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CURIN Research and Development News

Cover Story

Chitkara University Hosted the
Smart India Hackathon (SIH) 2022

SMART INDIA HACKATHON 2022

SIH

75 आज़ादी का अमृत महोत्सव

शिक्षा मंत्रालय भारत सरकार
सत्यमेव जयते

अखिल भारतीय शिक्षा समागम

राष्ट्रीय शिक्षा नीति 2020 – कार्यान्वयन विमर्श

7–9 जुलाई, 2022, वाराणसी

Dr. Archana Mantri
Vice Chancellor, Chitkara University, Punjab
One of the panellists in an event
inaugurated by Hon'ble Prime Minister of India

100

**100 Patent Applications and
112 Research Publications
in a Quarter**

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EXPLORE
YOUR
POTENTIAL

COVER STORY

Chitkara University Hosted the Smart India Hackathon (SIH) 2022

We were the nodal centre for the Hardware Edition of SIH 2022

During August 25-29, 2022, CURIN, Chitkara University, Punjab hosted the Hardware Edition of the Smart India Hackathon (SIH) 2022. This prestigious hackathon is a nationwide initiative of the Ministry of Education's Innovation Cell that provides students with an opportunity to work on and solve pressing problems put forward by the different ministries, industries, and other competent organisations. As part of the Azadi Ka Amrit Mahotsav celebrations, the Innovation Cell and All India Council for Technical Education identified 75 higher educational institutes as nodal centres to host the SIH 2022.

In this segment of the hackathon that was held at Chitkara University, fifteen teams from all over India, having a total of 105 participants worked on three problem statements presented by the Ministry of Home Affairs, Government of India

On the 5th day of the hackathon, Hon'ble Shri Kamal Kishor Yadav (IAS) - Director, Information and Public Relations, Punjab, presided over the valedictory event as the chief guest and Hon'ble Dr. Madhu Chitkara - Pro-Chancellor, Chitkara University was the guest of honour.

Out of the 15 teams that competed, 4 teams were selected by the jury who were awarded the cash prizes. While the top two teams won INR 100,000 each, the other two teams shared the prize money and received INR 50,000 each.

The cash prize winners of INR 100,000 each were the teams Sky Strikers from Bharati Vidyapeeth College of Engineering, Navi Mumbai, Maharashtra and Dronacharya Yantramanav from Prathyusha Engineering College, Thiruvallur, Tamil Nadu. The two teams that shared the cash prize of INR 100,000 were ECE Allrounders from Vasavi College of Engineering, Hyderabad, Telangana and Team Jarvis Group from KLE Technological University, Hubballi, Karnataka.

The two winning teams of SIH Junior 2022 were Pix Fuser from St. Johns High School, Chandigarh, and BCM Arya from BCM Arya Model Senior Secondary School, Ludhiana.

Dr. Madhu Chitkara congratulated all the winners and lauded the local organising team from CURIN, Chitkara University, headed by Dr. Sachin Ahuja (Director Research), Dr. Sheifali Gupta (Professor), Dr. Varinder (Assistant Professor), and Dr. Bhanu Sharma (Assistant Professor) for their efforts in successfully organizing SIH 2022 at Chitkara University.

Panellist in an Event Inaugurated by Hon'ble Prime Minister of India

Dr. Archana Mantri – Vice Chancellor, Chitkara University, Punjab was invited as one of the panellists in the panel discussion titled Internationalization of Education. This panel discussion session was held as part of the three-day Education Summit entitled Akhil Bharatiya Shiksha Samagam that was organized during July 7-9, 2022 on the Implementation of National Education Policy 2020 at Varanasi, Uttar Pradesh. The summit was inaugurated by Hon'ble Prime Minister of India, Shri Narendra Modi ji.

Dr. Archana Mantri, in the panel discussion spoke about the necessity of global exposure in this fast syncing global village. The issue of interdependence to meet the economic challenges were also highlighted by madam. She also gave insight about the global programs at Chitkara University and the immense benefits reaped by our students through these programs.

Chitkara University MoU with CSIO for Collaborative Research Work

Anchored by CURIN

Dr. S. Anantha Ramakrishna - Director, CSIR-Central Scientific Instruments Organisation (CSIO), Chandigarh and Dr. Archana Mantri – Vice Chancellor, Chitkara University, Punjab, signed an MoU for carrying out collaborative research work by the two organizations. The scope of the MoU encompasses usage of common research facility, incubation/development of the existing technologies available with CSIR-CSIO by the companies incubated at Chitkara Innovation Incubator Foundation, internship opportunities for students of Chitkara University at CSIR-CSIO, and running joint academic programs. The MoU was signed at CSIO in the august presence of the eminent scientists from CSIO. From Chitkara University, this initiative was led by Dr. P. K. Khosla, Pro Vice Chancellor (Research), CURIN.

Invited Talk at SCL, Mohali by Dr. P.K. Khosla

Acute scarcity of Integrated Circuits during pandemic has made India allocate INR 76,000 Crores to semiconductor devices and displays. The Semi-Conductor Laboratory (SCL), Mohali, Punjab is a critical infrastructure of our country. Perils of cyber-attack can hinder the working of such a crucial sector. Dr Khosla - Pro Vice-Chancellor (Research), CURIN, Chitkara University was invited by SCL on July 19, 2022 to deliver a lecture on Social Engineering Attacks in order to safeguard against any untoward incident. He explained how human psychology is manipulated to reveal the sensitive information against the interests of the victims. Several case studies were discussed for effective and easy comprehension. After the session, the audience felt more confident to handle any attempts of social engineering attacks. 56 participants attended and benefited from this session.

Invited Talk on Cyber Security

On September 17, an invited talk on the topic 'Cyber Evolution: Knowing the Advance Cyber Crime Techniques and its Counter Defense Mechanisms' was organized that was delivered by Mr. Smith Gonsalves - Director & Principal Consultant, CyberSmithSECURE. He explained about various opportunities for potential industry-academia collaborations for cyber preparedness. A team of researchers from Chitkara University working in the domain of cyber security headed by Dr. P. K. Khosla attended this session and also shared details of their research work and projects in the domain of cyber security with Mr. Smith.

Two Patents of Chitkara University in Healthcare Sector Commercialized

Anchored by GoI funded Technology Enabling Centre (TEC) and NewGen IEDC at Chitkara University

A patent licensing agreement dated 28th September 2022 has been signed by and between Chitkara Innovation Incubation Foundation (CIIF) and M/S. Cutting Edge Medical Devices Private Limited, Indore (CEMD) for the patent titled 'A Device for Monitoring Health Parameters' having an application number 201911007068, which was filed on 22-02-2019.

Additionally, a related patent dated 16-07-2020 having an application number 202011030405 and is titled 'Health Monitoring System for Pregnant Women and Fetus' has also been licensed to CEMD.

Hon'ble Vice Chancellor, Dr. Archana Mantri has signed the agreement for & on behalf of CIIF.

The development of proof-of-concept of these patents was supported by Chitkara University Technology Enabling Centre and Chitkara University NewGen IEDC (GoI funded centres sponsored by Department of Science and Technology at Chitkara University).

As an outcome of the patent licensing agreement, CEMD has an exclusive license of the patents which shall initially be for a period of two years. The license is renewable on two-yearly basis through mutual discussions, between CEMD and Chitkara University, based on realized milestones of the commercialization of the patents.

M/s. Cutting Edge Medical Devices Private Limited (CEMD) is a med-tech start-up company from Indore, Madhya Pradesh. The company started its journey from the IIT Delhi Incubator. The company is founded by Dr. Pankaj Parashar, a Doctor who is also pursuing a Ph.D. in Biomedical Engineering from IIT Delhi. The company has been the industrial partner for development of proof-of-concept of the patents and is willing to further develop market-ready products based on the patents.

Other Activities of Chitkara University Technology Enabling Centre (TEC) in Q3 2022

Technology Enabling Centre has been set-up by Department of Science and Technology (DST), GoI with an objective to promote industry-academia collaborations. Chitkara University TEC conducts a lot of activities to bring industry and academia on a common platform to promote their collaborations for joint development of technologies.

1. Invited Talk on Food Processing Machinery by an Industry Expert

TEC invited Mr. Gulshan Chouhan from Chouhan Engineering Company (Manufacturers & Suppliers of Confectionery Machines), Rajpura on August 11, 2022 to talk about some of these machinery where he believes that the faculty from Chitkara University can collaborate with his industry. The session was attended by close to 30 faculty members from Mechanical Engineering and Mechatronics departments. There were good discussions around the different technologies involved in food processing machines (especially Candy processing machines) and avenues were explored for collaborations.

