Module-02, Basic Mathematics and Statistics

Mathematics (Linear Algebra)

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Linear Algebra

For data Science and AI, the basic and fundamental concept is need to known about data representations. The Linear algebra play a key role in emerging field like data science, machine learning and deep learning. So we now start it basic concepts.

Definition

Algebra is the branch of mathematics, which deal with variables like, x, y and z. if the variable have power is "one" are called linear. So these studies is called linear algebra.

- Linear algebra, consist of vectors and Matrix.
- Basic operation on matrix like, multiplication and matrix decomposition.

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System of Linear Equations

The number of linear equations more the one,it make system of linear equations. Starting very basic,

- Let us consider general notation for two equations

$$a_1x + b_1y = c_1 \tag{1}$$
$$a_2x + b_2y = c_2 \tag{2}$$

- Let example for two equation

$$2x + 3y = 1 \tag{3}$$
$$3x + 2y = 3 \tag{4}$$

- Solution to above system
  The solutions for above system of equation is (x,y), (12/5, -3/5)

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Matrix Algebra

As, we known that the matrix have rows and columns vectors, how to we get matrix from above discussion.

- General matrix and vector notations

$$Ax = c \tag{5}$$

- Where,
  A is matrix
  x variables.
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As, we known matrix's has rows and columns, two or more rows or columns make matrix. single row called row vector similar single column called column vector.

- How to convert general system of equations to matrix form
  $\begin{bmatrix} a_1 & b_1 \\ a_2 & b_2 \end{bmatrix}, \begin{bmatrix} x \\ y \end{bmatrix}, \begin{bmatrix} c_1 \\ c_2 \end{bmatrix}$
- Now equation(5) become try to such a way,
  $Ax = y$
  where,
  x,y are independent, dependent variables.
- $\begin{bmatrix} a_1 & b_1 \\ a_2 & b_2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} y_1 \\ y_2 \end{bmatrix}$

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Working with Matrix Algebra

- How to find x.
- We need to shift the matrix to right side.

$$x = A^{-1}c \tag{6}$$

- How to find A^{-1}
  As we know,

$$A^{-1} = \frac{adj(A)}{det(A)} \tag{7}$$

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Great Job
Thank you