



**MANAV RACHNA**  
Ividyaparishad

**MANAV RACHNA  
UNIVERSITY**

(FORMERLY MANAV RACHNA COLLEGE OF ENGINEERING  
NAAC ACCREDITED 'A' GRADE INSTITUTION)

Declared as State Private University under section 2F of the UGC act, 1956

*Workshop on Nonlinear Optimization, Variational Inequalities and  
Artificial Intelligence  
March 22<sup>nd</sup> – 26<sup>th</sup>, 2021*

**Organized by**  
**DEPARTMENT OF MATHEMATICS**  
**MANAV RACHNA UNIVERSITY**  
Sector 43, Aravalli Hills, Manav Rachna Campus Rd,  
Faridabad, Haryana 121004

## ABOUT THE UNIVERSITY



Manav Rachna University (MRU) is a leading State Private University (established by Haryana State Legislature Act No 26 of 2014 & under section 2(f) of UGC Act 1956), offering globally relevant education. MRU is listed on the official website of Government of Haryana. The University has evolved from Manav Rachna College of Engineering (MRCE), which was established in the year 2004, a NAAC accredited 'A' Grade institution ranked 10<sup>th</sup> among all the private engineering institutes of the country. MRU has been ranked 4<sup>th</sup> among the Emerging Engineering Institutes of the country (The Times Engineering Survey 2018). The accreditations/rankings are testimonial to the trust of accrediting bodies in the quality of education being offered, a well-established teaching and learning process guided by the global best practices and a culture of academic excellence promoting research, innovation & entrepreneurship.

## ABOUT THE DEPARTMENT

At MRU, the department of Mathematics believes in 'Learning by Doing' strategy. The department equips the students with mathematical tools and their applications in diverse fields. The lab component in mathematics strengthens the foundation of the course for students. The department offers an extensive B.Sc. (H) Mathematics, M.Sc. Mathematics & Ph.D. Mathematics program.

The department focuses on the overall development of the students. Apart from laying the strong foundation of the varied courses, various skills & personality attributes are also groomed by exposing the students to:

- ❖ Research Projects
- ❖ Participation in conferences, workshops and extra-curricular events,
- ❖ imbibing new ideas through educational visits &
- ❖ improvising behavior through motivational lectures

## ABOUT THE PROGRAM

The program shall provide a platform to understand and apply different mathematical and computational approaches for solving optimization problems, comparison & connection among the existing and new solution methods, detail analysis using algorithms and its applications.

Topics to be covered

- ❖ Nonlinear Constrained Optimization and Convexity
- ❖ Unconstrained Optimization
- ❖ Variational Inequalities
- ❖ Evolutionary Algorithms using AI Techniques
- ❖ Emerging OR Problems

## LEARNING OUTCOMES

After going through the various sessions, participants would be able to:

- ❖ Understand the concepts of Convexity, Variational inequalities and its applications
- ❖ Solve Different OR Problems using Mathematical and computational approach
- ❖ Apply Evolutionary algorithms using AI techniques
- ❖ Explore Emerging OR Problems using mathematical and computational convex optimization

## RESOURCE PERSONS

- Prof. C.S. Lalitha  
(Head & Dean, Faculty of Mathematical Sciences, University of Delhi)
- Prof. S.K. Mishra (BHU, Varanasi)
- Dr. B.B. Upadhyay (IIT Patna)
- Dr. Tanveer Ahmad (IIT Indore)
- Dr. Vinay Singh (NIT Mizoram)
- Dr. Kalpana Shukla (MRU, Faridabad)
- Ms. Priyanka Mishra, Software Professional (IIT Patna)

All the resource persons are the eminent academicians & researchers in the concerned area.

## PEDAGOGY

The pedagogy consists of the expert lectures, interactive sessions and hands on sessions.

## INVITED ATTENDEES

- Professionals in Academics and R&D
- Research Scholars
- UG/PG Students

## IMPORTANT DATES AND REGISTRATION FEES

Registration Fee per participant (Rs.)	Registration Closes on
Rs. 300/-	March 20, 2021

## \*\* MODE OF WORKSHOP - ONLINE

Timings: Monday & Friday: 10:00am – 12:00 noon & 2:00pm – 3:30 pm  
Tuesday – Thursday : 2:00pm – 3:30 pm

MODE OF PAYMENT: Bank Transfer

BANK DETAILS FOR MANAV RACHNA UNIVERSITY:

ACCOUNT NAME	MANAV RACHNA UNIVERSITY OPERATIONS
ACCOUNT NUMBER	50200050331373
BANK NAME	HDFC BANK LIMITED
IFSC CODE	HDFC0002549
A/C BRANCH	PALAM VIHAR GURGAON
ADDRESS	H BLOCK, OPPOSITE CELEBRITY HOMES, PALAM VIHAR, GURGAON
CITY	GURGAON 122017
MICR	110240247

## REGISTRATION LINK

<https://forms.gle/wPzKcaNZey94A5RKA>

Fee once paid is non-refundable.

