

Four Weeks Workshop on
During 10th June to 5th July 2024
Developing AI applications in the Physics
domain with Python

Jointly Organized
by
Association of All Computer Science
Teachers (AACST)
&
Indian Association of Physics Teachers
SRC08e

A REPORT

Event : Online Workshop on **Developing AI applications in the Physics domain with Python.**

Organizers: The 20 days workshop was jointly organised by the Association of All Computer Science Teachers (AACST) and Indian Association of Physics Teachers (IAPT SRC08e).

Convener: Dr Abha Khandelwal

Duration: From 10th June to 5th July 2024

No of Participants: **134 participants**

Event Overview:

The workshop on Developing AI Applications in the Physics Domain with Python was a highly ambitious and successful event held from June 10, 2024, to July 5, 2024. The workshop attracted 134 participants, including ex-vice-chancellors, professors, teachers, research scholars, and students from STD X to PG. The event aimed to impart knowledge on developing AI applications using Python.

Resource Persons

- Dr. Abha Khandelwal - Retired Head, Dept of Computer Science, Hislop College, Nagpur
- Prof. Manu Pratap Singh - Director, Institute of Engineering and Technology, Dr. Bhimrao Ambedkar University, Agra
- Ms. Pratibha Rashmi - Assistant Professor, Dr. Bhimrao Ambedkar University, Agra
- Mr. Aditya Singh - Dayalbagh Educational Institute, Agra
- Ms. Ritika Raghav - Dayalbagh Educational Institute, Agra

Key Coordinators

- **Convener:** Dr. Abha Khandelwal
- **Coordinators:** Dr. Halim Ahmad, Dr. Gajanan Jadhav
- **Vice-President, SRC-08E:** Dr. Govind Lakhotiya
- **Student Coordinators:** Yugansh Kanoje, Aaishwarya Mendawade, Anushka Palandurkar

Inaugural Function

The inaugural function took place on June 10, 2024, at 6:30 PM in an online mode, presided over by Prof. P.K. Ahluwalia, President of IAPT. Founder AACST and Convener, Dr. Abha Khandelwal delivered the opening remarks, and the keynote address on AI was given by Prof. Manu Pratap Singh. Dr. Suryakant Thorat chaired the session.

Course Structure

The workshop ran for 20 working days, Monday to Friday, 6:30 PM to 8:00 PM. The course content covered:

1. Python programming

Basics (Variables, Data Types, Operators, String Manipulation)

Control Flow (if, else, elif, for, while)

Functions (Defining functions, Parameters, Arguments, Return values, Lambda functions)

Modules and Packages (Importing modules, Built-in modules)

Data Structures (Lists, Tuples, Dictionaries)
Libraries (NumPy, Pandas, Matplotlib, SciPy)
Data Files (CSV)

2.Applications in Physics Using Python

Kinematics, 3D objects,
Projectile motion,
Plotting trajectories using matplotlib
Simulation and Visualisation of Simple Harmonic Motion (Simple
Pendulum and Spring-mass system)
Data manipulation with NumPy and Pandas
Simulation and Visualization of electric and magnetic fields

3.Artificial Intelligence and Machine Learning

Introduction to AI and ML
ANN
Convolutional Neural Networks
Deep Learning
Real-life applications: Image recognition,
Pattern recognition

4.Applications of AI in the Physics Domain Using Python

Using Supervised Learning
Laws of Refraction (Snell's Law)
And using Unsupervised Learning
Clustering between different phases of matter based on temperature and
pressure data (K-means)
Clustering light sources based on their spectral characteristics (K-means
and PCA)
Clustering of Brownian motion trajectories based on diffusion coefficient.

Course Highlights

- **Bridging Physics and AI:** Exploring the intersection to push scientific boundaries.
- **Python Libraries:** Utilization of NumPy, Pandas, and Matplotlib for AI algorithms and data analysis.
- **Expert Guidance:** Personalized support from experienced instructors.
- **Collaboration and Networking:** Engaging with fellow participants to foster a collaborative learning environment.

