AXIS BANK

AXIS BANK CENTRE FOR MATHEMATICS AND COMPUTING

ANNUAL REPORT 2023
JANUARY - MARCH 2023

April 12, 2023

Prof. S. Gopalakrishnan,
Convenor,
Axis Bank Centre for
Mathematics and Computing,
Indian Institute of Science,
Bangalore - 560012

Website - https://abcmc.iisc.ac.in

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1 | GOVERNING STRUCTURE

GOVERNING STRUCTURE

Governing Board
Chaired by Director, IISc
2 members nominated by Axis Bank
2 other members from IISc, nominated by IISc Director
Convenor of the Centre is the Member Secretary of the Governing Board

Scientific Advisory Board
Chair: Appointed by Director, IISc
Convenor of Centre
One member from Axis Bank
3 other members appointed by Director, IISc

Office of Axis Bank Centre for Mathematics and Computing
Convenor of the centre
One Program manager
2 Office Assistants

GOVERNING BOARD MEMBERS

PROF. GOVINDAN RANGARAJAN
Director, IISc and Chair

PROF. KAUSHAL VERMA
Dean, Physical and Mathematical Sciences, IISc

PROF. NAVAKANTA BHAT
Dean, Interdisciplinary Sciences, IISc

PROF. SRIKANTH IYER
Associate Dean, UG (B.Tech), IISc

MR. SUBRAT MOHANTY
Group Executive,
Banking Operations and
Transformation, Axis Bank

MR. NEERAJ GAMBIR
Group Executive, Treasury, Markets and Wholesale banking Products, Axis Bank

PROF. S. GOPALAKRISHNAN, CONVENOR
Axis Bank Centre for Math and Computing, IISc

SCIENTIFIC BOARD MEMBERS

PROF. S. GOPALAKRISHNAN, CHAIR SB
Professor, Department of Aerospace Engineering

PROF. PRABAL KUMAR MAITI
Chair of Department of Physics

PROF. ARVIND AYYER, CO-CONVENOR
Professor, Department of Mathematics

PROF. ABHISHEK SINGH
Professor, Materials Research Centre

PROF. T. A. ABINANDAN,
Professor, Materials and Engineering

MR. N. BALAJI
Business Intelligence Unit,
Axis Bank

ADMINISTRATIVE STAFF

PROGRAMME MANAGER
Dr. M. K. Raghavendra

SENIOR PROJECT ASSOCIATE
Mr. J. Vivek Gnana Pandian

OFFICE EXECUTIVE
Ms. C. Abhinandana

SHORT BIOGRAPHICAL SKETCH OF PROF. S. GOPALAKRISHNAN, CONVENOR

Prof. Gopalakrishnan received his BE degree from UVCE, Bangalore, master's degree in Engineering Mechanics from IIT, Madras, Chennai and Ph.D from School of Aeronautics and Astronautics from Purdue University, USA in 1992. He was a Postdoctoral Fellow in the Department of Mechanical Engineering at Georgia Institute of Technology. In 1997, he joined the Department of Aerospace Engineering at IISc, Bangalore, where currently he is a Senior Professor. His principal areas of interest are Wave Propagation in complex media, Computational Material Science, Computational Mechanics, Smart Structures, Structural Health Monitoring, MEMS, and Nano Composite Structures.

Prof. Gopalakrishnan has a total of 228 international journal papers, 8 graduate level textbooks, two undergraduate books, 13 book chapters, and 160 international conference papers. He has an h-index of 54 in Google Scholar with 10300 citations, which is highest in India for any researchers in Aerospace domain. He is in the editorial board of 6 international journals and is Editor-in-Chief of ISSS Journal for Micro and Smart Systems and the Associate Editor for Smart Materials and Structures and Structural Health Monitoring international journals. Prof. Gopalakrishnan is decorated with many awards and honors, which include International Structural Health Monitoring person of the year awards 2016 instituted by SAGE Publications, Fellow of Indian National Academy of Engineering, Fellow of Indian Academy of Sciences, Associate Fellows AIAA, Distinguished Alumnus Award, IIT, Madras, Satish Dhawan Young Scientist Award by Government of Karnataka, Biren Roy Trust award of Aeronautical Society of India, Alumni Award for Excellence in Research at IISc in the year 2013 and the Royal Academy of Engineering, UK Distinguished visiting Fellowship. He was elected Fellow of Institute of Mechanical Engineers, UK in the year 2021.

Prof. Gopalakrishnan is one of the most highly cited Aerospace researchers in India. In the years 2020, 2021 and 2022, he made it to the list of top 2% of scientists in the world published by Stanford University, USA. Prof. Gopalakrishnan was the head of the Aerospace Project Assessment and Review Committee of The National Programme of Micro and Smart Systems (NPMASS), DRDO, Government of India, where he was responsible for delivering many micro devices required for aircraft/spacecrafts and missile platform of the country. He was also a member of the Structures Panel of the Aeronautical Research & Development Board, Government of India, and the President of Institute for Smart Structures and Systems. He was a member of NAL Research Council between 2013-2015. He has attracted research funding to the tune of 10 million US dollars from top Aerospace Companies, which include Boeing Aircraft Company, Pratt & Whitney Corporation, USA, Office of Naval research, USA, Air Force Office for Advanced Research, Tokyo, and the Aeronautical Research and Development Board. Within the IISc, he has held various administrative positions. He was the Chair of Department of Aerospace Engineering (2015-2019), Associate Chairman for Centre for Scientific and industrial Consultancy and was the founder Chairman of Intellectual Property Cell. Currently, he is the Convenor for the Pratt & Whitney Centre at IISc and the Convenor of Axis Bank Centre for Mathematics and Computing at IISc. He has guided 28 Ph.Ds, 7 M.Tech (Research) and 23 M.E students.

SHORT BIOGRAPHICAL SKETCH OF PROF. ARVIND AYYER, CO-CONVENOR

Prof. Arvind Ayyer completed Integrated M.Sc from Indian Institute of Technology, Kanpur, India in 2003. He went on to do Ph.D in Physics from Rutgers University, USA under the joint supervision of Joel L Lebowitz and Doron Zeilberger titled "Statistical Mechanics and Combinatorics of Some Discrete lattice Models". His area of interest include Probability theory, Combinatorics, Statistical Physics, Mathematical Physics and Experimental Mathematics. From Sep 2010 to June 2013, he worked as Krener Assistant Professor in University of California, Davis. Prof. Ayyer joined Indian Institute of Science in July 2013 as an Assistant Professor and in 2018 he was promoted as Associate Professor.

Prof. Arvind Ayyer has 68 Journal publications and 5 conference publication. He has one general article on "Magical Genius who loved Games". He is an associate editor of Indian Journal of Pure and Applied Mathematics and a member of the editorial board for Algebraic Combinatorics and Resonance. Prof. Ayyer has been bestowed with grants from SERB, Royal Society Yusuf Hamied International Exchange Award, Indo-Swedish grant, and NSF Travel Grant.

Prof. Ayyer has conducted workshops in algebraic combinatorics, graph theory, random processes, large deviation theory in statistical physics and representation theory. Two of his students have defended their Ph.D. theses while four more are working on their doctoral thesis. Prof. Ayyer has taught 9 courses at the UG and PG level. Prof. Ayyer is serving as Convenor, IISc Mathematics Initiative, as an Associate faculty at the Department of Physics and the Co-Convenor of Axis Bank Centre for Mathematics and Computing.

2 | PREAMBLE

Indian Institute of Science and Axis Bank signed an MoU on January 9th, 2023, to start a centre to promote Applied Mathematics and Computation. IISc Director, Prof. Govindan Rangarajan and Mr. Amitabh Chaudhry, Managing Director and Chief Executive Officer of Axis Bank signed the documents. Convenor of the newly started centre Prof. S. Gopalakrishnan and Co-Convenor Prof. Arvind Ayyer, Prof. Navakanta Bhat, Dean of Inter Disciplinary Sciences, Prof. Phaneendra Yalavarthy, Chair of Office of Development and Alumni Affairs were present during the event.

The centre has been named Axis Bank Centre for Mathematics and Computing (ABCMC). It will promote cutting edge research in Applied Mathematics and Computing cutting across all branches of Science and Engineering by providing fellowships to students and project grants to faculties of IISc. Funds are also allocated for visiting professors and appointing Postdoctoral positions. Workshops and other outreach programmes will also be part of the Centre's activities. The Centre will bring together IISc's capabilities in this domain to solve some of the problems of 21st century. The tenure of the MoU will be for a duration of three years. The event of MoU signing was widely covered

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THE TIMES OF INDIA

IISc, Axis Bank ink pact to establish centre for maths & computing

TNN | Jan 9, 2023, 06.46 PM IST

BENGALURU: The Indian Institute of Science (IISc) on Monday said it signed an MoU with Axis Bank to establish a centre for mathematics and computing.
Spread over 1.6-lakh-square feet, the Centre will have state-of-the-art labs and programmes that will benefit faculty and students from more than twenty departments of IISc. It will host the new IISc BTech programme in mathematics & computing and the ongoing interdisciplinary PhD programme in mathematical sciences.

It is expected that more than 500 engineers and scientists will benefit from the Centre every year, IISc said in a statement, adding: "The Axis Bank Centre for Mathematics and Computing is India's first comprehensive academic research centre on mathematics and computing. It will play a vital role in building the nation's future as many contemporary and futuristic areas such as artificial intelligence (AI) and data science rely on the foundations of mathematics and computing."

