Introduction to AI and ML

Matrix Project

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Question

The point diametrically opposite to the point $P(1,0)$ on the circle $x^2+y^2+2x+4y-3=0$ is :

Given circle in matrix form:

$$xx^T + x\begin{bmatrix}2\\4\end{bmatrix} = 3$$

Solution

general equation of circle in matrix form:

$$xx^T - 2xc^T = r^2 - cc^T$$

Here,
on comparing with our equation
-2c^T $= \begin{bmatrix} 2 \\ 4 \end{bmatrix}$
$centre\ \ of\ \ circle\ \ c = \begin{bmatrix} -1 & -2 \end{bmatrix}$
and
$r^2 - cc^T = 3$
$r^2 - 5 = 3$
$radius\ \ of\ \ circle\ \ r = 2^{3/2}$

Given $P(1,0)$ is the point on the circle

Let $Y(a,b)$ be the diametrically opposite point to P.

As $Y(a,b)$ lies on circle and diametrically opposite to $P(1,0)$

So,

c is the mid point of $P(1,0)$ and $Y(a,b)$

$$c = \frac{P + Y}{2}$$

$$Y = 2c - P$$

$$Y = 2\begin{bmatrix} -1 & -2 \end{bmatrix} - \begin{bmatrix} 1 & 0 \end{bmatrix}$$

$$Y = \begin{bmatrix} -3 & -4 \end{bmatrix}$$

$$Therefore,$$

$$Y = \begin{bmatrix} -3 & -4 \end{bmatrix} \ is \ the \ diametrically \ opposite \ point \ to \ \mathrm{P(1,0)}$$