POWERFUL TOOLS IN LINEAR ALGEBRA - ARTIFICIAL INTELLIGENCE AND DATA SCIENCE(AIDS) .

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ABSTRACT

When we talk about new technologies and the advancement in the field of Computer Science, the first thing that comes to our mind is Artificial Intelligence and Data Science (AIDS) & machine learning(ML). Artificial Intelligence has seen resurgence in the 21st century because of its ability to mimic functions done by human intelligence like "problem solving" and "learning". It is slowly becoming the area of interest of the new generation because of its modern capabilities which even human intelligence struggle to perform like competing at highest level in strategic game systems, intelligent routing, operating cars autonomously and simulations. Artificial Intelligence may look easy but there are several tools involved in making it successful.

Linear algebra become the base of this field. The strength of linear algebra is ignored by the researchers due to the poor understanding. It powers major areas of Data Science including the hot fields of Natural Language Processing and Computer vision. Linear algebra is a must-know subject in data science. It will open up possibilities of working and manipulating data.

 The objective of this paper is to throw light on one to one relation between linear algebra & data science with the help of some basic application .

KEYWORDS: Linear Algebra, Data Science, Machine Learning, Applications.

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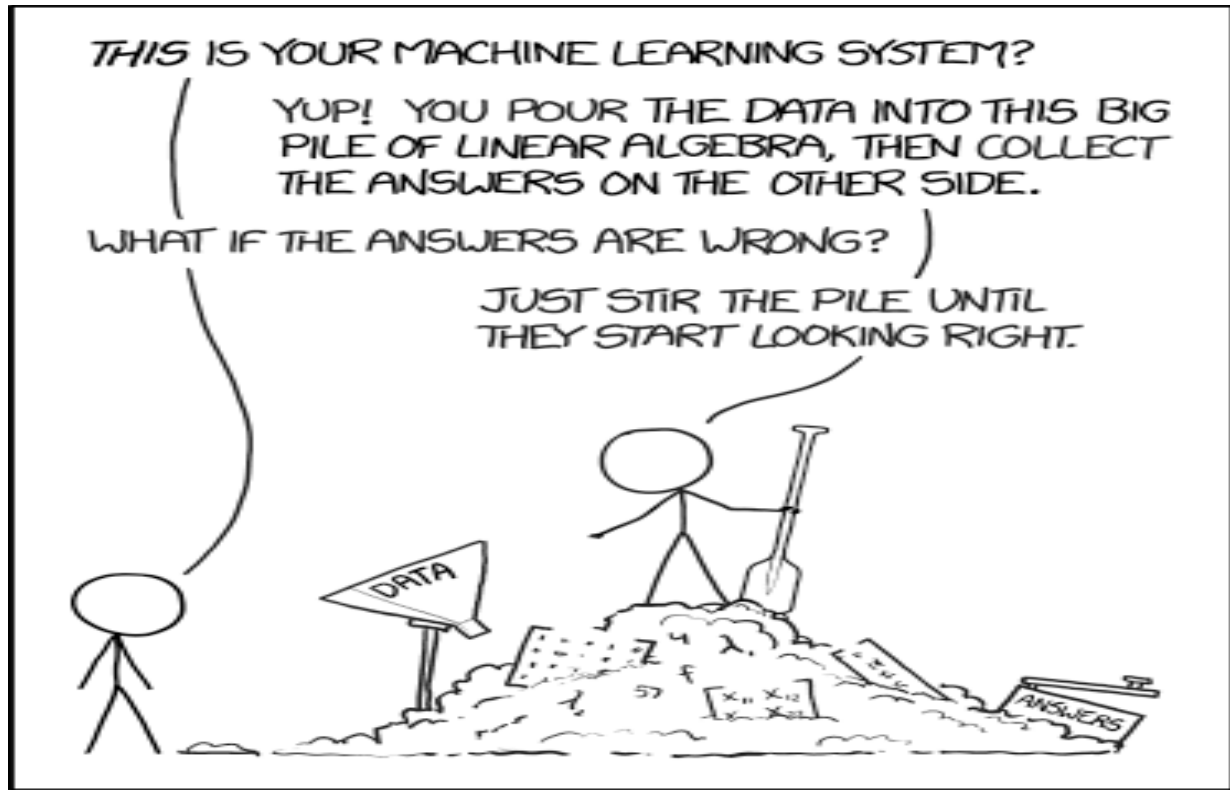
WHY LINEAR ALGEBRA?

Linear algebra plays a vital role in better understanding artificial intelligence and quantum computing, as currently BFSI is heading towards advanced tools and techniques of deep learning, a subset of artificial intelligence. In the context of data science, linear algebra plays a crucial role in various areas, including data manipulation, machine learning, and data analysis. Linear algebra, widely considered as the "guru of mathematics", is a computational tool for science, engineering, and data analytics

Linear algebra is a fundamental and essential component of mathematics. **Mathematical structures that are closed under the operations of addition and scalar multiplication are considered part of this field of mathematics, and it contains the theories and models of systems of linear equations, matrices, determinants, vector spaces, and linear transformations as well as other branches of mathematics.** It is a mathematical field that deals with vectors and matrices, and more broadly with vector spaces and linear transformations. Understanding linear algebra enables data scientists to efficiently manipulate and analyze data, apply transformations, build and optimize machine learning models, and extract meaningful insights. It forms the backbone of many data science techniques and is essential for a deeper understanding of the field.

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HERE ARE SOME KEY ASPECTS OF LINEAR ALGEBRA IN DATA SCIENCE:

1. **Vectors and Matrices**: Vectors are fundamental elements in linear algebra. In data science, vectors can represent various entities such as data points, features, or parameters. Matrices, on the other hand, are collections of vectors and are widely used to represent datasets, transformations, and relationships between variables.

2. **Linear Transformations**: Linear transformations are mathematical operations that map vectors from one space to another while preserving certain properties. In data science, linear transformations are applied to perform operations such as dimensionality reduction, feature extraction, and data normalization.

3. **Matrix Operations**: Linear algebra provides a set of operations for manipulating matrices, including addition, subtraction, multiplication, and inversion. These operations are extensively used in data science for tasks such as matrix factorization, solving systems of linear equations, and calculating eigenvalues and eigenvectors.

4. **Linear Regression**: Linear regression is a commonly used statistical technique in data science for modeling the relationship between variables. It utilizes linear algebra concepts to estimate the coefficients that define the linear relationship between the dependent and independent variables.

5. **Eigenvalues and Eigenvectors**: Eigenvalues and eigenvectors are critical concepts in linear algebra that have various applications in data science. They help in understanding the inherent structure of data, dimensionality reduction techniques like Principal Component Analysis (PCA), and spectral clustering algorithms.

6. **Machine Learning Models**: Linear algebra forms the foundation of many machine learning models. Techniques such as linear regression, support vector machines (SVM), and principal component analysis (PCA) heavily rely on linear algebra operations and concepts.

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CONCLUSIONS:

In this paper we introduced to Linear Algebra, Artificial intelligence & data science. Linear algebra is something Machine Learning experts can't live without. Linear algebra ideas and methods are easiest to comprehend while solving interesting problems, it will help to understand abstract concepts the best.

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