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Axis Bank, IISc sign MoU to set up Centre for Mathematics and Computing

January 09, 2023 - Updated 09:18 pm IST

BY BL BENGALURU BUREAU

0 COMMENTS SHARE READ LATER

Prof Govindan Rangarajan, Director, IISc; Prof. S. Gopalkrishnan, Convenor, Axis Bank Centre for Mathematics and Computing, IISC and Amitabh Chaudhry, MD&CEO, Axis Bank

Axis Bank announced signing a Memorandum of Understanding (MoU) with the Indian Institute of Science (IISc), Bengaluru to establish a Centre for Mathematics and Computing at the Institute.

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Axis Bank Signs Up Contract with the Indian Institute of Science, Bengaluru

By CIO Insider Team

According to reports, **Axis Bank** has contracted up with the Indian Institute of Science (IISc), Bengaluru, to establish a Centre for Mathematics and Computing at the Institute.

The Axis Bank Centre for Mathematics and Computing is India's first comprehensive Academic Research Centre on Mathematics and Computing.

IISc says, "It will play a vital role in building the nation's future as many contemporary and futuristic areas such as **Artificial Intelligence** and Data Science rely on the foundations of mathematics and computing."

Feast over 1.6 lakh square feet of space, the Centre will have state-of-the-art labs and programs that will profit faculty and students from more than twenty departments of the premier institute.

The Centre will swarm the new IISc BTech program in Mathematics & Computing and the ongoing Interdisciplinary PhD program in Mathematical Sciences. It is predicted that over 500 engineers and scientists will take advantage from the Centre every year.

Figure 1: The reports that appeared in the print media after signing of the MOU.

in all the newspapers. Once fully operational, it will become India's first comprehensive academic and research centre in the area of Mathematics and Computing

ABCMC will have a Governing Body chaired by the Director of IISc and a Scientific Body chaired by the Convenor of the centre for guiding the programmes of the centre. The fellowships and other activities will start from financial year 2023-24.

OBJECTIVES OF THE CENTRE

- Develop rigorously-trained human resources who will become future leaders in mathematics and computing and champion India's surge in this area.
- Conduct cutting-edge research in this area leading to international visibility of the highest order.
- Develop innovative, deep tech solutions to meet the current and emerging requirements of not only the country but also the world.
- Develop Partnerships with other leading Universities in the world in the areas of Mathematics and Computing.
- Develop international interactions by inviting world renowned researchers in this area.
- Conduct several workshops and out-reach programmes in Mathematics and Computing to disseminate the knowledge among Engineering and Science Student communities.

ACTIVITIES OF THE CENTRE

To fulfill the objectives of the Centre, the following activities are planned from financial year 2023-2024.

- Axis Bank Centre Postdoc Fellowship to work in IISc for three scholars.
- Axis Bank Centre PhD Fellowship for six students of IISc.
- Axis Bank Centre M.Tech Fellowship for six students of IISc
- Axis Bank Centre Project Grants for two faculties of IISc
- Axis Bank Centre Internships for 10 B.Tech students from other Institutions other than IISc.
- Axis Bank Centre Workshops on Maths & Computing and Communication skills
- Axis Bank Centre support for travel grant
- Axis Bank Centre – Chair for International Visiting Professor
- Axis Bank Centre – Chair for Visiting Professor

In the present financial year, two workshops were conducted. All other activities will start from next financial year. However the announcements for M.Tech and project grants has been circulated and the nominations for M.Tech and proposals for project grant have been received.

3 | GOVERNING BOARD

The policy formulation of the Centre will be made by the Governing Board. It was set up in the month of January 2023 under the chairmanship of Director of IISc. The details of the board are given on page 4. The convenor of the Board is Prof. S. Gopalakrishnan, convenor, Axis Bank centre for Mathematics and Computing.

SUMMARY OF FIRST GBM

- Prof. Govindan Rangarajan, Director, IISc and Chair, Prof. Navakanta Bhat, Dean, Interdisciplinary Sciences, Member, Mr. Subrat Mohanty, Group Executive, Banking Operations and Transformation, Axis Bank, Member, Mr. Neeraj Gambir, Group Executive, Treasury, Markets and Wholesale Banking Products, Axis Bank, Member (online participation), Prof. S. Gopalakrishnan, Professor, Department of Aerospace Engineering, Convenor were present.

- Prof. S. Gopalakrishnan, presented the newly constituted Governing body and the details of the members. The setting up of the office, appointment of the office staff and B.Tech instructors were informed to the Board.

- The details of the announcements made for M.Tech fellowship and Project Grants were shared with members.

- Approval of the revised budget for the present and next financial year.

- The GB approved the formation of Scientific Board. It was decided to have one combined meeting of both the boards.

- Social media accounts for the centre must be opened. Centre should be given more visibility in the IISc webpage.

- After the meeting all the members participated in the inauguration of the centre at Department of Aerospace Engineering.

ACTION POINTS

1	Approval for Revised Budget: 2022-23	Approved
2	Approval for Revised Budget: 2023-24	Approved
3	Creation of social media accounts	ABCMC accounts started in Twitter and Facebook
4	Options to get GB approval for certain decisions taken by the Scientific Board by email	Approved
5	Joint meeting between scientific and governing boards	August / September meeting will be joint meeting
6	Visibility of the centre in the IISc webpage	Has been included in the Interdisciplinary sciences division

4 | SCIENTIFIC BOARD

The Scientific Board (SB) has been constituted after the approval of Governing Board. The SB is an important part of the centre. The selection of students for M.Tech, PhD and Postdoctoral fellowship and projects for grant will be objective of the board. The board will also decide the criteria for visiting professors and travel grant. The details of the Scientific Board members are given on page 5. Prof. S. Gopalakrishnan, senior professor of Department of Aerospace will be the convenor and Prof. Arvind Ayyer, professor of Mathematics will be the co-convenor of the centre.

SUMMARY OF FIRST SCIENTIFIC BOARD MEETING (SBM):

Meeting was held on March 7th, 2023. The agenda of the meeting was circulated one week before the meeting. A copy of project proposals was shared with the members before the meeting.

Agenda

- Selection of M.Tech fellowship. Sixteen nominations received from six departments/ centre.
- Selection of Projects. Twenty-four proposals sent by different faculty members to provide grant only to two.
- Selection criteria for International Visiting Professors
- Selection criteria for National Visiting Professors
- Selection criteria for B.Tech Internships
- Discussion of proposal for workshop by Prof Chirag Jain.
- Selection Criteria for Ph.D fellowship
- Selection criteria for Post-docs
- Equipment Purchase for B.Tech (math and Computing) course

SUMMARY OF THE MEETING

- Prof. Gopalakrishnan – Convenor, Prof. Arvind Ayyer - Co- Convenor, Prof. Prabal Kumar Maiti, Chair, Physics Department, IISc and Prof. T. A. Abhinandanan, Professor, Material Engineering, IISc were present in the meeting.

- Prof. S. Gopalakrishnan, Chairman of the Scientific Board presented the activities and details of announcement sent for M.Tech fellowship and project grants.

- Six students for the M.Tech fellowship were selected from a list of 16 students. Out of six students, two each belong to Women and SC/ST, one each belong to OBC/NCL and EWS category.

- The project proposals were shortlisted, and the members of the Board will evaluate the proposals on a scale of 10. The average score will be the basis for selection of the proposal of the grant.

- The selection criteria for B.Tech internship, Visiting professor and Postdoctoral and PhD, fellowship were decided.

- The proposal for conducting a workshop on Big Data Algorithms in Biology by Prof Chirag Jain was discussed. The board has approved the proposal. It has been sent for Governing Board's approval.

ACTION POINTS

1	Approval of List of Axis Bank M.Tech fellowship	Approved by the SB. Sent to GB
2	Announcement for nomination of 5 Axis Bank PhD fellowship	Has been sent to all the Chairs
3	Announcement for Axis Bank Postdoctoral fellowship	Will be sent after 28th of March
4	Selection of Project Proposal for Axis Bank grants from 11 shortlisted proposals	Board members will give scores by March 20th. The selection will be based on Average scores
5	Selection of students for Axis Bank B. Tech Internships from the pool of Indian Academy fellowships	Write to Prof. P. K. Das and explore the option of selecting from the pool.
6	Workshop proposal by Prof. Chirag Jain	Approved by the SB. Sent to GB

5 | APPOINTMENTS

The centre activities will be coordinated by the following staff members. They were appointed soon after the signing of the MoU. The office is fully functional.

PROGRAMME MANAGER

Dr. M. K. Raghavendra is appointed as Programme Manager. He has 22 years of experience in teaching and research in Physics. Raghavendra has worked in the undergraduate programme and teachers training programme of IISc. His recent assignment was chief consultant in Technical Secretariat Group for National Steering Committee setup for preparation of National Curriculum Framework.

SENIOR PROJECT ASSOCIATE

Mr. Vivek Gnana Pandian is appointed for the post. He has degree in statistics, mathematics and computer science. He has 14 years of experience in e-publishing company. And has proficiency in computer languages and coding. Vivek is familiar with internet tools such as HTML, XML, JavaScript, Java and CSS. He has also worked on interfaces like DB-library & ODBC. He can also work with software packages MS-Office, Acrobat Distiller, Photoshop.

OFFICE EXECUTIVE

Ms. C. Abhinandana is appointed for the post. She has engineering degree with MBA. She is an organized and energetic team player, with a confirmed ability to prioritize and manage a high volume of tasks with independence. Abhinandana is known for attention to detail, perseverance to meet deadlines, and excellent written and verbal communication skills. She has worked as project assistant and administrative assistant in IFCAM project and IISc Mathematics Initiative in IISc for five years.

B.TECH INSTRUCTORS

Dr. Manpreeth Singh and Dr. Geethika Sebastian have been appointed as Instructor for B.Tech programme of IISc.

