IIT PALAKKAD

Industry Academia Conclave 4.0

2022 Edition

Index

Overview

The 4th edition of the Industry Academia Conclave was conducted on August 13th, 2022 at the Nila Campus of IIT Palakkad. There were around 27 delegates across industry and academia in attendance. This year's IAC was conducted in offline mode for the first time in 2 years owing to the COVID-19 pandemic.

The program was inaugurated in the Agora auditorium with a lamp lighting ceremony followed by the Presidential address delivered by Dr Sovan Lal Das, Dean Academics,Associate Professor, IIT Palakkad. This was followed by the institute presentation delivered by Dr Santhakumar Mohan, Dean ICSR, Associate Professor, IIT Palakkad.

Then it was time for the keynote speeches by our guest speakers Mr Vibin Aravindakshan and Professor K P Ramachandran. This was followed by a poster presentation by the students showcasing their projects and research work to the delegates. Parallely, there was also a showcase of the incubates guided by the institute and their work.

Taking advantage of the offline mode of the IAC, the delegates were then taken on a tour of the campus showing the extensive laboratories and facilities provided by the institute for research and development. The tour was led by both professors and students, who were under the guidance of Dr Sanjukta Chakraborty. The delegates toured the laboratories and facilities in the Ahalia campus and the Nila campus. They also visited the site of the permanent campus.

Post lunch, it was time for the department-wise talks. Each department had a separate venue for attending the talks and some talks were held online. The IIT Palakkad community was encouraged to attend the talks to improve their knowledge about the current trends, problems and requirements of the industries and to establish a connection between academia and industry.

In the evening, the IAC came to an end with a closing ceremony.

The IAC 4.0 was a success as the attendees had walked away with a plethora of knowledge imparted by the industry delegates and the academicians. .

KEYNOTE SPEECHES

Keynote speech 1

The first keynote speaker was Mr Vibin Aravindakshan, Founder and CEO, FitSaga and former Director of product management at Salesforce. A veteran in product management, he spoke about 'Building skills relevant to industries while at university'. He started out by discussing the objectives of any company in general, among which he told that the maximization of shareholder wealth was the main one. He then spoke about the characteristics/persona of industries, which includes features like exploitation, adaptability, organization, shorter horizon view, and outcome driven nature of industries. He also gave us a detailed insight into what should students build for a career in industry.

Mr Vibin then explained to what extent are the things like coursework, CGPA, Research, soft skills, leadership and communication skills are important in getting a good career in industry. He mentioned that while the coursework helps in building the fundamentals, it alone is not sufficient and that CGPA is usually just a credibility for fit; it is important that we good and relevant experience. He mentioned that observation, experimentation, systematic work and the ability to do hypothesis testing are required.

Mr Vibin also highlighted the importance of teamwork, which requires us to earn trust, develop the ability to communicate well, meet expectations and set expectations and gave some real-life examples. The examples were an actual problem at work for a Material Science Engineer and an interview problem for a consultant. Using these examples, he stressed the importance of critical thinking, and explaining how we should logically break down a problem into fundamental questions and try to solve it by making necessary assumptions, hypothesis, etc. He concluded his talk by giving the message 'be passionate, and keep a scientific mindset'. The talk ended with a Q&A session.

Keynote speech 2

The second keynote speaker was Professor K P Ramachandran, Dean of Industry Relations and Research, National University of Science & Technology, Oman.

In his talk, Professor Ramachandran gave insights into the current research and development in industries, industry linkage between China and Japan, and the connection between academia and industry. He mentioned that with many fields becoming multidisciplinary there's increasing need for multisystem understanding and different ways the industry engages universities. He discussed this connection from a university's perspective, taking into picture both staff and students.

Professor Ramachandran remarked that although industry and academia have different goals and purposes, this link between academia and industry invokes creative thinking among students and also helps with their recruitment. The talk ended with a Q&A session.

CIVIL ENGINEERING

SURAT METRO RAIL PROJECT

The first speaker for the department of Civil Engineering was Dr Saibaba Ankala, ex-Chief Engineer, Indian Railways, who provided interesting insights and details on the Surat Metro Rail Project. He went over exciting topics such as the vision of the Indian Railways, solar-powered trains and stations, and the adoption of Japanese bullet train technology. Additionally, he explained the components of bridges and how they are constructed differently in various locations such as rivers, land, and hilly areas. He also addressed the reasons behind the serpentine design of bridges. He shared his wealth of experience in construction, discussing the challenges posed by soil and rocks. Finally, Dr Ankala showcased drone photography and time-lapse videos to illustrate the construction process, concluding with an explanation of the advantages of drone inspection.

ULCCS Ltd.