2. Awareness Session on White Paper Writing Competition for the Faculty Members of Different Departments

Under TEC, we launched a White Paper Writing Competition with an objective to understand the specific problems of different MSME industries in the region and to explore ways of collaborating with these industries for working on joint projects. We conducted several awareness sessions with the faculty members of various departments of the university to encourage them to participate in this competition. These sessions were delivered by Mr. Sagar Juneja – Assistant Dean, CURIN and the Coordinator of TEC project at Chitkara University.

On August 12, an awareness session was conducted for the faculty members of Mechanical Engineering, Civil Engineering and Mechatronics Engineering departments of the university, wherein a total of 25 faculty members participated.

On August 20, this session was conducted for the faculty members of School of Hotel Management and about 10 faculty members participated in it.

On August 29, a similar session for Chitkara Design School was organized. There were close to 20 faculty members in the session from Fine Arts, UX/UI, Animation, Fashion Designing, Game & Interactive Design, and Communication Design departments.

3. Meeting with General Secretary of Mohali Industry Association

On August 18, Mr. Sagar Juneja met Mr. Rajeev Gupta - General Secretary of Mohali Industrial Association (MIA) at MIA Bhawan, Industrial Area, Sector 73, Mohali to discuss about the various opportunities of collaborations with the industries of MIA. Mr. Rajeev was given insight into the TEC project and how it is mutually beneficial for both industry and academia.

4. Invited Talk on Talent Analytics by an Industry Expert

On September 3, TEC invited Mr. Pushpinder Singh - Chief Technology Officer, Ambiente Technologies Pvt. Ltd. (ATPL), Punjab, to discuss some of his specific problems related to analytics, especially talent analytics, wherein he sought collaboration with the academia. ATPL was interested in building data based decision making solutions (including software) for Talent Management, Performance Appraisals, Defining & Maintaining Company Culture etc. Close to 25 faculty members from the departments of Business Management, Computer Science and Engineering and CURIN attended this session.

5. Invited Talk on Compact Fortified Rice Making Machine by an Industry Expert

Under our Industry-Academia connect series, TEC invited Mr. Rajeev Kumar & Mr. Gurdeep Singh from Vishavkarma Agro Industries, Rajpura, on September 23 to discuss the idea of building a Compact Fortified Rice Making Machine. They discussed about the need for this machine, its technical details as well as the challenges associated with the machines currently available in the Indian market. The session was attended by close to 20 faculty members from Mechanical Engineering department as well as Mechanical Engineering experts from CURIN. The session was followed by a healthy discussion and possibilities of building an indigenous solution were explored.

Research@CURIN

Top-five Research Papers of the Quarter Published by CURIN during July – September 2022

Faculty members and research scholars from CURIN publish high-quality research articles in top peer-reviewed journals and conferences. In this section of the newsletter, we select five high-impact research papers from CURIN and attempt to discuss them in the form of short summaries.

The researcher papers discussed in this issue are the ones that were published during July – September 2022. The complete list of publications by CURIN faculty members and scholars during this period is available in a separate section.

A Facial Retouching Detection System to Detect if the Facial Image is Original or Edite

By: Gurinder Singh, Assistant Professor, CURIN

This article is based on the research paper titled 'IPDCN2: Improvised Patch-based Deep CNN for Facial Retouching Detection' published by Dr. Gurinder Singh from CURIN, Chitkara University, Punjab, in Elsevier journal entitled Expert Systems with Applications.

With the advancement of photo editing softwares, nowadays facial retouching becomes a common practice across different social media platforms, Curriculum Vitae (CV) related websites, photo sharing applications, and magazines publishing flawless facial images of celebrities. In this article, an improvised patch-based deep convolution neural network (IPDCN2) is proposed to classify whether a facial

$(a @ b \times c)$: Convolution layer (Filters = a, Kernel size = $(b \times c)$)
$(MP @ a \times b)$: Max Pooling (Pooling size = $(a \times b)$)
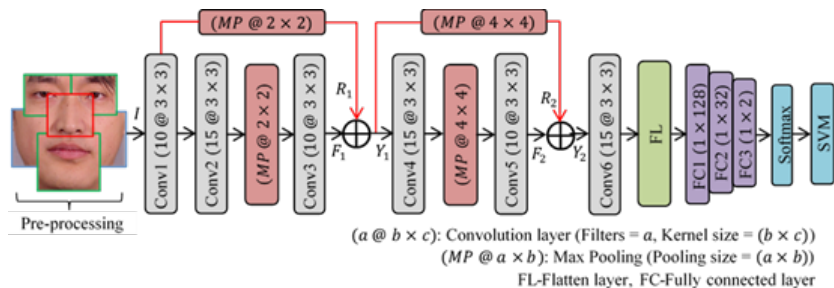FL-Flatten layer, FC-Fully connected layer

Illustration is borrowed from the published paper

image is original or retouched. The proposed network comprises of three stages i.e., pre-processing, high-level features extraction, and classification as shown in Fig. 1. Initially, we propose a pre-processing stage to extract only relevant patches from the input image by using 68 facial landmarks. In the second stage, an efficient and robust Convolutional Neural Network (CNN) based on residual learning is employed to extract the high-level hierarchical features from these patches. The proposed network uses the concept of residual learning with the help of max pooling layers to maximize the information flow across the neural network. Lastly, the extracted high-level features are passed to fully-connected layers for classification. The experimental results show that the proposed network outperforms the existing state-of-the-art techniques by providing an accuracy of 99.84% on ND-IIITD dataset. Moreover, the proposed network provides a classification accuracy of 95.80%, 83.70%, and 97.30% on YMU, VMU, and MIW make-up datasets, respectively.

The main contributions of this article are as follows:

- The present study proposes a novel facial retouching detection approach that uses only relevant patches from the input facial image and then these patches are provided to robust CNN to extract deep facial retouching features.
- A pre-processing stage based on 68 facial landmarks is proposed to extract only relevant patches from the input image.
- The proposed CNN employs dual skip connection with the help of max pooling layers to improve the overall information flow across the neural networks.
- The extensive experimental analysis supported with ablation studies confirms that proposed network outperforms the existing facial retouching detection approaches.

A Low-noise CMOS Amplifier for Improved Neural Signal Recording in Biomedical Applications

By: Dr. Kulbhushan Sharma – Assistant Professor, CURIN

This article is based on the research paper titled as "Design of a Low-noise Low-voltage Amplifier for Improved Neural Signal Recording" published by Dr. Kulbhushan Sharma and Dr. Rajnish Sharma from Chitkara University, Punjab, India in collaboration with Semiconductor Limited Mohali in Review of Scientific Instruments (Publisher: American Institute of Physics).

This paper focuses on design of a low-noise neural amplifier architecture which is an important circuit block of various neural recording systems. These neural recording systems are used in curing of brain related chronic diseases such as Mental Disorders, Alzheimer, Dementias, Brain Cancer., Epilepsy, Parkinson Brain, Strokes and Transient Ischemic Attack etc. The neural amplifier used in neural recording systems must deliver high gain with low-noise and low-power operation for faithful detection of above-mentioned chronic diseases.

Using the foundry Semi-conductor Laboratory CMOS technology library authors of this paper designed a neural amplifier which delivers gain of 49.9 dB, bandwidth of 5.3 Hz–8.6 kHz, noise of 2.6 µVrms and low power consumption of 11.5 µW. Many new techniques have been proposed by authors in this paper so as to reduce power consumption and noise. The demonstrated neural amplifier architecture in this paper has the ability to work at the same supply and tunable voltages.
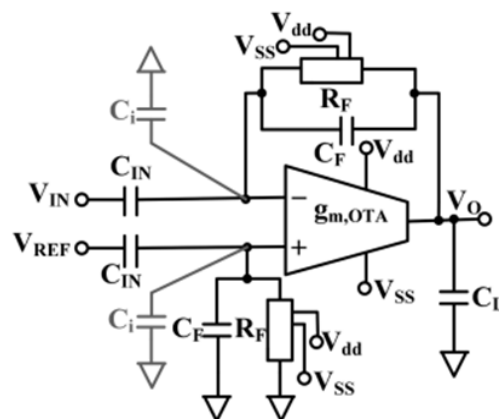
Illustration is borrowed from the published paper

The techniques introduced in this paper are anticipated to be used in the design of different low-noise circuits, such as transimpedance amplifiers, voltage amplifiers, and filters. With reduction in noise level of these circuits' various biomedical applications like bio-potential recording, pulse oximetry and bio-impedance spectroscopy will be benefitted. Besides this, it is expected that the novel techniques introduced in this paper will lead to development of biomedical systems for personal healthcare and medical diagnosis.

An Energy Efficient Algorithm for Building Future Green 6G Networks based on Cell-Free Massive MIMO Technology

By : Dr. Ashu Taneja – Assistant Professor, CURIN

This article is based on the research paper titled 'Energy Aware Resource Control Mechanism for Improved Performance in Future Green 6G Networks' published by Dr. Ashu Taneja and Dr. Shalli Rani from Chitkara University, Punjab, in Elsevier journal entitled Computer Networks.