Dr. Manpreeth Singh is a PhD from Indian Institute of Technology Delhi. He works in Topological Dynamics. Earlier Manpreeth Singh worked in National Programme on Technology Enhanced Learning (NPTEL), IIT Madras as Online Teaching Assistant, Chaotic Dynamical Systems. He has worked as Teaching Assistant in IIT Delhi, Assistant Professor (Guest Faculty) - Zakir Hussain Delhi college, University of Delhi.

Dr. Geethika Sebastian is a PhD from Indian Institute of Technology, Hyderabad. She works in the field of Functional Analysis, Banach Algebras. Earlier Geethika has worked as Visiting Scientist in Indian Statistical Institute, Bangalore Centre and Teaching Assistant in IIT, Hyderabad. She has won the Excellence in research award, for the year 2017-18, instituted by IIT, Hyderabad.

6 | SETUP

The office for the centre is setup in AE216, 2nd floor, Department of Aerospace Engineering, IISc. The office is well equipped with office furnitures, computers, printers, conference tables and display facilities. The office space was inaugurated by Prof. Govindan Rangarajan, Director of IISc on February 17th 2023. Mr. Subrat Mohanty, Group Executive, Banking Operations and Transformation, Axis Bank was also present. The faculties of Department of Aerospace Engineering, members of Governing Board, Scientific Board, Chair of ODAA Prof. Phaneendra Yalavarthy participated in the event. High tea was served after the inauguration.

Figure 2: Collage showing office space, venue, inauguration of the centre on February 17th

7 | WEBSITE

The website for the Centre was inaugurated along with the office space by Prof. Govindan Rangarajan, Director of IISc on February 17th, 2023. The website has the pages for objective, people behind the centre, activities, and events of the centre. Provision for receiving applications online will be enabled in the due course. The URL for the same is https://abcmc.iisc.ac.in. The centre is listed in the inter disciplinary sciences division of IISc website (https://iisc.ac.in/academics/divisions/division-of-interdisciplinary-research/)

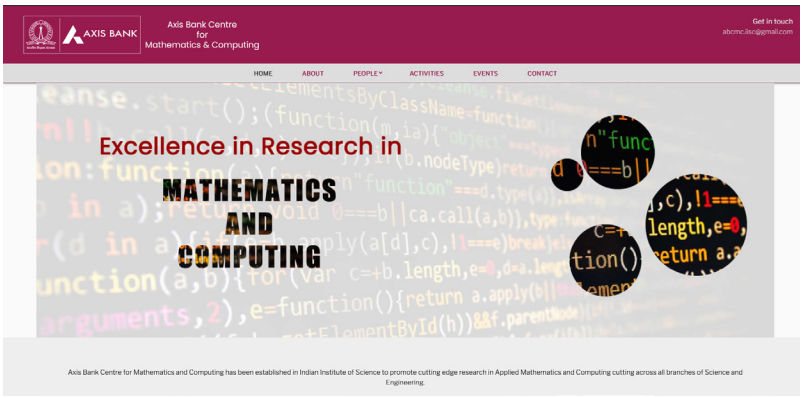
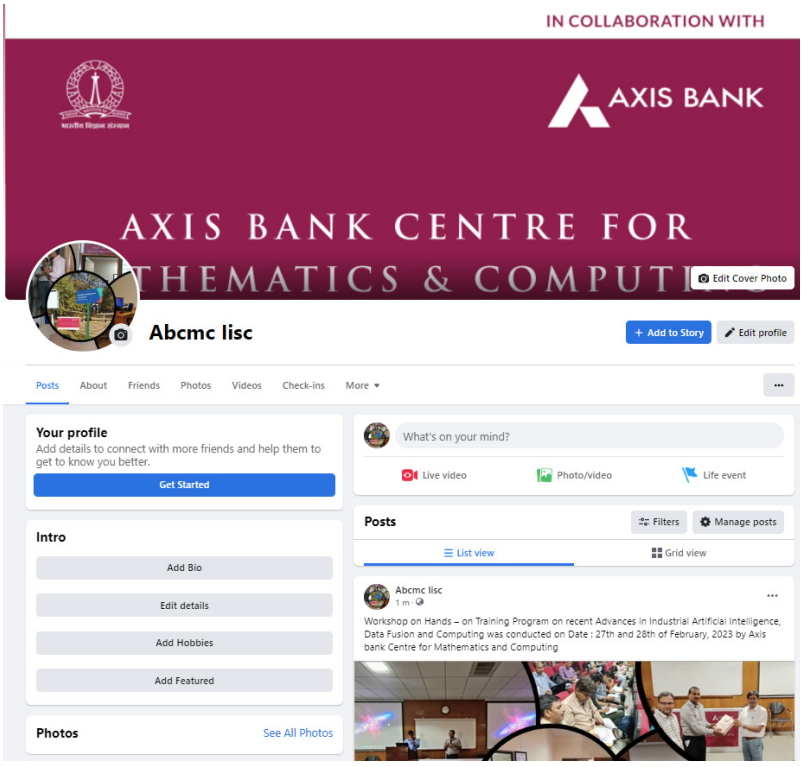


Figure 3: Screen shot of the website of ABCMC.

The Centre also has presence in social media platforms like Twitter (@AbcmcIisc) and Facebook (Abcmc Iisc).

Figure 4: Facebook and Twitter account of ABCMC



8 | WORKSHOP

IISc MEDICAL IMAGE COMPUTING WORKSHOP 2023

IISc MEDICAL IMAGE COMPUTING WORKSHOP 2023

24th and 25th of February 2023
Organized by: Prof. Jaya Prakash, IISc and Prof. Vaanathi Sundaresan, IISc
Venue: S. V. Narsaiah Auditorium, Instrumentation and Applied Physics, IISc, Bangalore

Medical image computing involves development of mathematical and computational algorithms for reliable, automated, quantitative analysis of medical imaging data. One popular choice is machine learning/artificial intelligence, which provides the ability to learn appropriate models directly from existing (curated) data. The Medical Image Computing Workshop 2023 organised on February 24-25, 2023, aimed to provide an overview of artificial intelligence techniques to help diagnosis, therapeutic planning and follow-up, and biomedical research.

Figure 5: Group photo of the participants of the workshop

Ms. Baisakhi Banerjee, Executive Vice President and Regional Head of Axis Bank was the chief guest of the event while Prof. Gopalakrishnan, Convenor of Axis Bank Centre for mathematics and Computing provided an introduction to the Centre.

Overall, out of around 180 applicants, we shortlisted 60 participants. We have got 26 poster registrations in total, most of them were from research students across different institutes. We had 10 speakers in total, 3 among them were from outside Bangalore and remaining from within Bangalore. Out of the total number of speakers, 7 speakers were from academia, 2 were clinicians and 1 was from industry. We have got an exciting spread of topics ranging from histological data to clinical MR imaging, clinical applications of medical imaging to overcoming practical challenges in the implementation of medical imaging.

Introducing the Centre

Prof. Gopalakrishnan,
Convenor of Axis Bank Centre for Mathematics and Computing,
IISc

Chief Guest

Ms. Baisakhi Banerjee,
Executive Vice President and Regional Head of Axis Bank

Figure 6: The chief guest Ms. Baisakhi Banerjee felicitated by convenor of the Centre Prof. S. Gopalakrishnan

PARTICIPANTS FROM ACADEMIC INSTITUTIONS

Shridhar Devamane	Global Academy of Technology, Bangalore
Deepak	Indian Institute of Technology, Bombay
Neelapala Anil Kumar	Alliance University, Bangalore
Amit Chougule	BITS Pilani, Rajasthan
B. V. Poornima	SJCE, JSSSTU, Mysuru
S. Rashmi	JSS STU, Mysuru
S. Priyadharshini	SASTRA University
Parichita Mishra	Manipal School of Life Sciences, MAHE, Manipal
Shazia	JNCASR, Jakkur, Bengaluru, Karnataka
Bheeshm Sharma	Indian Institute of Technology, Bombay
T. Jenisha	Vellore Institute of Technology, Vellore
M. Pavanya	Manipal Academy of Higher Learning, Karnataka
Sankar Pariserum Perumal	National Institute of Technology, Karnataka
Avik Sengupta	Indian Institute of Technology Hyderabad
N. Balaji	NMAM Institute of Technology, Nitte
Yash Rathod	Indian Institute of Technology, Hyderabad
Sakshi Gupta	National Institute of Technology Rourkela
Subungshri Basymatary	Central Institute of Technology, Kokrajhar
Abhijith Vasista	St John's Research Institute, Bangalore
Hari Kishan Repala	National Institute of Technology, Calicut
Suraj Kumar	Indian Institute of Technology, Guwahati
G. S. Harish	National Institute of Technology, Goa, India
Akshay Daydar	Indian Institute of Technology, Guwahati
Prateek Singh	CSIR-IGIB, New Delhi
Justin Joseph	CBR, Indian Institute of Science, Bangalore
Ajay Pratap Singh	CSIR-IGIB, New Delhi
Nevasini Sasikumar	PES, Bangalore
Mantri Krishna Sri Ipsit	Indian Institute of Technology, Bombay
Pisharody Harikrishnan Gopalakrishnan	Indian Institute of Technology, Palakkad
T. P. Raseena	National Institute of Technology, Tirchy
Seema Choudhary	CSIR-CEERI, Pilani, Rajasthan
A. N. Madhavanunni	Indian Institute of Technology, Palakkad
M. Gayathri	Indian Institute of Technology, Palakkad
Sindhura	Indian Institute of Technology, Tirupati
Arita Halder	Indian Institute of Technology, Kharagpur
Krishna Sumanth Vengala	Indian Institute Of Technology Tirupati
P. Shaswath	BMSIT
Ayantika Das	Indian Institute of Technology, Madras
Arunima Sarkar	Indian Institute of Technology, Madras
Ravi Vasihnavi	Indian Institute of Technology, Tirupathi
K. S. Rashmi	CSIR 4PI

PARTICIPANTS FROM INDUSTRY

Maturi Pavan Kalyan	TCS Innovation lab, Trivandrum

PARTICIPANTS FROM IISc

Karn Tiwari
Priyanka Bhansali
Shruti Soni
Gargi Mandal
P. Naveen
Vaddadi Venkatesh
Raji Susan Mathew
Swathi Padmanabhan
Avva Bhavitha Sriya
A. S. Anandhu
H. S. Prajwal
Yashash Jain
Nirmalya Gayen
Yash Dravid
H. R. Shreyas

PARTICIPANTS WITH CLINICAL BACKGROUND

Shiva Ram Male
School of Medical Sciences,
University of Hyderabad

Amrissh Prakash
CMC, Vellore

Pranjali Khirthar
St. Johns Hospital; MPSTME,
NMIMS Mumbai.