Dr Arun Emmanuel, ULCCS Ltd., delivered the second talk touching upon collaboration between industry and academia, as well as state-specific obstacles to infrastructure development. Dr Emmanuel currently leads the Technology, Skilling, and Research division of ULCCS Ltd., and was a Project Scientist for a global research project on Limestone Calcined Clay Cement (LC^3).

Dr Emmanuel highlighted the development of LC^3, a low-cost and low-carbon cement resulting from the global research project he was involved in. Emphasizing the importance of sustainable and environmentally friendly building materials, he discussed potential applications of LC^3 in the construction industry.

Dr Emmanuel further elaborated on the scope for collaboration between academia and the construction industry. He stressed the need for bridging the gap between theoretical knowledge and practical implementation. He explored potential avenues for partnerships, research collaborations, and knowledge exchange to encourage innovation in the construction sector.

Addressing the specific context of Kerala, Dr Emmanuel elucidated the infrastructure
development challenges faced in the region. He discussed the unique geographical and
environmental factors affecting construction projects in the state. The presentation briefly described strategies to overcome these issues and ensure sustainable development.

Dr Emmanuel concluded his talk by introducing ULCCS Ltd. (Uralungal Labour Contract Co-Operative Society Limited), an organization that he currently leads. ULCCS is involved in over 7,500 projects across Kerala, contributing significantly to the construction industry. He shared details about the organization's mission, vision, and notable achievements - emphasizing their commitment to quality and sustainability. There was a brief Q&A session.

LARSEN & TOUBRO Ltd.

The third speaker was Dr Amarnath, L&T Ltd., who talked about digital transformation strategies in civil engineering, focusing on Building Information Modeling (BIM), 3D printing, drones, IoT construction automation, and prefab construction.

He discussed the implementation of BIM in India through the India BIM Association, highlighted infrastructure projects and countries adopting BIM, and shared information about skill development initiatives in India. Dr Amarnath also showcased how L&T Construction benefits from

implementing BIM. The talk concluded with images of L&T Construction's buildings and factories, along with a summary of the specific advantages of BIM in Metro projects.

INSTITUTION OF STRUCTURAL ENGINEERS

The fourth speaker was Mr. Harikrishnan Panikkaveettil, a chartered structural engineer affiliated with the Institution of Structural Engineers in London, delivered a presentation on the Institution and its offerings.

Mr. Panikkaveettil provided a brief overview of the Institution of Structural Engineers, underlining its role in promoting excellence in the field of structural engineering. He laid emphasis on the importance of professional membership and described the professional development resources available to members.

Mr. Panikkaveettil discussed the Certificate in Structural Behaviour, a program offered by the Institution. He provided detailed information about the structure and content of the program, explaining how interested individuals could participate. The presentation highlighted the benefits of acquiring this certification and its relevance in the industry.

Concluding his presentation, Mr. Panikkaveettil underscored the benefits of student membership in the Institution of Structural Engineers. He elaborated on the resources, networking opportunities, and career advantages that students stood to gain through membership. The talk ended with a Q&A session.

COMPUTER SCIENCE AND ENGINEERING

CONTINENTAL

The first talk for the department of Computer Science and Engineering was delivered by Dr Srividhya K from Continental. She spoke about Continental Automotive, which focuses on developing autonomous driving technologies to reduce the number of casualties on roads. According to statistics, road accidents are globally responsible for roughly 1.35 million deaths and 50 million injuries annually. The 'Vision Zero' strategy aims to bring these numbers down to zero.

To make this vision a success, Dr Srividhya explained how the company wants to increase vehicular penetration of autonomous driving technologies. Sensors, cameras, and radar systems provide vehicles with a comprehensive view of their surroundings - making autonomous driving possible. Some of the components that Continental Automotive deals with include front cameras, smart cameras, satellite cameras, long and short-range radar, LiDAR, and surround view cameras.

She talked about the MFC500, which is a multi-functional mono camera developed by Continental. The company has also built the FSC2(3)x-front satellite camera, which is high resolution, long-range, and has a scalable field of view. These cameras make object detection and tracking possible.

Dr Srividhya spoke about the perception stack used by Continental Automotive which consists of various two-dimensional and three-dimensional pipelines. These generally begin with object detection, followed up with object tracking. Classification and segmentation tasks are performed afterwards.

She then moved to explaining the concept of object detection. Object detection is the process of locating objects in an image or video frame. In

the context of autonomous driving, it is often used to find vehicles and obstacles present on the road. One-stage object detection techniques such as YOLO are lightweight and thus more suitable for embedded systems within vehicles, compared to two-stage object detection models such as R-CNNs. Object tracking deals with tracing identified objects across multiple frames to interpret their trajectories. A variety of filters, LSTMs, RNNs and other deep learning models apply to this task. Object classification involves predicting the type or class of an object in an image. Convolutional Neural Networks (CNNs) find popularity here. During segmentation, each pixel in an image is classified as belonging to a particular label.