The increasing number of connected devices, smart phones and sensor nodes has put the burden on the energy consumption due to limited life span of these battery powered devices. To manage the increased energy overhead and the huge data traffic, future wireless networks are envisioned. The technological advancements of future wireless networks include massive multi-input multi-output (mMIMO), millimeter wave (mmWave) communication, cell densification and heterogeneous networks (HetNets). These offer huge benefits of increased data rates and spectral efficiency (SE) but the

Illustration is borrowed from the published paper

hardware complexity and increasing energy consumption are the main challenges of these technologies. The usage of separate radio frequency (RF) chain per antenna element in massive MIMO system led to high power and cost

overhead. MmWave technology suffers from the limitations of signalling overhead, reduced coherence time and shorter wavelengths. Reducing the cell density below a certain threshold leads to performance errors. A promising key technology that caters to the needs of billions of connected devices with reduced overhead is the cell-free mMIMO. Cell-free mMIMO is a promising 6G technology in which there are no cell boundaries and a large number of access points (APs) are deployed in a given geographical area. A large number of communicating nodes are being served by the cooperating APs. This article proposes an energy efficient network based on the cell-free mMIMO which aims for maximization of sum spectral efficiency. Through different power control mechanisms, it offers power optimization by allowing only a subset of APs to serve a particular user. An energy-efficient resource control algorithm is proposed, which aims to improve the system performance by the efficient utilization of resources. The algorithm is MIPA-MCAS, minimum interference pilot allocation and maximum channel gain AP selection which allocates pilots to the user nodes based on minimum interference criteria and selects AP subsets based on maximum channel gains.

Allowing a set of APs to serve a particular node against using all APs results in improved performance in term average mean square error and achieved signal-to-noise ratio (SNR) or signal-to-noise-plus-interference ratio (SINR). The spectral efficiency performance of the system is evaluated for different receive combiners for different pilot lengths. At pilot length of 20, maximum spectral efficiency of 8.512 bits/s/Hz is achieved with minimum mean square error (MMSE) and partial-MMSE (PMMSE) receive combiners, which outperforms partial regularized zero forcing (PRZF) and maximal ratio (MR) combining. It is further found that the spectral efficiency offered by the proposed algorithm to 95% of the users improves by 3.39%. In the end, the article gives a comparison of proposed algorithm with other two algorithms, namely RRPA-MCAS and RPA-MCAS respectively. RRPA-MCAS algorithm utilises round robin method for pilot allocation against random pilot allocation in RPA-MCAS algorithm with the same AP selection criteria. The proposed algorithm achieves 7.416 bits/s/Hz spectral efficiency with full power control mechanism and sum-spectral efficiency power control scheme against 6.626 bits/s/Hz achieved with RPA-MCAS algorithm. Thus, the article offers a 6G enabled sustainable network which aims for optimum utilization of power resources, enhanced network coverage along with green communication capabilities.

Energy Efficient Blockchain enabled Cognitive Wireless Networks for Smart Cities

By : Himanshi Babbar – Assistant Professor, CURIN

This article is based on the research paper titled 'Improvement of Energy Conservation using Blockchain-enabled Cognitive Wireless Networks for Smart Cities', published by Dr. Shalli Rani and Dr. Himanshi Babbar from CURIN, Chitkara University, Punjab, India in Scientific Reports, Nature.

Although there is a non-linear relationship between the number of nodes and sensing efficiency, multi-node cooperative spectrum sensing (CSS) can improve spectrum sensing efficiency in cognitive wireless networks (CWN) applications in smart cities. The regular operation of CWN is hampered by cooperative sensing by nodes with low computing costs, which is unfavorable to enhancing sensing reliability and reduces spectrum sensing energy efficiency. In cognitive sensor networks, the evaluation and interpretation of nodes are improved, and the problem of sensor selection is solved for spectrum sensing that is energy-efficient. We looked at how to significantly enhance spectrum detection accuracy while also lowering energy consumption in smart cities. We employ energy detection for spectrum sensing and

Illustration is borrowed from the published paper

discuss the difficulty of sensor selection in order to maximize energy efficacy in spectrum sensing while minimizing complexity. In order to ensure that a node's trust value conforms to its own without any ambiguity, blockchain encrypts the information of nodes through the fusion center (FC). CWN-FC selects high-performance nodes to participate in CSS. We have made a comparison of finding solutions, average number and energy utilization of the sensing nodes with various existing algorithms and reported our findings in this paper.
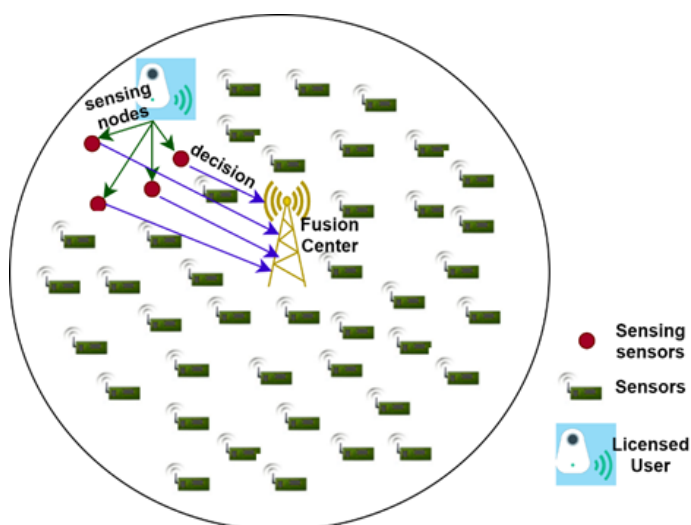
Methylammonium Lead Iodide based Perovskite Solar Cells for Improved Performance of Photovoltaic (PV) Devices

By: Savita Kashyap – JRF and Research Scholar, CURIN

This article is based on the research paper titled 'The Influence of Top Electrode Work Function on the Performance of Methylammonium Lead Iodide based Perovskite Solar Cells having various Electron Transport Layers' published by Dr. Rahul Pandey, Ms. Savita Kashyap, and Dr. Jaya Madan from Chitkara University, Punjab, India in Elsevier Journal entitled as Chemical Physics Letters.

Nowadays, several semiconducting materials are explored to be used in PV (photovoltaic) devices at the industrial level. However, currently, more than 95% PV market is dominated by crystalline silicon (c-Si) and multi-crystalline Si based PV devices due to their availability and mature manufacturing methods. On the other hand, it has issues with production cost and efficiency. The latter is usually not more than around 22% in best-selling panels and it is no secret that making Si solar panels is a high thermal budget process since high temperature process is required for device fabrication. Moreover, the power conversion efficiency (PCE) of c-Si based PV devices staggered with a record efficiency of 26.7%, and the continuous improvement in efficiency is not easy since c-Si based PV devices have a theoretical performance limit of 29.4%. Therefore, different materials are explored for use in PV devices.

A research team in VLSI Centre of Excellence, Chitkara University, Rajpura, Punjab, India, comprising of Dr. Rahul Pandey, Ms. Savita Kashyap, and Dr. Jaya Madan have proposed methylammonium lead iodide based perovskite solar cells. Recently, perovskite solar cells (PSCs) have received much attention due to their low manufacturing cost and high conversion efficiency. Charge transport layer present in PSC helps extract photo-generated charge carriers. Although abundant research has been done in finding suitable charge transport layers, there are still many scopes to study the different charge transport layers. This work presents a theoretical study of PSCs with five different electron transport layers (ETLs) used independently and also as stack while also varying the top electrode (cathode) work function to determine its influence on the overall performance of PSCs with different ETLs. In this article, stacked TiO2/PCBM ETL devices are more resistant structure to variations in the cathode work function. Jsc is independent of electrode work function for all ETLs. Voc remains unaffected for almost all ETLs until the electrode work function of 4.8 eV. Fill factor and conversion efficiency depends on ETL and electrode work function. As the cathode work function is increased, at the FTO/ETL interface, electric field initially pointing from FTO to ETL is gradually changing and pointing from ETL to FTO. The former favours electron transport and the latter unfavour electron transport from ETL to FTO. Therefore, fill factor and efficiency decreased as the work function is increased. Devices with TiO2, SnO2, ZnO, WO3, and SrTiO3 yielded maximum efficiencies of about 26%, 27.5%, 27.5%, 27%, and 27%, respectively. This work provides new insights into PSC and paves way for improving performance.
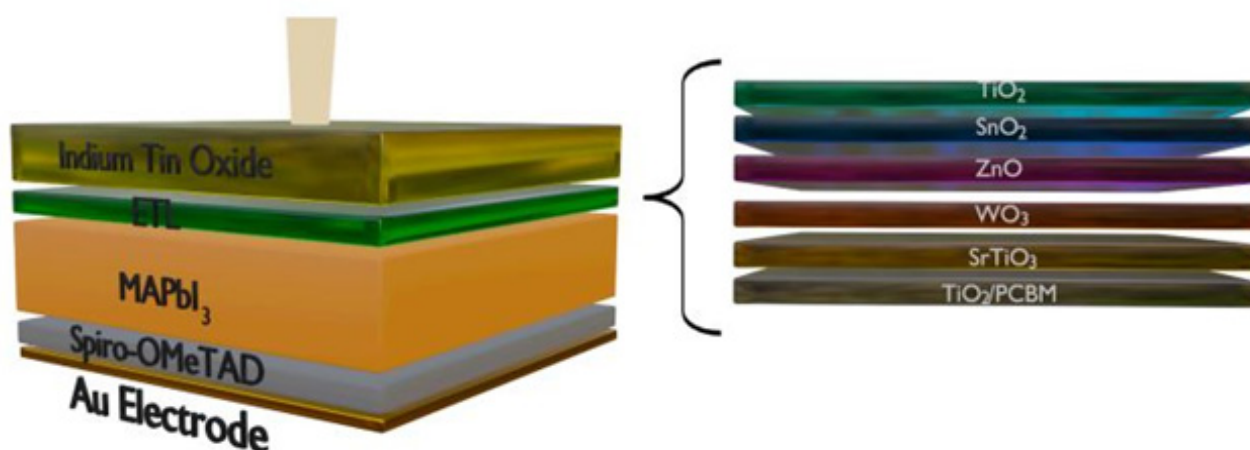