Figure 7: Pictures of participants of the workshop

Workshop on Medical Image Computing Schedule
Schedule

Day-1 24th Feb 2023

Sl. No.	Time	Event	Title of Talk
		Prof. Gopalakrishnan (5 minutes) Convenor of Axis Bank Centre for Mathematics and Computing, IISc	Introducing the centre
1	08:45 AM – 09:00 AM	Prof. Navakanta Bhat (5 minutes) Dean, Division of Interdisciplinary Sciences, IISc	Welcome Address
		Ms. Baisakhi Banerjee (5 minutes) Executive Vice President and Regional Head of Axis Bank	Inaugural Address
2	09:00 AM – 10:00 AM	Prof. Chandra Sekhar Seelamantula Indian Institute of Science, Bangalore	Sparse and super-resolution ultrasound imaging
3	10:00 AM – 11:00 AM	Dr. Lokesh B Aster-CMI Hospital, Bangalore	AI Applications in Clinical Neurology
4	11:00 AM – 11:30 AM	Tea Break	
5	11:30 AM – 12:30 PM	Dr. Mythri Shankar Aster-CMI Hospital, Bangalore	Clinical Applications of nuclear medicine (PET CT, SPECT CT, theranostics)
6	12:30 PM – 02:00 PM	Lunch Break	
7	02:00 PM – 03:00 PM	Prof. Pradipta Maji Indian Statistical Institute, Kolkata	Color Normalization of Histological Images: Rough-Fuzzy Computing to Deep Learning
8	03:00 PM – 04:00 PM	Prof. Debnath Pal Indian Institute of Science, Bangalore	Introducing the ICMR-IISc Imaging Data Bank
9	04:00 PM – 04:30 PM	Tea Break	
10	04:30 PM – 07:00 PM	Poster Session	
11	07:00 PM – 08:00 PM	Dinner	

Day-2 25th Feb 2023

Sl. No.	Time	Event	Title of Talk
1	09:00 AM – 10:00 AM	Prof. Neelam Sinha International Institute of Information Technology, Bangalore	Surgical Video Analysis using Deep Learning
2	10:00 AM – 11:00 AM	Prof. Ananda Shankar Chowdhury Jadavpur University, Kolkata	A Graph-theoretic Perspective for Biomedical Image Computing
3	11:00 AM – 11:30 AM	Tea Break	
4	11:30 AM – 12:30 PM	Prof. Jayanthi Sivaswamy International Institute of Information Technology, Hyderabad	Looking beyond the performance metrics in CAD design
5	12:30 PM – 02:00 PM	Lunch Break	
6	02:00 PM – 03:00 PM	Dr. Sudhakar Prasad GE-Healthcare, Bangalore	Regularisation in Deep Learning for Medical Image Computing
7	03.00 PM – 04.00 PM	Prof. Phaneendra K. Yalavarthy Indian Institute of Science, Bangalore	The Edge of Artificial Intelligence: Self-driving Medical Image Analysis
8	04:00 PM – 04:25 PM	Closing Remarks (inputs about workshop from speakers and audience) and Best Poster Awards	
9	04:25 PM – 04:30 PM	Vote of Thanks – Prof. Phaneendra Yalavarthy (Chair – ODAA)	
10	04:30 PM – 05:00 PM	Tea Break	

SPARSE AND SUPER-RESOLUTION ULTRASOUND IMAGING

PROF. CHANDRA SEKHAR SEELAMANTULA

Department of Electrical Engineering
Indian Institute of Science, Bangalore

24th February, 2023 (Friday)
9.00 am - 10.00 am

ABSTRACT

Conventional ultrasound scanners are inundated with data samples captured from the ultrasound probe. The data deluge consumes tremendous memory and power leaving little to no scope to improve on the computational front for imaging algorithms. Thus, suboptimal classical delay-and-sum beamformers are often employed. We begin by first reducing the data captured by leveraging the novel convolutional beamformers that convolve between two sparse sub-apertures. We have shown that we can reduce the number of transducer elements required to only 12 percent of the total. We thus require far fewer analog-to-digital converters (ADCs), reducing cost and power to an order of magnitude lower. Thus, we not only reduce memory and power necessities but also permit room for deploying sophisticated post-processing algorithms. We propose two novel super-sparse array designs. One super-sparse design allows us to get a similar resolution to that generated by a uniform linear array (ULA), while the other one offers super-resolution, which has a virtual aperture twice that of a ULA.

In the second part of the talk, we show how it is possible to overcome the classical resolution limit in ultrasound image reconstruction, and achieve super-resolution by adopting high-resolution image reconstruction techniques. Starting from the Helmholtz wave equation, we analyze the ultrasound echoes and show that the image reconstruction problem essentially boils down to one of parameter estimation, which can be performed efficiently using state-of-the-art sub-Nyquist sampling machinery. We demonstrate applications to super-resolution considering nondestructive testing as an application.

BIOGRAPHY

Chandra Sekhar Seelamantula (Senior Member, IEEE) received the Bachelor of Engineering degree with Prof. K. K. Nair Gold Medal and Best Thesis Award in Electronics and Communication Engineering from Osmania University College of Engineering, Hyderabad, in 1999 and the Ph.D. degree from the Department of Electrical Communication Engineering, Indian Institute of Science (IISc), Bangalore, in 2005. During April 2005–March 2006, he worked as a Technology Consultant for ESQUBE Communication Solutions Private Limited, Bangalore, India, where he developed proprietary audio coding solutions. During April 2006–July 2009, he was a Postdoctoral Fellow with Biomedical Imaging Group, École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland, where he specialized in optical-coherence tomography,

holography, splines, sparse signal processing, and sampling theories. In July 2009, he joined the Department of Electrical Engineering, IISc, where he is currently a Professor and directs research with Spectrum Lab. His lab works on cutting-edge topics in speech processing, image processing, computational imaging, and machine learning. He served as an Adjunct Faculty with the Centre for Neuroscience, IISc. He was the Vice-Chair (2013–2017) and Chair (2017–2021) of IEEE Signal Processing Society Bangalore Chapter, an Associate Editor for the IEEE SIGNAL PROCESSING LETTERS (2013–2017), an Associate Editor for the SPIE Journal of Electronic Imaging (2014–2018), the Senior Area Editor of the IEEE SIGNAL PROCESSING LETTERS (2017–2021), and an Associate Editor for the IEEE TRANSACTIONS ON IMAGE PROCESSING (2018-2022), the Area Chair for the IEEE International Conference on Acoustics, Speech, and Signal Processing 2020-2023, and Member of IEEE Technical Committee on Computational Imaging (2020-). He received the Outstanding Editorial Board Member award for his service as Associate Editor of IEEE Transactions on Image Processing. He was on the Organizing Committee (Tutorials, Publicity, and Local Organization) of Interspeech 2018, IEEE International Symposium on Biomedical Imaging 2020, served as the General Chair of International Conference on Signal Processing and Communications 2020. He was the recipient of Prof. Priti Shankar Teaching Award from IISc, Digital Health Prize at National Bio-Entrepreneurship Competition (NBEC) 2018, the Grand Challenges Exploration – India (Round 5) Research Award funded by Bill and Melinda Gates Foundation and Biotechnology Industrial Research Assistance Council in 2020, and four Qualcomm Innovation Fellowship awards (joint recipient with Ph.D. students) during 2019-2022.

AI APPLICATIONS IN CLINICAL NEUROLOGY

DR. B. LOKESH

Aster-CMI Hospital, Bangalore

24th February, 2023 (Friday)
10.00 am - 11.00 am

ABSTRACT

Neurological disorders lead to higher disability rates as compared to other medical disorders. Disorders affecting the Brain, spinal cord, peripheral nerves and muscles can affect behaviour, cognition, ability to walk, speak, learn, and move. Appropriate diagnosis of neurological illnesses has been a complex task. Over the years Neurology has witnessed several medical innovations which have increased the diagnostic capabilities and therapeutic options. The wave of artificial intelligence tools in conjunction with high-quality clinical data will lead to improved prognostic and diagnostic models in neurological disease, facilitating expert-level clinical decision tools across healthcare settings. The use of artificial intelligence in neurology promises to innovate the patient journey, in diagnosis, prognosis, and treatment. Some of the key applications for artificial intelligence in neurology would be in decreasing time for diagnostic test interpretation, expanding access to diagnostic testing, empowering patient-led diagnosis, individualising treatment decisions, expanding access to treatment and accelerating new treatment discovery. However, translating technical computational success to meaningful clinical impact is a challenge and another limitation of clinical AI studies is the amount of available data with high-quality clinical outcome labels. In this presentation an overview of the applications of AI in neurological disorders will be presented along with our research work in collaboration with Indian Institute of Science.

