{bmatrix} -1 \\ 1 \\ 0 \end{bmatrix}$$

Putting
$$y = 3x \Rightarrow y = x$$

Putting $y = x$ into $0 \Rightarrow 72y$
 $\sqrt{3} = \frac{1}{\sqrt{3}} = \frac{1$





X = [Xi] + My

B) Non-Spectral approach.

Sure we Objoured Insar Independent Set of vectors that Span Column Space A. If b projects onto the on edgen vector laving flue Column space VI A Corresponding to non terro riogen value, $\lambda z3$, $\begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix}$ 3 X,= 1 = > X, 2 /3

 $X = \begin{bmatrix} x_1 \\ 0 \end{bmatrix} + Ny$ $N = \begin{bmatrix} -1 \\ -1 \end{bmatrix} = \begin{bmatrix} -1 \\ 0 \end{bmatrix} \qquad y = \begin{bmatrix} y_1 \\ y_2 \end{bmatrix}$

 $N = \frac{1}{\sqrt{2}} \begin{bmatrix} -1 & -1 \\ 0 & 1 \end{bmatrix} \quad y = \begin{bmatrix} y_1 \\ y_2 \end{bmatrix}$ $X = \begin{bmatrix} \frac{1}{3} \\ 0 \\ 0 \end{bmatrix} + \frac{1}{\sqrt{2}} \begin{bmatrix} -1 & -1 \\ 0 \\ 0 \end{bmatrix} \begin{bmatrix} \frac{1}{3} \\ \frac{1}{3} \\ 0 \end{bmatrix}$

$$f(y_{1},y_{2}) = |x||^{2}$$

$$f(y_{1},y_{2}) = \left(\frac{1}{3} + \frac{1}{52}(-y_{1} - y_{2})\right)^{2} + \frac{1}{3}(-y_{2} + y_{2})$$
at Munimum

$$\frac{2f(y_{1},y_{2})}{3y_{1}} = \frac{2f(y_{1},y_{2})}{3y_{2}} = 0$$

$$\frac{2f(y_{1},y_{2})}{3y_{2}} = 2\left(\frac{1}{3} - \frac{1}{32}(y_{1} + y_{2})\right)^{2} - \frac{1}{32} + y_{1} = 0$$

$$\frac{2}{332} + y_{1} + y_{2} = 2$$

$$\frac{2}{332} + y_{1} + y_{2} = 0$$

 $\dot{X} = \begin{bmatrix} y_3 \\ 0 \\ 0 \end{bmatrix} + \begin{bmatrix} -y_1 - y_2 \\ y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} y_3 + \frac{1}{12}(-y_1 - y_2) \\ y_{1/2} \\ y_{2/2} \end{bmatrix}$

 $\|x\|^2 = \left(\frac{1}{3} + \frac{1}{52}(-y_1 - y_2)\right)^2 + \left(\frac{y_1}{52}\right)^2 + \left(\frac{y_2}{52}\right)^2$

 $\|x\|^2 = \left(\frac{1}{3} + \frac{1}{52}(-y_1 - y_1)\right) + \frac{y^2}{2} + \frac{y^2}{2}$

$$2y_{2} + y_{1} = \frac{2}{3\sqrt{2}} - 2$$

$$(2y_{1} + y_{2}) - 2y_{2} - y_{1} = 0$$

$$(2y_1 + y_2) - 2y_2 - y_1 = 0$$
 $y_1 = y_2$
Into (1)

Into (1)
$$3y_1 = \frac{2}{3J_2} \implies y_1 = \frac{2}{9\sqrt{2}} = y_2$$

$$y = \begin{bmatrix} 5/9 \\ y_1 \end{bmatrix} = \begin{bmatrix} 5/9 \\ 5/4 \end{bmatrix}$$

Report the minimum norm shotron.

So
$$X = \begin{bmatrix} \frac{1}{3} + \frac{1}{52}(-\frac{1}{3} - \frac{1}{3}) \\ \frac{1}{3} + \frac{1}{52}(-\frac{1}{3} - \frac{1}{3}) \end{bmatrix} = \begin{bmatrix} \frac{1}{3} + \frac{1}{52}(-\frac{1}{3} + \frac{1}{3}) \\ \frac{1}{3} + \frac{1}{52}(-\frac{1}{3} - \frac{1}{3}) \end{bmatrix} = \begin{bmatrix} \frac{1}{3} + \frac{1}{52}(-\frac{1}{3} + \frac{1}{3}) \\ \frac{1}{3} + \frac{1}{32}(-\frac{1}{3} + \frac{1}{3}) \end{bmatrix}$$

$$X = * \begin{bmatrix} 79 \\ 79 \\ 79 \end{bmatrix} = \begin{bmatrix} 17 \\ 17 \\ 79 \end{bmatrix}$$

Find on algebraic expression for the Ax=I, $X = \begin{bmatrix} x_1 \\ 0 \end{bmatrix} + HY, I = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$ She I is 3 boy 3, then X will also be

3x 3 months,

(3x1)

- so we one to project the Comombal bossis

verys:

(b) y onto the

Column Space A $\left(111 \right) \left(\begin{array}{c} 1 \\ 1 \end{array} \right) X_1 = \left(\begin{array}{c} 1 \\ 1 \end{array} \right) \left(\begin{array}{c} 1 \\ 0 \end{array} \right) \implies X_1 = \frac{1}{3}$ the X, Corresponds to X = 1/9 1 Pos in (6) flan X2 Corresponds to X = /g [] with $\begin{pmatrix} 1 & 1 & 1 \end{pmatrix} \begin{pmatrix} 1 & 1 & 1 \end{pmatrix} \begin{pmatrix} 1 & 1 & 1 \end{pmatrix} \begin{pmatrix} 0 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix}$

Again
$$X_0$$
 Correspond to $X = \frac{1}{4} \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ as in $\int_{X_0}^{X_0} \left[\frac{1}{4} \right] \left[\frac{1}{4} \right]$

2: Both Use the XIIII spew of the montrix in question, howeve the Spectral approach is more strought forward to deal with - One non for eign value with its Comosponding allow vector is knough for us to the to obtain the vector to project on A. - For mon-spectral method, A must be granke one matrix. - But in both the Eregen verdes must be lungary underpudnet.