Course Outcomes

- **Enhanced Problem-Solving Skills:** Applying AI techniques to physics problems.
- **Experimental Design and Data Analysis:** Designing experiments and analyzing data using statistical and ML techniques.
- **Interdisciplinary Insights:** Gaining insights from both AI and physics to foster creativity and innovation.
- **Career Opportunities:** Opening diverse career paths in academia, research, and industry.

Recorded Lectures: Were made available on Google Classroom for revision before assessment.

Additional Learning Resources

To further enrich the learning experience and address participants' requests for deeper understanding, Dr. Abha Khandelwal prepared 12 comprehensive presentations on Python programming and various AI subtopics. These detailed resources significantly enhanced the participants' grasp of the material, aiding in better comprehension and retention.

In addition, Dr. Khandelwal developed engaging assignments designed to bolster coding skills, providing participants with extra opportunities to practice and apply their knowledge.

Master of Ceremony

The sessions were hosted by:

- Dr. G.L. Jadhav
- Dr. Halim Ahmad
- Dr. Govinda Lakhotiya
- Dr. Abha Khandelwal
- Akansha Khandelwal
- Mrs. Rupa Rajakumari
- Dr. Varsha Pande
- Dr. Shubhangi Raut
- Mugdha Rotkar
- Dr. Aruna Chamatkar

Chairpersons

- Prof. Sumeet Gill
- Prof. Vandna Luthra
- Prof. Ramesh Manza
- Prof. Satish Sharma

- Dr. Sarmistha Sahu
- Dr. Lata Jadhav
- Dr Abha Khandelwal
- Principal Dr. Kailash Rewatkar
- Prof. Y.K. Vijay
- Dr. Chitra Ravi
- Prof. Rekha Ghorpade
- Principal Dr. A.B. Sasankar
- Dr. S.B. Kishor
- Mrs. Rupa Rajakumari
- Dr. Prajkta Dhote
- Dr. Gagan Gupta
- Dr. Ajay Lad
- Dr. Jyoti Ghushe

Assessment and Certification

Participants were assessed through topic-wise assignments and required to maintain 75% attendance and submission of assignments. Participation certificates were awarded to those meeting the criteria.

Valedictory Function

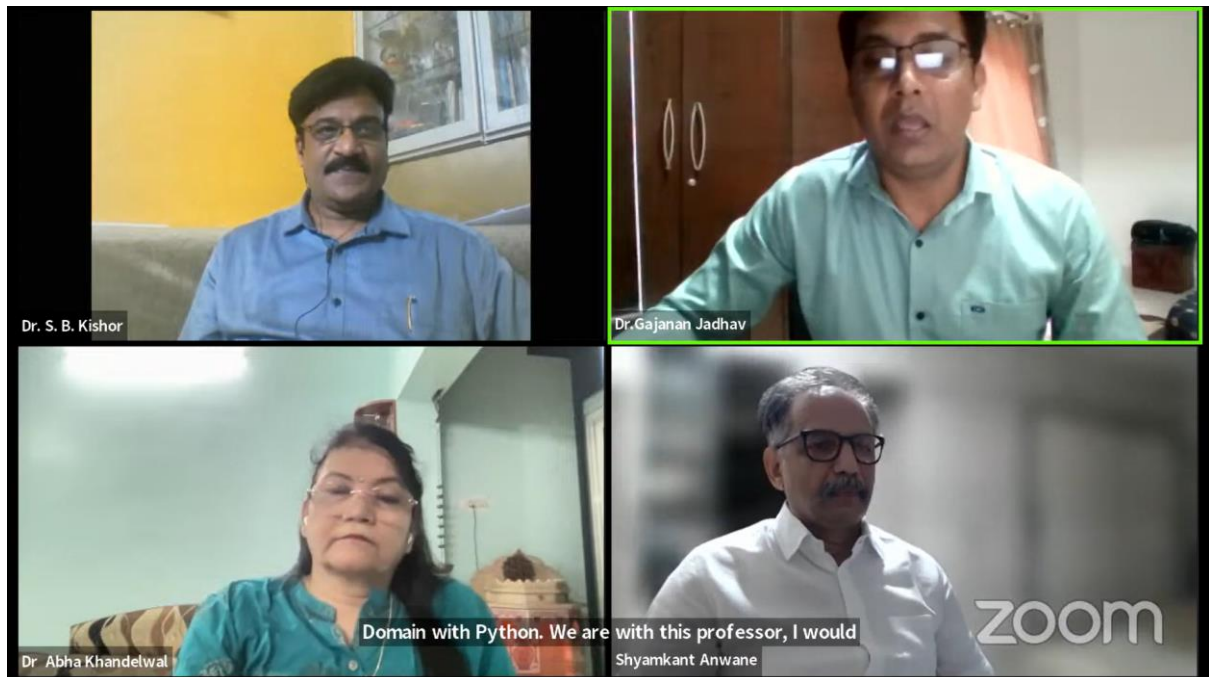
The valedictory function on July 5, 2024, was attended by all participants and resource persons. The Chief Guest was Prof. Mahendra P. Dhore, PRO-VC of SGB Amravati University. Dr. Abha Khandelwal, the convener, provided an overview of the workshop's success. Prof. Ahluwalia, President of IAPT, chaired the session, and Dr. Govinda Lakhotiya delivered the introductory remarks. Ms. Ritika Raghav, speaking on behalf of the resource persons, expressed her gratitude and shared insights on their collective efforts and experiences throughout the workshop.

