MARATHWADA MITRA MANDAL'S
COLLEGE OF ENGINEERING
An Autonomous Institute I Approved by AICTE New Delhi
Recognised by Directorate of Technical Education Mumbai
Affiliated to Savitribai Phule Pune University

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Date- 24/03/2025

Department of Computer Engineering
Academic Year 2024-2025, Sem-II

Report on Faculty Development Program(Online)
"High Performance Computing and AI"

Topic:High Performance Computing and AI

Date & Time: 17/3/2024 to 22/3/2042, 9.00 AM to 4.00 PM

No. of Participants: 92

Mode of Conduction: Online

Microsoft team Links:
Day 1 - March 17, 2025:
Inauguration and session1:Link Inauguration and session1_FDP_HPC_ & AI
session 2:Day1_Session2_FDP_HPC&AI
Day 2 - March 18, 2025:
Day 2:Day2_FDP_HPC&AI
Day 3 - March 19, 2025:
Day 3:Day3_FDP_HPC & AI
Day 4 - March 20, 2025:
Day 4:Day4_FDP_HPC&AI
Day 5 - March 21, 2025:
Day 5:Day5_FDP_HPC & AI
Day 6 - March 22, 2025:
Day 6:Day6_FDP_HPC &AI

Co-ordinator for the FDP: Dr.Geetha Chillage , Dr. Swati Shekapure

Topics covered in FDP:

The Faculty Development Program (FDP) on "High Performance Computing & Artificial Intelligence" was conducted from 17th March 2025 to 22nd March 2025. The FDP aimed to provide faculty members with knowledge and hands-on experience in cutting-edge technologies such as parallel programming, artificial intelligence, and computing architecture. The sessions were conducted by renowned experts from academia and industry.

Topics covers includes,Agentic AI,RAG ,Introduction to HPC and OpenMP-I,HandsOn session on OpenMP, CPU advancements and limitations, GPU architect, GPU vs CPU, Numba compiler for automated parallelism,Custom cuda kernels,Parallel Programming using MPI,HandsOn session on MPI Point to Point Communication,HandsOn session on MPI Collective Communication

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Speaker of Guest FDP:

1. Ms.Meenal Malu, LTIMindtree, Pune
2. Mr. Atul Khalate, LTIMindtree, Pune
3. Dr.D.B.Kulkarni, Professor, Walchand College of Engineering, Sangli
4. Ms.A.S.Pawar, Assistant Professor,Walchand College of Engineering, Sangli
5. Dr.Nilesh Pikle,IIIT, Nagpur
6. Mr. Shailesh Patil, Professor of Practice,Walchand College of Engineering, Sangli
7. Dr.Karveer Manwade,Head and Professor,HSIT,Nidasoshi.Belgaum,Karnataka

Day wise briefing of the session

Day 1 - Inauguration & Keynote Sessions

- The FDP commenced with an inaugural session where Mr. Ashish Kulvekar ,Scientic G, CDAC, Pune and Dr.D.B.Kulkarni, Professor, Walchand College of Engineering, Sangli and National supercomputing head, addressed the participants and emphasized the importance of High-Performance Computing (HPC) and Artificial Intelligence (AI) in academia and industry.
- **Session 1:** "Agentic AI" by Ms. Meenal Malu (The DataTech Labs Inc.) provided insights into how AI can function autonomously and improve efficiency in various domains.
- **Session 2:** "RAG (Retrieval-Augmented Generation)" by Mr. Atul Khalate (LTIMindtree, Pune) introduced participants to new AI techniques that enhance data retrieval and processing.
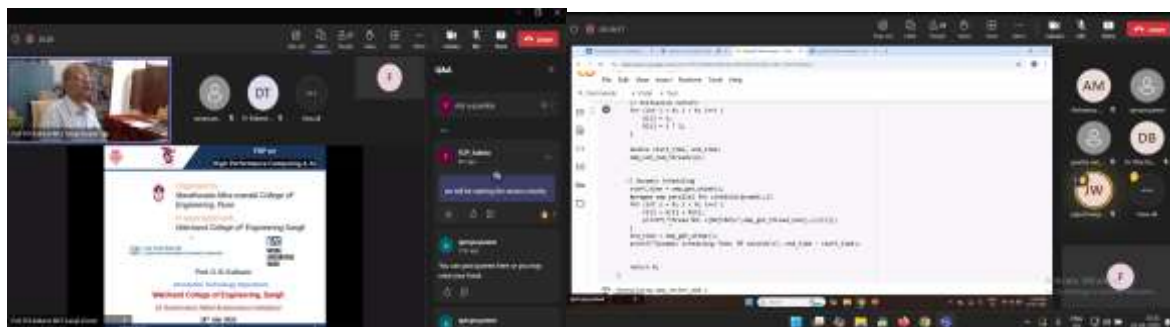

Day 2 - Introduction to HPC & OpenMP

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- **Session 1:** "Introduction to High-Performance Computing and OpenMP-I" by Dr. D.B. Kulkarni covered fundamental concepts of HPC, its applications, and OpenMP for parallel programming.
- **Session 2:** "OpenMP-II" by Ms. A.S. Pawar delved deeper into OpenMP functionalities, including task parallelism and synchronization techniques.
- **Session 3:** A hands-on session on OpenMP by Dr. D.B. Kulkarni & Ms. A.S. Pawar helped participants implement OpenMP directives in real-world applications.