Illustration is borrowed from the published paper

Expert Sessions Delivered by DRC, CBS

Related to PhD Coursework, Research Methodology, Research Ethics, etc.

Faculty members of Doctoral Research Centre (DRC), Chitkara Business School (CBS) were invited by several institutions to deliver expert sessions. The details of these sessions are given below.

- On July 23, Dr. Urvashi Tandon - Associate Professor delivered a session on Exploratory and Confirmatory Factor Analysis in a five-day workshop on Research Methodology & Data Analysis organized by Maharaja Agrasen University, Himachal Pradesh. She also delivered an expert session on Blueprint of Writing Research and Funding Process in a two-day workshop organized by Chitkara School of Health Sciences during August 16-17.

- Dr. Amit Mittal – Professor chaired a session in the National Seminar on Quality Assurance in Higher Education held on 2-3 September. It was sponsored by National Assessment and Accreditation Council (NAAC), India and TATA Tele Business Services and was organized by Chitkara University Accreditation and Quality Assurance Cell.

Dr. Mittal delivered an expert session in an AICTE Training and Learning (ATAL) sponsored program on Academic Leadership organized by Gurukula Kangri Deemed to be University, Haridwar, Uttarakhand during September 14-19, 2022. He was also invited to deliver an expert session in the PhD coursework classes on September 19 by the Neville Wadia Institute of Management Studies and Research, Pune, Maharashtra. He discussed about the challenges encountered by the scholars in their research journey and the ways to tackle them. During September 24 and 25, Dr. Mittal delivered expert sessions on Research Methodology for the PhD Scholars of MET's Institute of Management, Bhujbal Knowledge City, Nasik, Maharashtra.

- Dr. Sukhpreet Kaur - Assistant Professor delivered an expert session in a workshop conducted by GNA University, Phagwara. Her session was titled Essentials of Literature Review and it was held on September 10.

Events organized by DRC, CBS

- Seven-day Workshop on Advanced Research Methodology

To make the research scholars understand and analyse quantitative data for their research, a seven-day workshop on advance statistical tools including SPSS and AMOS was organized during 25-31 July, 2022. Resource persons for this workshop were Dr. Srinivasan R. Iyenger (Jamnalal Bajaj Institute of Management Studies, Mumbai), Dr. Arun Aggarwal and Dr. Balraj Verma (DRC, CBS). It was attended by 55 research scholars and faculty members, and the participants were able to get a deep understanding of data analysis techniques like Factor Analysis, Confirmatory Factor Analysis, Structural Equation Modelling, etc. They could also develop an understanding of primary and secondary data analysis, parametric and non-parametric tests for their research, etc. Secondary data analysis was done using EViews and participants were explained the steps to perform econometric and statistical analysis, generate forecasts, and model simulations. Finally, they also learned how to produce high-quality graphs and tables for publication.

- Workshop on Mixed-method Research Design

On August 22, a one-day workshop on Mixed-method Research Design was organized and delivered by Dr. Sridhar Manohar, in which research scholars of the university participated and gained insights into both inferential and descriptive statistics using mixed-methods. They learned that by combining the quantitative and qualitative approaches, limitations of individual approach can be balanced out.

- A Seminar on Sampling Design

A seminar on Conceptual and Practical Insights into Sampling Design was organized on September 17 and it was delivered by Dr. Balraj Verma (Assistant Professor, DRC, CBS). The goal was to train the participants on different sampling techniques and develop their understanding on calculating the sample size and techniques to reduce sampling errors.

Scholarship under The Social Innovator Fellowship Program won by Dr. Neha Tuli and Mr. Shivam Sharma

Dr. Neha Tuli (Assistant Professor, CURIN) and Mr. Shivam Sharma (Project Manager, CURIN), both working in the Immersive and Interactive Technology Lab (IITL) of CURIN won a scholarship in The Social Innovator Fellowship Program by Schaeffler India (leading industrial and automotive supplier). They were among the top 11 winners from over 500+ entries that were shortlisted after 24 weeks of evaluation process. They delivered their final presentation in an event held in Pune during July 5-6, 2022 and were awarded a cash prize of INR 100,000 along with free access to an eight-week hybrid mentorship at the Centre for Innovation Incubation and Entrepreneurship, IIM Ahmedabad to help them further develop and scale their solutions.

Insights CURIN

Liquid Crystal: A Fascinating State of Soft Matter

Centre for Liquid Crystal Research (CLCR), CURIN, Chitkara University is doing some excellent work for the advancement of Liquid Crystal technology. Let's get an insight into some of the projects at CLCR.

Liquid crystal (LC) one of the most attractive soft matter systems, has fascinated scientists for decades due to their unique physical properties originated from controllable orientational and/or positional orders, diverse optic and photonic applications. Soft Matter was proposed by Nobel Prize laureate, Pierre-Gilles de Gennes in his Nobel acceptance speech in 1991, which describes materials between aqueous substances and ideal solids, such as colloids, foams, liquid crystals (LCs), gels, polymers, and active matter. LCs are of great interest to the academicians including botanists, chemists, physicists, mathematicians and engineers. Thus in view of diversity of applications, LCs are relevant to wide range of branches of sciences and technology: from biological systems to display technology; from polymer networks to cell membranes; from optical processing systems to telecommunications, etc.
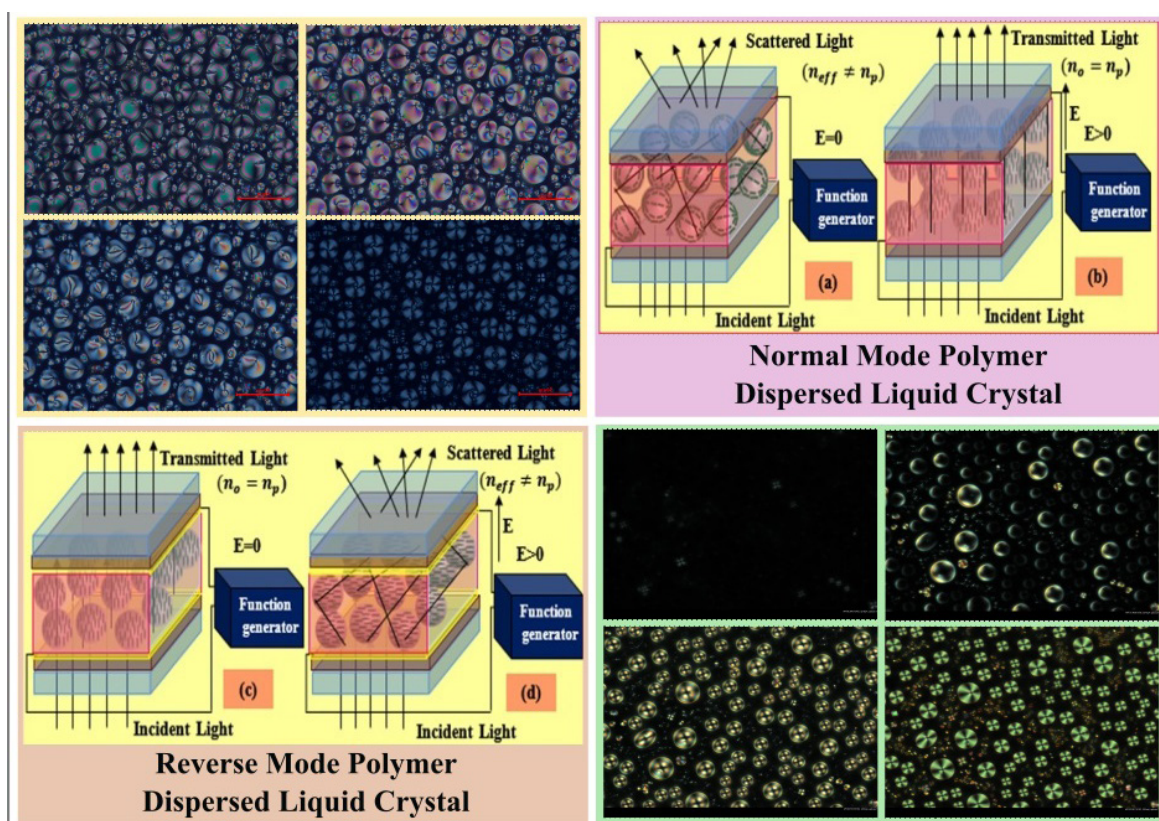
The Centre for Liquid Crystal Research (CLCR) has been established for the advancement of LC technology for next-generation devices and mainly focuses on design, development and characterization of micro/nano scale particles doped LC, self-assembly of colloids and interaction of colloids nano particles at solid-liquid interface, surface morphology, interaction of LC with nano materials, polymer dispersed LC (PDLC) and cholesteric LC for different display applications including light shutters, smart windows, flexible display devices and augmented displays, etc. If one could know how to design, fabricate, and manipulate these micro/nano structures in soft matter (LC) systems, that would open new opportunities in both scientific research and practical applications, such as the interaction between light and soft matter, the intrinsic assembly of the topological patterns, and the multidimensional control of the light (polarization, phase, spatial distribution, propagation direction).