She also explained how metrics such as mean average price and average precision-recall curves are used to evaluate the performance of autonomous driving systems.

Dr Srividhya then gave a brief overview of some of Continental Automotive's products. Continental's surround view system provides a high field of view using fish-eye cameras. The company has also developed rear-view and parking assist systems. In-cabin sensing is another critical area of focus, which includes occupancy detection, child presence detection, thermal cameras, and vital sign monitoring.

The company also markets driving features such as Emergency Brake Assist (EBA), Lane Change Assist (LCA), Adaptive Cruise Control (ACC), Stop and Go (S&G), Headlight Assist (HLA), and Lane Departure Warning (LDW).

She concluded her presentation, remarking that autonomous driving is an exciting space with numerous areas to explore and many research problems waiting to be solved. The talk ended with a brief Q&A session.

ATOLL

The second speaker, Mr Sumit Dev from Atoll, delivered an informative presentation covering The Internet of Things (IoT) and location intelligence.

He started with a summary of various IoT technologies. Sensors such as GPS, infrared (IR), ultrasound, sound, and many more are used for data collection. Each type of sensor has its strengths and weaknesses. For instance, GPSes are ineffective in enclosed spaces and IR sensors are short-ranged and have privacy implications. Mr Sumit then explained that many tradeoffs need to be considered while deploying sensors, including affordability, ease of maintenance, reliability and accuracy. For example, RFID is well-established, but the sophisticated hardware and software it requires can make costs prohibitive. Bluetooth is ubiquitous but may have problems with pinpointing locations accurately. Ultra-wideband (UWB) technology is precise and powerful but has issues with interoperability.

The incoming data from sensors then needs to be processed - which involves rejecting outliers, removing noise, and applying appropriate filters.

Mr Sumit then talked about location intelligence, reference frames, lateration and triangulation techniques. Location intelligence entails understanding when, where and how an event or activity occurs. Determining the position of objects in space forms an important part of location intelligence. Both absolute and relative reference frames are used to establish positions. Mr Sumit explained that multiple anchors (i.e. sensing nodes placed at various known locations) are often used to determine an object's location. Subsequently, trilateration, multilateration, or triangulation techniques can be employed. Trilateration involves measuring the time of arrival of signals from multiple anchors, while multilateration involves measuring the time difference of arrival of signals from multiple anchors. Triangulation

involves measuring the angle of arrival of signals from multiple anchors.

Finally, Mr Sumit talked about sensor fusion, where data from multiple sensors are combined to improve accuracy and reliability. He also added that machine learning algorithms can learn from the data collected by the sensors, allowing systems to improve over time. He concluded his talk with a brief Q&A session with the audience.

MICROSOFT

The third speaker, Sachin Sharma, Director of Product at Microsoft Edge, has had an extensive career path in the IT industry - taking up the mantle of a developer, system analyst/team lead, project manager, delivery manager, and a program manager. His presentation highlighted the roles and responsibilities of product managers in IT.

In an IT organization, program managers are responsible for translating business requirements into engineering and bringing software products to market for different sets of people. Product managers (PMs), on the other hand, have end-to-end responsibilities for the product. They focus on identifying target markets, defining the value proposition, and ensuring that their product meets the needs of the users.

Mr Sharma then stated that the goal of every product manager is to achieve product-market fit, which means that the product solves a core need for the identified set of users. To achieve product-market fit, a deep understanding of users and their needs is critical. PMs need to be able to identify the solutions that will address those needs and bring them to market. This involves working with various teams such as design, engineering, and data. Product managers are also responsible for defining the product roadmap and prioritizing features based on customer feedback and market trends. They work closely with technical program managers to ensure that features are implemented timely and effectively.

Overall, the role of a product manager is to ensure that the product meets the needs of the users and the market and to guide the product through its entire lifecycle, from ideation to launch and beyond.

Mr Sharma concluded his talk by stressing the importance of soft skills in the industry, especially for aspiring product managers. He encouraged the audience to explore careers such as software engineering and product management, noting that there is increasing demand for talent in these spaces. The talk concluded with a Q&A session.

MULTICOREWARE

The next session was a common session for the Computer Science Engineering department and the Electrical Engineering department. The talk was delivered by Nathiya Sengodan and Vinod Kannan from Multicoreware, a company that works on various software intellectual properties (software IPs) and services.

Multicoreware's platform group focuses on compiler and tool development. They are also concerned about microarchitecture-aware optimisations on the AI/ML technology stack. This involves taking advantage of specialised hardware such as artificial intelligence (AI) accelerators and Neural Processing Units (NPUs) to create performant AI/ML applications.

