



APPLICATION OF LINEAR ALGEBRA IN DATA SCIENCE

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Annotation: In this article Application of linear algebra in data science, The purpose of science, the task of science, linear forms . Linear and square forms. Methods of making quadratic forms canonical. The law of inertia for the quadratic form. Information is given that they should have knowledge of positive definite quadratic forms .

Key words: Linear algebra, Euclidean spaces, orthogonal, orthonormal systems, orthogonalization process, orthogonal complementary space.

INTRODUCTION.

The purpose of the science "The purpose of teaching the science of linear algebra is to familiarize students with the set of necessary information of mathematics (concepts, assertions and their proof, methods of solving practical problems, etc.) and to study the interrelationships of the directions of mathematics . At the same time, it helps students to think logically, draw correct conclusions, and improve mathematical culture. Teaching students to think logically, apply theoretical knowledge directly to practice, draw correct conclusions and make decisions is one of the main tasks of the science of linear algebra.



BOOKS AND METHODOLOGY

The task of the science "The task of the science of linear algebra is to teach students to think logically, to directly apply theoretical knowledge to practice, to draw correct conclusions and make decisions. As a result of mastering the science, the student will: Educationally: the concept of matrices, operations on matrices, minors and algebraic complements, matrix inverses, determinants and their properties, Laplace's theorem, matrix and determinant theory related to solving systems of linear equations. Axioms of linear space and some results derived from them, linear dependence, to acquire knowledge about the concepts of dimension and basis, transition matrix from one basis to another basis, change of coordinates when the basis changes, Euclidean spaces, orthogonal and orthonormal systems, orthogonalization process, orthogonal complementary space need

RESULT AND DISCUSSION

Linear forms . Linear and square forms. Methods of making quadratic forms canonical. The law of inertia for the quadratic form. Must have knowledge of positive definite quadratic forms . They should have knowledge of operations on linear operators , space of linear operators and their properties, characteristic coefficient of a linear operator, eigenvalue and eigenvectors of a linear operator, joint substitutions in Euclidean space. In terms of skills :

Ability to perform operations on matrices, minors and algebraic complements , calculating inverse matrices, determinants, solving systems of linear equations.

Linear algebra is the branch of mathematics that studies linear spaces and their linear reflections. The development of linear algebra began in the 19th century with the emergence of a general theory of linear equations. Concepts such as determinant vectors, matrices, which were used in the process of studying linear equations, led to the understanding that objects that can be added together and multiplied by scalar have a special place in mathematics, and to study them separately from other concrete properties. At the end of the 19th century, when it was determined that the problem of reducing the equations of second-order surfaces to the canonical (simplest) form is a problem of linear algebra, linear algebra merged with the analytic geometry of multidimensional space, and linear, bilinear, quadratic forms, linear substitution and reflection, Euclidean space, projective enriched with spatial concepts.

Due to the need of differential geometry and mechanics, concepts of tensors summarizing vectors, semilinear forms summarizing linear and bilinear forms were



introduced in Linear Algebra. Sections of linear algebra such as tensor algebra and semilinear algebra were created.

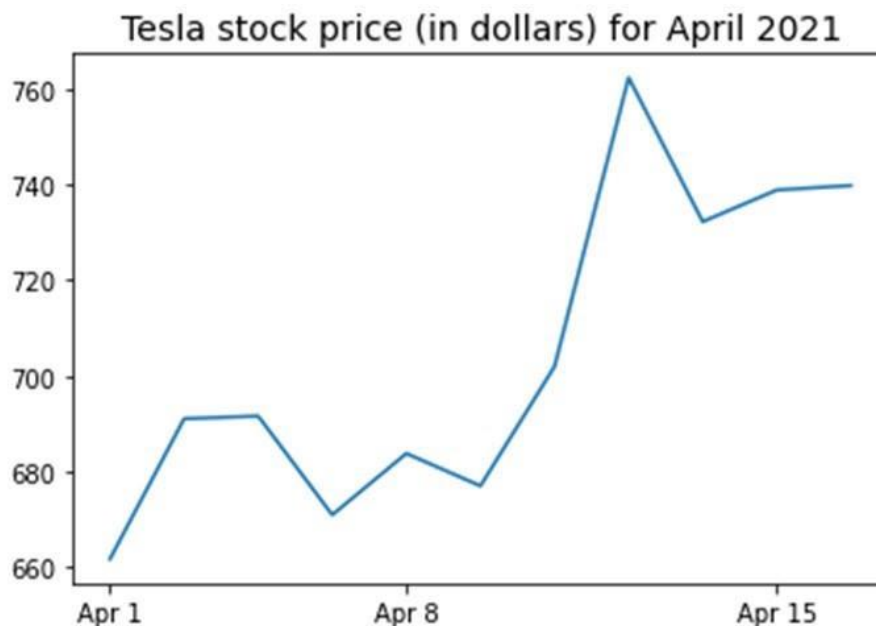
Linear algebra plays a central role in data science. It is used in many fields, such as linear regression, principal component analysis (PCA), singular value decomposition (SVD), eigendecomposition, etc. Linear algebra is used to solve systems of linear equations, which are used to model many real-world problems. It is also used to represent and manage large data sets such as images, videos,

1. Linear Regression
2. Principal Component Analysis (PCA)
3. Singular Value Decomposition (SVD)
4. Eigenvalue Decomposition
5. Matrix Factorization
6. Latent Semantic Analysis (LSA)
7. Recommender Systems
8. Neural Networks
9. Computer Vision
10. Natural Language Processing (NLP)
11. Clustering
12. Image Processing
13. Optimization
14. Signal Processing
15. Control Systems.

and audio. Matrix eigenvectors and eigenvalues are used in PCA and SVD, which are the main techniques for data compression and dimensionality reduction. In general, linear algebra provides the mathematical foundation for many data science techniques and is essential for understanding and implementing machine learning algorithms. Some of the main applications of linear algebra in data science are:



To visualize the data, it is necessary to define the matrices of the columns of visual features:



CONCLUSION. In conclusion, we have thus discussed several applications of linear algebra in data science and machine learning. Using the Technology Stock Market dataset, we illustrated important concepts such as matrix dimension, column matrices, square matrices, covariance matrices, matrix transpose, eigenvalues, dot products, and more.

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