



Department of Mathematics

FDP and National Mathematics Day 2025 Event Report

16-22 December, 2025

One-Week Faculty Development Program on "From Numbers to Intelligence: Matrix Applications in AI & ML" with Celebration of National Mathematics Day 2025

Organized by: Department of Mathematics, Jaypee University of Information Technology, Waknaghat, Solan (HP)

Duration: December 16–22, 2025

Program Convener:

Prof. (Dr.) Rakesh Kumar Bajaj, Head, Department of Mathematics, JUIT

Program Coordinator:

Dr. Pradeep Kumar Pandey, Associate Professor, Department of Mathematics, JUIT

No. of Registered Participants: 68

Summary

The Department of Mathematics **Jaypee University of Information Technology, Waknaghat**, successfully conducted a prestigious one-week online Faculty Development Program (FDP) from **December 16–22, 2025**, with the thematic focus on "**From Numbers to Intelligence: Matrix Applications in AI & ML**." This comprehensive initiative was designed to bridge the gap between classical mathematical theory and contemporary applications in artificial intelligence and machine learning. The FDP concluded with the celebration of National Mathematics Day on December 22, 2025, featuring a special session on Vedic Mathematics. The program brought together distinguished resource persons from premier institutions including Indian Institutes of Technology (IITs), Indian Institute of Science (IISc), and Indian Institute of Management (IIM), attracting participants from academia, research organizations, and industry sectors.

Introduction and Objective

The rapid evolution of artificial intelligence and machine learning has necessitated a deeper understanding of the mathematical foundations that underpin these technologies. Matrix theory and linear algebra serve as the backbone of numerous AI and ML algorithms, yet their practical applications in modern computational frameworks often remain inadequately explored in traditional academic settings. Recognizing this gap, the Department of Mathematics at JUIT initiated this comprehensive FDP to equip faculty members, scientists, and engineers with both theoretical knowledge and practical insights into matrix applications in contemporary computing paradigms.

The primary objectives of the FDP were:



- Theoretical Foundation Building:** To provide participants with a comprehensive understanding of matrix theory and linear algebra fundamentals necessary for AI and ML applications.
- Practical Application Focus:** To demonstrate real-world implementations of linear algebraic concepts in dimensionality reduction, least squares modeling, and manifold learning.
- Computational Integration:** To bridge theoretical concepts with modern computational techniques and matrix-based methods for data analysis and model stability.
- Industry Relevance:** To enable participants to understand matrix-based methods for enhancing model robustness, reducing computational costs, and improving noise reduction and data compression in machine learning computations.

Mode of Conduction

The entire FDP was conducted in online mode through **Google Meet**, ensuring accessibility to participants across geographical boundaries. Daily sessions of 3 hours were structured strategically to maintain engagement while allowing participants to balance their academic and professional commitments. The synchronous online format facilitated interactive learning, with resource persons providing opportunities for real-time question-and-answer sessions and clarifications.

Registration and Participation

The program followed an inclusive registration process with nominal registration fees to ensure broad participation. Research scholars and students were charged a minimal fee (₹200/- until November 15, increasing to ₹300/- until November 30), while faculty and industry professionals were charged identically. This transparent and equitable fee structure reflected the university's commitment to democratizing access to high-quality academic content. Participation certificates were awarded to attendees who maintained minimum 80% attendance and achieved qualifying marks in the assessment quiz.

Day 1: Tuesday, December 16, 2025 – Inauguration

The inaugural session of the Faculty Development Program began with a formal welcome address by Dr. P.K. Pandey, Associate Professor and Program Coordinator from the Department of Mathematics at Jaypee University of Information Technology (JUIT), Waknaghhat. This opening ceremony effectively set the academic tone for the week-long event, providing participants with a comprehensive overview of the FDP's objectives, expected learning outcomes, and the pivotal role of matrix theory in advancing artificial intelligence and machine learning applications. Dr. Pandey highlighted the program's structure, emphasizing its blend of theoretical foundations and practical implementations across 12 technical sessions, culminating in the National Mathematics Day celebration. The Hon'ble Vice Chancellor Prof (Dr.) Rajendra Kumar Sharma delivered a motivational speech, underscoring the university's commitment to fostering interdisciplinary research and bridging pure mathematics with emerging technologies like AI/ML. Prof. (Dr.) Rakesh Kumar Bajaj, Head of the Department of Mathematics and



Convener of the FDP, extended a warm welcome, sharing insights into the department's vision and the strategic importance of such programs in faculty upskilling. Special appreciation was expressed for the chief guest and first session speaker, Prof. Swanand R. Khare from IIT Kharagpur, whose expertise in linear algebra applications was introduced to the audience.



Session 1 (11:30 AM – 1:00 PM)

Title: Least Squares and Applications to Data Fitting and Classification

Session Chair: Dr. P.K. Pandey, Department of Mathematics, JUIT

Resource Person: Prof. Swanand R. Khare, Indian Institute of Technology Kharagpur

Prof. Swanand R. Khare's inaugural technical session introduced participants to the foundational concept of least squares methodology, a cornerstone of data fitting and machine learning classification tasks. The session explored how the least squares framework provides an optimal approach for approximating solutions to over determined systems of equations, with direct applications in linear regression, logistic regression, and various classification algorithms. The discussion included mathematical rigor and practical implementation considerations, enabling participants to understand the theoretical underpinnings while remaining cognizant of computational constraints and numerical stability issues.



Session 2 (2:00 PM – 3:30 PM)

Title: A Geometric Perspective of Linear Algebra – Part 1

Session Chair: Prof. R.S. Raja Durai, Department of Mathematics, JUIT

Resource Person: Prof. Arulalan Rajan, Centre for Continuing Education, Indian Institute of Science, Bangalore

Prof. Arulalan Rajan's geometric perspective revolutionized the traditional approach to teaching linear algebra by transitioning from abstract algebraic manipulations to visual and intuitive geometric interpretations. This session established the conceptual framework for understanding vectors, vector spaces, linear transformations, and their geometric representations. By contextualizing linear algebra within geometric space, participants gained deeper insights into the behavior of matrices and their applications in transforming data spaces, which is fundamental to dimensionality reduction techniques and manifold learning algorithms.