CLCR is headed by Dr. Pankaj Kumar, Professor (Applied Sciences -Physics) and Dean, PhD Program, CURIN. A team of researchers and PhD scholars are working under his guidance on various projects including government funded projects under DST-INSPIRE and DST- SERB schemes. One of the key members of the team Dr Vandna Sharma completed her PhD under DST INSPIRE fellowship at the CLCR and recently joined as a Post-Doctoral Fellow at Jozef Stefan Institute, Slovenia (Europe) in a prestigious ERC project.

More than 100 research papers have been published in reputed SCI and SCOPUS indexed journals as well as 20+ patents have been filed by CLCR. The 26th National Conference on Liquid Crystal (NCLC) in association with Indian Liquid Crystal Society was also organized by CLCR in 2019.

Below are the details about some of the ongoing projects at CLCR.

1. Polymer Dispersed Liquid Crystal (PDLC) Smart Window:

PDLC films consist of sub-micrometer size LC droplets within a polymer matrix and are used as the electro-optical devices. PDLC films are found to be of enormous scientific and technological interest attributable to their ample applications such as smart windows and privacy windows, lightweight displays and holographic films, optical elements, switching gratings, sensors, micro lenses, lasers, smart food packaging etc.

2. Topographically Induced Vertically Aligned LC (VALC) via Self Assembled Nano-scale Particles:

The VALC displays have dark black back-ground color, higher contrast ratio and better image quality compared with in-plane switching (IPS)/twisted nematic displays. Consequently, as an alternative of polyimide alignment layer different approaches have been used to control the vertical anchoring of LC for display applications. However, in liquid crystal display (LCD) industry, several LC methods have been developed to achieve high performance LCD distinguished by the way of LC alignment, such as twisted nematic (TN), vertical alignment (VA), in-plane switching (IPS), and fringe field switching (FFS) etc. Among all, VA method is most preferable as VALC has perfect dark state without an electric field. Most suitable for producing flexible plastic LC displays requiring a low temperature process (compatible with heat-sensitive materials), smart phones and watches, televisions (TV), monitors and notebooks.

3. Cholesteric Liquid Crystal (ChLC) Light Shutter:

ChLC shutter technologies have potential impact and have several good features. The helical structure with controlled pitch of ChLC molecules and their composites makes them extremely promising for light shutter applications. The ChLC shutter has two switchable and stable states: light absorption or scattering state (opaque state) and transparent (planar state). The ChLC are also useful curtain-free smart windows, see-through displays, light modulators and photonics. The color selectivity and tunability of light shutters makes them for color tunable mirrors.

Thanks a due to Dr. Pankaj Kumar for sharing the required details about CLCR for inclusion in the Res Novae.

Activities under 'STEM Demonstration and Popularization' Project

Funded Project by NCSTC, DST, GoI to promote Science, Technology, Engineering and Mathematics (STEM) fields among school students

The National Council for Science and Technology Communication (NCSTC) division of the Department of Science and Technology (DST), Government of India awarded a project to CURIN, Chitkara University in December 2021 under 'STEMM Demonstration and Popularization' scheme to promote among school students skills like innovative mindset, problem solving, design thinking etc., so as to motivate them to take up a career in science. Dr. Archana Mantri – Vice Chancellor, Chitkara University, Punjab is the Principal Investigator (PI) of the two-year project and Mr. Sagar Juneja – Assistant Dean, CURIN is the Co-PI.

This section is going to showcase the activities being done under the project during July – September 2022.

- On July 22, a tutorial session was organized at the Shemrock World School, Zirakpur on the topic Ideation to Prototyping and it was delivered by Mr. Chanpreet Singh (Project Manager, CURIN). The students of classes 8th to 10th enjoyed the session and learned new concepts, especially the 3D printing technology. It was demonstrated to the students that how ideas are generated and how these ideas can be converted into tangible prototypes and products. Students were made aware about the role of technology and entrepreneurship in tackling societal problems. Over 70 students attended the session.

- During July 25-26, three awareness seminars were organized at Angels Valley School, Rajpura to incline students toward STEM fields. One each of these seminars were delivered by Dr. Varsha Singh (Assistant Professor, CURIN), Dr. Reetu Malhotra and Dr. Pooja Mahajan (Assistant Professors, Applied Sciences) and attended by over 100 students of classes 8th to 10th. Dr. Reetu talked about Probability and related it with the real world examples to make students understand the practical applications of the concept. Dr. Pooja spoke about Sustainable Energy Technologies and

discussed about latest advancements in the field of sustainable technologies and the need for sustainable technologies. Dr. Varsha Singh delivered an expert talk on the topic Fascinating Concepts of Science, Maths, Engineering, and Technology with Examples of Practical Applications in Real World'.

- During August 1-2, 2022 three seminars were conducted at SD Public School, Rajpura by the faculty experts from Chitkara University to make students aware about how technology can impact our lives. These expert were - Dr. Jyotsna Kaushal (Professor, CURIN), Dr. Satyam K Agrawal (Professor, CURIN) and Dr. Pooja Mahajan (Assistant Professor, Applied Sciences). Dr. Jyotsna delivered a talk on the topic What Role does Science and Technology Play in Solving

Societal Problems? Dr. Satyam spoke about Understanding the Basics of Science and Dr. Pooja spoke on the topic of Emerging Energy Technologies. These sessions were attended by close to 100 students of classes 8th to 12th.

• Similar awareness sessions were held at Adharshila - The Foundation School, Rajpura during August 4-5, 2022 and were delivered by Dr. Reetu Malhotra (Assistant Professor, Applied Sciences), Dr. Varsha Singh and Dr. Bhanu Sharma – Assistant Professors, CURIN. Students of classes 8th to 12th attended these sessions.

• On August 8, Sagar Juneja – Assistant Dean, CURIN and Co-PI of this STEM Project, conducted a Faculty Orientation Session at St. Soldier Paradise Senior Secondary School, Zirakpur. The objective of this session was to make the school teachers and Principal aware about the STEM project, explain the requirements and expectations from the school and understand the interest of the school in participating in this project. Close to 15 faculty members from the school attended this session.

• Dr. Bhanu Sharma and Dr. Amanpreet Kaur – Assistant Professors, CURIN jointly delivered a tutorial on the topic Importance of Inculcation of Disruptive Technologies in Science and Mathematics Education at the Shemrock World School, Zirakpur on August 9, 2022. The aim of this tutorial was to showcase AR/VR technologies to the students and demonstrate science and

mathematics projects based on these technologies. Students were also introduced to technology buzzwords like Metaverse, IoT and Blockchain with an objective to spark their interests in latest technological advancements.

• On September 13, a tutorial on 3D Printing Technology was conducted at Baby Convent School, Banur by Mr. Chanpreet Singh (Project Manager, CURIN), who is also a 3D printing expert at Chitkara University. In this tutorial, he discussed how to convert your ideas into tangible prototypes using a systematic approach. He demonstrated the working of the 3D printer to the school students, who were absolutely amazed by this technology. Around 25 students participated in this session.