Concluding Remark:

Dr. Abha Khandelwal's vision and leadership were instrumental in transforming the workshop from a mere concept into a highly successful reality. Her dedication and hard work were widely acknowledged and appreciated by all participants. Prof. P.K. Ahluwalia, President of IAPT, commended her efforts in guiding the workshop to success. During the valedictory function, Prof. Mahendra Dhore, Pro Vice-Chancellor of SGB Amravati University, praised Dr. Khandelwal for her exceptional contribution and for translating her vision into an impactful and practical learning experience. Her commitment ensured the workshop not only met but exceeded the expectations of all involved, providing participants with valuable skills and knowledge in developing AI applications using Python.

The success of the workshop was also attributed to the exceptional efforts of the resource persons. Dr. Abha Khandelwal's teaching of Python was praised for being charming, easy, and flawless, making the programming language accessible and enjoyable for all participants. Prof. Manu Pratap Singh provided in-depth insights into Artificial Intelligence, while Ms. Ritika Raghav was lauded for her exceptional teaching abilities, particularly in making complex concepts understandable. Mr. Aditya Singh excelled at breaking down intricate problems into simple, manageable steps, further enhancing the learning experience. Ms Pratibha Rashmi for teaching data structure. Their collective expertise and dedication played a crucial role in the workshop's outstanding success.