Arulalan M.R. (Presenting)

2x₁ + x₂ = 3
4x₁ + 2x₂ = 6

Soln: x₁ = 1; 0; 1.5; k
x₂ = 1; 3; 0; 3-2k k ∈ R.

Ex 3: Solve for x₁, x₂

2x₁ + x₂ = 3
2x₁ + x₂ = 4.

No soln. Least Square Soln.

x₁ : No Solution.
x₂ :

$$\begin{pmatrix} x_1 \\ x_2 \end{pmatrix} \rightarrow \begin{bmatrix} 2 & 1 \\ 2 & 1 \end{bmatrix} \rightarrow \begin{pmatrix} y_1 \\ y_2 \end{pmatrix} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$$

Arulalan M.R.

14:35 | One week FDP-NMD 2025

Sahil Gupta
R.S. Raja Durai
Saurabh Srivastava
Rakesh Kanji
Mandeep Singh
Pradeep K Pandey
Dr. Vinod C...
54 others
Rakesh Kumar Bajaj

Session 3 (3:45 PM – 5:15 PM)

Title: Multi objective and Constrained Least Squares with Applications

Session Chair: Dr. Saurabh Srivastava, Department of Mathematics, JUIT

Resource Person: Prof. Swanand Ravindra Khare, IIT, Kharagpur

The concluding session of the first day advanced the least squares framework introduced in Session 1 by incorporating constraints and multiple competing objectives. This session addressed real-world optimization problems where practitioners must balance multiple criteria while adhering to physical, computational, or regulatory constraints. Prof. Khare's exposition of multiobjective optimization techniques provided participants with methodologies applicable to portfolio optimization, resource allocation, and machine learning model training with competing performance metrics.



Swanand Khare (Presenting)

$\hat{y}_i = \hat{f}(x_i) = \alpha_1 f_1(x_i) + \alpha_2 f_2(x_i) + \dots + \alpha_p f_p(x_i) \quad \forall i=1,2,\dots,N$

$\hat{y} = \begin{bmatrix} \hat{y}_1 \\ \vdots \\ \hat{y}_N \end{bmatrix} \in \mathbb{R}^N, \quad \hat{y} = \begin{bmatrix} \hat{y}_1 \\ \vdots \\ \hat{y}_N \end{bmatrix} \in \mathbb{R}^N$

$\hat{y} = y - \hat{y} \in \mathbb{R}^N$

$\hat{y} = \begin{pmatrix} \hat{y}_1 \\ \vdots \\ \hat{y}_N \end{pmatrix}$

$\min_{\alpha_1, \alpha_2, \dots, \alpha_p} \sum_{i=1}^N \hat{y}_i^2 = \min_{\alpha_1, \dots, \alpha_p} \hat{y}^T \hat{y} = \min_{\alpha_1, \dots, \alpha_p} \|\hat{y}\|_2^2 = \min_{\alpha_1, \dots, \alpha_p} \|\hat{y} - \hat{y}_d\|_2^2 = \min_{\alpha_1, \dots, \alpha_p} \|\hat{y} - \hat{y}_d\|_2^2$

11:56 | One week FDP-NMD 2025

FDP-NMD 2025
R S Raja Durai
Saurabh Srivastava
Swanand Khare
R.K. SHARMA
Prof. Amit Srivastava
Suyash Chauhan
53 others
Rakesh Kumar Bajaj

Day 2: Wednesday, December 17, 2025 – Advanced Linear Algebra and Distributed Computing

The second day deepened the mathematical exploration into linear algebra while introducing modern computational paradigms for distributed processing.

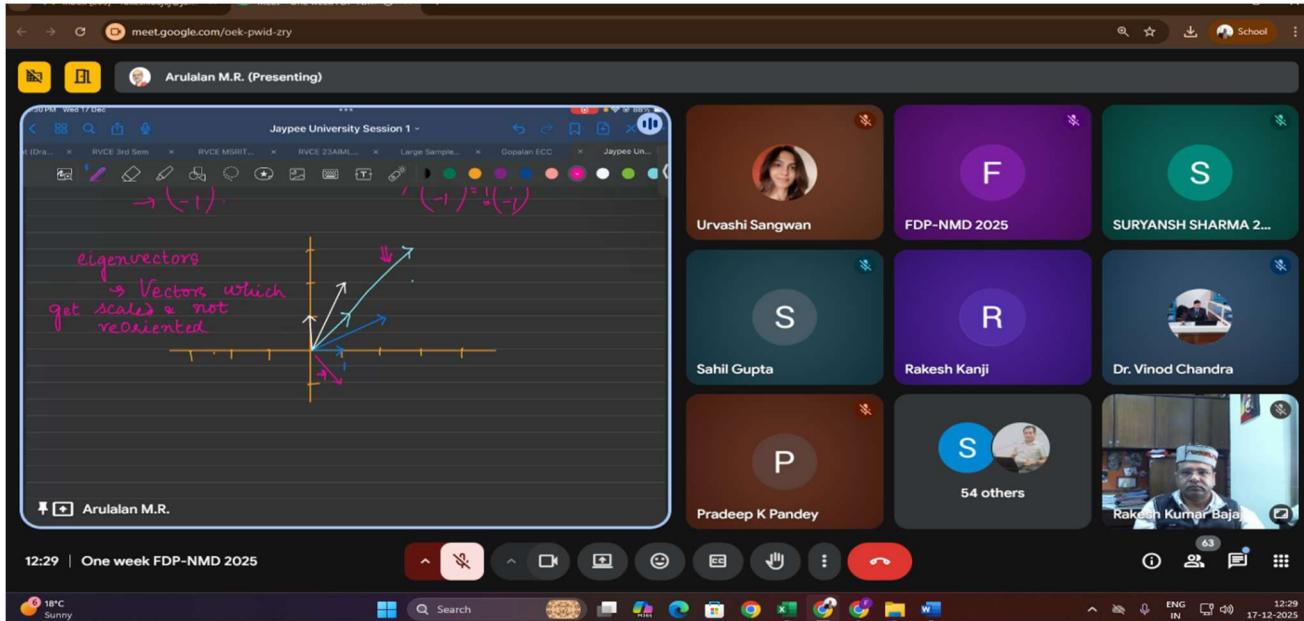
Session 4 (11:30 AM – 1:00 PM)