BIOGRAPHY

Dr. Lokesh, is a Lead Consultant Neurologist working at Aster CMI Hospital, Bangalore. He did his MBBS, MD Internal Medicine, DM Neurology from Kasturba Medical College, Manipal. He obtained additional training in Cerebrovascular sonography from the National University Hospital Singapore, University of Alabama, Birmingham, USA and training in Peripheral Nerve sonography from Institute of Neurology, Italy and Thomas Jefferson University, Philadelphia. He has cleared comprehensive exam on applied Physics, Carotid duplex and Transcranial Doppler conducted by American Society of Neuroimaging. He has been an invited speaker for workshops on Neurosonology both in India and Asia. He is a member of the Neurological Society of India, Indian Academy of Neurology, Indian Stroke Association, and currently he is the President for Society of Neurosonology. His research work has been on application of Nerve ultrasound in Peripheral Neuropathies. Along with Prof Leo H Visser from Tilburg University, Netherlands he has done extensive research on sonographic patterns of nerve enlargement in Hansen's Neuropathy. He has several publications in the field of Neurosonology. Currently he is pursuing research in Data science and Machine learning. He is working on image segmentation on peripheral nerve ultrasound images in collaboration with the Department of Computational and Data Sciences, IISc, and Audio analytics of speech in Neurological disorders in collaboration with Department of Electrical Engineering, IISc.

CLINICAL APPLICATIONS OF NUCLEAR MEDICINE (PET CT, SPECT CT, THERANOSTICS

DR. MYTHRI SHANKAR

Aster-CMI Hospital, Bangalore

24th February, 2023 (Friday)
11.30 am - 12.30 pm

ABSTRACT

Take a peek into the art of imaging and science of therapy. Nuclear Medicine is an amalgamation of physics, AI and clinical judgement. Multiple parameters can influence the quality of the images and therefore the patient management and outcomes (diagnosis/ treatment). Objective of this talk is to give an overview of these parameters involved and bring in a 360 degree perspective where the 2 sides of the brain meet - (art & science).

BIOGRAPHY

Dr. Shankar is a nuclear medicine specialist in Bangalore with over 25 years of clinical experience and expertise in her niche field across USA and India. She works in her highly specialized niche of nuclear medicine, spanning nuclear cardiology, nuclear oncology, theranostics, radioisotope therapies and osteoporosis.

- Specialized in Nuclear Medicine: Nuclear Cardiology, Nuclear Oncology, Theranostics, Radioisotope Therapies and Osteoporosis.
- Board Certified Lifestyle Medicine Physician.
- Author EASE #1 Amazon bestseller
-TEDxSpeaker
- Co-Founder- The Green Foundation India.
- Creative Head- The Green Hub.
- Mother and award-winning organic gardener.
- Environmentalist and Health Activist.
- Predominantly Vegan.
- Culinary Medicine and fitness enthusiast.

As a physician, she has always emphasized continued education and the constant pursuit of excellence. What sets her apart is her patient-friendly focus on healthcare delivery, with the belief that every human has a chance at disease reversal or mitigation through a multi-pronged approach that involves, among other things, the right food as medicine.

Dr. Shankar received her postgraduate residency graduate training at DVAMC-UCLA (Division of Veteran Affairs, University of California Los Angeles, USA), where she also served as a Chief Resident in her final year of training. She has had extensive training in her specialty from various prestigious institutions, such as UCLA, Cedars Sinai, Children's Hospital of Los Angeles, King-Drew University, University of Texas and Harvard Medical School.

Her experience has enabled the integration of the most appropriate protocol selection while performing sophisticated radioactive injection procedures. She is reputed for her high standards of technical skills and for her professional style of working as a team member with physicians throughout the community. She was the first person to get a private license to use a rubidium generator in the entire state of California, USA. She is currently the lead consultant in Nuclear Medicine at Aster CMI Hospital in Bangalore. She is also actively involved in academic activities and several research projects across many points of interest.

COLOR NORMALIZATION OF HISTOLOGICAL IMAGES: ROUGH-FUZZY COMPUTING TO DEEP LEARNING

PROF. PRADIPTA MAJI

Indian Statistical Institute, Kolkata

24th February 2023 (Friday)
2.00 pm - 3.00 pm

ABSTRACT

In histology, microscopic images of tissue sections are examined to study the manifestation of diseases under consideration. The most important property of histological images is the enormous density of data, more cellular details, compared to other imaging modalities, which makes computer-aided diagnosis more accurate than other modalities. To facilitate pathologists' examination, tissue samples are stained with multiple contrasting histochemical reagents, which in turn highlight different tissue structures and cellular features. Hence, color in pathology plays a pivotal role as a good indicator of histological components. One of the most common and primary problems of histological tissue analysis is the inadmissible inter and intra-specimen variation in stained tissue color. Consequently, numerical features extracted from histological images may lead to difficulty in image interpretation by automated systems, trained on a specific stain color appearance. Hence, the foremost and challenging task in hematoxylin and eosin-stained histological image analysis is to reduce color variation present among images. In this talk, two recently introduced approaches will be discussed for stain color normalization. While the first approach is based on rough-fuzzy computing, the second one is developed around a popular deep learning architecture, called generative adversarial network. The merits and demerits of the state-of-the-art methods and these two approaches will also be covered in detail.

BIOGRAPHY

Pradipta Maji received the B.Sc. degree in Physics, the M.Sc. degree in Electronics Science, and the Ph.D. degree from Jadavpur University, Kolkata, India, in 1998, 2000, and 2005, respectively. Currently, he is a professor and head of the Machine Intelligence Unit, Indian Statistical Institute, Kolkata. He has published more than 150 papers in international journals and conference proceedings. His research interests include machine learning, computer vision, medical imaging, and bioinformatics. Prof. Maji is a Fellow of the National Academy of Sciences, India. He received the 2008 Microsoft Young Faculty Award from Microsoft Research Laboratory India Pvt., the 2009 Young Scientist Award from the National Academy of Sciences, India, the 2011 Young Scientist Award from the Indian National Science Academy, India, and the 2015 Young Faculty Research Fellowship from the Ministry of Electronics and Information Technology, Government of India. He has been selected as the 2009 Young Associate of the Indian Academy of Sciences, India.

INTRODUCING THE ICMR-IISC IMAGING DATA BANK

PROF. DEBNATH PAL

Indian Institute of Science, Bangalore

24th February 2023 (Friday)
3.00 pm - 4.00 pm

ABSTRACT

The quality of data available to build models and algorithms is central to the success of any translational effort in medical science. In absence of data standards, we get into a cycle of garbage-in and garbage-out syndrome despite best efforts in improving the models and algorithms. This problem is global and has acute consequences, especially for India given its vast diversity in ethnicity, lifestyle, climate, geography, and so on. To bridge this critical gap in data and data-standards relevant to India and the Indian context, the Indian Council for Medical Research, New Delhi (ICMR) and the Indian Institute of Science, Bengaluru (IISc) have joined efforts to build a data bank, whose first phase is called MIDAS-INDIA (Medical Imaging Data Sets for India). The goal of the data bank is to lay India-specific standards (incorporating best practices adapted to the Indian context) and use them to archive Gold Standard data for use in translational science and development. The effort is being driven in a scalable manner through a hub-and-spoke model, where hubs are organizations with disease-specific focus and work with partner organizations to gather data as per prescribed standards under specified protocols and policies. The ICMR and IISc are the nodal institutions that will oversee the effort and will develop and deploy technologies to gather, manage and disseminate the data. IISc's sister organization ArtPark will participate alongside to lay the foundation of this endeavor. The talk will share further details on this project, where we expect a large number of Indian academicians, and eventually the industry to join forces.

BIOGRAPHY

Debnath Pal is a professor at the Department of Computational and Data Sciences, Indian Institute of Science, Bengaluru. He received a Bachelor's degree in 1993 and a Master's degree in 1995 in chemistry from the University of Calcutta, Kolkata, and the Indian Institute of Technology, Kharagpur, respectively.

He obtained his Ph.D. degree from Jadavpur University, Kolkata, in the year 2000 for his research in the area of structural bioinformatics under a fellowship from the Council for Scientific and Industrial Research, New Delhi. He served two years as a Humboldt postdoctoral fellow in IMB-Jena, Germany and another two years as a post-graduate researcher at the University of California, Los Angeles, USA. Currently, his group focuses on the development of methods and algorithms in multi-scale biology using multi-modal approaches under the scope of systems biology. His group is interested in understanding biological function, disease, and drug discovery. More details: http://cds.iisc.ac.in/faculty/dpal/

SURGICAL VIDEO ANALYSIS USING DEEP LEARNING

PROF. NEELAM SINHA

International Institute of Information Technology, Bangalore

25th February 2023 (Saturday)
9.00 am - 10.00 am

ABSTRACT

Advancements in computer vision are transforming several aspects of healthcare, all the way from diagnostic imaging to computer-aided surgeries. While imaging modalities such as CT, MRI, ultrasound help in studying anatomical and functional aspects, surgical videos can potentially enable on-the-fly assistance in the Operation Theatre. In this talk, we focus on challenges in analyzing videos of Laparoscopic cholecystectomy (LC). LC is the procedure followed for removal of gallbladder by making small incisions in the abdomen. This procedure is generally performed by the surgeon relying solely on the endoscopic perspective. Any additional visual surgical assistance would potentially improve the overall efficiency and quality of the surgery. Surgical tool presence detection, tool localization and phase classification are critical in providing surgical workflow analysis, surgical visual aid and also in determining the skill with which the surgery is performed. We will discuss some recent techniques that utilize Deep Learning framework for understanding LC surgical videos.

