

## DEANS MESSAGE



Dear Alumnus,

Warm wishes from your alma mater.

William Wordsworth in ‘How Beautiful is the Rain’ said:

How beautiful is the rain! After the dust and heat,

In the broad and fiery street, In the narrow lane,

How beautiful is the rain!

The scorching summer in Mumbai is almost behind us and as Mumbaikars eagerly await the gentle downpour of the monsoon rains

to cool us down from the sweltering heat of the past few months, I would like to apprise you of the key events that took place at the Institute over the past month.

1. After two years of the pandemic, the revival of the FAN (Faculty Alumni Network) meeting was the talking point of May. The 2022 edition of FAN was held in collaboration with Ohio State University (OSU) at the latter’s campus in Columbus, Ohio, USA, on May 13 & 14, 2022. The event witnessed many eminent academicians and industry practitioners, who gathered to discuss emerging technologies and develop mutually beneficial and transformative initiatives, and their applications in the real world.
2. It was bittersweet for our brilliant graduating students at the Institute’s Valedictory Function as they celebrated the end of their tough academic program but also melancholic that they were leaving their beloved Institute. Two of our eminent alumni, Mr. Arun Firodia and Dr. Ganesh Natarajan, were the chief guests and shared heartfelt memories of their graduation days. Our students organized and performed various entertaining activities, making the evening memorable for those graduating from the Institute.
3. We, at the Institute, always look forward to meeting our alumni. Recently, IIT Bombay, in collaboration with the IIT Bombay Heritage Foundation Boston Chapter, hosted an alumni interactive session on May 19, 2022, in Boston, USA. During a nostalgia-filled informal dinner, many of the attendees reminisced over their time spent at the Institute. I would like to thank the IIT Bombay Heritage Foundation for their support in curating this wonderful event. I also hope to see you again next year!
4. I am delighted to share that our Interdisciplinary Programme in Climate Studies (IDPCS) turned 10 this year. The inaugural ceremony of the year-long anniversary celebrations was held on May 2, 2022, at IIT Bombay. It was our honour to welcome Dr. M Ravichandran, Secretary, Ministry of Earth Sciences Government of India, as the Chief Guest for the occasion, as well as our special guests Dr. Akhilesh Gupta (Senior Adviser, Department of Science and Technology, Government of India), Dr. Nisha Mendiratta (Head, CCP-SPLICE, DST) and Shri. K. S. Hosalikar (Head, Climate Research and Services, India Meteorological Department, Pune). We look forward to many more celebrations from IDPCS in the upcoming months.
5. Recently, our alumni couple, Vinaya Kapoor (B.Tech., Chemical Engineering, 1992) and Samir Kapoor (B.Tech., Electrical Engineering, 1992) generously contributed towards the creation of the first Chair Professorship in the field of Climate Studies, titled “Vinaya and Samir Kapoor Chair in Climate Studies” at the Institute. The Chair’s vision is to establish IIT Bombay as a thought leader in Climate Studies. IIT Bombay greatly appreciates their vision and their generous contribution to support research in an important problem of global challenge.
6. I am also proud to announce that our esteemed alumnus, Dr. Arun Majumdar has been appointed as Dean of the Stanford Doerr School of Sustainability (the new climate change school at Stanford University). IIT Bombay wishes him the very best as he begins this new and challenging phase in his career.
7. Our prominent Chemical Engineering alumni and the Department of Chemical Engineering collaborated and conducted a webinar ‘Future of Medical Technologies’ on May 21, 2022 (the fourth in the virtual panel series titled ‘Changing Role of Chemical Engineers’). My sincere thanks to our ChemE alumni for this exciting and impactful initiative.

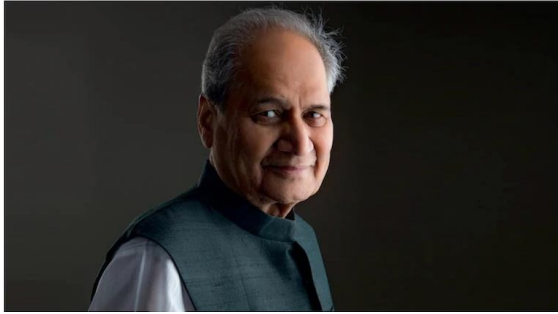
Over the years, our involved and vibrant alumni community has contributed immensely to IIT Bombay's advancement. I would like to thank each one of you for your generosity and trust that you will continue to support your cherished alma mater in the future, as well.

In the meantime, here is an invite to you to visit us during the lovely rains (offer you a rain-check if you cannot!!), with steaming hot chai and spicy farsan, to go with the heavenly downpour.

Sincerely,

Prof. Ravi Gudi

## **SPECIAL FEATURE**



### **IIT Bombay Pays Homage to Indian Industry Magnate, Late Mr. Rahul Bajaj**

The Institute will inaugurate the Rahul Bajaj Technology Innovation Centre on June 10, 2022

Veteran Industrialist, Padma Bhushan awardee, and former chairman of the Bajaj group of industries, sadly passed away on February 12, 2022. Among his many glorious accomplishments, the late Shri. Rahul Bajaj was also a former member of the Rajya Sabha, chairman of

the International Business Council, a philanthropist, and more.

Mr. Bajaj became the Managing Director of Bajaj Auto in 1972 and the company witnessed outstanding growth under his leadership in the 70s and 80s. He was instrumental in launching the very affordable Chetak scooter which became an aspirational symbol and also the key mode of transportation for millions of middle-class Indians in the 80s. The 'Hamara Bajaj' jingle encapsulated the Indian middle-class' hopes for a better future.

After his retirement, Mr. Bajaj pursued many interests, including being actively involved in uplifting India's education system. He had a long and fruitful relationship with IIT Bombay where he was the Chairman of the Board of Governors of the Institute between 2003-2006. Under his leadership, IIT Bombay grew and flourished, even as he made a lasting impact on those who knew him and worked under his tutelage.

