Interpretación geométrica en $\mathbb{R}^n$

- $\mathbf{x_{ij} = r_{ij} - \overline{r}_j}$

$$X = P\dot{R} \qquad p_{ij} = \begin{cases} 1 - \frac{1}{n} & i = j \\ -\frac{1}{n} & i \neq j \end{cases} \qquad P_{(n\times n)} = I_{(n\times n)} - \frac{1}{n} \cdot v_{(n\times 1)} \cdot v'_{(1\times n)} \qquad v' \equiv (1, \ldots, 1)$$

$$r_j \in \mathbb{R}^n \ ; \ \forall j = 1 \ldots n \Longrightarrow P \cdot r_j = r_j - \frac{1}{n} \cdot v \cdot (v' \cdot r_j) \qquad \frac{1}{n} \cdot v' r_j = \frac{1}{n} \sum_{i=1}^{n} r_{ij} = \overline{r}_j \Longrightarrow$$

$$P \cdot r_j = r_j - v \cdot \overline{r}_j \Longrightarrow x_{ij} = r_{ij} - \overline{r}_j$$

$$A_1(1,4) \ \ B_1(3,1) \ ; \ R = (A_1, B_1) = \begin{pmatrix} 1 & 3 \\ 4 & 1 \end{pmatrix} \ ; \ P = \begin{pmatrix} 1/2 & -1/2 \\ -1/2 & 1/2 \end{pmatrix} \ ; \ \overline{r}_j = (2.5, 2)$$

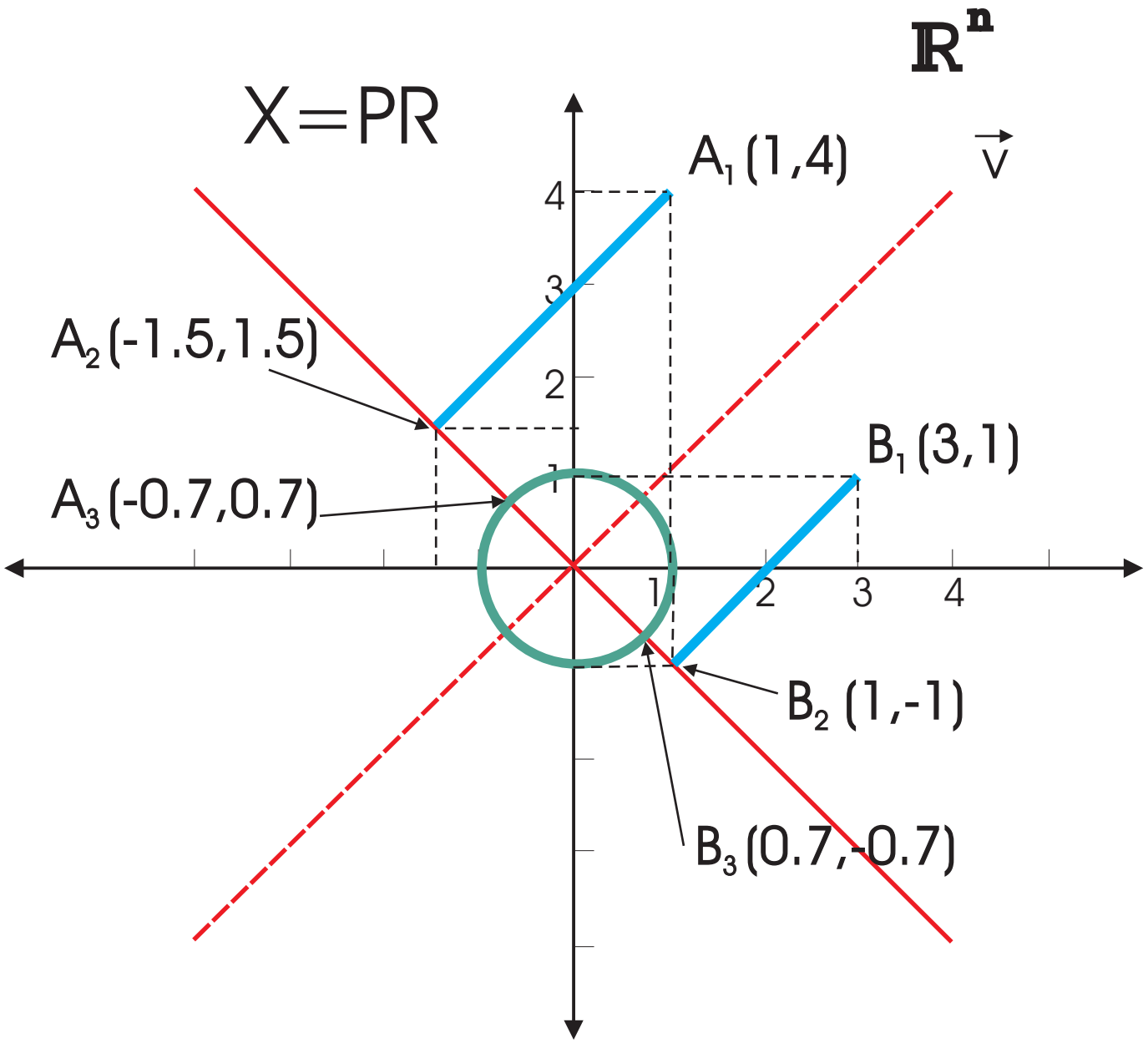
$$\begin{pmatrix} 1/2 & -1/2 \\ -1/2 & 1/2 \end{pmatrix} \cdot \begin{pmatrix} 1 & 3 \\ 4 & 1 \end{pmatrix} = \begin{pmatrix} -3/2 & 1 \\ 3/2 & -1 \end{pmatrix} = \begin{pmatrix} 1 - 2.5 & 3 - 2 \\ 4 - 2.5 & 1 - 2 \end{pmatrix} = (A_2, B_2)$$

$$(A_2, B_2) = \begin{pmatrix} r_{11} - \overline{r}_1 & r_{12} - \overline{r}_2 \\ r_{21} - \overline{r}_1 & r_{22} - \overline{r}_2 \end{pmatrix} = \begin{pmatrix} -3/2 & 1 \\ 3/2 & -1 \end{pmatrix}$$

- $\mathbf{x_{ij} = \dfrac{r_{ij} - \overline{r}_j}{s_j \sqrt{n}}}$

$$s_j = (1.5, 1) \ ; \ X = P \cdot R = \begin{pmatrix} 1/2 & -1/2 \\ -1/2 & 1/2 \end{pmatrix} \cdot \begin{pmatrix} \frac{2}{3\sqrt{2}} & \frac{3}{\sqrt{2}} \\ \frac{8}{3\sqrt{2}} & \frac{1}{\sqrt{2}} \end{pmatrix} = \begin{pmatrix} -\frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} \end{pmatrix} = (A_3, B_3)$$

$$d(A_3, B_3) = 2 \Longrightarrow \text{radio} = 1$$


$\mathbb{R}^n$
X=PR
A_1 (1,4)
$\vec{v}$
A_2 (-1.5,1.5)
A_3 (-0.7,0.7)
B_1 (3,1)
B_2 (1,-1)
B_3 (0.7,-0.7)
1
2
3
4