BIOGRAPHY

Neelam Sinha is a faculty at IIIT-B. Her research interests lie in applying ML techniques for healthcare applications. She has collaborators at NIMHANS, where she works with radiologists on neurodegenerative disorder detection (Glioma, Essential Tremors, Parkinsons') and Haemorrhage classification. She obtained her PhD from IISc on strategies for rapid MR imaging. She was at GE Healthcare, prior to joining IIIT-B.

A GRAPH-THEORETIC PERSPECTIVE FOR BIOMEDICAL IMAGE COMPUTING

PROF. ANANDA SHANKAR CHOWDHURY

Jadavpur University, Kolkata

25th February 2023 (Saturday)
10.00 am - 11.00 am

ABSTRACT

In this talk, I will show how graph theory can be elegantly used to develop solutions for typical problems in the field of biomedical image computing as well as (biomedical) signal processing. A few illustrative examples will be briefly presented spanning graph cuts, bipartite graph matching and spectral theory of graphs and hypergraphs. Solutions to two problems from the area of neuroradiology and neurosurgery will be discussed in detail. In the first problem, I will show how one can accurately segment brain tumours from 3D MRI data using a synergistic combination of deep learning and graph cuts [1]. In the process, we will derive new expressions for the terms appearing in the energy function of the standard graph cut. For the second problem, I will present how brain tumours can be classified in a coarse-to-fine manner from radiology (MRI) as well as histopathology (WSI) data using deep features and a Graph Convolutional Network (GCN) [2]. We will demonstrate here how an informative graph for the GCN can be constructed by considering feature similarity as well as graph topology.

REFERENCE

[1] A. De, M. Tewari, E. Grisan, A.S. Chowdhury: A Deep Graph Cut Model for 3D Brain Tumour Segmentation, Proc. Forty-fourth International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), Glasgow, Scotland, UK (2022), 2105 -2109.

[2] A. De, R. Mhatre, M. Tewari, A.S. Chowdhury, Brain tumour classification from Radiology and Histopathology using Deep Features and Graph Convolutional Network, Proc. Twenty-Sixth International Conference on Pattern Recognition (ICPR); Montreal, Canada (2022), 4420 – 4426.

BIOGRAPHY

Ananda Shankar Chowdhury is a Professor and former Head in the department of Electronics and Telecommunication Engineering (E.T.C.E.) at Jadavpur University, Kolkata, India where he leads the Imaging, Vision and Pattern Recognition (IVPR) group. He received a B.Sc. (with Hons.) in Physics from the Presidency College in 1996, a B.Tech. from the Institute of Radiophysics and Electronics in 1999, and an M.E. in Computer Engineering from Jadavpur University in 2001. He earned his Ph.D. in Computer Science from The University of Georgia, USA in July 2007. He then worked as a post-doctoral fellow in the department of Radiology and Imaging Sciences at National Institutes of Health, USA during the period August 2007 to December 2008. His research interests are broadly in the areas of Computer Vision and Pattern Recognition with an emphasis on problems arising in Biomedical, Multimedia and Surveillance domains. He has held invited academic visits to different universities in Germany, Singapore, Brazil, Italy, The Netherlands, France and Norway. He is a senior member of IEEE and an IAPR TC-member of Graph based Representations in Pattern Recognition. He currently serves as an Associate Editor for IEEE Transactions on Image Processing, a Senior Area Editor for IEEE Signal Processing Letters and an Area Editor for Pattern Recognition Letters. His Erdos Number is 2.

LOOKING BEYOND THE PERFORMANCE METRICS IN CAD DESIGN

PROF. JAYANTHI SIVASWAMY

International Institute of Information Technology, Hyderabad

25th February 2023 (Saturday)
11.30 am - 12.30 pm

ABSTRACT

Computer aided diagnostics (CAD) aims to provide assistance to clinicians or be standalone solutions for screening or triage. Sustained research in CAD area has been done for over 30 years. From serving as a second reader in breast cancer screening in 1998, the role of CAD is envisaged to expand with the resurgence in AI. Specifically, the success of deep learning (DL) based approaches to long standing computer vision problems has led to excitement in using CAD not only as a virtual assistant but also as a stand-alone solution in screening. However, the adoption of CAD in healthcare has not kept pace with the expectations. In this talk, I will look at the reasons for the same and outline directions in which the CAD community is reorienting its efforts to pave way for better adoption. I will review the emerging strategies developed to lessen the 'black box' nature of DL-based CAD models and share our group's effort in this direction as well.

BIOGRAPHY

Jayanthi Sivaswamy is Raj Reddy Chair Professor at IIIT Hyderabad. She has worked in the medical image computing area for nearly 2 decades. She has extensively worked on CAD development for eye diseases in collaboration with leading eye hospitals in India and in The Netherlands. Her recent work is focused on problems (explainability, continual learning) related to translation of CAD in general as well as deriving normative representation for the brain and its aging process in the Indian population. Her work on the creation of the first brain atlas for the Indian population received wide attention. Part of her current work is directed towards developing VR-based solutions to help modernise teaching of anatomy in medical colleges. Jayanthi received her MS and PhD in Electrical Engineering from Syracuse University and worked at the University of Auckland, New Zealand before joining IIITH in 2001. She served as the General Chair of the IEEE International symposium on biomedical imaging in 2022 and has organized the Medimage workshop several times as a satellite event of the Indian conf. on computer vision, graphics and image processing conference.

REGULARISATION IN DEEP LEARNING FOR MEDICAL IMAGE COMPUTING

DR. SUDHAKAR PRASAD

GE-Healthcare, Bangalore

25th February 2023 (Saturday)
2.00 pm - 3.00 pm

ABSTRACT

Deep neural networks have revolutionised the ways of doing image analysis. Over the past decade, bigger neural networks with several millions of parameters are being built, pushing the boundaries of performance. However, along with these advancements comes the problem

of model overfitting. This problem is even more pronounced in medical image analysis due to scarcity of good quality training data, diversity in imaging modalities, etc. One way to address this challenge is by regularising neural networks during their training. There are a number of regularisation methods that have been developed and shown to be useful in general image analysis tasks. Fortunately, for some medical image analysis problems, one can further utilise the knowledge of how images are acquired/formed to build effective regularisation methods. In this talk, we will discuss a few standard methods used in practice along with those that are specific to medical images.

BIOGRAPHY

Prasad Sudhakar is a staff scientist at the Advanced Technology Group, GE HealthCare. He is involved in research, design, and development of solutions to clinical problems involving medical images as well as for making imaging chains more efficient. Towards these, he primarily uses tools from signal processing and machine learning/AI. He is also a visiting faculty at the Department of CDS, IISc. Prasad holds a PhD in signal processing and applied mathematics from INRIA-Rennes, France, and an MSc (Engg.) from IISc, Bangalore.

THE EDGE OF ARTIFICIAL INTELLIGENCE: SELF-DRIVING MEDICAL IMAGE ANALYSIS

PROF. PHANEENDRA K. YALAVARTHY

Indian Institute of Science, Bangalore

25th February 2023 (Saturday)
3.00 pm - 4.00 pm

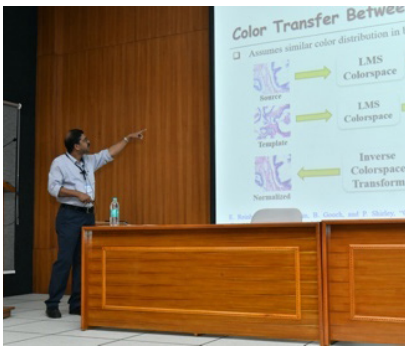
ABSTRACT

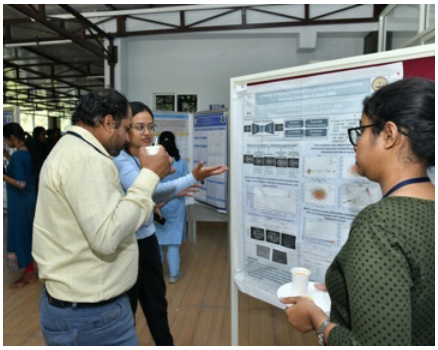
There is a lot of similarity between self-driving cars and current AI adoption in medicine, especially in Radiology. Today, AI solutions for radiology are focused towards image enhancement. However, with the advent of innovation and the positive potential impact of AI augmentation, radiologists should expect to see more of automated diagnosis in the near future. The long-term vision for AI in medical imaging should stop at autonomous vehicle level 4 automation—the radiologist will still be in charge of the majority of cases, and AI can help them drive along the "highway" of simple use cases. The talk will focus on current challenges and list opportunities for the researchers along with development at our group that focus on edge AI.