AI accelerators are hardware components designed specifically to speed up the processing of AI and ML applications. NPUs are specialized microprocessors that focus on executing AI tasks at a high speed while consuming minimal power. They are designed to handle the compute-intensive tasks that are necessary to train and run neural network models. This is achieved through the use of a dedicated processing engine that can execute large numbers of parallel operations simultaneously.

The speakers underlined that there is a growing demand for professionals with expertise in designing and optimizing AI systems around these specialized hardware units.

The company is also working on software accelerator libraries that contain optimizations for their hardware. In addition to working on compilers and accelerators, the group develops tools for debugging and profiling ML code. These tools can help developers identify and correct errors in their code, as well as find ways to improve performance - making it easier for developers to create efficient ML code that runs quickly and smoothly on a variety of hardware platforms.

The talk concluded with a mention of Multicoreware's collaborative efforts with IIT Palakkad - with reinforcement learning being a key area of focus. There was a brief Q&A session after the talk.

ELECTRICAL ENGINEERING

The talks for the department of Electrical engineering began with a joint session for Electrical engineering and Mechanical engineering by Bosch. The summary of this talk can be found under the Mechanical Engineering talks.

TEXAS INSTRUMENTS

The first talk exclusive to the department of Electrical engineering was delivered by Mr. Ketan Sharma, an Analog Engineer who designs medical Integrated Circuits at Texas Instruments. His talk was about the journey of medical imaging devices in Texas Instruments India. He elaborated on the importance of such devices, and in specific discussed ultrasound transmitters. Mr. Sharma described the method for designing a medical ultrasound system in a stepwise manner, which were - understanding customer requirements, defining specifications, designing, performance verification, and different types of validation. This was then followed by a brief overview of the receive signal chain in medical ultrasound systems. The process outlined by Mr. Sharma ensured that a particular medical device meets the required performance standards and specifications. The talk concluded with a brief Q&A session.

INTEL

The second speaker, Mr Suresh, from Intel, talked about the drought in chips globally, despite the expected rise in the semiconductor market and mentioned several reasons for this shortage, e.g., the COVID-19 pandemic. He emphasized on the need to design products with availability in mind, and also increase production capacity in order to alleviate the shortage in chips.

The speaker then stated that although there are ways to deal with the issue, a number of challenges accompany them, such as fabrication

costs, resource inefficiency, and lack of young talent specializing in the domain. He concluded the talk by stressing on making efforts to best these hurdles, one way mentioned was to invest in the future generation of talent. There was a Q&A session after the talk.

GENERAL ELECTRIC

The third talk was delivered by Dr Rajesh Langoju, from GE, who addressed the challenges faced by imaging systems in increasing resolution and coverage while reducing radiation dose, computational time, and costs. He talked about the pivotal role of AI in dosage management, resolution enhancement, artifact management and regarding noise as a side effect of attempting to reduce radiation doses. The speaker highlighted GE's deep learning-based approach to reducing noise artifacts - True Fidelity, and a couple of other effective methods - Noise2Noise and Noise2Void. He concluded the talk by discussing the tradeoffs involved in CT imaging, and the importance of maintaining high-quality detectors. Dr Rajesh also brought to light the enormous potential of incorporating AI in CT imaging. The talk ended with a Q&A session.

BOSCH

The last talk for this department was delivered by Mr. Vishal Saraswat, Bosch, who discussed the opportunity and challenges in automotive cybersecurity, and the use of electrical equipment and software in automobiles. He highlighted the increase in the number of Electrical control Units (ECUs) in vehicles. Mr Vishal spoke about the advancement in the automobile intelligent transportation system and the rise in associated security concerns such as vehicle theft and cyber attacks. He spoke about one of the concerning cyber attacks, termed 'Jackware' by which a hacker can hijack and remotely control a machine or car by using ransomware. He mentioned how previously ransomware was restricted to computers but now with IOT, it can embed devices and this has become an omnipresent threat. The talk ended with a Q&A session.

MECHANICAL ENGINEERING

BOSCH

The first talk was delivered by Mr Prashanth P from Bosch. This was a joint session for the departments of Electrical Engineering and Mechanical Engineering. Mr Prashant's talk focused on the emerging field of electric vehicles (EVs) and explored the potential collaborations. The talk centered around the theme of future mobility, and introduced their classification system known as PACE, which represents Personalized, Automated, Connected, and Electrified aspects.

The presentation provided an insightful overview of vehicles and batteries. It delved into the distinction between EVs and hybrids, with a specific emphasis on Battery Electric Vehicles (BEVs), which exclusively rely on electric power. The talk covered the process of changing batteries in EVs, along with the various charging methods available. These methods included AC charging or household charging, and DC charging, known for its fast charging capabilities.