Title: A Geometric Perspective of Linear Algebra – Part 2

Session Chair: Dr. Mandeep Singh, Department of Mathematics, JUIT

Resource Person: Prof. Arulalan Rajan, Centre for Continuing Education, Indian Institute of Science, Bangalore

Building upon the geometric foundations established in Session 2, Prof. Arulalan Rajan continued his exposition into advanced concepts including eigenvalues, eigenvectors, and their geometric interpretations. This session illuminated how eigenvectors represent special directions in transformed spaces where matrices act as scaling operators. The geometric understanding of eigendecomposition proved crucial for subsequent sessions on Principal Component Analysis, Singular Value Decomposition, and manifold learning techniques, all of which rely fundamentally on eigenvalue and eigenvector computations.



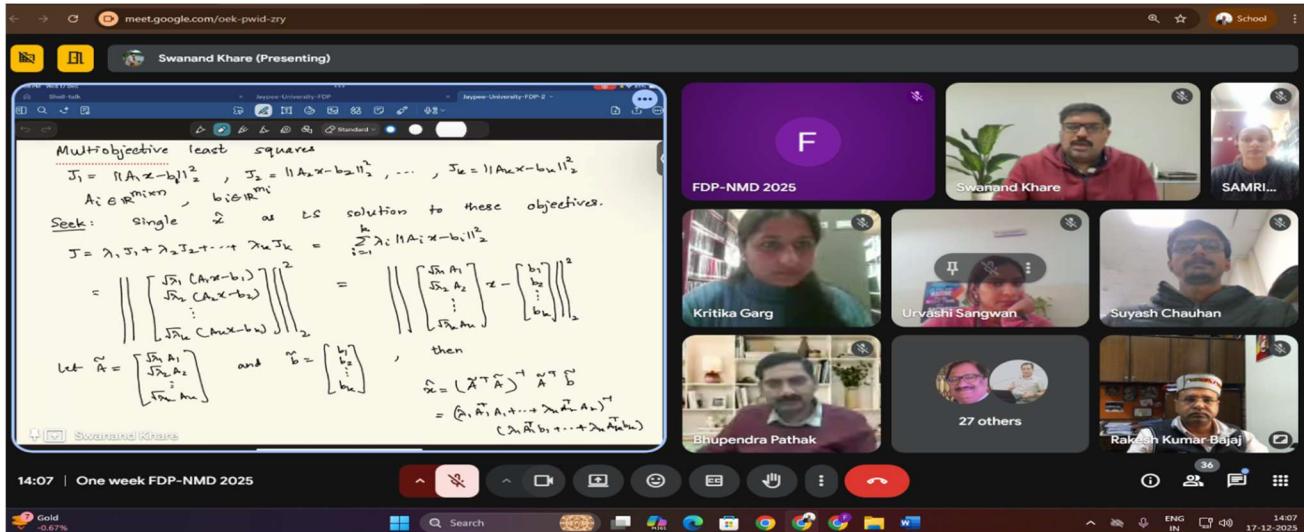
Session 5 (2:00 PM – 3:30 PM)

Title: Recursive and Distributed Least Squares

Session Chair: Dr. Saurabh Srivastava, Department of Mathematics, JUIT

Resource Person: Prof. Swanand R. Khare, Indian Institute of Technology Kharagpur

Prof. Khare's presentation on recursive and distributed least squares addressed a critical challenge in contemporary machine learning: processing large-scale datasets that cannot be accommodated in a single computational unit's memory. The session introduced the Kalman filter and related recursive algorithms that enable sequential updating of least squares solutions as new data arrives. Additionally, distributed variants of least squares algorithms were discussed, with emphasis on data-parallel and model-parallel approaches essential for leveraging modern computational architectures including multi-processor systems and cloud computing platforms.



Session 6 (3:45 PM – 5:15 PM)

Title: Fourier analysis through the Lens of Linear Algebra

Session Chair: Dr. Mandeep Singh, Department of Mathematics, JUIT

Resource Person: Prof. Arulalan Rajan, Centre for Continuing Education, Indian Institute of Science, Bangalore

The final session of Day 2 reinterpreted classical Fourier analysis, which has dominated signal processing and time-series analysis for over two centuries, from the perspective of linear algebra and matrix theory. This unified framework illuminated the deep connections between Fourier decomposition, basis representations, and inner product spaces. Prof. Rajan's exposition demonstrated how the Fourier transform emerges naturally from linear algebraic principles, providing participants with a more fundamental understanding of frequency domain analysis, spectral methods, and their applications in machine learning contexts including feature extraction and pattern recognition in audio and image processing.



Day 3: Thursday, December 18, 2025 – Decomposition Techniques and Dimensionality Reduction

The third day focused on matrix decomposition methodologies, with particular emphasis on techniques that form the foundation of dimensionality reduction and feature extraction in machine learning.