## CONVENER:

Dr. Kalpana Shukla  
Assistant Professor – Department of Mathematics,  
Manav Rachna University, Faridabad,  
Ph.: 8853802932  
kalpanashukla@mru.edu.in

## ORGANIZING COMMITTEE:

- Dr. Deepa Arora (Head, Department of Mathematics, MRU)
- Dr. Aparna Vyas (Associate Professor & Associate Head)

## **REPORT**

### **Workshop on ‘Nonlinear optimization, Variational inequalities and Artificial Intelligence (WNVIA2021)**

**Date** -22<sup>nd</sup> March to 26<sup>th</sup> March 2021

**Resource Persons** - Dr. B. B. Upadhyay - IIT, PATNA Prof. C.S. Lalitha- Delhi University Prof. S.K. Mishra-BHU Dr. Tanveer- IIT, Indore Dr. Kalpana Shukla-MRU Ms. Priyanka Mishra- IIT, PATNA Dr. Vinay Singh- NIT, MIZORAM

The Department of Mathematics, MRU organized a One Week Workshop on ‘Nonlinear optimization, Variational inequalities and Artificial Intelligence (WNVIA2021)’ from 22<sup>nd</sup> March to 26<sup>th</sup> March, 2021. The 05-day workshop was designed to provide a platform to understand and apply different mathematical and computational approaches for solving optimization problems, comparison & connection among the existing and new solution methods, detail analysis using algorithms and its applications.

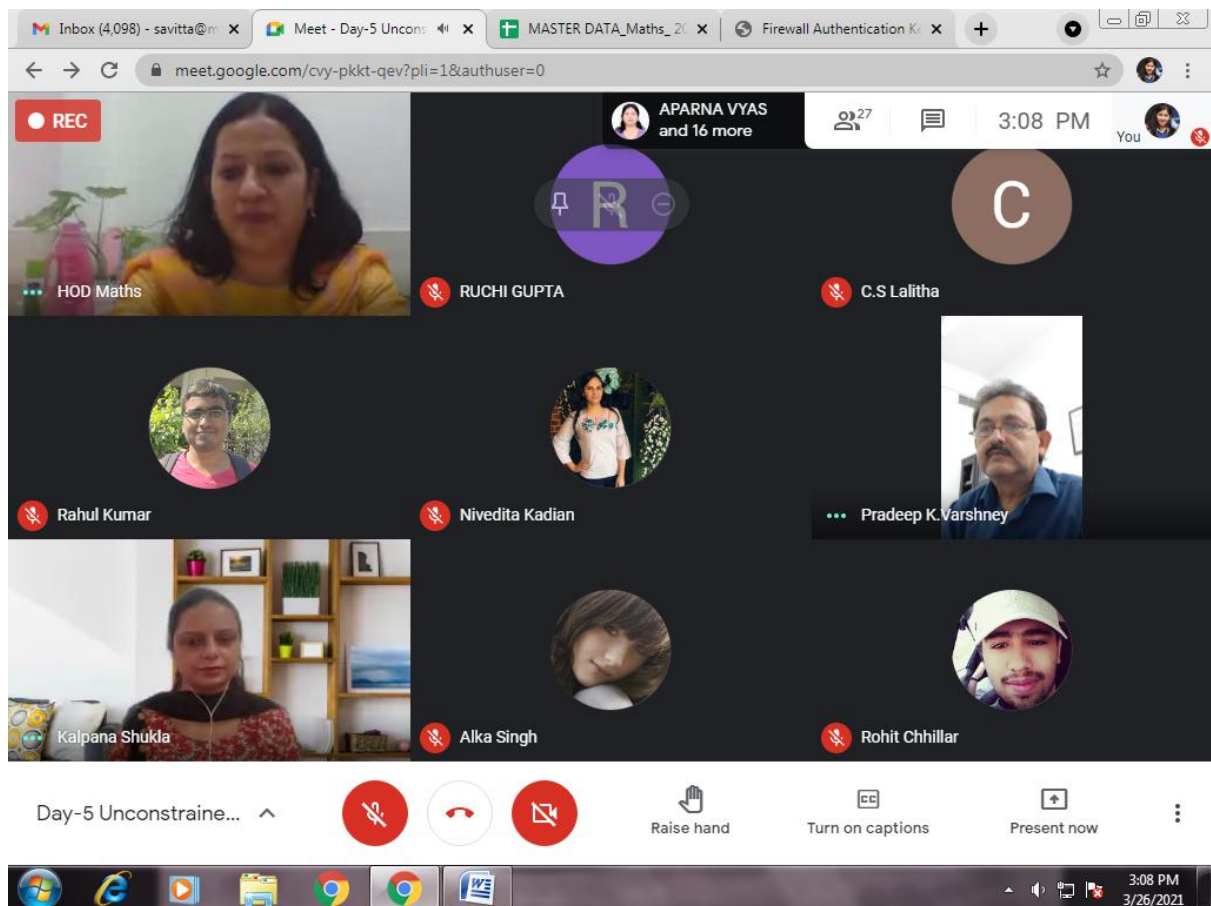
Six academicians from various institutions of fame like IIT, NIT, Central Universities and from MRU were the resource persons and delivered eminent sessions to impart all aspects of optimization and applications among the participants supplemented with informative tools and techniques. 27 external participants from IIT, NIT, Central Universities, Engineering Colleges and Private Universities, Skyline University College, Sharjah, UAE and 50 internal participants from the Department of Mathematics, MRU mainly Faculty members, Research scholars, UG/PG students were the part of this learning programme.