Mr. Bajaj had a long association with IIT Bombay and his demise was a blow to the extended IIT Bombay family. To continue their patriarch's connection with the Institute, the Bajaj family will inaugurate the Rahul Bajaj Technology Innovation Centre at IIT Bombay on June 10, 2022.

IIT Bombay is indebted to Mr. Bajaj for his contributions to the Institute. Three members of IIT Bombay's family who knew Mr. Bajaj, and worked with him closely, recall fondly their numerous interactions with him.

IIT Bombay pays homage to Mr. Rahul Bajaj, a towering personality who was as well-known for his business prowess as he was for his straight-talk.

IIT Bombay will miss Mr. Rahul Bajaj deeply.

Prof. Pradipta Banerji, Professor, Department of Civil Engineering, IIT Bombay, who worked closely with Mr. Rahul Bajaj shared some of his warm memories of the preeminent industrialist.

"One of the characteristics of the late Shri. Rahul Bajaj was that he was a deeply principled man and they were reflected in his actions. I remember vividly when he was asked to Chair the Board of Governors of IIT Bombay. Even though he accepted the offer reluctantly due to time constraints, his dedication to the Institute was outstanding and, he, often, left me speechless. Under his guidance, IIT Bombay took bold decisions which positively impacted the lives of students, faculty members, and the extended IIT Bombay community.

Mr. Bajaj was instrumental in establishing the IIT Bombay Monash Academy Research Centre. The Institute's faculty members are eternally thankful for his overwhelming support of the retired employees' medical initiatives and schemes. I remember clearly when Mr. Bajaj very patiently heard Prof. Ghosh who campaigned

for medical provisions to be made for retired employees of the Institute. Finally, the scheme became a reality as a result of Mr. Bajaj's tireless efforts.

Finally, it's because of his visionary outlook that led to IIT Bombay housing one of India's finest incubators, SINE, which plays a significant role in fostering entrepreneurship and nurturing tech start-ups.

We will miss Mr. Bajaj deeply.”

Prof. Ashok Misra, former Director of IIT Bombay, currently Distinguished Professor at the Indian Institute of Science, Bangalore, pens an emotional tribute to the beloved Late Mr. Rahul Bajaj.

“Rashmi (my wife) and I were extremely sad when we learnt that our beloved Mr. Rahul Bajaj has left for his heavenly abode. This is a big personal loss for us.

Mr. Rahul Bajaj was a towering personality and a great visionary whose enormous contributions to the growth of the Indian industry are very well known. In addition, his contributions to the academic world are priceless.

I interacted closely with Mr. Bajaj during his Chairmanship of the Board of Governors of IIT Bombay from 2003 to 2006. He was an outstanding chairman who brought fresh energy to the board. His progressive approach to issues and his guidance made me a better Director of IIT Bombay.

Mr. Bajaj would always come to campus a day before the Board meeting was scheduled and discuss the agenda in detail. It was amazing to see the detailed notes he made before every board meeting. His timely and specific suggestions improved the governance of the Institute and helped improvise the Institute's accounting system. After our Board meetings, he'd visit select departments on campus to learn about their academic activities and interact with faculty members patiently. These visits also helped us design and improve the infrastructure of the various departments and centres at the Institute.

Soon after he took over as chairman of the Board, he presided over his first convocation in 2003. Before the ceremony, he watched the video recording of our previous year's convocation and pointed out how the male degree recipients were dressed in kurta pyjamas. He suggested that I follow their example and I was so inspired that I quit wearing western suits for subsequent ceremonies.

Mr. Rahul Bajaj's energy and out-of-the-box thinking energized the Institute and working with him were fun and challenging. His flamboyance and clarity of thought were key trademarks of his personality. Together, we transformed IIT Bombay, and, by the end of his tenure, the Institute became the leading IIT in India.

Mr. Bajaj was also a philanthropist and he contributed generously to the Rahul Bajaj Technology Innovation Centre and sponsored several Chair Professorships at IIT Bombay.

I also have many other fond memories of Mr. Bajaj, both within the institute and when he'd visit our home for dinners. I enjoyed visiting him in Pune for his annual get-togethers where he introduced me to some of the leading industrialists there. I continued my interactions with him well after his stint with IIT Bombay ended and he never failed to ask me about my work and family. I valued my friendship with him; in fact, he was like an elder brother to me.

What Mr. Bajaj accomplished in his life is truly inspirational and he was a great asset to our nation and the world. I salute my mentor and a dear friend. I will forever miss his august presence.”

Prof. Dipan Ghosh, former Deputy Director, IIT Bombay, currently a visiting professor at the Centre for Excellence in Basic Sciences at the University of Mumbai, reminisces and recollects his fond memories of working with the late Mr. Rahul Bajaj at IIT Bombay.

“I have had the good fortune of knowing Mr. Rahul Bajaj at close quarters when he was the Chairman of IIT Bombay's Board of Governors. I was, for some time during this period, the Deputy Director of the Institute. One of my duties was to receive Mr. Bajaj when he arrived at the Gymkhana ground in a helicopter and escort him to the guesthouse. This allowed me to talk to him informally. Our conversations at the breakfast table of the mini-dining room of the Jal Vihar Guest House ranged from politics to business to philosophy.

Mr. Bajaj was an outspoken person and his criticism and witticism spared no one. I once made a cheeky comment while travelling with him in a Mercedes car arranged for him by the Bajaj Group in Mumbai and said, “The Chairman of General Motors will never be seen riding a Ford car!” to which he smiled and commented, “I should have asked the company to send him a ‘Hamara Bajaj’”.

The Bajaj group of industries under Mr. Rahul Bajaj’s leadership has not just revolutionised private transport but has also changed the dynamics of public transport in India. He once mentioned that the tagline for Bajaj scooters should have been, “Hamara Bajaj – MBBS”, the acronym standing for “Miya, Bibi and Bachchon Samet” a reference to the whole family frequently travelling by a single scooter on Indian roads.