Mr Prashant gave key insights into the recent focus on electric vehicles (EVs) and the reasons driving their increasing prominence. Three key global drivers for the adoption of electric powertrains were highlighted. Emission regulations, driving bans, and subsidies/incentives policies play a vital role in encouraging the shift towards EVs. Factors such as vehicle scrappage and Bharat Stage emission regulations were discussed, indicating the importance of these regulations in shaping the transition to electric mobility. The various schemes introduced by nations, such as the Production Linked Incentive (PLI) scheme in India, also play a major role in promoting the transition to EV usage.

The drivers for electrification in India were addressed by the speaker, which are: the need to reduce oil imports, combat urban pollution, and meet climate protective commitments, consumer motivation to reduce greenhouse gas emissions and the government's target to lower greenhouse gas emissions per unit GDP by 33-35% by 2030.

Mr Prashanth mentioned several challenges specific to India when it comes to the adoption of EVs. These challenges included range anxiety (concerns about the limited driving range of EVs), lack of suitable EV options for consumers, limited charging infrastructure, insufficient awareness about EVs among the general public, and uncertainties surrounding EV technologies.

The question of why fast charging is not yet popular was also addressed. The discussion explored the limitations or barriers hindering the widespread adoption of fast charging technology. Potential factors that may contribute to this could include high costs, technical constraints, and the need for extensive charging infrastructure development. Mr Prashanth explained how understanding and addressing these challenges are crucial for Bosch and other industry players to facilitate the transition to electric mobility effectively.

A comprehensive analysis of electrification power trends was presented. The discussion highlighted various factors influencing electrification, using trend radars and their impacts. These factors included market dynamics, legislative changes, consumer preferences, original equipment manufacturers (OEMs)/mobility providers' strategies, technological advancements, and competition.

An area of focus in the talk was the flagship technology of electric axles, indicating Bosch's dedication to developing advanced drivetrain solutions for electric vehicles (EVs). Furthermore, the importance of high voltage cables, specifically those exceeding 60 volts, was emphasized as a critical component in EV power systems. The concept of economics of scale and scope was also addressed, underscoring the significance of cost-effective mass production and a broad product portfolio in driving the electrification revolution.

The talk further explored engineering roles at Bosch within the context of EVs and battery electric vehicles (BEVs). A case study was presented, specifically focusing on system engineering and its application in various use cases, vehicle types, and powertrain configurations. This highlighted Bosch's expertise in designing and integrating complex systems for efficient and reliable EV performance.

Additionally, Mr Prashant spoke about system and software engineer roles, emphasizing their importance in developing cutting-edge technologies for EVs. As EV technology continues to evolve rapidly, It showcases Bosch’s commitment to staying at the forefront of innovation and addressing future topics in the EV sector. Overall, the talk showcased Bosch's commitment to shaping the future of mobility through electric vehicles and their dedication to technological advancements in the field. The talk ended with a Q&A session.

CONTINENTAL

The second talk was delivered by Mr Priyadarshi Mishra and his FEA team, from Continental, who is responsible for conducting Computer-Aided Engineering (CAE) simulations. The talk was focused on the Finite Element Analysis (FEA) simulation methodology for robust testing. The team began the talk by explaining how within the CAE domain, thermal simulation emerged as a significant area, particularly

given Continental's main product being sensors. Thermal simulation in CAE involves considering factors such as ambient temperature, wattage, geometry, flow pattern, the external environment, and the car environment.

The talk provided insights into the thermal simulation process, emphasizing the various teams involved. These teams include requirement engineering, software, hardware, mechanics, and testing. The company highlighted the utilization of specific software tools like ANSYS Icepak, ANSYS Fluent, and COMSOL Multiphysics for conducting thermal simulations.

The team explained how Continental's commitment to robust testing and simulation methodologies indicates its dedication to ensuring the reliability and performance of their products, particularly in the field of sensors. By leveraging FEA and CAE simulations, Continental aims to optimize thermal management, account for different operating conditions, and enhance overall product quality.

A comprehensive explanation on crash and safety analysis, highlighting both active and passive safety systems were provided and the team emphasized the significance of Advanced Driver Assistance Systems (ADAS) in enhancing vehicle safety. The talk also touched upon the Bharat New Car Assessment Programme (NCAP) regulations, which outline the safety standards for vehicles in India.

Various concepts such as the concept of the crumple zone, which absorbs impact energy during a collision, were explained along with different types of crashes, including frontal, lateral, roll-over and pedestrian, and impacts to the head and lower body were explained. The team also highlighted how occupant studies are a crucial aspect of safety

analysis, focusing on factors such as occupant articulation, seat squash, and belt routing. The major output of these studies is the evaluation of occupant injuries, which is vital for ensuring compliance with regulations and NCAP standards.