Another Funded Project Sanctioned by the NCSTC Division to CURIN in Q3 2022

The National Council for Science and Technology Communication (NCSTC) division of the Department of Science and Technology (DST), Government of India has sanctioned INR 22,62,750/- to CURIN, Chitkara University for the project titled Awareness and Training Program for Teachers on Teaching Mathematics through Origami for Patiala and Mohali districts of Punjab.

Dr. Kalpna Guleria - Associate Professor, CURIN is the Principal Investigator (PI) of the project and Dr. Ashutosh Mishra - Professor & Dean, Chitkara School of Mass Communication, Chitkara University, Punjab and Dr. Kulbir Singh Bath - Joint Director, Punjab State Council for Science & Technology, (PSCST), Chandigarh are the Co-PIs.

The main aim of the project is to train the teachers so that they can further improve and enhance the skills of school students in teaching basic concepts of mathematics by presenting these concepts in an interesting manner using origami based models, and spatial visualization skills. This will allow students to develop the ability to construct, characterize and comprehend shapes by learning mathematical concepts through origami.

The Patent Office has Granted 32 Patents to Chitkara University in Q3, 2022.

100 Patents Filed in a Quarter by CURIN

During July – September 2022, a total of 180 patents were filed by all the departments of Chitkara University, of which 100 were filed by faculty members and research scholars from CURIN.

The details of these 100 patents, which also include industrial design registrations are given below.

S.No.	Patent Title	Inventors	Application Number
1	A biosensor system for fluorescence resonance energy transfer (fret) assay	Varun Aryan Chhabra, Rajnish Kaur, Akash Deep, Changanamkandath Rajesh, Mansi Chitkara	202211041062
2	A device for diagnosis of social communication disorder	Muskan Chawla, Surya Narayan Panda, Vikas Khullar, Sonu Goel, Prabin Kumar Panigrahi	202211040230
3	A finger worn device for remote operation of an external articles	Anjali, Shinnu Jangra, Gurjinder Singh, Nitin Kumar Saluja, Debarshi Ghosh, Rashpinder Kaur, Varinder Singh	202211046850
4	A jacket for pressure and cool massage for shoulder and neck	Shalli Rani, Divya Gupta	202211053082
5	A non-toxic synergistic herbal dental care composition, method of manufacturing the same, and uses thereof	K.R. Ramkumar, Kr Sugasini, T.V. Lakshmi	202211055724
6	A vector repellent gel formulation and method of preparation thereof	Manpreet Kaur, Neha Dahiya, Raj Rani, Varsha Singh	202211045507
7	Adjustable device for holding an article	Naveen Kumar, Rajesh Kumar Kaushal, Jaspreet Singh Bajaj, Mohit Verma	202211054498
8	An herbal oral hygiene composition and a process for preparing the same	Neha Dahiya, Manpreet Kaur, Raj Rani, Varsha Singh	202211039803
9	Anti-acne scrub soap composition and method of its preparation	Raj Rani, Manpreet Kaur, Neha Dahiya, Varsha Singh	202211051130
10	Assembly for lifting patient from hospital bed	Surya Narayan Panda, Sanjeev Verma, Sachin Ahuja, Sonu Goel, Prabin Kumar Panigrahi, Suderson Jena, Usha Desai, Muskan Chawla	202211045768
11	Asset management system	Sagar Juneja, Inder Singh, Kritika Kapoor	202211038901
12	Augmented reality based system for book	Neha Tuli, Shivam Sharma, Archana Mantri	202211043321
13	Automated cup dispenser assembly	Rupesh Gupta, Jatin Singla, Tanmay Arya, Nitish Malik, Sheifali Gupta	202211050881
14	Automated energy saving exhaust fan assembly	Rashmi Aggarwal, Vishal Verma, Kuldeep Kumar, Sachin Ahuja	202211042287
15	Automated sanitization and cleaning system for escalators	Kalpna Guleria, Sushil Kumar, Sunita Tiwari	202211047344
16	Automated solar water-pumping system	Deepika Chaudhary, Jaiteg Singh, Nishu Bali, Sachin Ahuja, Akhilendra Khare, Neelam Dahiya	202211045504

| 17	Blockchain-based secured system for smart contract farming	Ishu Sharma, Arshnoor Kaur, Jagdeep Sharma, Tushar Malik, Kirandeep Kaur	202211055064
18	Cabinet to assist in organizing garments	Shalli Rani, Ankita	202211055368
19	Cell culture flask for in vitro hypoxia treatment	Satyam Kumar Agrawal	202211043461
20	Cell culture platform for in vitro studies	Satyam Kumar Agrawal, Madhunika Agrawal	202211039219
21	Device and method for testing port vulnerability	Sachin Ahuja, Rahul Mishra, Dhiraj Singh	202211053790
22	Device for malware detection	Deepak Thakur, Tanya Gera, Jaiteg Singh, Sachin Ahuja	202211050882
23	Device for portable document format protection	Sachin Ahuja, Rahul Mishra, Dhiraj Singh	202211053548
24	Device for visually impaired	Jai Prabhat Ranjan, Krishna Kumar Gupta, Sachitanand Singh, Sheifali Gupta, Rupesh Gupta	202211044889
25	Device to vary controls of an entertainment system remotely in a vehicle	Shalli Rani	202211054499
26	Doormat with safety system	Pradeepta Sarangi, Gurpreet Singh, Kapil Sharma, Lekha Rani, Kalpna Guleria, Neetu Mittal, Bishnu Prasad Rath, Ashok Kumar Sahoo	202211040030
27	Electromagnetic eddy current brake assembly	Rupesh Gupta, Ashutosh, Amil Sharma, Rohit Jaiswal, Sheifali Gupta	202211040231
28	Embedded tool with enhanced classification performance	Ruchi Mittal, Varun Malik, Sb Goyal, Jaiteg Singh, Sachin Ahuja, Vikram Singh	202211046852
29	Fire control system together with AI-enabled drone	Shweta Lamba, Anupam Baliyan, Vinay Kukreja, Rishabh Upadhyay	202211038657
30	Geospatial sensing device	Neelam Dahiya, Sartajvir Singh, Sheifali Gupta	202211038904
31	Head-mounted device with virtual reality-induced actions	Amanpreet Kaur, Priyanka Datta, Narinder Pal Singh, Archana Mantri	202211043322
32	Heat treatment electric furnace	Rakesh Goyal, Sushanta Jashwara, Punam	202211045767
33	IoT enabled cage for monitoring of animals	Satyam Kumar Agrawal, Madhunika Agrawal, Vikas Khullar	202211040455
34	Keychain for storing accessories	Rajesh Kumar Kaushal, Naveen Kumar, Suresh Limkar, Mohit Kumar, Dimple Kumar	202211048592
35	Milk dispensing apparatus	Deepak Chaudhary, Nishu Bali, Jaiteg Singh, Neelam Dahiya, Sachin Ahuja	202211054678
36	Multibeam travelling wave antenna array	Sagar Juneja	202211054049
37	Numismatic display assembly	Anuraag Dash, Jyoti Prakash Dash, M Karthik, Amaan Salim Hassanali, Surya Narayan Panda, Prabin Kumar Panigrahi, Sudarson Jena	202211050883
38	Plant disease diagnostic system	Shweta Lamba, Anupam Baliyan, Vinay Kukreja, Rishabh Upadhyay	202211039391
39	Surveillance system to monitor unauthorized activities at door	Rupesh Gupta, Sarang Sharma, Prerna, Simret Kaur, Aakash, Sheifali Gupta	202211039802
40	System and method for blockchain based document verification	Rahul Mishra, Dhiraj Singh, Sachin Ahuja	202211048864
41	System and method for blockchain-based agricultural supply chain management	Ishu Sharma, Tushar Malik, Jagdeep Sharma, Arshnoor Kaur, Kirandeep Kaur	202211054675

42	System and method for decentralized autonomous healthcare documentation	Sachin Ahuja, Rahul Mishra, Dhiraj Singh	202211053550
43	System and method for detection of kidney disease	Kalpna Guleria	202211052914
44	System and method for detection of latent tuberculosis infection	Kalpna Guleria	202211050660
45	System and method for detection of lung cancer	Kalpna Guleria	202211050658
46	System and method for detection of Parkinson disease	Kalpna Guleria, Sachin Ahuja	202211050195
47	System and method for generating heat and maintaining hygiene of a commode	Shalli Rani, Ankita	202211050877
48	System and method for microwave-assisted desalination of water	Nitin Kumar Saluja, Varinder Singh, Simran Midha, Gurjinder Singh	202211053076
49	System and method for nut cracking and shelling	Deepali Gupta, Kanwal Preet Kour, Malvinder Singh, Kamali Gupta	202211050879
50	System and method to maintain temperature in a garment worn by a user	Shalli Rani, Ankita	202211053549
51	System for tracking expiration date of food products in a refrigerator	Shalli Rani, Dhruv Jindal	202211054680
52	System to control an unmanned aircraft vehicle to detect plant disease and spray fluid	Shweta Lamba, Anupam Baliyan, Vinay Kukreja, Rishabh Upadhyay	202211039390
53	Table assembly with solar panel	Bhanu Sharma, Archana Mantri	202211040028
54	Travelling wave antenna for 5G applications	Sagar Juneja	202211047995
55	Virtual reality system to monitor behavior of rodents	Gurjinder Singh, Thakur Gurjeet Singh, Nitin Kumar Saluja, Narinder Pal Singh, Debarshi Ghosh, Rashpinder Kaur, Anjali	202211046851
56	Water purification system and a method to operate the same	Vaneeta, Amanpreet Kaur, K.R. Ramkumar, Sudesh Mittal	202211055725