Mr. Bajaj took a keen interest in IIT Bombay and its wellbeing. Back then, Mr. Bajaj was made aware of IIT Bombay’s concerns for its employees since no provisions had been made for their medical coverage after their retirement. I was very actively involved in seeking such a scheme along with some colleagues (notably Professor D. P. Roy and Professor P. K. Pattanayak). The Director of the Institute, Professor A. K. Misra, was also very supportive of the concept and entrusted me with the responsibility of presenting our proposal before the Board.

During my first presentation, Mr. Bajaj didn’t seem enthusiastic and remarked that it would impact the Institute’s financial bottom line. But I countered that all Central Government employees are covered under the CGHS post-retirement but no such facility was available for IIT Bombay’s employees. He was very moved by my persistence and advised me to consult with M/s K. A. Pandit, an actuary firm, who helped me revise the proposal and devise a sustainable model to fund the scheme. Mr. Bajaj blessed our revised scheme and instituted what is known today as the Post-Retirement Medical Scheme. Employees of IIT Bombay owe Mr. Bajaj a debt of gratitude and will always be grateful to Mr. Bajaj.

Among his many contributions to the Institute, he also helped broaden the scope of the relationship that the Institute had with industry and public life. His vision for IIT Bombay was that it should continue its leadership in the field of education and technology.

Our nation has lost one of its most crucial voices and whose contributions have been instrumental for the betterment of Indian industry. Mr. Rahul Bajaj will long be remembered for bringing transformation to our society, especially among poor and middle-class Indians, with his two-wheeler technology.

I was deeply privileged to have known him and learned from him. We, at IIT Bombay, will always cherish his legacy. May his soul rest in eternal peace.”

Once again, IIT Bombay deeply mourns the loss of Mr. Rahul Bajaj – industrialist, philanthropist, and a well-wisher-cum-friend of the Institute. The Institute will carry forth his legacy of excellence in education, engineering, and technology.

May his soul rest in eternal peace.

## **FACULTY INTERVIEW**



### **Prof. D.N. Singh: Paving the Path for Future Generations**

Prof. D N Singh, an IIT Kanpur alumnus, is currently the D.L. Shah Chair Professor for Innovation, Department of Civil Engineering (Geotechnical Engineering Division), IIT Bombay.. Prof. Singh’s can-do attitude has been instrumental in the setting up of a unique Laboratory for Geoenvironmental Research & Innovation (LGeReIn)#, as well as launching an internationally renowned journal Environmental Geotechnics\*, Institution of Civil Engineers, UK.

We are delighted to speak with Prof. Singh for the Dean ACR Newsletter.

Read more about his incredible journey from IIT Kanpur to IIT Bombay and his commitment to placing India on the world map in the field of environmental geotechnical engineering.

**Prof. Singh...you got your B. Tech in Civil Engineering from IIT Kanpur but then pursued your M. Tech and Ph.D. in Geotechnical Engineering. What made you move from Civil to Geotechnical Engineering?**

Prof. Singh: Actually, I almost opted for chemical engineering but realised I couldn't pursue it since I feared chemistry. I also believe I was destined to pursue civil engineering, and later, geotechnical engineering. During my undergraduate years at IIT Kanpur, Prof. Basudhar, Prof. Yudhbir, Prof. Madhav, Prof. Kameshwar Rao, and Prof. Chandra taught classes in geotechnical engineering. Apart from being magnanimous figures, they were fatherly and outstanding teachers, who were influential in my subsequent switch to geotechnical engineering.

On a lighter note, a close friend once told me that people pursuing geotechnical engineering have Rahu (planet) placed in their Lagna (planetary position in a horoscope), and apparently, in my horoscope, Rahu is placed in the Lagna chart! So, can one really challenge one's destiny?

**What exactly is geotechnical engineering?**

Prof. Singh: Geo means the earth, or anything that exists on, above, and/or beneath the earth and any activity around them is under the domain of geotechnical engineering. However, the subject of geotechnical engineering is constantly evolving. I'm also deeply involved in understanding how the environment and the biosphere influence practices in geotechnical engineering under the realm of Environmental Geotechnology (EG), a subject that got created unknowingly due to the immense efforts made by my students, whom I prefer calling as The Envgeos, and the collaborators.

For example, we now study the contemporary issues like valorisation of industrial waste and the circular economy associated with it, landfills, nuclear-, municipal- and industrial- waste disposal sites, energy geotechnics (viz., gas hydrates, geothermal engineering, Carbon Capture, Utilization, and Storage, enhanced oil recovery, CH<sub>4</sub>-CO<sub>2</sub> replacement, etc.). Like I said before - the subject is evolving day by day, one life is less to master it as the sky's the limit.

**Your research in geotechnical engineering is very diverse. How has the IIT Bombay ecosystem helped you leverage your research activities?**

Prof. Singh: The ecosystem at IIT Bombay respects its employees and provides absolute freedom to them. Most of the credit goes to the staff of Dean R&D and Dean Academic office who have always gone beyond their call of duty and helped me to navigate through the myriad protocols and complex procedures that are essential to get our projects off the ground.

Another important aspect is that I have always been surrounded by extraordinary minds with whom I'm able to brainstorm ideas. The student community at IIT Bombay is truly exceptional and they astonish me every single day by asking the most thought-provoking questions. I often tell my students that the open ecosystem at IIT Bombay does not just allow you to dream big, but it's also where one can achieve all of their dreams as well. Nothing is impossible here. Also, the industry has always liberally assisted me by sponsoring my professional activities and R&D.

**The Environmental Geotechnology Laboratory is a state-of-the-art lab at IIT Bombay. Can you take us through how the lab came about and what were some of the challenges you faced while setting it up?**

Prof. Singh: My students and I created the Environmental Geotechnology Laboratory (EG lab) from the ground up, and it functions entirely on the Public-Private Partnership (PPP) model. I initiated the concept of personal labs, which, back then, was very uncommon in the civil engineering department. The concept of a personal lab came with its own set of challenges. I was considered by my seniors at that time as a separatist and solo player who was self-centred... However, I always believed that crazy ideas require a hidden den and invisibility before they mature. Advanced research cannot be discussed and executed in public places.