All the sessions were intellectually drafted & executed within the stipulated time frame and abetted in meeting the desired outcomes of the Workshop. The post session feedback and the overall feedback of the workshop are the testimonials of the same. The participants actively interacted during the sessions and their queries were addressed satisfactorily by the experts.

The workshop was a successful event with around 49 participants. Some glimpses of the workshop are attached.

The Valedictory session witnessed the culmination of knowledge sharing, new learning's and experiences gathered during the one week of the workshop.

## GLIMPSES OF THE WORKSHOP



REC C C.S Lalitha is presenting

### Normal Cone

Let  $K \subseteq \mathbb{R}^n$  be a nonempty closed convex set.  
 A vector  $d \in \mathbb{R}^n$  is said to be **normal** to  $K$  at  $\bar{x} \in K$  if

$$\langle d, y - \bar{x} \rangle \leq 0, \quad \forall y \in K.$$

C.S Lalitha HOD Maths Kalpana Shu... Dr. B. B. Upa... Yogendra Pa... Rashid Zya ANKITA PAN...

DAY 1(22/3/21) - WNVIA2021 Intro... X

People (54) Chat

- saumya singh
- SAVITTA SAINI
- Shalini Sharma
- Shish Dubey
- Shivani Sain
- shobhit pandey
- simran khanna
- Sudeep Deepak
- Yashi Jakhra
- Yogendra Pandey

DAY 1(22/3/21) - WNVIA2021 Intro... ^

Raise hand Turn on captions C.S Lalitha is presenting

Search results - edvin@mru.edu.in X Manav Rachna Educational Institi X Meet - DAY-3:EEG/MRI base X (7) WhatsApp X +

meetgoogle.com/ard-rmnh-myw7authuser=0

google - Google Se... Inbox - edvin.masih... Gmail YouTube Maps New Tab

REC M Tanveer is presenting C.S Lalitha and 22 more 10:40 AM You

EEG/MRI based Universum support vector machines

Dr. M. Tanveer

Associate Professor and Ramanujan Fellow  
 OPTimization for MACHine Learning (OPTIMAL) Research Lab  
 Indian Institute of Technology Indore  
 Email: mtanveer@iiti.ac.in

Workshop on Nonlinear Optimization, Variational Inequalities and Artificial Intelligence

24.03.2021

Ashish Vashisht has left the meeting

kalpana shukla A P

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DAY-3:EEG/MRI based Universum ... ^

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REC M Tanveer is presenting

### Ongoing Research Projects

**Project-I Classification and prediction of Alzheimer disease using multimodal imaging data**  
Sponsoring Agency: DST-SERB under Ramanujan scheme  
Sanctioned Amount and Duration: INR 8.9 Millions (2016-2021)

**Project-II Optimization models and algorithms for non-parallel support vector machines**  
Sponsoring Agency: SERB - Early Career Research Award (ECRA) Scheme  
Sanctioned Amount and Duration: INR 2.6 Millions (2017-2020)

**Project-III Detection of human brain disorders using novel machine learning approaches**  
Sponsoring Agency: CSIR - Extra Mural Research (EMR) Scheme  
Sanctioned Amount and Duration: INR 3.1 Millions (2018-2021)

DAY-3:EEG/MRI based Universum... People (42) Chat

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IN CALL

- ADVIN MASIH (You)
- Akansha Malik
- Aika Singh
- Ankita Yadav
- anveksha moar

kalpana shukla Pathshala 4 Engineering P4E Shish Dubey simran khanna

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