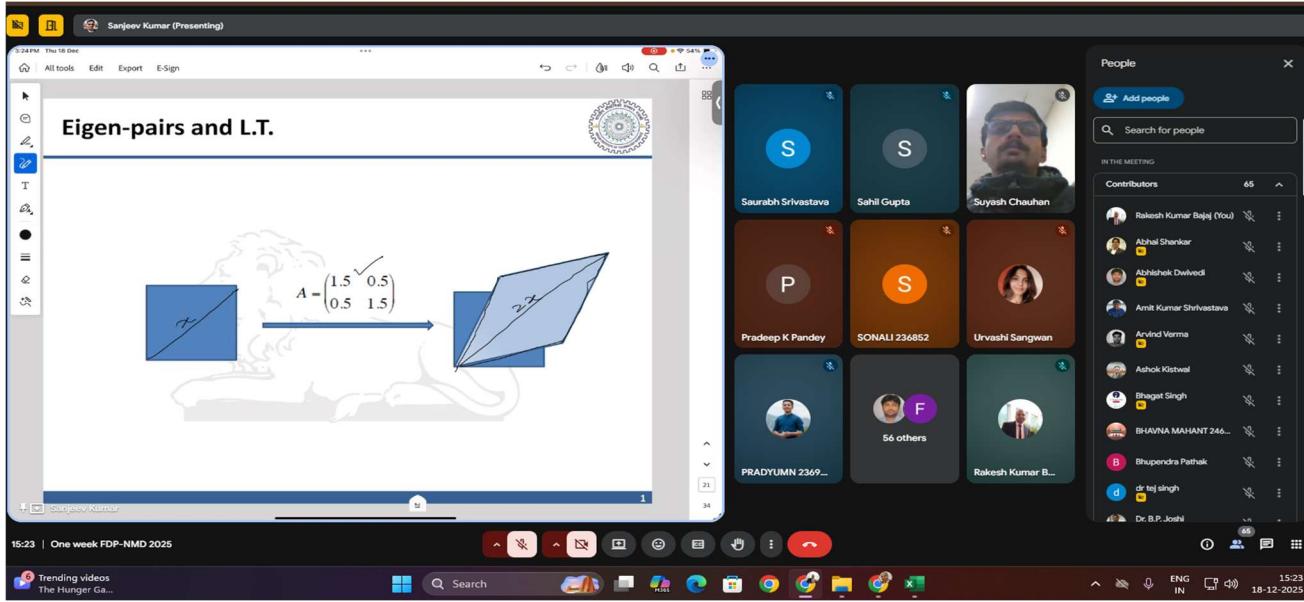
Session 7 (2:30 PM – 4:00 PM)

Title: Singular Value Decomposition and Low-Rank Approximation

Session Chair: Dr. Neel Kanth, Department of Mathematics, JUIT

Resource Person: Prof. Sanjeev Kumar, Indian Institute of Technology Roorkee

Prof. Sanjeev Kumar's comprehensive treatment of Singular Value Decomposition (SVD) presented one of the most powerful and widely-used matrix decomposition techniques in applied mathematics and machine learning. The session detailed how SVD decomposes any rectangular matrix into a product of orthogonal matrices and a diagonal matrix of singular values, providing profound insights into matrix rank, numerical conditioning, and data geometry. Particularly important was the exposition on low-rank approximation, which truncates the SVD to retain only the most significant singular values and their corresponding components. This approximation technique underpins numerous machine learning applications including image compression, noise reduction, recommendation systems, and latent factor models.



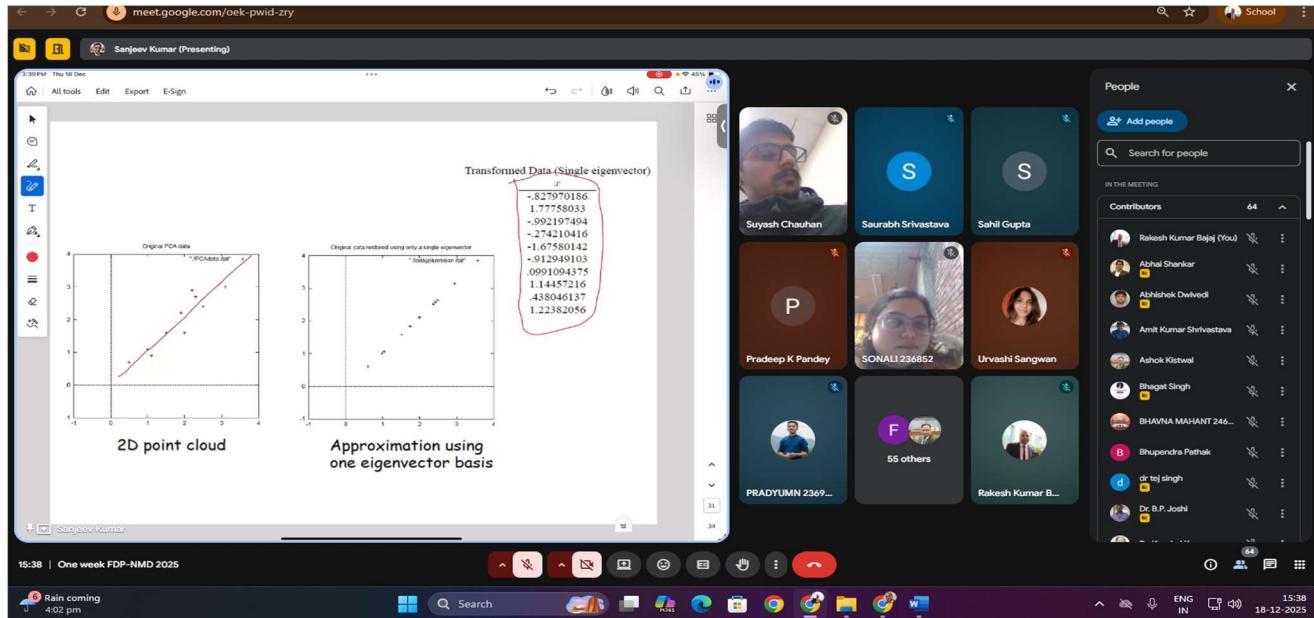
Session 8 (4:30 PM – 6:00 PM)

Title: Principal Component Analysis and Linear Discriminant Analysis

Session Chair: Dr. Neel Kanth, Department of Mathematics, JUIT

Resource Person: Prof. Sanjeev Kumar, Indian Institute of Technology Roorkee

The closing session of Day 3 applied the matrix decomposition foundations from Session 7 to two fundamental machine learning techniques: Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA). PCA, which relies on eigen-decomposition of covariance matrices, identifies directions of maximum variance in high-dimensional data spaces, enabling dramatic dimensionality reduction while preserving the essential information content. LDA, conversely, emphasizes discriminative directions that separate different classes in labeled datasets. Prof. Kumar's integrated treatment of these techniques demonstrated their complementary roles in exploratory data analysis, data preprocessing, and feature extraction pipelines used across diverse machine learning applications.