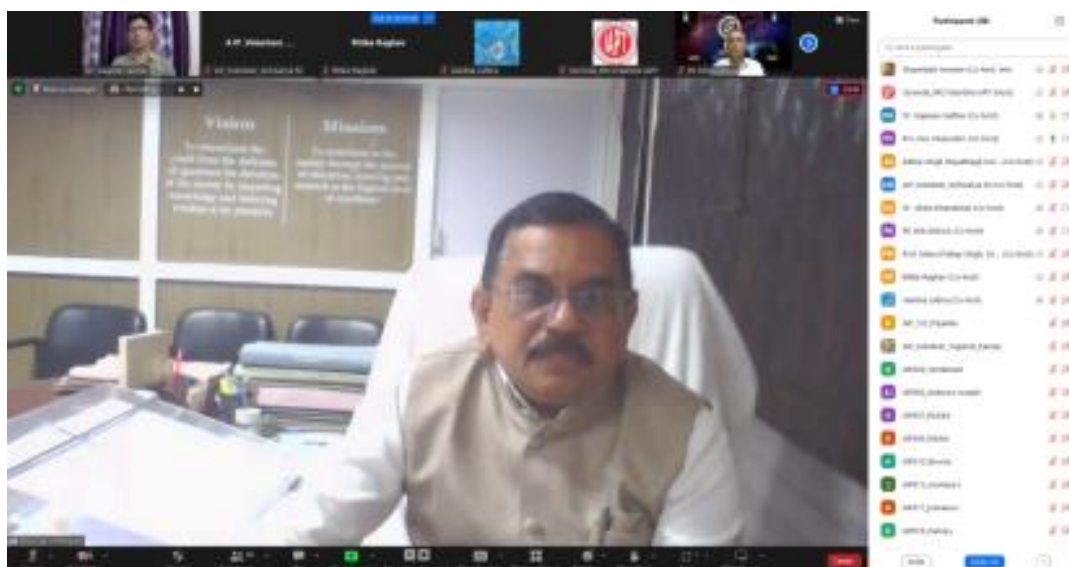
Some Clicks



Inauguration Of Workshop



Expert Talk Chaired by Dr Suryakant Thorat



Dr M P Dhore, Pro Vice Chancellor, SGB Amravati University, Amravati at Valedictory Function



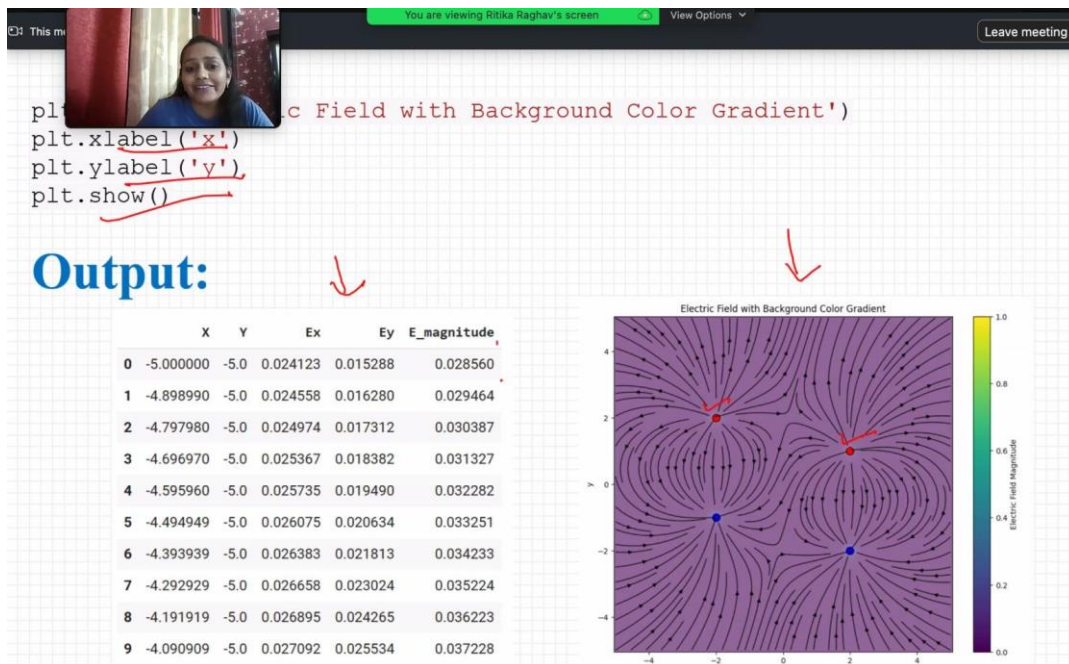
Chief Guest Dr M P Dhore, Pro Vice Chancellor, SGB Amravati University, Amravati