The talk emphasized the importance of Finite Element Analysis (FEA) crash studies in vehicle design. The studies involve building and assembling models, preparing seat configurations, and conducting simulations to evaluate occupant safety. The utilization of FEA simulations enables Continental to optimize the design, reduce time and costs compared to traditional design approaches that do not incorporate simulation.

Several software tools were mentioned as being used for crash tests, including LS Dyna, ANSA, and Hypermesh. These software solutions play a crucial role in conducting crash simulations and analyzing the structural integrity and occupant safety of vehicle designs.

The team stressed on Continental's commitment to crash and safety analysis, its dedication to delivering advanced safety systems and ensuring compliance with stringent regulatory standards. By employing sophisticated simulation tools and methodologies, the company strives to enhance vehicle safety and protect occupants in the event of a crash. The talk ended with a Q&A session.

TCS Research

The third talk was delivered by Dr Gerald Tennyson, from TCS Research. Dr Gerald discussed the concept of ICME (Integrated Computational Materials Engineering) as a paradigm shift in materials discovery, design, development, and deployment. He emphasized the growing importance of modeling and simulations in these processes, enabling engineers and

researchers to gain valuable insights and optimize material properties more efficiently. TCS was mentioned as a prominent organization contributing to advancements in this field, focusing on the intersection of technology and materials.

The talk also touched upon the significance of the industrial revolution and its transformative impact on society. It highlighted key milestones such as the advent of steam power, the harnessing of electricity, and the evolution of computing, which have all played pivotal roles in shaping modern industry. The concept of connectivity was underscored, emphasizing how these technological advancements have interconnected various aspects of our lives.

The shift towards collaborative design in industries was highlighted, stressing on the importance of effective communication and cooperation among stakeholders. The concept of ICME (Integrated Computational Materials Engineering) was explored during the talk and its potential to revolutionize materials development, design, and deployment was explained. The digital thread, which enables the seamless flow of digital information across the product lifecycle, was also emphasized as a vital aspect of modern manufacturing.

Dr Gerald addressed the different classes of industrial problems involving materials, focusing on challenges faced in materials development and deployment. These challenges encompassed materials and product design, process design and scale-up, operations, and product and process development. He stressed the need for innovative solutions to address these challenges, underscoring the role of computational tools in providing insights and minimizing reliance on intuition-based experiments. The systematic capture of knowledge and the integration of digital twin and digital thread technologies were presented as the way forward to enhance efficiency and effectiveness in manufacturing processes.

The evolution of the ICME/MGI (Materials Genome Initiative) ecosystem was discussed during the talk, highlighting the progress made in integrating computational tools and materials science. An overview of ICME in India was also provided, showcasing the country's initiatives in leveraging this approach for advancements in materials engineering. The talk further highlighted Boeing's use of ICME for aerospace materials, illustrating the real-world applications and benefits of this approach in the industry.

The PREMAP (Platform for Realization of Engineered Materials And Products) R&I (Research and Innovation) program by TCS was explained during the talk. This program aims to develop advanced predictive modeling capabilities for materials properties and behavior. It showcases TCS's commitment to pushing the boundaries of materials science through research and innovation, aligning with the principles of ICME.

Tailoring the microstructure of materials to obtain desired properties was mentioned as a key focus area. The talk also delved into the role of data science and machine learning in the computational aspect of materials research, showcasing their potential for analyzing and predicting material behavior.

The concept of digital steelmaking, which encompasses modeling the entire steel production process, from steelmaking to the final products was explained. This holistic approach enables the optimization of steel production and the development of high-quality products.

Dr Gerald spoke about materials informatics and how it helps in designing for sustainability. Materials informatics leverages data-driven approaches to extract knowledge and insights from large datasets, aiding in the discovery and development of new materials. This helps in design for sustainability concept, which focuses on creating environmentally friendly and socially responsible materials and processes.

Dr Gerald also spoke about the role of engineers in Industry 4.0, emphasizing the need for engineers to adapt to the changing landscape of advanced technologies and automation. Engineers are expected to play a crucial role in implementing and maintaining smart manufacturing systems, IoT devices, and data-driven decision-making processes. Several software tools were mentioned during the talk: MOOSE, MicroSim, PyCalphad, CalculiX, OpenFOAM, PRISMS Center, Code Aster, FEniCS, etc. These tools are utilized in various aspects of materials research and engineering, ranging from finite element analysis to computational thermodynamics and fluid dynamics simulations.

