EE5600 - Introduction to AI & ML Assignment 2

Virendra Patil
AI20MTECH01003

***Abstract*—Given a point and intercepts on the axes, we need to find the equation of line passing through them. The python implementation of the said method is available at *https://github.com/virendra-patil/EE5600-Intro-to-AI-ML/tree/main/Assignment_2*.**

1 Problem Statement

Vector2, Example V, Problem 7(2): Find the equation to the straight line which passes through the point (5, 6) and has intercepts on the axes equal in magnitude but opposite in sign.

2 Solution

We solve the above stated problem using vectorized intercept form. The given point can be represented by a vector in 2D space and let the magnitude of the intercept be 'a'.

Let the following vector represent the point through which the line passes,

$$\begin{pmatrix}5\\6\end{pmatrix} \tag{1}$$

The vectorized intercept form where the intercepts have same magnitude but opposite signs is given by,

$$\begin{pmatrix}\frac{1}{a} & \frac{1}{-a}\end{pmatrix}\mathbf{X} = 1 \tag{2}$$

where X vector represent's x and y coordinates in 2D space.

From equation 1 and 2 we can find the value of intercept 'a',

$$\begin{pmatrix}\frac{1}{a} & \frac{1}{-a}\end{pmatrix}\begin{pmatrix}5\\6\end{pmatrix} = 1 \tag{3}$$

$$\frac{5}{a} + \frac{6}{-a} = 1 \tag{4}$$

$$5 - 6 = a \tag{5}$$

$$a = -1 \tag{6}$$

From equations 1 and 2, the equation of a line can be given as,

$$\begin{pmatrix}\frac{1}{a} & \frac{1}{-a}\end{pmatrix}\mathbf{X} = 1 \tag{7}$$

$$\begin{pmatrix}\frac{1}{-1} & \frac{1}{1}\end{pmatrix}\mathbf{X} = 1 \tag{8}$$

$$\begin{pmatrix}-1 & 1\end{pmatrix}\mathbf{X} = 1 \tag{9}$$

Figure 1 represents the line in 2D space.

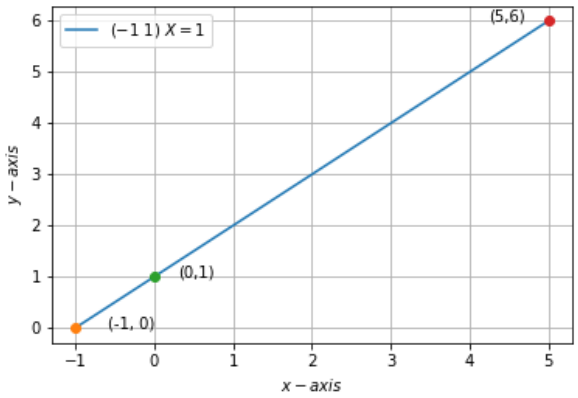

Fig. 1: Plot representing the line passing through point (5,6) and given intercepts