I'm very proud that the EG lab was and is fully independent and self-sufficient since its inception. I'm able to fund the lab by taking on additional consultation work and other independent projects from industry and government bodies. Students who work in the lab are remunerated for the projects we work on and we're not

dependent on funds from the Institute. Over the years I've met and worked with outstanding and dedicated The Envgeos who have kept me on my toes.

At this juncture of my career, I have stepped out of the laboratory and embraced real-life situations, and converted those into my workspace. For example, since a municipal landfill and an industrial waste heap can't be created within a lab setting, we adopted the local Kanjurmarg landfill and several industrial premises as personal laboratories and technology demonstration sites.

**How is the lab beneficial to students of the Institute, your research pursuits, and the world around us?**

Prof. Singh: Thirty years back, barely anyone in India talked about the environment and environmental geotechnology. But now, the LGeReIn has put India on the world map in this context. Also, as founding editor-in-chief of Environmental Geotechnics, India is being recognized as a major force in the field of environmental geotechnology, which has never happened before.

I'm very gratified that the LGeReIn is training young researchers in this upcoming field who will carry the legacy of IIT Bombay onto a much larger global platform in the future. The LGeReIn has also successfully handled practical and real-life challenges like the infrastructure in difficult terrains viz., Dharamshala Ropeway project, Navi Mumbai International Airport project, 4th container terminal at Jawaharlal Nehru Port, Bandra Worli Sea Link, and several other projects have proven to be immensely beneficial to the society.

**As someone who has worked in academia and pursued research and industry projects throughout your illustrious career – what do you think of the synergy between these two fields? How can we improve this strategic alliance between academia and industry which has the potential to transform the world we live in?**

Prof. Singh: Industry and academia need to collaborate. Industries will always move at a faster pace and academia needs to get out of its comfort zone and match its pace. The key challenges are that the industry wants quick answers and solutions and those can be challenging for us to handle. But academics and researchers need to be dynamic and approach, interact and work with industry and come up with timely and innovative solutions for the latter's core concern areas. Time is of the essence for industry, and they will invest in academic research only if they're provided with innovative, efficient, and timely solutions. We cannot afford to be in our silos and need to complement each other.

**You recently launched a new international journal and have also taken on the role of Editor-in-chief, Environmental Geotechnics, ICE Publishing, London, UK. You're also an Editorial Board Member of the International Journal of Geomechanics, ASCE, and various other editorial journals. Can you tell us more about your overall experience in the editorial space?**

Prof. Singh: It all came about because one of my Ph.D. scholars, and, currently, a faculty member at IIT Mandi, was concerned that the waiting period to publish in established journals was several years and many papers were unfairly rejected without any proper review/feedback. Also, these journals perceived topics to be contemporary and futuristic and hence they were not approved for publication. This was the major motivation to start Environmental Geotechnics to cover topics that are gaining relevance now. I'm happy to note that the journal has been very well received by readers and lauded by the Institution of Civil Engineers, and is supposed to be the best launch ICE, UK, has ever had.

**In your opinion, what are some of the most essential qualities that are key for young researchers? Is there any advice you'd like to give our up-and-coming young researchers?**

Prof. Singh: Any researcher, by default, should stay young in spirit. The minute they feel that they're wise and seasoned professionals, their zest for research dies. So - always stay young in your mind and heart and pay attention to contemporary issues. The younger generation is very talented and it would be prudent for us, the older generation, to be patient and listen to their ideas and understand their perspective. The world needs fresh young eyes to resolve modern challenges. So, my advice to them would be to work hard, dream big, just go for it and continue challenging us.

My message would be, "Don't try to be no.1, be the only one."

### **Prof.Singh, what are your plans for the future?**

Prof. Singh: I want to create an 'elite' think tank of experts from all walks of life. I would say, 'a polyclinic' of wise achievers, where the issues faced by the contemporary society could be addressed.

Readers' suggestions for further betterment are always welcome.

What an incredible story of dedication, hard work, and a never-say-die attitude. Prof. Singh's many accomplishments in the field of geotechnical engineering have paved the way for the next generation of researchers to have an easier path in the field. We thank Prof. Singh for his time and for sharing his incredible story with us.

## **CONVERSATION WITH ALUMNI**



### **Zenobia Driver – Dreaming Big for Her Alma Mater - Part 2**

We spoke with our alumnus, Ms. Zenobia Driver (M.Sc., Chemistry, 1998), last month where she took us back in time to when she was a student at IIT Bombay, and reflected on her career trajectory and her subsequent life as an entrepreneur.

In this second part of the conversation, she observes how her beloved Insti has changed over the years, describes her life as a volunteer, gives reasons why it's important for alumni to give back to their alma mater, and her hopes and dreams for her very cherished Insti

### **Q: As someone who has been in constant touch with IIT Bombay as an alumni volunteer – what are some of the changes you have observed on campus from when you were a student to now?**

One of the most heartening changes that I have seen is an increase in the proportion of female students on campus to almost 25% today. When I was a student on campus, it was possible to walk from H10 to Chinko's or Vihar Gate and see no other woman on the way apart from the H10ites I was walking with. Today, that would be close to impossible.

But a sad change is that the old H10 building no longer exists. Albeit, it's great to see that a tall new hostel with extra floors is being built in its place to house the ever-increasing number of women students at IITB. Also, Project Evergreen - the alumni-led project to fund, design, and build a complex of 3 hostels on campus – includes one hostel predominantly for women students.

I also feel really proud when I hear about some of the initiatives that the Institute has taken toward gender equality and inclusion – I think our Insti is leading the way for many others in India, though there is a lot more to be accomplished. Examples of such initiatives include the compulsory online course on gender equality, the various diversity groups set up for LGBTQ students, etc.

Another change that has improved the quality of life on campus is the expansion in the number and types of places to eat and the freedom it gives students from mess food. Although, I have heard (as-yet-unsubstantiated) rumours that the mess food has improved over the years. Though our dear old Chinkos no longer exists, it's been replaced by Gulmohar Café, even as the number of eating options outside campus has exploded.