BIOGRAPHY

Phaneendra Yalavarthy received B.Sc. and M.Sc. degrees in physics from Sri Sathya Sai University, Puttaparthy, India in 1999 and 2001 respectively. He also obtained a M.Sc. degree in Engineering from Indian Institute of Science, Bangalore, India in 2004. He received a Ph.D., working as a U.S. Department of Defense Breast Cancer Pre-doctoral Fellow, in biomedical computation from Dartmouth College, Hanover, USA in 2007. He worked as a post-doctoral research associate in the Department of Radiation Oncology, School of Medicine, Washington University in St. Louis, USA from 2007-2008. Currently, he is working as a Professor of Medical Imaging in the Department of Computational and Data Sciences, Indian Institute of Science, Bangalore, India. More details: http://cds.iisc.ac.in/faculty/yalavarthy/

PICTURES TAKEN ON DAY 1





PICTURES TAKEN ON DAY 2








9 | WORKSHOP

HANDS-ON TRAINING PROGRAM ON RECENT ADVANCES IN INDUSTRIAL ARTIFICIAL INTELLIGENCE, DATA FUSION AND COMPUTING

WORKSHOP ON HANDS-ON TRAINING PROGRAM ON RECENT ADVANCES IN INDUSTRIAL ARTIFICIAL INTELLIGENCE, DATA FUSION AND COMPUTING

27th and 28th of February, 2023
Organized by: Prof. S. Gopalakrishnan, Convenor, ABCMC, IISc
Venue: Auditorium, Department of Aerospace Engineering, IISc, Bangalore

On February 27th and 28th, 2023, the Axis Bank Centre for Mathematics and Computing at IISc hosted a Hands-on Training Workshop for Faculty of Engineering Colleges in Karnataka as well as UG/PG students of IISc on the topic Recent Advances in Industrial Artificial Intelligence, Data Fusion, and Computing at the IISc Aeronautics Auditorium. XponentialOrbitShifters facilitated and conceptualized the afore mentioned workshop.

There were numerous innovative ideas, and insights shared by experts such as Prof. Jagadeesh Gopalan from IISc, Mr. Amit Chatterjee from Intel, Mr. Derrick Jose from Flutura Data Sciences, Mr. Vinay & Mr. Aditya rom Skyserve. Ai, Mr. Vardarajan from Flutura Data Science, Mr. Animesh, Mr. Subramanya, Mr. Rajesh from Flutura Data Science and others in the field.

The workshop was attended by 40 engineering faculties from all around

Figure 8: Collage of pictures of workshop

Karnataka and 35 IISc students. Certificate of participation was given to all the participants.

The 2-day Hands on Training for Academic Faculties & for UG, PG and PhD students of IISc, prepares participants to get professionally equipped and trained in latest digital and non-digital pedagogical tools (including case method and simulations), cutting-edge research methods, and advanced specialised areas in Industrial AI, Data Fusion and Computing. The programme aims to provide the participants an exposure to the area of deep learning and its future applications.

Prof. Gopalan Jagadeesh, Head of Aerospace Engeineering IISc and Mr. Amit Chatterjee, Strategic & Startup Initiatives, Intel Corporation inaugurated the event at IISc Aeronautics Auditorium. The objective of this convention is to enhance the quality of Knowledge and Hands on Training for IT Education in the state and help build quality manpower for the IT Industry.

The workshop was conducted in association with Industrial AI Consortium & BITES witnessed the participation of more than 90 senior academicians from across the engineering colleges from the state as well as UG, PG Students from IISc. The event was a resounding success.

Figure 9: Group photo of the participants of the workshop

Introducing the Centre
Prof. S. Gopalakrishnan,
Convenor
Axis Bank Centre for Mathmatics and Computing, IISc, Bangalore

Guest of Honour
Prof. Gopalan Jagadeesh,
Professor, Department of Aerospace Engineering, IISc, Bangalore

Chief Guest
Mr. Amit Chatterjee,
Strategic and Startup Initiatives,
Intel Corporation

PARTICIPANTS FROM ACADEMIC INSTITUTIONS

Name of the Faculty	Department	Institution Name
Ramesh Babu N	Computer Science & Engineering	Amruta Institute of Engineering & Management Sciences
Dr. Srinivasa R	Computer Science and Engineering	Amruta Institute of Engineering & Management Sciences
Shreeshayana r	Electrical and Electronics Engineering	ATME COLLEGE OF ENGINEERING
Vinod Kumar P	Electrical and Electronics Engineering	ATME College of Engineering
Goutam R	Computer Science and Engineering	Atria Institute of Technology
Dr. Chayadevi M L	Computer Science & Engineering	B N M Institute of Technology, Bangalore
Dr. Bharati Reshmi	Artificial Intelligence and Machine Learning	Basaveshwar Engineering College, Bagalkot
Dr Vishwanath Kagawade	AIML	Basaveshwar Engineering College, Bagalkot
Vinay Shettar	Electronics and Communication Engineering	BGMIT MUDHOL
Kshama k b giri	Information science and Engineering	BGS Institute of Technology
Sahana D Gowda	Computer science and engineering	BGS institute of technology
Vinayak A. Telsang	Computer Science and Engineering	Biluru Gurubasava Mahaswamiji Institute of Technology
Bhargav H K	CSE	BITES
Prathibha.s	Electronics and communication	BMSCE
Dr. Kavitha Jayaram	Computer Science and Engineering	BNM Institute of Technology
Geetha L S	CSE	BNMIT
Sumana SG	Computer Applications	Dayanand sagar University
Shaila SG	Computer science and engineering (Data Science)	Dayananda Sagar University
Monish L	Department of CSE (Data Science)	DAYANANDA SAGAR UNIVERSITY
Dr. Harish H M	Electronics and Communication Engineering	Government Engineering College Haveri
P B Gnanamurthy	Civil Engineering	Government Engineering College Mosalehosahalli
Krishnananda L	Electronics and Communication Engineering	Govt Engineering College Mosalehosahalli
Darshan M Katgeri	Mechanical	Jain College og Engineering, Belagavi
T Somasekhar	CSE	K.S Institute of technology
Shivaprasad Mukhandmath	School of Mechanical Engineering	KLE Technological University
Shridhar Doddamani	Automation and Robotics	KLE technological University
Dharmendra Ponnaswami	Aeronautical Engineering	KLS Gogte Institute of Technology
Nikhil Inamdar	ECE	KLS GOGTE INSTITUTE OF TECHNOLOGY, BELAGAVI
Pradyumna G R	Electronics and Communication Engineering	N.M.A.M. Institute of Technology
Sandhya B R	Computer Science and Engineering	Nitte Meenakshi Institute of Technology
Mahesh BL	AIML	NMAMIT, Nitte

Name of the Faculty	Department	Institution Name
M K Pushpanjali	CSE	NMIT
Merin Meleet	Information Science and Engineering	RV College of Engineering
H Pavithra	Computer Science and Engineering	RV college of engineering
Praveen B.R	Electrical and Electronics Engineering	Sai Vidya Institute of Technology
Sangappa R Biradar	Artificial Intelligence and Machine Learning	SDM College of Engineering and Technology
Raghav S	Information Science and engineering	Sir M Visvesvaraya Institute of Technology
Mayuri K P	COMPUTER SCIENCE AND ENGINEERING	SIR MVIT- BENGALURU
Maltesh IG	Electronics and Communication Engineering	SKSVMACET Laxmeshwar
Ramesh N Koppar	Information Science & Engineering	SKSVMACET, Lakshmeshwar
K. P Linija	Artificial Intelligence and Machine Learning	Sri Sairam college of Engineering
Prof. Sivaprakash C	Artificial Intelligence and Machine Learning	Sri Sairam College of Engineering Bengaluru
Harish Kumar M	Artificial Intelligence and Machine Learning	Vemana Institute of Technology
Malathi V	ECE	Vemana Institute of Technology

PARTICIPANTS FROM ACADEMIC INSTITUTIONS

Name of the participant	Department	Institution Name
Agastasya Gaur	UG	Indian Institute of Science
Mohit Kumar Gupta	Robert Bosch Centre for Cyber Physical Systems	Indian Institute of Science
Nisarg Bhatt	Physics	Indian Institute of Science
R K Shishir	UG	Indian Institute of Science
Sachin Kumar Lal	Centre for Product Design and Manufacturing	Indian Institute of Science
Akhilesh Kumar	Materials Engineering	Indian Institute of Science
Nirbhay Raghav	IMI-Mathematical Sciences	Indian Institute of Science
Satya Chaithanya Duggisetty	IMI	Indian Institute of Science
Rathod Dinesh	Computer Science and Automation	Indian Institute of Science
Mahendra Gehlot	Aerospace Engineering	Indian Institute of Science
Kiran George Varghese	Centre for Product Design and Manufacturing	Indian Institute of Science
Mrigank Pawagi	UG (B.Tech.)	Indian Institute of Science
Anand S	Physics	Indian Institute of Science
Umang Majumder	UG	Indian Institute of Science
Nikhil Jayswal	Aerospace Engineering	Indian Institute of Science
Himanshu Gupta	Aerospace Engneering	Indian Institute of Science
Sanjeev Kumar	Civil Engineering	Indian Institute of Science
Bireshwar Das	Robert Bosch Centre of Cyber Physical Systems	Indian Institute of Science

Name of the participant	Department	Institution Name
Vageesh Singh Baghel	Mechanical Engineering Department	Indian Institute of Science
Sangeeta Yadav	Cds	Indian Institute of Science
Manish Kumar	CPDM	Indian Institute of Science
Rohit Chowdhury	CDS	Indian Institute of Science
Sri Ramoji Sreeja	CPDM	Indian Institute of Science
Kausik Bhattacharya	C.P.D.M.	Indian Institute of Science
Gorantla Sandeep	RBCCPS	Indian Institute of Science
Sibi K	Aerospace Engineering	Indian Institute of Science
Sayan Chaudhuri	Aerospace engineering	Indian Institute of Science
Sirjan Hansda	UG Btech	Indian Institute of Science
Anushka Dassi	UG	Indian Institute of Science
Ramesh Babu Jangala	Aerospace engineering	Indian Institute of Science
Ishaan Kaushal	Centre for Product Design and Mfg	Indian Institute of Science
Prajakta Sanjay Borse	Computational and Data Science	Indian Institute of Science
Brijesh Kanodia	Physics	Indian Institute of Science
Dhiraj Kumar Jha	Aerospace	Indian institute of science
Sai Niranjan Ramachandran	Mathematics	Indian Institute of Science

The participants saw how advances in artificial intelligence, machine learning, and the internet of things are changing the way we approach production and manufacturing. The potential for increased efficiency, productivity, and cost savings is enormous, and hearing about the many real-world applications already in use was enthralling. There were numerous innovative ideas, and insights shared by experts such as Legendary Prof. Jagadeesh Gopalan -IISc, Mr. Amit Chatterjee - Intel, Mr. Derrick Jose- Flutura Data Sciences, Mr. Vinay & Mr. Aditya - Skyserve. Ai, Mr. Vardarajan - Product Head Flutura Data Science, Mr. Animesh, Mr. Subramanya, Mr. Rajesh from Flutura Data Science and others in the field.