Day 4: Friday, December 19, 2025 – Manifold Learning and Complex Data Structures

The fourth day transitioned from traditional linear methods to nonlinear manifold learning, addressing scenarios where data lies on lower-dimensional nonlinear structures embedded in high-dimensional ambient spaces.

Session 9 (2:30 PM – 4:00 PM)

Title: Manifold Learning – Theory

Session Chair: Dr. Sriti Thakur, Department of Mathematics, JUIT

Resource Person: Prof. Sanjeev Kumar, Indian Institute of Technology Roorkee

Prof. Kumar's theoretical treatment of manifold learning provided sophisticated mathematical frameworks for understanding and exploiting nonlinear data geometry. The session introduced foundational concepts including topological manifolds, differential manifolds, and tangent spaces, establishing the mathematical vocabulary necessary for advanced machine learning. Key theoretical results regarding the preservation of local and global geometric properties during dimensionality reduction were presented, along with the mathematical justification for various manifold learning approaches. This theoretical foundation proved essential for understanding practical implementations in the subsequent session.



Multi-Dimensional Scaling:

Multidimensional scaling (MDS) is a method used in data sciences to visualize and compare similarities & dissimilarities of high dimensional data.

PCA minimizes dimensions, preserving covariance of data. MDS minimizes dimensions, preserving distance between data points.

They are same, if covariance in data = Euclidean distance between data points in high dimension.

Manifold-Face.ipynb

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Connect

Sanjeev Ku... Pradeep K... FDP-NMD...
Dr. Vinod Chandra Dr. Vinod C... SURYANSH... Rakesh Kanji
Sahil Gupta 44 others Rakesh Ku...

Session 10 (4:30 PM – 6:00 PM)

Title: Manifold Learning – Implementations

Session Chair: Dr. Sriti Thakur, Department of Mathematics, JUIT

Resource Person: Prof. Sanjeev Kumar, Indian Institute of Technology Roorkee

Building upon the theoretical foundations of Session 9, Prof. Kumar presented practical implementations of major manifold learning algorithms including Locally Linear Embedding (LLE), ISOMAP, Laplacian



Eigenmaps, and t-Distributed Stochastic Neighbor Embedding (t-SNE). The session emphasized algorithmic details, computational complexity considerations, hyperparameter tuning strategies, and practical guidance for selecting appropriate manifold learning techniques for specific applications. Case studies demonstrated applications in image analysis, text document visualization, and biological data exploration, illustrating how abstract geometric principles translate into powerful practical tools for understanding complex datasets.

Day 5: Saturday, December 20, 2025 – Advanced SVD Applications

The fifth day provided deeper exploration of Singular Value Decomposition applications, consolidating learning from earlier sessions and preparing participants for more advanced machine learning contexts.

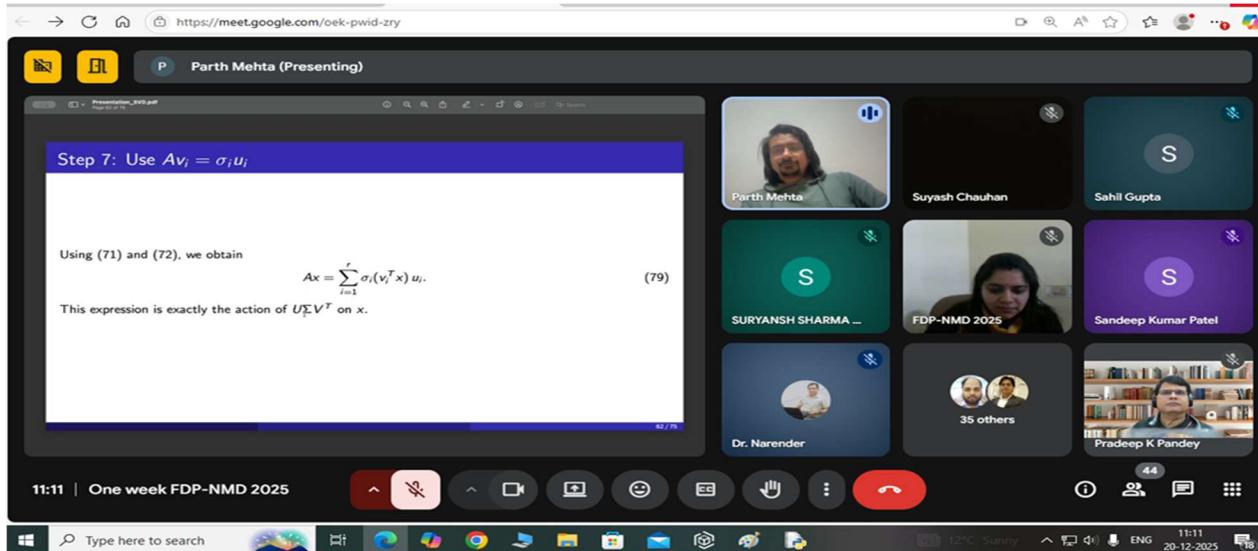
Session 11 (10:00 AM – 11:30 AM)

Title: Singular Value Decomposition – Advanced Techniques

Session Chair: Dr. Meghna Dhalaria, Department of CSE&IT, JUIT

Resource Person: Dr. Parth Mehta, Brij Disa Centre for Data Science and Artificial Intelligence, Indian Institute of Management Ahmedabad

Dr. Parth Mehta, representing IIM Ahmedabad's premier data science center, presented advanced SVD techniques that extend beyond basic low-rank approximation. The session covered randomized SVD methods for massive-scale datasets, truncated SVD implementations for computational efficiency, and theoretical aspects of SVD stability under data perturbations. Dr. Mehta's expertise in data science provided a bridge between pure mathematics and practical industrial applications, emphasizing how these advanced techniques enable real-time processing of big data in contemporary machine learning systems.