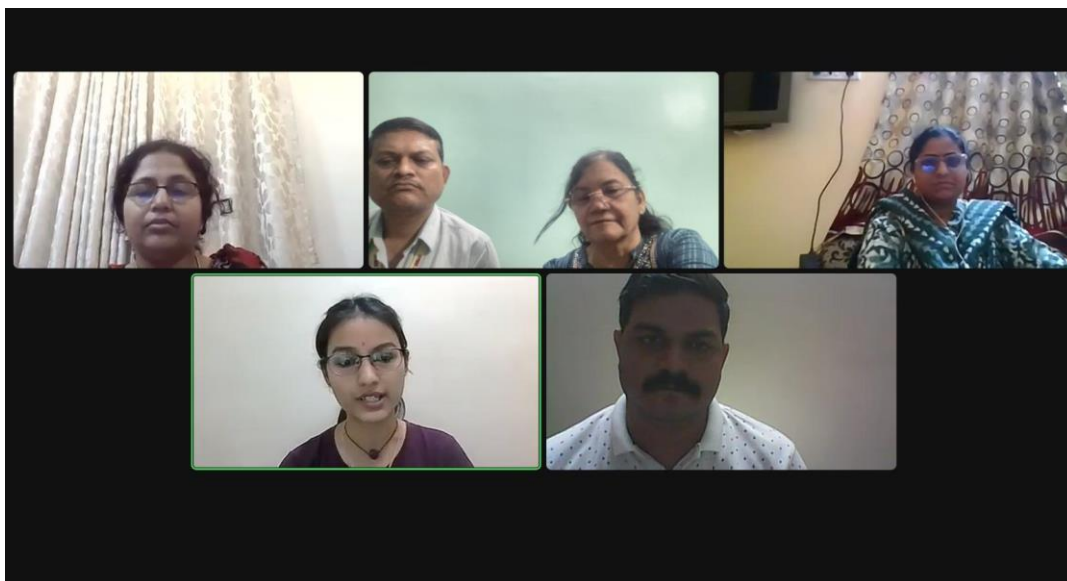
Prof P K Ahluwalia, President IAPT during his deliberation in Valedictory Function



Session Conducted by Resource Person Dr Abha Khandelwal, Convener of Workshop and EC Member SRC-08E IAPT, Founder-AACST.



Session Conducted by Resource Person Ms Ritika Raghav



Session Conducted by Resource Person Mr Aditya Singh

Artificial Intelligence: The New Paradigms



Prof. Manu Pratap Singh
Department of Computer Science
Institute of Engineering & Technology
Dr. B. R. Ambedkar University, Khandari,
Agra-282002
Email: manu_p_singh@hotmail.com

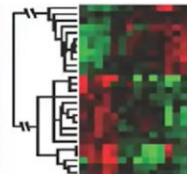
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assigning any new medical value, if computer is able to

When Do We Use Machine Learning?

ML is used when:

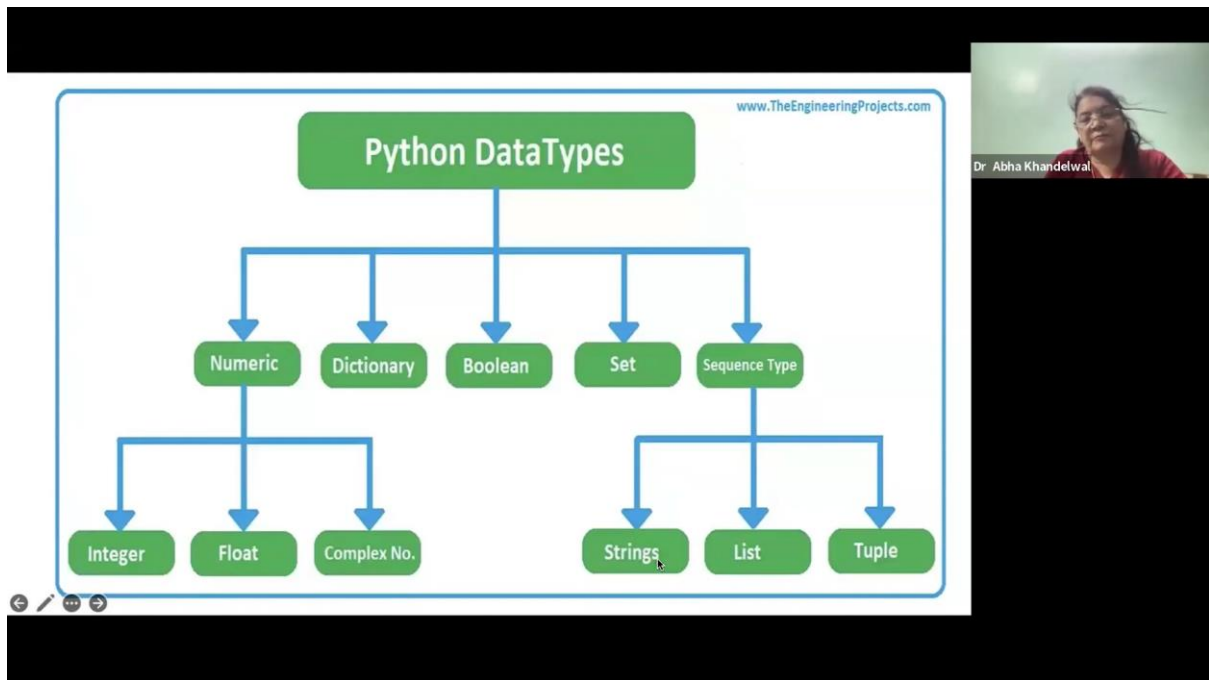
- Human expertise does not exist (navigating on Mars)
- Humans can't explain their expertise (speech recognition)
- Models must be customized (personalized medicine)
- Models are based on huge amounts of data (genomics)



Learning isn't always useful:

- There is no need to "learn" to calculate payroll

Sessions Conducted by Resource Person prof Manu Pratap Singh



Sessions Conducted by Resource Person Dr Abha Khandelwal

36_Session06_18 June 2024_PR.ipynb

```

1 # maximum of three numbers
2
3 a, b, c = 64, 73, 55
4
5 if (a > b):
6     if (a > c):
7         max = a
8     else:
9         max = c
10 else:
11     if (b > c):
12         max = b
13     else:
14         max = c
15
16 print('maximum =', max)
17
18 # note how many times we are comparing two numbers..

```

Python Function, Modules and Packages

Ms. Pratibha Rashmi
Assistant Professor
Department of Computer Science
Dr. Bhimrao Ambedkar University, Agra

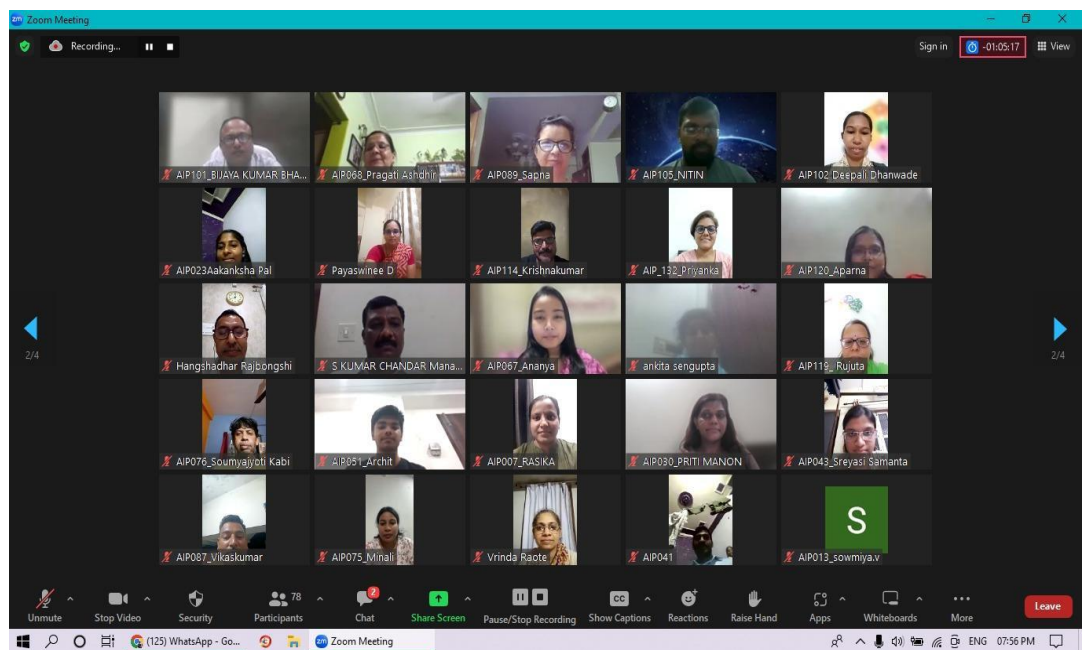
Contents at a Glance:

