


MATRIX COMPUTATION AND ITS APPLICATIONS

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PRE-REQUISITES : Some knowledge of matrix theory

INTENDED AUDIENCE : UG/PG

INDUSTRIES APPLICABLE TO : Any software/financial industry will be interested.

COURSE OUTLINE :
This course deals with applications of matrices to a wide range of areas of engineering and science. Initial some basics of linear algebra is discussed followed by matrix norms and sensitivity and condition number of the matrices. In this course , we will also discuss psudo-inverse of a matrix of any dimension (m x n) using Moore- Penrose theorem. Singular value decomposition of a general matrix is also discussed along with applications. Householder transformations, QR factorization will also be covered.

ABOUT INSTRUCTOR :
Prof. Vivek Kumar Aggarwal is presently working as an Assistant Professor in the dept. of Applied Mathematics, DTU Delhi. He earned his PhD in Mathematics from IIT Kanpur in 2005

Prof. Mani Mehra is presently working as an Associate Professor in the department of Mathematics, IIT Delhi. She earned her PhD from IIT Kanpur in 2005.

COURSE PLAN :

Week - 1: Introduction to binary operations, Vector spaces, subspaces.
Week - 2: Linearly independent and dependent vectors..
Week - 3: Basis of vector spaces, Linear functions, Row equivalent matrices.
Week - 4: Null spaces, Four subspaces associated with the matrix, Diagonal dominant matrices.
Week - 5: Coordinate of a vector, Linear transformation.
Week - 6: Range space and Null space of Linear transformation, Rank-Nullity theorem.
Week - 7: Matrix representation of Linear transformation, Similar matrices, Orthonormal bases.
Week - 8: Gram-Schmidt orthogonalisation process, QR factorisation, Inner product spaces.
Week - 9: Vector norm, Matrix norm, Sensitivity analysis.
Week - 10: Orthogonal matrix, Least square method, Jordan-Canonical form.
Week - 11: Singular value decomposition (SVD).
Week - 12: Moore-Penrose inverse, Householder transformation.