Session 12 (12:00 Noon – 1:30 PM)

Title: Applications of Singular Value Decomposition in Machine Learning and Artificial Intelligence

Session Chair: Dr. Meghna Dhalaria, Department of Mathematics, JUIT

Resource Person: Dr. Parth Mehta, Brij Disa Centre for Data Science and Artificial Intelligence, Indian Institute of Management Ahmedabad

The concluding session of the technical FDP component presented a comprehensive overview of SVD applications across diverse machine learning and artificial intelligence domains. Applications covered included recommender systems (matrix factorization), natural language processing (Latent Semantic Analysis), computer vision (face recognition and image understanding), and network analysis (graph decomposition). Dr. Mehta contextualized these applications within current industry practices, discussing how major technology companies leverage SVD-based methods for recommendation engines, search optimization, and content personalization. The session reinforced the central theme of the FDP: the indispensable role of linear algebra and matrix methods as the mathematical foundation for modern artificial intelligence.



The screenshot shows a Google Meet interface. The top bar displays the URL <https://meet.google.com/oek-pwid-zry>. The main content area shows a presentation slide titled "Application_SVD-2.pdf". The slide contains text and a mathematical equation. To the right of the slide is a 4x3 grid of participant thumbnails. The grid includes the following data:

Row	Column 1	Column 2	Column 3
1	Parth Mehta (Presenting)	Parth Mehta	F
2		FDP-NMD 2025	S
3	Dr. Narender	Abhil Shankar	Neelkanth Mathemati...
4	Rajeev Sachan	D 21 others	P
5			Pradeep K Pandey

At the bottom of the slide, there is a footer with the text "12:07 | One week FDP-NMD 2025" and a series of red circular icons for video, audio, and other meeting controls.

Day 6: Monday, December 22, 2025 – National Mathematics Day Celebration

The concluding day transitioned from the technical FDP to celebrate National Mathematics Day, marking the birth anniversary of the legendary mathematician Srinivasa Ramanujan on December 22.

Inaugural Session of National Mathematics Day (2:30 PM – 3:00 PM)

Dignitaries: Vice-Chancellor, Dean, Head of Department, and Program Coordinator delivered opening remarks contextualizing the significance of National Mathematics Day and its relevance to contemporary scientific and technological advancement. Speakers emphasized how mathematical innovations, spanning from ancient Vedic contributions to modern AI, continue shaping human civilization and problem-solving capabilities.



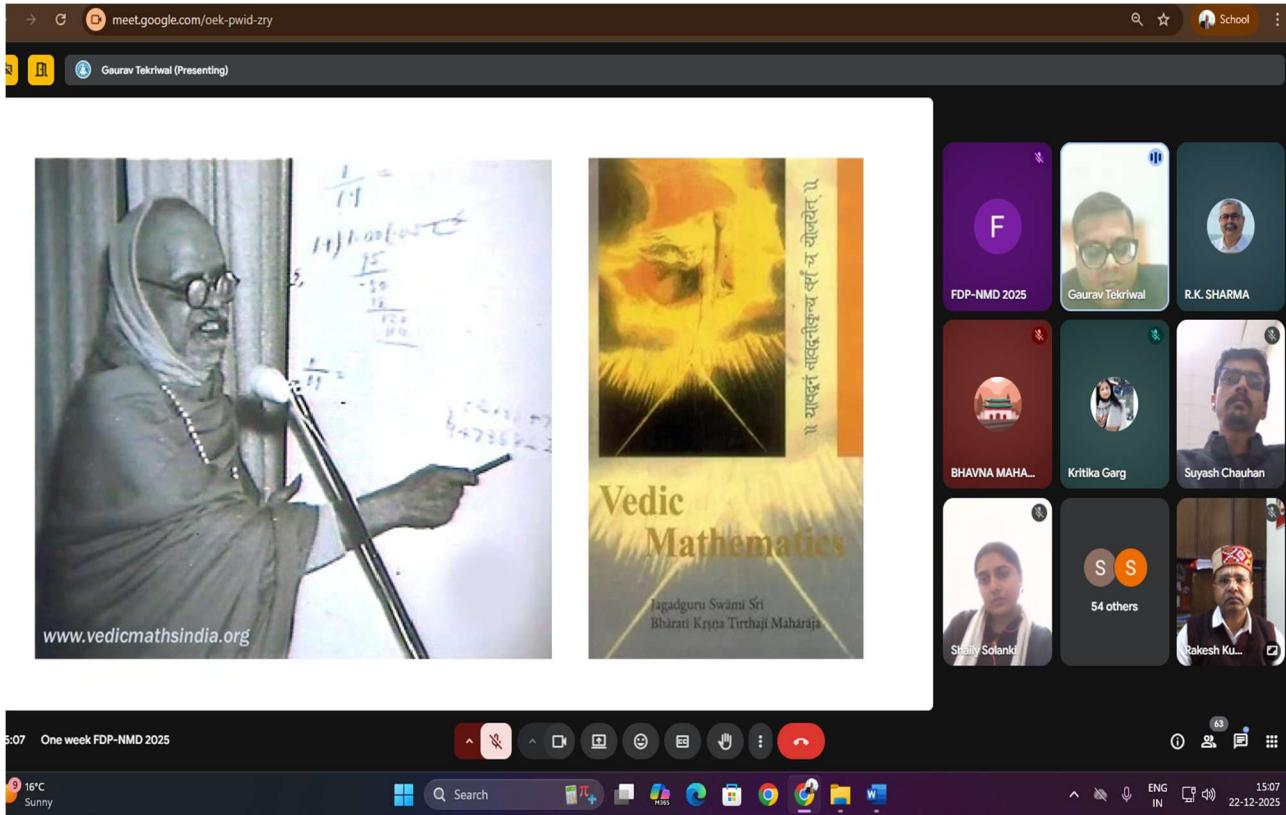
Special Session on Vedic Mathematics (3:00 PM – 4:30 PM)