The other change I've seen from my student days is the expansion of the BSBE (Biosciences and Bio-Engineering) Department. During my time volunteering for the Healthcare SIG of IITBAA I found that faculty and students across multiple departments are now engaged in initiatives in the Healthcare and Life Sciences domain.

It's also been great to see an increased focus on facilitating interaction between industry and research, as well as supporting start-ups in scaling their businesses. BETiC and SINE, the two incubators on campus, do a great job of identifying ideas with potential and nurturing start-ups. As one of the core group members of the Healthcare SIG of IITBAA, it's been a great experience collaborating with SINE, BETiC, and the BSBE Dept. for various workshops, events, etc.



**Q. You are one of IIT Bombay's most involved alumni. You've been the co-lead of Healthcare SIG, and you're a board member of IITBAA, among others. Why is giving back to your alma mater so important to you?**



I think of my years on campus as a transformative period, one in which I learnt a lot, came out of my shell, spread my wings, and learnt to fly unaided. The bonds of friendship made during those years have stood the test of time and have only grown stronger. The respect for logic and reason that were instilled in me as a student at IITB, as well as the varied life lessons I learned here, have proven to be invaluable.

IIT Bombay has had a tremendous influence in making me the person I am today. Volunteering and giving back to the Insti is, therefore, my way of saying Thank You to my alma mater which has given me so much. It also gives me an opportunity to stay connected with the Institute and the faculty, and to learn about new initiatives on campus, etc.

I've always been conscious of the fact that my education was heavily subsidised and we only paid a fraction of the actual cost to the Insti. So, giving back to my alma mater now is one way of trying to pay back a small portion of that debt, too.

Additionally, I have to confess that I volunteer my time on so many initiatives because it's often a lot of fun to do so. Through IITBAA and its initiatives, I've got to know so many alumni that I would otherwise never have interacted with, some of whom are now good friends.

**Q: We've recently started a campaign called "Stay Connected" for our alumni community. Many alumni members lost touch with their alma mater. As one of our most active alumni members, can you share with them the importance of being and staying connected to their alma mater?**

This question I can opine on, since I, myself, was out of touch with IITB for close to 16 years after graduation. One simple reason to stay in touch with IITB is that revisiting campus after being away for a long period of time is an incredibly energising and joyous experience, apart from allowing alumni to take a trip down memory lane. IITB's campus has a completely different vibe, and it's difficult to be immune to it.

While my professional life is far removed from research in science and technology, I've found the information in the campus newsletters to be very interesting. It's reassuring to know that while I'm focused on mundane things such as developing P&Ls and marketing plans, someone, somewhere, is working on developing nanomaterials that deliver targeted chemotherapy, or developing scaffolding that helps regenerate bone at the site of injury and slowly degrades within the body over time (the scaffolding, I mean, not the bone!). It's quite exciting to hear news about the start-ups at SINE, or the progress that one of the applications developed at BETiC – the Ayu stethoscope, for instance – has made.



Staying connected to my alma mater and the larger alumni community is also a way to reconnect with old friends and make new ones. Or, if you're the purpose-driven networking type of person and wish to connect with like-minded folks in similar fields to share information or bounce off ideas. As a friend of mine likes to say, Google still doesn't have all the answers and personal connections cannot be replaced.

**Q. What are your future ambitions and goals – both personally and for the Institute?**

Frankly, there are too many personal ambitions and goals for me to get into here but let me list just a few of those I'd like to see the Insti achieve:

- 1) Someone from IITB – a professor or an alumna - should win a Nobel Prize
- 2) The Insti should be known as one of the top engineering colleges in the world
- 3) I want to see a woman be the director of IITB someday



4) A lot more collaboration between Industry and Institute, and a lot more research ideas that become commercially successful



What a wonderful end to our two-part conversation series. We hope that every single one of Ms. Driver's dreams for her beloved Insti comes true. We'd like to thank Ms. Driver, not just for taking the time to speak with us, but also for her incredible dedication and service to her alma mater despite leading a hectic life. Thanks, again, Ms. Driver.

## INNOVATIVE PRODUCT AND TECHNOLOGY



### **Biomedical Engineering and Technology Innovation Centre (BETIC)**

Medical devices are critical for healthcare. Local and indigenous development of novel, suitable, reliable, and affordable medical devices change lives and impact the world around us, even as they create new jobs.

Since its inception in 2014 at IIT Bombay, the Biomedical Engineering and Technology Innovation Centre (BETIC) has built an ecosystem which is essential to develop local medical devices by connecting the key stakeholders in the medical and healthcare industry – government, academia, medical community, industry, investors and facilitators. Over the past few years, the team has met with several hundred doctors, identified over 400 unmet needs, created 200 novel concepts, and filed 50 patents. They've also developed 20 devices, incubated 15 start-ups, licensed five items to industry, and launched a few products directly into the marketplace.

The following start-up that BETIC supports reflect its core vision – which is to create global success stories of indigenous medical devices by providing the necessary guidance and reinforcement needed to med-tech innovators.



### **Bicondylar screw manufactured in SS 316L and successfully used in tibial articular surgery**

Ession Screw

Inventors' name: Mr. Rupesh Ghyar, Prof. B. Ravi, Mr. Suresh Deshpande

Technology/ Product: A bi-compression screw for bicondylar fractures. "A device to provide rigid compression, early weight-bearing capability and early union to fractured tibial bones."

The tibial plateau fractures affect knee alignment, stability, and motion-capability of the legs. Based on the nature of the fracture and where it's located, external or internal fixators hold the bone pieces together until it heals. In internal fixation, plates and screws transfer the load from one fragment to another, allowing the fracture to heal rapidly. The plate and screw sizes are usually limited, due to the anatomical space available within the site of the fracture and the loading of the bone. In conventional cases, where cancellous screws are used, compression is achieved by pressing the condyle with the screw head from one direction and pulling it by way of the thread purchase in the bone on the other. Also, the screw purchase within a bone loosens over a period of time. In addition, early load-bearing capacity also gets reduced until mechanical stability is achieved.