- Define Functions
- Passing Arguments to Functions
- Return a value to the functions
- Scope of Objects
- Different type of arguments
- User defined and built-in functions
- Modules
- Creating a module
- Import modules
- Renaming a module
- Python packages
- Import user-define python packages

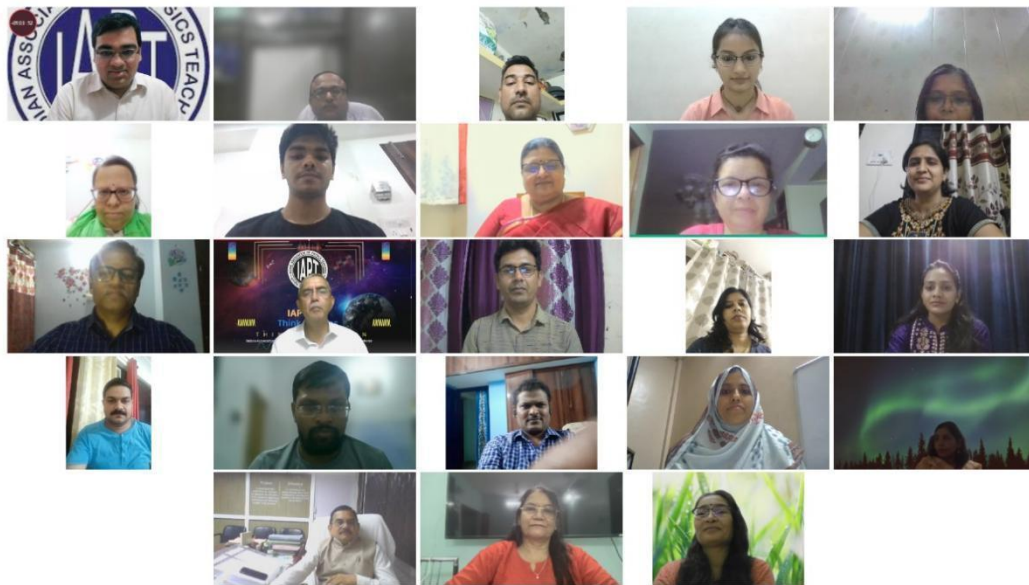
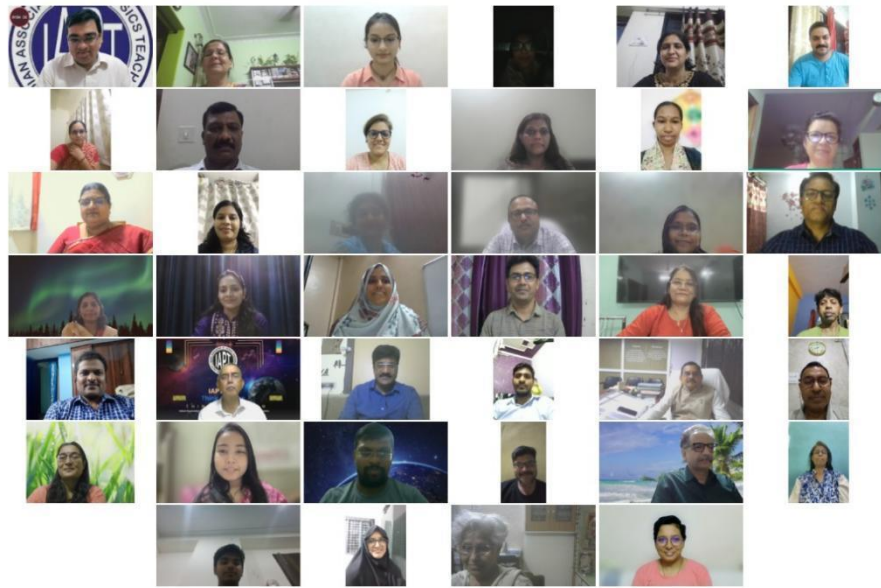
Sessions Conducted by Resource Person Ms Pratibha Rashmi