Title: An Introduction to Sutras of Vedic Mathematics

Session Chair: Dr. P.K. Pandey, Department of Mathematics, JUIT

Resource Person: Mr. Gaurav Tekriwal, Founder and President, Vedic Maths Forum India

Mr. Gaurav Tekriwal's enlightening presentation introduced participants to the elegant and efficient mathematical methodologies encapsulated in ancient Vedic texts. The Vedic mathematics sutras (aphorisms) provide compact verbal formulae for solving diverse mathematical problems with remarkable speed and elegance, often requiring fewer computational steps than conventional algorithms. The session covered applications of Vedic sutras to arithmetic operations, algebraic manipulations, and advanced problem-solving techniques. Mr. Tekriwal's presentation demonstrated that ancient mathematical wisdom possesses continued relevance and utility, offering complementary approaches to contemporary computational methods. The session served as a cultural and intellectual bridge, honoring the mathematical heritage of India while situating it within the context of modern mathematical sciences.



Closing Session (4:30 PM onwards)

The program concluded with a formal vote of thanks delivered by the organizing committee, acknowledging the contributions of resource persons, session chairs, institutional support, and participant engagement. Appreciation was extended to:

1. All distinguished resource persons from premier institutions (IIT Kharagpur, IIT Roorkee, IISc Bangalore, IIM Ahmedabad)
2. Session chairs who facilitated scholarly discussions and maintained academic rigor
3. Administrative and technical support teams ensuring seamless online delivery
4. All participating faculty members, researchers, and scholars who contributed to the vibrant learning atmosphere



Resource Persons and Affiliations Summary

The FDP benefited from the expertise of highly accomplished mathematicians and data scientists:

Resource Person	Affiliation	Sessions Conducted
Prof. Swanand R. Khare	Indian Institute of Technology Kharagpur	Sessions 1, 3, 5 (Least Squares, Multiobjective Optimization, Recursive & Distributed Methods)
Prof. Arulalan Rajan	Centre for Continuing Education, Indian Institute of Science, Bangalore	Sessions 2, 4, 6 (Geometric Perspectives in Linear Algebra, Fourier Analysis)
Prof. Sanjeev Kumar	Indian Institute of Technology Roorkee	Sessions 7, 8, 9, 10 (SVD, PCA/LDA, Manifold Learning)
Dr. Parth Mehta	Brij Disa Centre for Data Science and Artificial Intelligence, Indian Institute of Management Ahmedabad	Sessions 11, 12 (Advanced SVD and ML/AI Applications)
Mr. Gaurav Tekriwal	Founder and President, Vedic Maths Forum India	National Mathematics Day Special Session (Vedic Mathematics)

Learning Outcomes and Impact

Knowledge and Skill Development

Participants engaged in the FDP acquired comprehensive understanding of:

- Matrix Theory Fundamentals:** Deep knowledge of matrix operations, decompositions, and their geometric interpretations
- Linear Algebra Applications:** Practical applications in optimization, least squares fitting, and data transformation
- Dimensionality Reduction:** Mastery of PCA, LDA, SVD, and their applications in feature extraction
- Manifold Learning:** Understanding of nonlinear methods for complex data structure analysis
- Machine Learning Foundations:** Knowledge of how linear algebra underpins machine learning algorithms
- Computational Techniques:** Familiarity with recursive, distributed, and randomized algorithms for large-scale data processing



Professional Development

The FDP contributed to professional development by:

1. **Updating Curriculum Content:** Faculty members can integrate contemporary material on matrix applications in AI/ML into their courses
2. **Research Collaboration Opportunities:** Interactions with leading researchers create potential for collaborative research projects
3. **Industry Relevance:** Understanding of how theoretical concepts translate to practical industrial applications
4. **Teaching Methodology:** Exposure to innovative teaching approaches, particularly geometric perspectives on abstract concepts

Institutional Strengthening

For JUIT, the FDP:

1. **Enhanced Reputation:** Successfully organized a high-quality academic program featuring distinguished speakers from premier institutions
2. **Faculty Development:** Enriched the professional capabilities of the organizing department's faculty
3. **Network Expansion:** Created valuable connections with leading academic institutions and researchers
4. **Student Learning:** Provided opportunities for faculty to enhance their courses with state-of-the-art content

Participation Statistics and Reach

The FDP successfully attracted participants from:

- Academic institutions across India
- Research organizations and centers
- Industry professionals interested in AI/ML applications
- Graduate and postgraduate students
- Interdisciplinary professionals seeking mathematical foundations for computational work

E-certificates were issued to participants who met the minimum 80% attendance requirement recognizing their commitment to professional development.

Conclusion

The one-week Faculty Development Program on "**From Numbers to Intelligence: Matrix Applications in AI & ML**," concluded with the celebration of **National Mathematics Day** on **December 22, 2025**, represents a significant contribution to mathematical education and professional development in contemporary India. The program successfully bridged theoretical mathematical



foundations and practical applications in artificial intelligence and machine learning, addressing a critical gap in academic preparation for these rapidly advancing fields.

The comprehensive curriculum, spanning from fundamental least squares methodologies through advanced manifold learning and practical machine learning applications, provided participants with both breadth and depth of knowledge. The geometric perspective emphasized throughout the program fostered deeper intuitive understanding beyond algebraic manipulation. The involvement of distinguished resource persons from premier institutions including **IIT Kharagpur**, **IIT Roorkee**, **IISc Bangalore**, and **IIM Ahmedabad** ensured access to current research insights and best practices.