Dr. Suresh Deshpande, Swarup Hospital, Kolhapur, posed the need for an improved screw for bicondylar fractures. BETIC's bi-directional compression ESSION screw designed for bicondylar fractures provides rigid compression from the opposite direction by forming a lock between the two screw heads. It enables cortical compression of the tibial articular fracture instead of reduction by screw, which depends on porous cancellous purchase. The ESSION screw also allows for early weight-bearing capability and brings about a union of the fractured tibial bones.

## **NEWS FROM IITB BOMBAY**



### **IIT Bombay Alumnus Dr. Arun Majumdar named the first Dean of Stanford Doerr School of Sustainability**

IIT Bombay alumnus Dr. Arun Majumdar has been appointed the introductory Dean of Stanford University's new climate change school – the Stanford Doerr School of Sustainability. The school's mission is to mitigate critical issues facing the world from global climate change and sustainability. It will collaborate with external organisations to co-develop innovative solutions and identify new insights through education and research.

Dr. Majumdar completed his B.Tech. in Mechanical Engineering in 1985 from IIT Bombay. He is currently the Jay Precourt Provostial Chair Professor, a faculty member of the Departments of Mechanical Engineering and Materials Science and Engineering, and Senior Fellow and former director of the Precourt Institute for Energy.



### **The Interdisciplinary Programme in Climate Studies (IDPCS) turns 10 this year**

The inaugural ceremony of the year-long anniversary celebrations for the Interdisciplinary Programme in Climate Studies (IDPCS) was held on May 2, 2022, at IIT Bombay.

The Honourable Dr. M Ravichandran, Secretary, Ministry of Earth Sciences Government of India was the chief guest at the occasion. Other special guests included Dr. Akhilesh Gupta (Senior Adviser, @Department of Science and Technology, Government of India), Dr. Nisha Mendiratta (Head, CCP-SPLICE, DST), and Shri. K. S. Hosalikar (Head, Climate Research and Services, India Meteorological Department Pune).



### **First Chair Professorship in Climate Studies to be established at IIT Bombay**

IIT Bombay signed a Memorandum of Understanding (MoU) with its alumni Ms. Vinaya Kapoor (B.Tech., Chemical Engineering, 1992) and Mr. Samir Kapoor (B.Tech., Electrical Engineering, 1992) to establish the first Chair Professorship in Climate Studies titled "Vinaya and Samir Kapoor Chair in Climate Studies," on March 29,

2022. The Chair's vision for IIT Bombay is to be recognized as a thought-leader in interdisciplinary climate studies by pursuing transformative R&D, engaging consistently with undergraduates, and collaborating with industry.

The Chair will enable path-breaking research at IIT Bombay in climate studies, devise sustainable solutions for the ongoing climate crisis, and encourage more undergraduate students to engage with its IDPCS [Interdisciplinary Programme (IDP) in Climate Studies]. The Chair will play a key role in encouraging IIT Bombay's participation in state, national and international bodies on climate change assessment and/or mitigation. It will also enable active collaboration between the Institute, industry, international networks, and

government organisations for R&D, policy dialogues, and commercialisation of climate solutions and technologies.



### **FAN 2022 held at Ohio State University**

The much-awaited 2022 edition of the FAN (Faculty Alumni Network) meeting, hosted by IIT Bombay in collaboration with Ohio State University, USA was held on May 14 and proved to be a huge success. The event featured compelling and thought-provoking talks, discussions, and panel sessions on emerging areas of research in science and technology by esteemed dignitaries from all over the

world



### **Invention Factory launched at IIT Bombay**

IIT Bombay is pleased to announce the launch of the Invention Factory program. This six-week program brings together students from IITs all across India and gives them a unique opportunity to invent products of their choice. Students will work together in teams and compete for a substantial cash award. The “Best Inventions” will be determined by an illustrious panel of judges to ensure that the

functioning prototypes meet an important societal or consumer need.

The event originated in the US and was conducted by IIT Gandhinagar for the past two summers under the name Invent@IITGN. For the first time this year, IIT Bombay will conduct the program as Invention Factory® @IITB under the name Invent@IITB.

The program, beginning May 18, 2022, will include fun ice breaker and training sessions during its first week where students will learn how to operate 3D printers and laser technology. The following weeks will see the students developing their prototypes. The program ends on July 1, 2022, when the winners of the program will be announced. At the end of the program, all the prototypes developed by the students will be patented.

## **INSTITUTE HIGHLIGHTS**



### **Team Shunya from IIT Bombay wins \$50,000 to build a sustainable house**

IIT Bombay’s student technical team, Team Shunya, worked on sustainable housing solutions and won a funding award of \$50,000, and moved on to the build phase of the US Solar Decathlon Build Challenge 2023. The team designed Project Vivaan, a net-zero energy, net-zero carbon, and net-zero water house.

Project Vivaan was presented by the team in the competition event on April 23 & 24, 2022, at Golden Colorado, USA. Out of the 32 teams that participated in the design phase of the competition, 16 teams proceeded to the next round, with Team Shunya being the only Indian team among those shortlisted. Team Shunya also received the Globetrotter Award for the farthest distance travelled.

Team Shunya comprises a team of 50+ students working under the guidance of 8 professors from different departments of IIT Bombay. The Project Vivaan water house will be constructed over the next six months and demonstrate sustainable housing concepts to the world.





## IIT Bombay student wins the Best Poster Presentation award from HOPE

Tathagata Pal, a Ph.D. student from IIT Bombay, and his guide Prof. Soumyo Mukherji Pal received the Best Poster Presentation award from the Housing Opportunities and Prevention of Evictions Program (HOPE) program. Meetings for HOPE have been organized by the Japan Society for the Promotion of Science since 2008.