Prof S W Anwane, President, IAPT-SRC-08E with Dignitaries



Participants-Group Photo



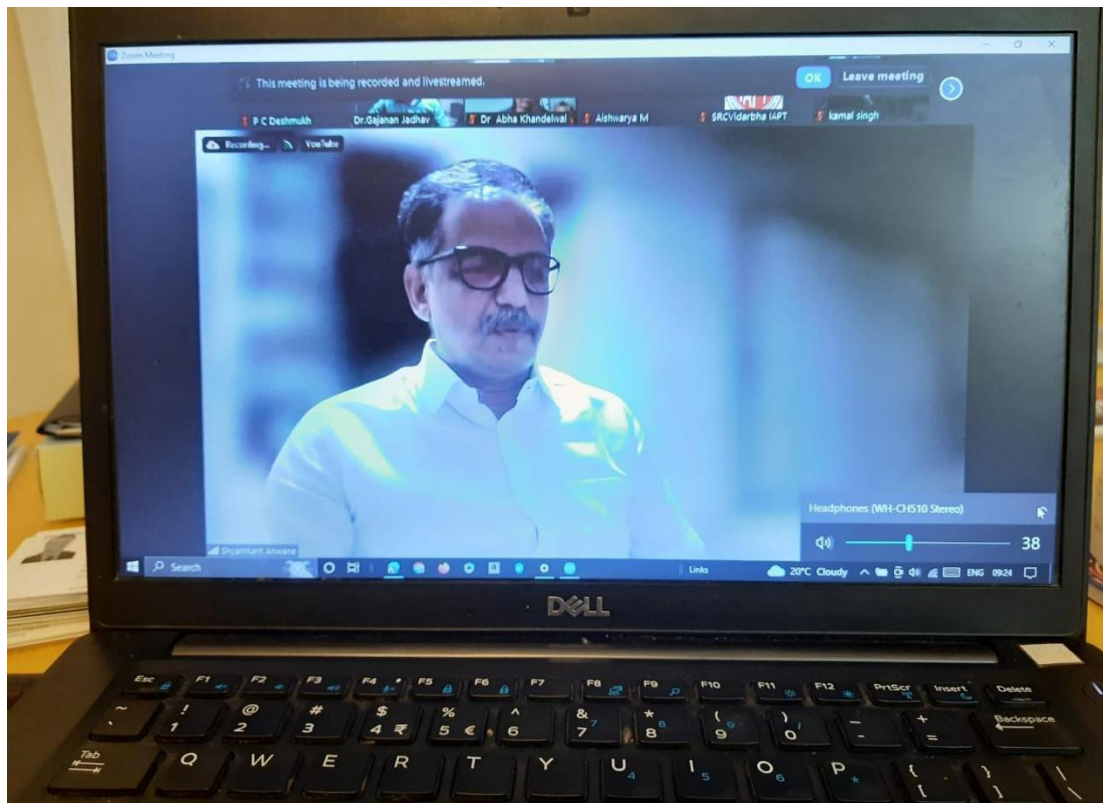
Group Photographs



Dr Abha Khandelwal, Convener of Workshop and EC Member SRC-08E IAPT, Founder-AACST.



Dr S B Kishor, President-AACST



Prof S W Anwane, President, IAPT-SRC-08e