INDUSTRIAL DESIGN REGISTRATIONS

57. 8 port super-wideband fractal MIMO antenna for IoT applications

By: *Manish Sharma, Ashwani Kumar, Vaishali Kikan, Gaurika Jaitly*

Application No. 371230-001
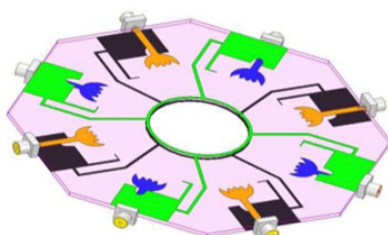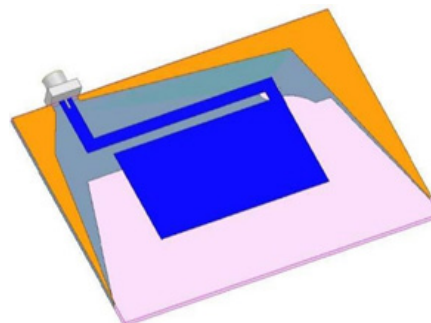

58. A monopole flared directional antenna

By: *Manish Sharma, Munish Vashishath*

Application No. 371233-001

59. Almirah

By: *Shalli Rani*

Application No. 369926-001

60. Animal treadmill with waste collecter

By: *Leema Nelson, Master Chaitanya, Mukesh Kumar, Vettivel S C, Parveen Kumar*

Application No. 371090-001

61. Balanced bullock cart

By: *Prateek Srivastava, Deepam Goyal, Mohit Kumar, Ashiwani Kumar, Shailendra Pratap Singh*

Application No. 369655-001

62. Book sorter for bags

By: *Anjali Rani, Yogesh Duggar, Vinay Kukreja*

Application No. 369227-001
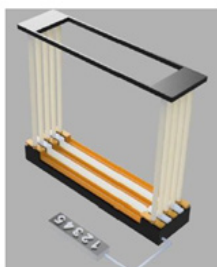
63. Bottle with trio corner boxes

By: *Kamaljeet Singh, Harshita Bhargave, Ankit Sharma, Atul Babbar, Bhavyam Kapoor*

Application No. 369153-001
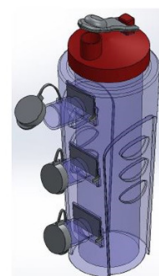
64. Box cum stand for stationary

By: *Nidhi Bansal Garg, Atul Garg, Mohit Bansal, Prateek Srivastava, Rishu Bhardwaj*

Application No. 367341-001
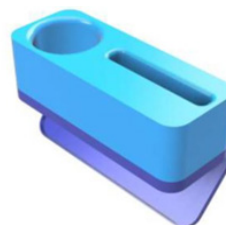
65. Cell culture platform for cell attachment

By: *Satyam Kumar Agrawal, Madhunika Agrawal*

Application No. 367420-001
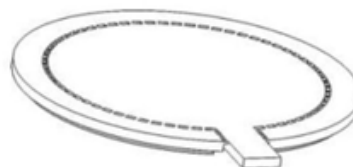
66. Cookware with anti-roll feature

By: *Anuj Kumar Jain, Rahul Bhandari, Varun Jindal, Amit Vajpayee, Nitin Jain, Vinay Kukreja, Raj Gaurang Tiwari, Mishika Maluja*

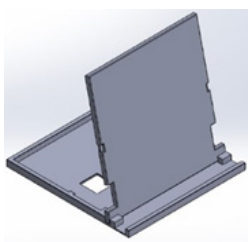**Application No**. 367339-001

67. Cover glass for protecting materials

By: *Leema Nelson, Htet Ne Oo, Heena Wadhwa, Mandeep Kaur*

Application No. 370373-001

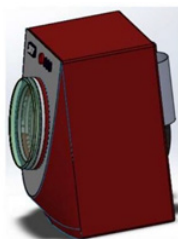### 68. Cup coaster cum smart phone stand

By: *Rajesh Kumar Kaushal, Naveen Kumar, Mohit Kumar, Manish Sharma, Suresh Limkar*

Application No. 369228-001

69. Device for efficient utilization of water and detergent for fully automatic washing machine
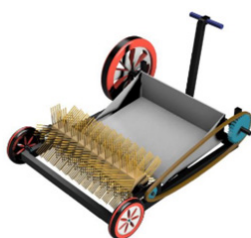
By: *Rakesh Ahuja, Himanshi Babbar, Shalli Rani, Mohit Kumar, Ravi Kumar Sachdeva*

Application No. 367475-001

70. Dust cleaning machine

By: *Bhanu Sharma, Jasmeet Singh, Barinder Singh, Jwala Singh, Mohit Rana, Lovish Matta, Harbani Sharma, Jatin Kumar Gulati, Hitesh Goyal*

Application No. 369313-001

71. Electric sweater

By: *Shalli Rani, Ekta Garg*

Application No. 369312-001

72. Foldable bath tub

By: *Neeraj Singla, Bhanu Sharma*

Application No. 369656-001

73. Foldable multipurpose table

By: *Neeraj Sharma, Bhanu Sharma*

Application No. 370823-001

74. Foldable object holder

By: *Bhanu Sharma, Archana Mantri, Narinder Pal Singh, Harbani Sharma, Deepika Sharma, Deepak Goyal, Neeraj Singla, Krishan Dutt Sharma, Sheena Angra*

Application No. 370750-001

75. Funnel cum column system for water purification

By: *Jyotsna Kaushal, Himanshu Goyal, Lal Nand*

Application No. 367336-001

76. Hammer with screw-threaded handle

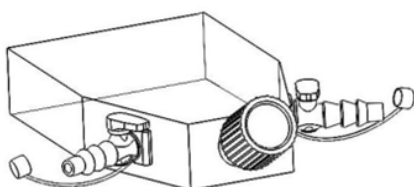**By:** *Karun Kumar Sharma, Ankit Sharma, Bhargav Prajwal Pathri, Atul Babbar, Bhavyam Kapoor*

Application No. 367936-001

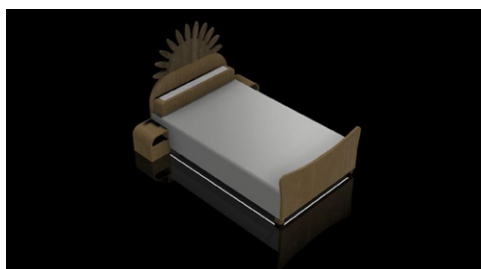
77. Hypoxia flask

By: *Satyam Kumar Agrawal*

Application No. 368500-001

78. In-built mosquito repellent furniture

By: *Ridhima Gajrotra, Prakul Agarwal, Pankaj Kumar, Vandna Sharma, Ankit Rai Dogra*
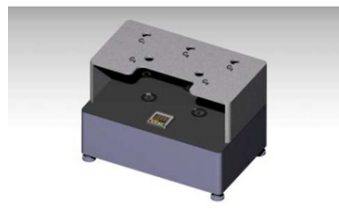
Application No. 369314-001

79. Individual heating platform for test tube

By: *Thakur Gurjeet Singh, Rajwinder Kaur, Nidhi Rani, Varinder Singh, Md Altamash Ahmad, Chanpreet Singh*
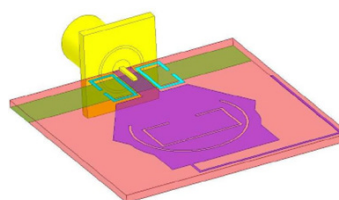
Application No. 370369-001

80. Integrated Bluetooth super-wideband antenna with tri-notched band

By: *Manish Sharma*

Application No. 371695-001

81. Lead apron with cassette pocket

By: *Mohit Sharma, Priti Panwar, Prateek Srivastava, Anita Gupta, Srishti Bhardwaj, Khursheed Ahmad Ganie, Deepam Goyal*