The HOPE meetings showcase the promise shown by brilliant young researchers and doctoral students from countries in the Asia-Pacific and Africa region. The meetings also allow them to have conversations with distinguished scientists and engage in interdisciplinary discussions with Nobel laureates from all over the world.



## IIT Bombay and IITBHF, Boston Chapter, host Interactive Session

IIT Bombay held an alumni interactive session in Boston, USA, in collaboration with the IIT Bombay Heritage Foundation, Boston Chapter, on May 19, 2022. A significant number of alumni members between 1966 and 2021 attended the session.

Prof. Subhasis Chaudhuri, Director, IIT Bombay, addressed the session and reiterated the Institute's commitment to alleviating critical global challenges such as healthcare and climate change. The many interactions during the session generated several new ideas and identified opportunities to strengthen alumni's participation in the growth of the Institute.

Later in the evening, the informal dinner session turned nostalgic as alumni members socialised and reminisced about their student lives at their beloved alma mater and, later, committed to supporting IIT Bombay's vision.



## Café 92 is finally open to the IIT Bombay community

Café 92 finally opened its doors to the IIT Bombay community on May 17, 2022.

Located close to IIT Bombay's main building, this brand-new eatery is surrounded by lush green trees and nestles amidst a wonderfully scenic locale on campus. Café 92 is named after IIT Bombay's class of '92 whose generous donation to their alma mater has ensured that the Institute has one more hangout joint for everyone to enjoy on campus

and offers a variety of continental, Indian, and fast food.

## TECH NUGGETS

### Dastur Energy Signs Pact with Advanced Resources International, IIT Bombay

Dastur Energy Pvt. Ltd. India has tied up with Advanced Resources International and IIT Bombay for geological mapping to enable large-scale storage of carbon dioxide in the country.

With the technical expertise and know-how of Advanced Resources International and IIT Bombay, the company will create large storage maps, which will enable the effective storage of carbon dioxide.

Advanced Resources International (ARI) is a consulting, research, and development firm providing services related to unconventional gas (gas shales, coalbed methane, and tight sands), enhanced oil recovery (EOR), and carbon capture, utilisation, and storage (CCUS).

## UPCOMING EVENTS





## Corporate Social Responsibility (CSR) conclave

The Corporate Social Responsibility (CSR) conclave will be held at IIT Bombay on July 6, 2022. The CSR conclave will serve as an opportunity for socially conscious corporates to partner with IIT Bombay on several pioneering projects the university is undertaking to address wide-ranging national and global challenges.

The CSR conclave aims to enable corporates to sharpen their CSR strategies while also helping to make their outcomes more impactful and measurable. It will also showcase cutting-edge research and infrastructure projects by IIT Bombay in the areas of climate change, health sciences, and energy, amongst many others.

Day & Date: July 6, 2022

Time: TBA

Venue: IIT Bombay



## Civil Services Reunion

IIT Bombay is organizing a two/three-day reunion for our alumni members who are part of the Indian Civil Services. The festivities planned are a way for our alumni to relive their journeys at IIT Bombay, get reacquainted with their peers and hostel buddies, visit their favourite hangout spots on campus, and participate in the many fun activities organised by the IIT Bombay community.

Day & Date: July 8, 9 and 10, 2022

Time: TBA

Venue: IIT Bombay



## Inauguration of Rahul Bajaj Technology Innovation Centre

The Director, Indian Institute of Technology Bombay cordially invites you to the "Inauguration of Rahul Bajaj Technology Innovation Centre" by Chief Guest : Dr. R.A. Mashelkar , Former Director General, CSIR & President, Indian National Science Academy, National Innovation Foundation, Global Research

Alliance in presence of Bajaj Family Members

Day & Date: Saturday, June 10, 2022

Time: 11:30 AM

Venue: Prof. B. Nag Auditorium, VMCC, IIT Bombay



## Tinkerer's Lab Inauguration

The Department of Chemical Engineering, IIT Bombay, has created a unique space for students called the Tinkerer's Lab where they can nurture their curiosity, build experiments, test/verify a hypothesis, innovate and develop solutions based on engineering principles on a smaller scale. The Lab is funded by Alkyl Amines CSR and will be inaugurated on June 13, 2022. The chief guest for the event is Padma Vibhushan awardee, Shri M.

M. Sharma.

Day & Date: Monday, June 13, 2022

Time: 11.00 am to 12.00 pm

Venue: IIT Bombay

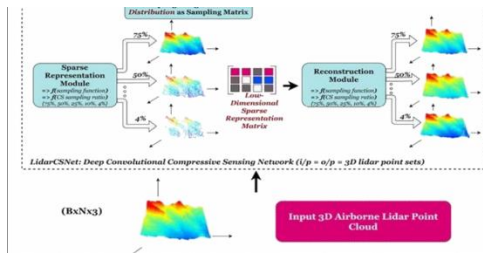
# STUDENT RESEARCH ARTICLE

## 3D Dense Reconstruction of Lidar Point Cloud from Samples: A Deep Learning Application

Name: Rajat Shinde

Department: CSRE

Program: Ph.D.



Year of study: 4

Name of supervisor: Prof. Surya S Durbha

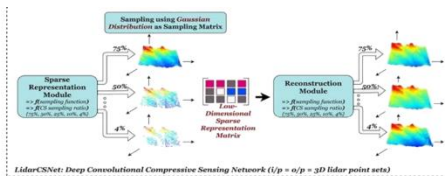
Research Topic: Compressive Sensing based 3D LiDAR Point Cloud Reconstruction and Classification

Previously Published: This work is published in the ISPRS Journal of Photogrammetry and Remote Sensing, currently the #1 ranked journal in the Physical Geography domain, and is available to read here.

