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Nilpotent matrix and Singular matrix

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Lecture
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Abstract: The nilopotent matrix and singular matrix same value satisfying by 0.

1. Introduction:

The nilopotent matrix and singular matrix same value Satisfying by 0.

AB=BA=I=A^T=0.

Nilopotent matrix:

A nilpotent matrix is a square matrix A for which there exists a positive integer k such that A^T = 0 where 0 is the zero matrix of the same size as A

The smallest such positive integer k is called the index or degree of nilpotency of the matrix A

Example: A^T= A^{T}=\begin{bmatrix}

2& -4\\

1 & -2

\end{bmatrix}

=-4+4=0

Properties of Nilpotent Matrices:

* Eigenvalues: All eigenvalues of a nilpotent matrix are zero.

* Determinant: The determinant of a nilpotent matrix is always zero.

Singular matrix:

A singular matrix is a square matrix whose determinant is equal to zero. In simpler terms, if you calculate the determinant of a square matrix and the result is 0, then that matrix is classified as a singular matrix.

Here are some examples of singular matrices:

Example 1 (2x2 matrix):

A = \begin{pmatrix} 2 & 4 \\ 1 & 2 \end{pmatrix}

The determinant of A is (2 \times 2) – (4 \times 1) = 4 – 4 = 0. Therefore, matrix A is singular. Notice that the second row is a scalar multiple (2 times) of the first row, indicating linear dependence.

2. Conclusion:

The nilpotent matrix and singular matrix same value Satisfying by AB=BA=I=0. Is called by "Equal matrix"

Book reference:

1. Beauregard, Raymond A.; Fraleigh, John B. (1973), A First Course In Linear Algebra: with Optional Introduction to Groups, Rings, and Fields, Boston: Houghton Mifflin
2. Co., ISBN 0-395-14017-XHerstein, I. N. (1975), Topics In Algebra (2nd ed.), John Wiley & SonsNering, Evar D. (1970), Linear Algebra and Matrix Theory (2nd ed.), New York: Wiley, LCCN 76091646.
3. Archibald, Tom (2010-12-31), Gowers, Timothy; Barrow-Green, June; Leader, Imre (eds.), "VI.47 Charles Hermite", The Princeton Companion to Mathematics, Princeton University Press, p. 773, doi:10.1515/9781400830398.773a, ISBN 978-1-4008-3039-8, retrieved 2023-11-15^ Ribeiro, Alejandro. "Signal and Information
4. ^ J.-S. Roger Jang (March 2001). "Matrix Inverse in Block Form".
5. ^ Weisstein, Eric W. "Invertible Matrix Theorem". mathworld.wolfram.com. Retrieved 2020-09-08.
6. ^ Horn, Roger A.; Johnson, Charles R. (1985). Matrix Analysis. Cambridge University Press. p. 14. ISBN 978-0-521-38632-6.
7. ^ Pan, Victor; Reif, John (1985), Efficient Parallel Solution of Linear Systems, Proceedings of the 17th Annual ACM Symposium on Theory of Computing, Providence: ACM
8. ^ Pan, Victor; Reif, John (1985), Harvard University Center for Research in Computing Technology Report TR-02-85, Cambridge, MA: Aiken Computation Laboratory
9. ^ A proof can be found in the Appendix B of Kondratyuk, L. A.; Krivoruchenko, M. I. (1992). "Superconducting quark matter in SU(2) color group". Zeitschrift für Physik A. 344 (1): 99–115. Bibcode:1992ZPhyA.344...99K. doi:10.1007/BF01291027. S2CID 120467300.
10. ^ Strang, Gilbert (2003). Introduction to linear algebra (3rd ed.). SIAM. p. 71. ISBN 978-0-9614088-9-3., Chapter 2, page 71
11. ^ Bernstein, Dennis (2005). Matrix Mathematics. Princeton University Press. p. 44. ISBN 978-0-691-11802-4.
12. ^ Tzon-Tzer, Lu; Sheng-Hua, Shiou (2002). "Inverses of 2 × 2 block matrices". Computers & Mathematics with Applications. 43 (1–2): 119–129. doi:10.1016/S0898-1221(01)00278-4.
13. ^ Bernstein, Dennis (2005). Matrix Mathematics. Princeton University Press. p. 45. ISBN 978-0-691-11802-4.
14. ^ Jump up to:a b T. H. Cormen, C. E. Leiserson, R. L. Rivest, C. Stein, Introduction to Algorithms, 3rd ed., MIT Press, Cambridge, MA, 2009, §28.2.
15. ^ Ran Raz. On the complexity of matrix product. In Proceedings of the thirty-fourth annual ACM symposium on Theory of computing. ACM Press, 2002. doi:10.1145/509907.509932.
16. ^ Stewart, Gilbert (1998). Matrix Algorithms: Basic decompositions. SIAM. p. 55. ISBN 978-0-89871-414-2.

17. ^ Haramoto, H.; Matsumoto, M. (2009). "A p-adic algorithm for computing the inverse of integer matrices". Journal of Computational and Applied Mathematics. 225 (1): 320–322. Bibcode:2009JCoAM.225..320H. doi:10.1016/j.cam.2008.07.044.
18. ^ "IML - Integer Matrix Library". cs.uwaterloo.ca. Retrieved 14 April 2018.
19. ^ Magnus, Jan R.; Neudecker, Heinz (1999). Matrix Differential Calculus : with Applications in Statistics and Econometrics (Revised ed.). New York: John Wiley & Sons. pp. 151–152. ISBN 0-471-98633-X.
20. ^ Roman, Stephen (2008), Advanced Linear Algebra, Graduate Texts in Mathematics (Third ed.), Springer, p. 446, ISBN 978-0-387-72828-5.
21. ^ Lin, Lin; Lu, Jianfeng; Ying, Lexing; Car, Roberto; E, Weinan (2009). "Fast algorithm for extracting the diagonal of the inverse matrix with application to the electronic structure analysis of metallic systems". Communications in Mathematical Sciences. 7 (3): 755–777. doi:10.4310/CMS.2009.v7.n3.a12.