The pragmatic use of the ICME strategy was highlighted by the speaker as a means to reduce process time and the number of laboratory trials. By incorporating computational models and simulations, engineers can streamline material development and troubleshoot issues more efficiently. This approach enables faster decision-making and enhances the overall productivity of the research and development process. The talk ended with a Q&A session.

BARANI HYDRAULICS

The fourth talk for the department was delivered by Mr Nithiyanandam Senthilmani from Barani Hydraulics. Mr Senthilmani's talk focused on the industry expectations from an engineer. He emphasized the importance of engineers possessing a wide range of skills and qualities. Firstly, he spoke about how engineers should be capable of applying scientific principles, utilizing their knowledge to understand and solve complex problems in their respective fields. Additionally, he stressed on how a strong foundation in mathematics is essential for engineers to perform

accurate calculations and design efficient systems. Furthermore, Mr Senthilmani mentioned how engineers need to exercise judgment and common sense to make sound decisions that align with industry standards and safety protocols.

In addition to technical competencies, the talk highlighted the significance of soft skills for engineers. Teamwork was emphasized as a crucial aspect of working effectively within the company. Mr Senthilmani laid emphasis on how engineers should be able to collaborate with colleagues, share ideas, and contribute to the collective success of projects. Continuous learning was also stressed upon, as the field of engineering is constantly evolving, requiring engineers to stay updated with the latest advancements and industry best practices. Moreover, according to Mr Senthilmani, creativity is a valuable trait for engineers. He acknowledged the importance of thinking outside the box and exploring innovative solutions to engineering challenges. Engineers must be encouraged to bring fresh perspectives to the table and explore new possibilities.

He emphasized on how problem-solving skills were considered fundamental for engineers. They should be able to analyze data in a systematic manner, using their scientific knowledge and mathematical skills to draw meaningful conclusions. This ability to critically analyze and solve problems efficiently is essential in ensuring the company's products and services meet the highest standards.

Mr Senthilmani then spoke about the significance of analytical ability in the field of engineering, highlighting the need to always have a plan B. Engineers should possess logical thinking skills to effectively analyze problems and develop alternative solutions when necessary. Attention to detail was another crucial aspect highlighted in the talk, with an

emphasis on understanding micro-level data. He mentioned how small errors can have significant effects, underscoring the importance of precision in handling details and how in engineering, details hold greater importance than mere perceptions.

Mr Senthilmani stressed upon the value of listening to the needs of clients and stakeholders. Effective communication skills are essential for engineers to understand the requirements of projects and effectively convey their ideas and solutions. Leadership qualities are also considered important, as engineers often find themselves in positions where they need to guide and coordinate teams.

The talk highlighted the multidisciplinary nature of mechanical engineering. Engineers were encouraged to explore various fields beyond the realm of mechanical engineering to enhance their knowledge and skills. This multidisciplinary approach enables engineers to bring new perspectives and innovative ideas to their work.

The difference between arts and science was briefly touched upon, and the speaker explained how arts focus on creativity and expression, whereas science and engineering are grounded in systematic processes and logical reasoning. However, the talk also acknowledged the importance of combining creativity with technical skills, as engineering feats often require innovative thinking. The speaker also presented examples of notable engineering feats, such as the Chenab rail bridge and the construction of an eight-lane road. These examples showcased the remarkable achievements of engineering in creating structures that are both functional and awe-inspiring.

The talk also addressed the significance of applying the knowledge gained so far by engineers in practical applications. Mr Senthilmani encouraged the future engineers to tap into their inner potential, exploring new ideas and pushing the boundaries of mechanical

engineering. According to him, by expanding the boundaries, engineers can contribute to advancements in the field and tackle complex challenges in innovative ways. The talk ended with a Q&A session.

WHEELS INDIA

The last talk for the department was delivered in an online mode by Mr T.A.B. Barathi from Wheels India. His talk focused on how mechanical engineering graduates could prepare themselves for the industry and how to meet the expectations of the industry. The talk was an interactive session where Mr Barathi engaged with the students and gave them valuable advice on how they could become ready to step into the mechanical engineering industry.

PHYSICS

Jawaharlal Nehru Centre for Advanced Scientific Research

The first speaker Prof. Santosh Ansumali from the Engineering Mechanics Unit, JNCASR and SankhyaSutra Labs, Bangalore delivered a talk titled 'Drik Ganita: Towards Realistic Simulation of Complex Systems'. He went on to say that the work done in their labs is centered around the idea that computational results must match experimentally obtained ones to a very high degree. He shed light on some of their ongoing projects involving complex real-life problems such as cardiovascular diagnosis and virtual angiogram, gasification and fluid dynamics.

He also walked us through the academic profiles and the works of several young minds behind the progress achieved in their endeavors. The tal ended with a Q&A session.