Figure 10: Picture of the participants

PROGRAM SCHEDULE

Program Title	Hands on Training Program for UG, PG and PhD students of IISc ON Recent advances in Industrial Artificial Intelligence, Data Fusion & computing.
Duration	27th and 28th February- 2 Days - 9.30 Am to 5.30 Am
Venue	Auditorium, Dept of Aerospace Engineering, Indian Institute of Science, Bangalore 560012
Mode of Training	Class Room Training
Contact Person:	Mr. J Vivek Gnana Pandian, Mob: 9035999468 Mr. Saravanan Sundramurthy, Mob:9845703121

Day 1
27th February 2023

Session	Session Timings	Topics	Content	Speakers
Day 1 27th February 2023	09.30 to 09.45 am	Inauguration	• Inauguration & Lighting of Lamp by chief guest • Keynote by	Prof. Gopalakrishnan (IISC) Prof Jagadeesh (IISc) & Amit Chatterjee (Intel)
	9.45 to 10.45 am	Demystifying Industry 5.0	• Introduction to Industry 5.0 • Application of Industry 5.0 • Trends in Industry 5.0I	Prof. Jagadeesh Gopalan Dept. of Aerospace Engineering, IISc, Bangalore
	10.45 to 11.15 am		Tea Break	
	11.15 to 12.00 pm	Demystifying Technology for Computing Excellence	• Moving Towards Society 5.0 • Computing workloads for Industry 5.0 • Promise of Quantum computing	Mr.Amit Chatterjee, Industrial IOT Segment Leader & Strategic Business Development, Intel Corp
	12.00 to 1.00 pm	Introduction to Satellite Intelligence computing workloads	• What is the process of extracting satellite intelligence • Practical application of satellite intelligence to banking industries • Practical application of satellite intelligence to construction industries.	Mr. Vinay S, Founder CEO-SkyServe.ai, Dfy Graviti Technologies
	01.00 to 02.00 pm		Lunch Break	
	02.00 to 02.30 pm	Live Demo	• Demystifying Digital Twins • Digital Twins Use Case	SME- Flutura Team Gartner ranked Industrial AI
	02.30 to 3.00 pm	Live Demo	• Satellite Intelligence Application	Mr. Vinay, S Founder, CEO-SkyServe.ai, Dfy Graviti Technologies
	03.00 to 03.30 pm		Tea/Bio Break	
	03.30. to 05.30 pm	Guided Hands on Session	• Creating your first Low code/No code AI output	Mr. Subramanya - SME-Flutura

Day 2
28th February 2023

	Session Timings	Topics	Content	Speakers
Day 2 28th February 2023	9.30 to 9.45	Previous Day Recap	• Summarise previous days key points	Mr. Derich Jose Co-Founder, & CEO-Flutura Data Science & Analytics
	9.45 to 10.45	How Industrial AI is revolutionising Energy, Engineering, Pharma & Defence	• What is Industrial AI • Industrial AI case study in Oil and Gas • Industrial AI case study in Pharma • Industry AI case study in Defense	Flutura and SME
	10.45 to 11.00		Coffee/Tea Break	
	11.00 to 12.00	Demystifying Vision Intelligence	• What is vision intelligence? • Vision intelligence for Weld defect detection • Vision intelligence for steel manufacturing quality • Vision intelligence for energy industry	Mr. Abhishek Kumar - SME-Flutura Data Science & Analytics
	12.00 to 01.00 pm	Introduction to low code /no code AI - Engineers Workbench	• Low code/No code AI tools • Why Low code/No code is the future • Task which can be done in EWB	Ms.Ketaki- SME- Flutura Data Science & Analytics
	01.00 to 02.00 pm		Lunch Break	
	02.00 to 02.30	Live Demo	• Oil and Gas Application	Flutura Team-SME
	02.30 to 03.00 pm	Live Demo	• Vision Intelligence Application	Mr. Vinay, S- SME Founder, CEO- SkyServe.ai, Dfy Graviti Technologies
	03.00 to 0315 pm		Tea Break	
	03.15 to 05.00 pm	Hands on	• Creating your first Actionable Exponential Digital Blueprint	Mr. Derick Jose, Co-Founder , & CEO- Flutura Data Science & Analytics
	05.15 to 05.30 pm	Session Closure	• Issue of Certificates/ Vote of Thanks.	

PICTURES TAKEN ON DAY 1

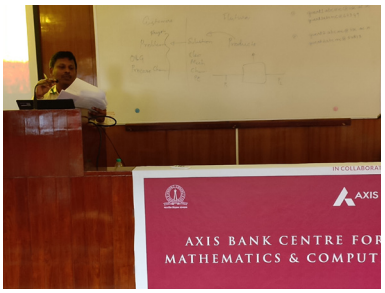





PICTURES TAKEN ON DAY 2








Vote of thanks was proposed by Prof. S. Gopalakrishnan :

I feel honoured and privileged to get the opportunity to propose a vote of thanks on this special occasion. I would like to thank all the honourable delegates who blessed us with their presence. I am also very much thankful to all Program Advisory Committee members and the invited speakers.

10 | CONSTRUCTION

As per the MOU signed by IISc with Central Public Works Department (CPWD), A Project Monitoring Group (PMG) has been appointed by the Director of IISc. The concept proposal and engineering renderings from TATA Consulting Engineers Limited has been received. The outside and inside view of the proposed building is shown below.

Figure 11: Architectural Renderings of the outside view of proposed building for Axis Bank Centre for Mathematics and Computing

The tentative schedule for each phase of construction along with the status is given below:

1	05% as the initial deposit at the time of communicating the administrative and financial approval for the project	Completed
2	10% - second installment – just after the award	In Progress
3	10% - third installment – after physical commencement of the work at site	To be disbursed based on progress
4	20% - fourth installment – after achieving physical progress of 15%	To be disbursed based on progress
5	20% - fourth installment – after achieving physical progress of 35%	To be disbursed based on progress
6	20% - fourth installment – after achieving physical progress of 55%	To be disbursed based on progress
7	10% - fourth installment – after achieving physical progress of 75%	To be disbursed based on progress
8	5% - fourth installment – after achieving physical progress of 90%	To be disbursed based on progress

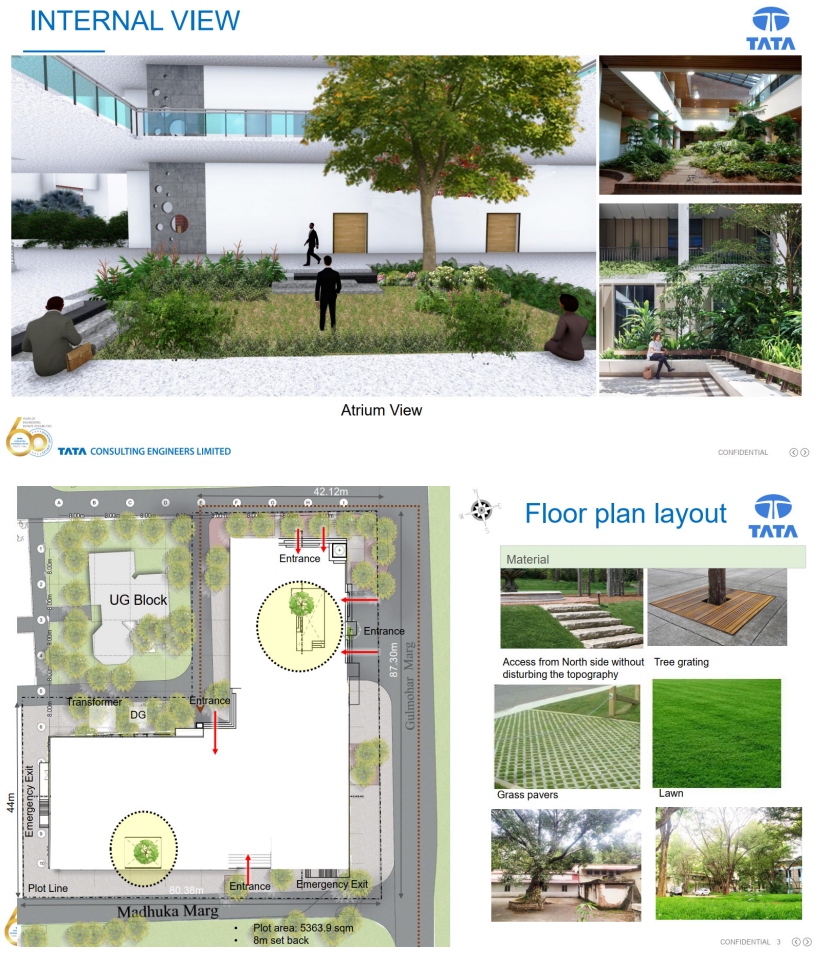


Figure 12: Architectural Renderings of the inside view of proposed building for Axis Bank Centre for Mathematics and Computing