Day 3 - CPU and GPU Architectures

- **Session 1:** "CPU advancements, limitations, GPU architecture, and GPU vs. CPU" by Dr. Nilesh Pikle explained modern processor architectures and their impact on computing performance.Sir has given NVIDIA course "Fundamentals of Accelerated Computing with CUDA Python" to the participants
- **Session 2:** "Numba compiler for automated parallelism" by Dr. Nilesh Pikle introduced an optimization tool for Python-based parallel computing.
- **Session 3:** "Custom CUDA kernels" by Dr. Nilesh Pikle provided hands-on training on writing efficient CUDA programs.

Day 4 - Memory Optimization in CUDA

- **Session 1:** "Memory optimization in CUDA" by Dr. Nilesh Pikle discussed memory hierarchies in GPUs and techniques to optimize memory usage.
- **Session 2:** "Shared memory and assessment" by Dr. Nilesh Pikle focused on shared memory allocation strategies and performance tuning.

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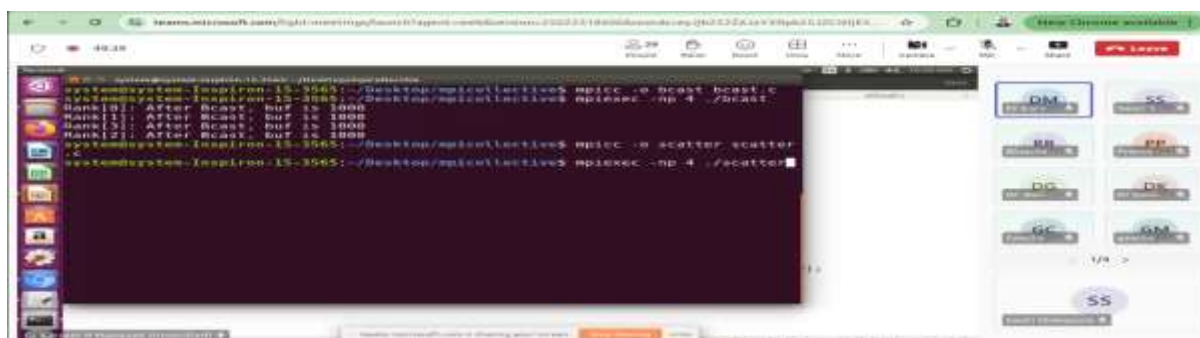Affiliated to Savitribai Phule Pune University

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● **Session 3:** "Industry session" by Mr. Shailesh Patil provided industry insights on optimization of system performance using high performance computing

Day 5 - Parallel Programming & MPI

● **Session 1:** "Parallel Programming using MPI" by Dr. Karveer Manwade covered the fundamentals of the Message Passing Interface (MPI) and its applications.
● **Session 2:** "Hands-on session on MPI Point-to-Point Communication" by Dr. Karveer Manwade guided participants through practical implementations of MPI communication.

Day 6 - Hands-on MPI & Conclusion

● **Session 1:** "Hands-on session on MPI Collective Communication" by Dr. Karveer Manwade provided an interactive session to solidify MPI concepts.
● **Session 2:** "Quiz, discussion, and Q&A session" by Dr. D.B. Kulkarni tested participants' knowledge and allowed for an open discussion on challenges and advancements in HPC and AI.

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● QA Session: The FDP concluded with a Question and Answer session by Dr. D. B. Kulkarni. Sir has addressed FDP and NSM related questions of participants

Conclusion

The FDP was a great success, providing faculty members with in-depth knowledge of high-performance computing and AI. The interactive sessions, hands-on practice, and expert guidance helped participants enhance their technical skills. Feedback from attendees was overwhelmingly positive, with participants appreciating the practical approach and expertise of the speakers.

Outcomes:

1. Gained insights into parallel computing architectures, programming models (OpenMP, MPI, CUDA), and AI acceleration techniques.
2. Hands-on sessions enabled faculty members to work with CPU and GPU-based parallel computing models.
3. NVIDIA certifications (worth ₹21,000) were provided for free to participants.
4. Participants received access to HPC resources for further exploration and research.

CO-PO Attainment

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
2.82	2.78	-	2.85	2.71	-	-	-	-	-	-	2.85	2.85	2.85

Dr.Geetha Chillage ,Dr.Swati Shekapure   Dr.K.S.Thakre
      Coordinators   **HOD, Compute Engineering**