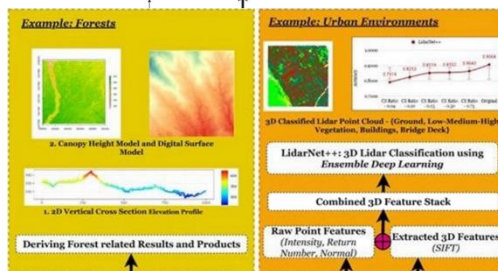
Have you ever wondered how amazing it would be to reconstruct an entire 3D point cloud based on very few measurements? Imagine, an airborne platform scanning overhead, capturing a bare minimum of measurements, and transmitting them to the processing facility. Subsequently, the reconstruction of the entire 3D point cloud is accomplished with near-perfect accuracy based on just those few measurements. You might wonder if this is possible? And the answer is yes, it is, indeed, possible.

A group of researchers from the GeoComputational Systems and IoT Research Group at the Centre of Studies in Resources Engineering, IIT Bombay, recently proposed a Deep Learning-based scalable approach for near-perfect reconstruction of 3D airborne lidar point clouds based on a few samples. The number of samples constituted is between 4% to 75% of the original number of points in the lidar point clouds

### How does this work?



Compressive Sensing is a signal processing technique enabling near-perfect reconstruction of the data based on very few (fewer than required for Nyquist-Shannon Sampling theorem-based reconstruction) measurements if the data is sparse enough or shows sparsity in a transformed domain.



Compressive Sensing works on optimizing the sparse nature of the measurements based on necessary mathematical conditions on the sampling matrix for near-perfect reconstruction. In their research paper, the authors implement a Deep Learning-based architecture, named LidarCSNet to utilize the inherent sparsity and redundancy present in the lidar file format. The authors test the efficacy of the proposed LidarCSNet for real-world lidar point clouds acquired for forest and urban environments.

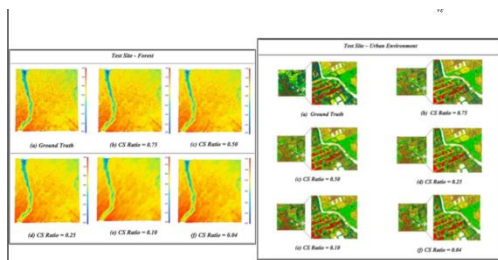


Figure: Illustration of 3D reconstruction results for samples generated from the 3D lidar scenes based on different sampling ratios

The work includes comprehensive evaluation based on 3D reconstruction and lidar-derived products such as Canopy Height Model (CHM) & 2D Vertical Elevation Profile for the forest domain and 3D classification for the urban environment. The 3D classification is implemented as a novel Deep Learning-based architecture named LidarNet++ which includes unclassified lidar point clouds and generates a 3D classified scene with ground, buildings, low vegetation, medium vegetation, high vegetation, and a bridge deck.



## Deep Learning for Point Cloud Processing

With the rapid advancement in processing capability and deep learning paradigms, it is now possible to explore big data for generating inferences. This has immense potential across various application domains. A Deep Learning framework comprises dense stacked layers performing convolutional operations for automated feature extraction and is scalable, as it allows the processing of big lidar data acquired over a large area of study in one go.

It is challenging to design a Deep Learning architecture for 3D point clouds because of the unstructured nature of lidar point clouds and their heterogeneous data model as pointsets. For instance, the same tree can comprise 2000 to 20000 points based on the resolution of the lidar scanner. The authors overcame this challenge by performing convolutions over point sets and, thus, passing the automatically extracted features over the subsequent layers and postulating the iterative compressed sensing approach as an end-to-end deep learning objective.

The authors believe that the findings have immense potential to be used in applications across the forestry and agriculture domains and have autonomous mobility as well. Also, it could be used for dense reconstruction of 3D point cloud data which is very useful for 3D computer vision applications and in overcoming data inconsistency while lidar scanning.

For more details, readers can read the original research article [here](#) and reach out to the authors for more details and feedback.

## ORBITUARY



In Honour of Dr. Arun Netravali

Dr. Arun Netravali, an Indian-American technological genius and a Distinguished Alumnus of IIT Bombay, sadly passed away on November 4th, 2021, in Dallas, USA.

Dr. Arun Netravali was born in Ankola, Karnataka (1946), and grew up in Mumbai. After five years of study in a municipal school, he joined King George High School and later Elphinstone College. He graduated from the Department of Electrical Engineering, IIT Bombay, in 1967 and completed his M.S. and Ph.D. at Rice University, Houston, Texas (1971). Dr. Netravali was also conferred with an honorary doctorate by the Ecole Polytechnique Federale, Lausanne, Switzerland.

An electrical engineer by profession, Dr. Netravali worked in NASA during his initial years before moving to Bell Laboratories, one of the best high-tech labs in the world. He became the ninth president of Bell Laboratories from (1999 – 2001) and later switched to Lucent Technologies as its Chief Scientist (2002-2003). During his tenure at Bell Laboratories, Dr. Netravali was instrumental in the rapid increase in innovations and led the grand alliance to develop High-Definition Television (HDTV) in the USA, which resulted in benefits for all in the community. Later, in 2003, he served as Managing Partner at Omni Capital and was director of various companies, including Agere Systems, Level 3 Communications, and LSI Logic. He authored over 170 technical papers and was an inventor on more than 70 patents. Dr. Netravali held the position of Adjunct Professor at the Massachusetts Institute of Technology and taught graduate courses at City College (New York), Columbia University, and Rutgers University. He received several honours, including the Padma Bhushan from the President of India, the National Medal of Technology from the President of the US, and the Marconi Prize for his contributions to digital video systems and services.

Dr. Netravali was a loving husband to Dr. Chitra Netravali and a doting father to their children, Ilka and Ravi. Ilka completed her M.D. and Ph.D. from Harvard Medical School, while Ravi did his Ph.D. from the Massachusetts Institute of Technology and currently teaches at Princeton University.

IIT Bombay mourns the passing away of Dr. Arun Netravali. He leaves behind a rich legacy of pioneering research and development projects and numerous technological breakthroughs in digital technology, such as digital video research and high-definition television. He dedicated his whole life to innovating and contributing to ground-breaking technologies that had the potential to transform human lives. Our deepest condolences go out to his family members. May his soul rest in eternal peace.