The National Mathematics Day celebration, featuring an exposition on Vedic Mathematics by Mr. Gaurav Tekriwal, enriched the program by connecting ancient mathematical wisdom with contemporary scientific advancement, reinforcing that mathematical excellence is not merely a modern phenomenon but a continuing contribution of Indian intellectual traditions.

The Department of Mathematics at JUIT, under the leadership of Prof. (Dr.) Rakesh Kumar Bajaj and the dedicated coordination of Dr. Pradeep Kumar Pandey, successfully executed a program that exemplifies the university's commitment to excellence, innovation, and the dissemination of knowledge to the broader academic and professional community. The positive feedback from participants, evidenced by their sustained engagement throughout the week-long program, confirms the FDP's success in achieving its objectives.

Looking forward, the department intends to leverage the success of this initiative to organize follow-up workshops, potentially introducing advanced topics such as tensor decomposition, matrix completion, neural network optimization, and reinforcement learning from linear algebraic perspectives. The strong participant engagement and positive reception suggest significant demand for continued education in this critical domain.

This FDP exemplifies the power of collaborative academic initiatives that bring together talented educators, motivated learners, and cutting-edge content to advance professional capabilities and contribute to the nation's technological development. As artificial intelligence and machine learning increasingly permeate all sectors of society, ensuring that educators, researchers, and practitioners possess deep mathematical foundations becomes increasingly crucial. The Department of Mathematics at JUIT has made a valuable contribution toward this essential objective.

Appendix: Program Highlights

- **Flyers, FDP Schedule, Brochure of FDP**
- **Total Duration:** 6 days (December 16–22, 2025)
- **Total Sessions:** 12 technical sessions + 1 special session (Vedic Mathematics)
- **Teaching Hours:** Approximately 37 hours of structured learning
- **Resource Persons:** 5 experts from premier institutions
- **Session Chairs:** 6 faculty members from JUIT's Department of Mathematics, & 1 from CSE.
- **Delivery Mode:** Online (Google Meet) – ensuring accessibility and scalability
- **Participation Model:** Interactive sessions with real-time Q&A opportunities
- **Reach:** Participants from multiple states and institutional backgrounds



One Week FDP on
“From Numbers to Intelligence: Matrix Applications in AI & ML”
December 16-22, 2025
With Celebration of National Mathematics Day on 22nd Dec 2025
Organised by
Department of Mathematics
Jaypee University of Information Technology, Waknaghath, Solan (H. P.)



This one-week Online FDP aims to introduce the participants to matrix theory and linear algebra concepts that form the foundation to key AI and ML algorithms. The program is beneficial for participants with basic knowledge of linear algebra and bridges theoretical concepts with modern computational techniques. Topics covered include dimensionality reduction, least squares modeling, manifold learning, and matrix-based methods for data analysis and model stability. The FDP also addresses noise reduction, compression, and stability in ML computations to improve model robustness and reduce computational costs.

Resource Persons



**Prof. Swanand
Ravindra Khare
IIT Kharagpur**



**Prof. Arulalan
Rajan
IISc Bangalore**



**Prof. Sanjeev
Kumar
IIT Roorkee**



**Dr. Parth
Mehta
IIM
Ahmedabad**



**Mr. Gaurav
Tekriwal
Vedic Maths
Forum**

FDP Convener



**Dr. Rakesh
Kumar Bajaj
Prof. and HOD
(Mathematics)
JUIT Waknaghath**

Date: 16-22 December, 2025.

Google meet link:
<https://meet.google.com/oek-pwid-zry>

**E-certificates will be given to participants
who attend the program with at least
80% attendance.**

FDP Coordinator



**Dr. Pradeep
Kumar Pandey
Associate Prof.
(Mathematics)
JUIT Waknaghath**



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NATIONAL MATHEMATICS DAY 2025

Monday 22 Dec, 2025

Google Meet Link:

<https://meet.google.com/oek-pwid-zry>



Celebrating the legacy of
legendary Mathematician

**Srinivasa
Ramanujan**

on his 138th birth
Anniversary

Department of
Mathematics,
Jaypee University of
Information Technology
cordially invites
you to celebrate
**National Mathematics Day
2025**

Program Schedule:

- 1 Inaugural Session:
02:30 P.M.- 03:00 P.M.
2. Keynote Lecture:
03:00 P.M.- 04:30 P.M.



**Keynote Speaker:
Gaurav Tekriwal**

Founder and President of :
The Vedic Maths Forum India.
Featured in "Mann ki Baat".
Seven times TED and TEDx speaker.



Registered List of Participants:

S. No.	Name	Affiliation
1	Kiran Devi	Jawaharlal Nehru Govt. Engineering College, Sundernagar
2	Madhu Bala Dadhwal	Himachal Pradesh University, Shimla
3	Mehak Mahajan	Himachal Pradesh University, Shimla
4	Pankaj	Government College Chamba, Himachal Pradesh, India
5	Tej Singh	Government College Chamba(H.P.)
6	Vikas Kumar Jayswal	Dr. Shivanand Nautiyal Govt. P. G. College Karanprayag (Chamoli)
7	Jitika	Jaypee University of Information Technology, Waknaghhat, Solan
8	Muskan Kapoor	Jaypee University of Information Technology, Waknaghhat, Solan
9	Pradyumn	Jaypee University of Information Technology, Waknaghhat, Solan
10	Shaily Solanki	Banasthali Vidyapith
11	Sonali	Jaypee University of Information Technology, Waknaghhat, Solan
12	Sougata Das	IIT KHARAGPUR
13	Suryansh Sharma	Jaypee university of information technology, wakhnaghhat, solan
14	Abhai Shankar Chaurasia	Allenhouse Institute of Technology, Kanpur
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17	Rajeev Kumar Sachan	Allenhouse Institute of Technology, Kanpur
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42	Shilpa kaushal	Jaypee University of Information Technology, Waknaghath, Solan
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50	Sameer	Career Point University, Hamirpur
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