CDK GLOBAL

The second speaker was Mr Vinod Aravindakshan from CDK Global, who spoke about the options available for MSc students after graduation. He introduced three possible career pathways after Masters in Physics, viz., PhD (Physics, Engineering, Business), Masters (MBA, MS) and jobs (R&D, Start-ups). The speaker deliberated on the careers of several personalities such as Mukti Khaire, Kris Gopalakrishnan and Elon Musk who elevated their skillset and also took diversions from their initial academic background. He highlighted the necessary skills to set foot into industry - technical/domain skills, people skills, communication skills and culture fit. He emphasized on the technique of skill-mapping wherein we upskill ourselves systematically, keeping in view the company's requirements. The talk ended with a Q&A session.

CHEMISTRY

VIMANO EWA Pvt. Ltd

The first speaker was Dr Nagesh Kini, CTO and Co-Founder at Vimano EWA Pvt. Ltd. His talk revolved around the fascinating subject of battery technology and its remarkable development through the confluence of academia and industry. Dr Nagesh provided an insightful overview of the historical evolution of energy and energy storage, with a particular emphasis on batteries. He drew attention to the limitations of Lithium-ion batteries stemming from the scarcity of lithium and highlighted the industry's current exploration of alternative alkali metals for battery applications.

Furthermore, Dr Nagesh shared invaluable advice with the students on how they can enhance their skill sets and effectively prepare themselves to thrive in the realm of research and development, as well as in various industries. His emphasis on upskilling resonated strongly with the audience, offering them practical guidance for future career paths.

The event concluded with an interactive Q&A session, during which Dr Nagesh enthusiastically addressed the students' queries, further enriching their understanding of the topics discussed.

UNILEVER R&D | IIT PALAKKAD

The second speaker was Dr Venkataraghavan R, Platform Leader of S&T at Unilever R&D and adjunct faculty at IIT Palakkad. His talk centered around the captivating theme of "Academic Pursuit & Industrial Applications: Perspective on Research & Innovation".

Dr Venkataraghavan’s talk was an interactive session, engaging the students in a unique manner. Drawing inspiration from

stand-up comedy, he utilized the method of 'crowd work' to encourage active participation from the audience.

During the interactive session, Dr Venkataraghavan explored the world of research and delved into the myriad opportunities available to students in this field. He initiated the discussion by providing insights into the fundamental aspects of research, followed by an exploration of the essence of both industrial and academic research. He also delved into the transition from academia to industry, highlighting the similarities and dissimilarities between the two domains.

Moreover, Dr Venkataraghavan shared invaluable wisdom regarding the potential challenges that students might encounter during their academic and professional journeys. Drawing from his personal experiences, he provided enlightening anecdotes and advice to help students navigate these challenges successfully. The session concluded with Dr Venkataraghavan addressing the questions raised by the students, further enriching their understanding and providing valuable insights into the topics discussed.

MATHEMATICS

CREDIT SUISSE

The first speaker was Dr Shankar Maddu from Credit Suisse, who shared insightful details about his background, education, and professional journey. He highlighted his Ph.D. thesis topic on model risk management, capturing the audience's attention with this intriguing topic. Dr Shankar delved into the importance of model risk reports, shedding light on the potential financial losses that can arise from fundamental errors and inappropriate usage of models. He emphasized the crucial role of model validation and the application of mathematics within the financial services industry. Drawing from his industry experience, Dr Shankar imparted key learnings, emphasizing the value of practice, persistence, effective presentation skills, and pattern recognition. His informative session provided the audience with valuable insights into the intricacies of model risk management. After the talk, there was a brief Q&A session.

META

Dr Anant Atyam from Meta, was the second speaker. Dr Anand shared his own experiences from his career with the audience. He engaged with the audience through an interactive session. This allowed the attendees to further explore and seek clarification on the topics he covered. This enriched the overall learning experience, providing a diverse perspective and enhancing the audience's understanding.

Summary

The 4th edition of the Industry Academia Conclave was a profound success and proved to be extremely beneficial for the IIT Palakkad community. After 2 years of IAC being conducted online, this year's event was more exciting and engaging as it was conducted in an offline mode. With a number of companies from various industries in attendance, it was beneficial to the students gearing up for their future careers. The Q&A sessions were particularly useful as it provided an opportunity for the students to clear their doubts directly with delegates from the academia and the industry. The poster presentation and the showcase of the incubates highlighted the prowess of IIT Palakkad when it comes to promoting research and entrepreneurship.

We hope that the upcoming editions of the Industry Academia Conclave will be even more successful.

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Disclaimer: *The views expressed in this article are not to be construed in any manner as the official views of IIT Palakkad.*