Application No. 367938-001

82. Multifacility bed with expendable feature and baby protector

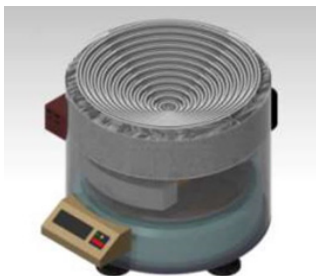**By**: *Multifacility bed with expendable feature and baby protector*

Application No. 370375-001

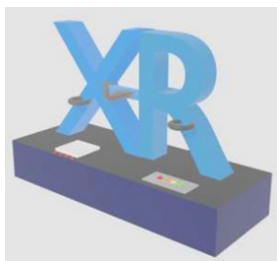## 83. Multi-functional chemical catalyzer

By: *Thakur Gurjeet Singh, Rajwinder Kaur, Nidhi Rani, Varinder Singh, Md Altamash Ahmad, Chanpreet Singh*

Application No. 370123-001

84. Multipurpose virtual reality (VR) dock station

By: *Neha Tuli, Shivam Sharma, Sanchit Vashisht, Archana Mantri*

Application No. 367474-001

85. New style ketchup sachets

By: *Vandna Sharma, Pankaj Kumar, Ankit Rai Dogra*

Application No. 363932-001

86. Portable matki

By: *Ruchi Mittal, Amit Mittal, Jaiteg Singh, Varun Malik, Vikram Singh, Vikas Rattan*

Application No. 367340-001

87. Portable projector cum laptop stand with adjustable height
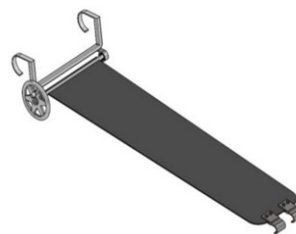
By: *Rajesh Kumar Kaushal, Mohit Kumar, Manish Sharma, Williamjeet Singh, Jeetender Kumar, Shilpi Garg*

Application No. 367939-001

88. Portable two-wheeler seat cover

By: *Leema Nelson, Vettivek S C, Mukesh Kumar, Parveen Kumar*

Application No. 371234-001

89. Self-size adjusting belt

By: *Varun Jindal, Yukta Nagpal, Vinay Kukreja*

Application No. 370370-001

90. Shampoo-conditioner bottle

By: *Nidhi Bansal Garg, Atul Garg, Mohit Kumar Kakkar, Mohit Bansal, Reetu Malhotra, Prateek Srivastava*
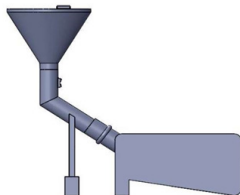
Application No. 367337-001
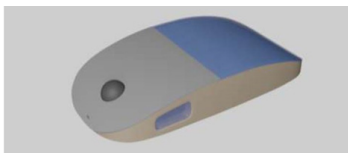
91. Smart portable commode for infant/toddlers

By: *Mohit Kumar, Muskan Chawla, Silky, Mamta Janagal, Sanjeev Verma, Surya Narayan Panda*

Application No. 368265-001

92. Smart touchpad mouse with a high-security feature for the device

By: *Varun Jindal, Vinay Kukreja*

Application No. 370371-001

93. Sofa chair

By: *Tanya Gera, Deepak Thakur, Jaiteg Singh, Sachin Ahuja*

Application No. 371210-001
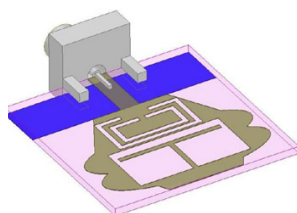

94. Spy pen cum drone (set)

By: *Jatin Kumar Gulati, Harbani Sharma, Bhanu Sharma, Deepika, Jasmeet Singh*

Application No. 369230-001
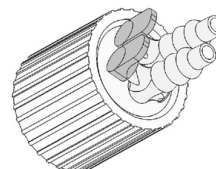

95. Super-wideband monopole antenna with three filters

By: *Manish Sharma*

Application No. 371694-001

96. Universal cell culture flask cap for hypoxia treatment

By: *Satyam Kumar Agrawal*

Application No. 368501-001
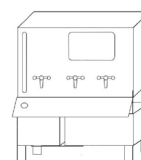

97. Walking stick cum walker

By: *Taniya, Amanpreet Kaur, K.R. Ramkumar*

Application No. 370751-001

98. Water cooler to prevent wastage of water

By: *Ashu Taneja, Rinku, Arun Lal Srivastav, Sughosh Madhav, Veena Chaudhary, Ruchi*

Application No. 369229-001

99. Weight lock based hook

By: *Anuj Kumar Jain, Amit Vajpayee, Rahul Bhandari, Nitin Jain, Varun Jindal, Vikrant Sharma, Vinay Kukreja, Raj Gaurang Tiwari, Vikas Solanki, Yukta Nagpal*

Application No. 369157-001

100. Wheelchair with commode and cistern

By: *Naveen Kumar, Rajesh Kumar Kaushal, Surya Narayan Panda, Sanjeev Verma, Mohit Kumar, Jyoti Sharma*

Application No. 369155-001

Participation of CURIN Faculty Members as Resource Persons in Various Events

- Dr. S.N. Panda - Professor and Executive Director (Research) was invited to deliver a talk on Artificial Intelligence and its Applications in Innovation at the CDMS Research Seminar that was organized by Western Sydney University, Australia on July 7. More than 50 faculty members and students of Western Sydney University attended this seminar.

  Being a trained assessor of National Assessment and Accreditation Council (NAAC), Dr. S.N. Panda visited T. John College, Bengaluru, Karnataka during September 4-5, 2022 as the Member Co-ordinator of NAAC Peer Team and assessed the qualitative matrix of NAAC.

- Dr. Shalli Rani – Professor, CURIN was invited to deliver a talk on Ph.D Guidance in a ten-day faculty development program on Teaching Learning Process and Assessment held at Brainware University, Kolkata during July 12-22, 2022. The broad areas that were covered in this program were Curriculum Framework & Learning Outcomes, Online Education, Student Feedback System, Education Policy (NEP 2020), Creation of Effective Audio-Visual Education Content, Design and Development of MOOCs Course Based Credit System, Research Guidance/ Supervising Research Scholars, Writing (Academic) and Securing Intellectual Property.
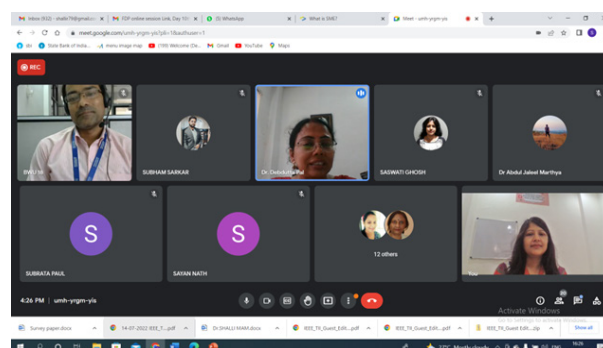
- Dr. Prateek Srivastava – Associate Professor, CURIN was invited by ISHRAE Chandigarh Chapter on September 10 for a technical talk on the topic Radiant Heating and Cooling System. Radiant cooling system is considered to be one of the most advanced systems in the area of HVAC system for enhanced energy efficiency. Dr. Prateek discussed the design implications of the system for various climatic conditions of India. He also explained various successful case studies of radiant cooling system in India and abroad. The event was attended by 40 industry professionals and 15 students.

  On September 17, Dr. Prateek was invited by the organizers of Ins & Out (Chandigarh's biggest Architectural Exhibition) to deliver a talk on Radiant Heating and Cooling System and to be part of the Panel Discussion on Building Energy Efficiency. This was the 8th annual exhibition organized by Ins and Out. More than 100 participants attended the program.

  Dr. Prateek has bagged Undergraduate Program Equipment Grants worth USD 5,000. The grant was awarded for the project Experimental Analysis

of Condensation Free Radiant Cooling System. Condensation free radiant cooling system will be designed and developed to minimize the overall cost of the system by replacing DOAS with IDEC. Condensation free radiant cooling system will help in simplifying the operation of the system and improve the energy efficiency. It will also help in improved market adaptation.

- Dr. Satyam Kumar Agrawal, Professor (Research), CURIN, was invited as the resource person at the two-day faculty development program (FDP) on Blueprint of Writing Research & Funding Process on 16-17 September 2022. It was organised by the Department of Optometry, Chitkara School of Health Sciences. Dr. Agrawal discussed the key points on institutional, departmental and individual`s eligibility for applying a project. How one should make a complete and detailed profile on funding agency`s platform and its importance was emphasized in the FDP. Further, details on calls for proposals, type of proposals and drafting a correct and impressive proposal were discussed in depth. The audience was also familiarized by the proposal writing involving ethical approvals and their importance. It was attended by around 20 faculty members and 40 scholars from the Department of Optometry, Computer Science and Engineering and CURIN.

- On September 30, Chitkara College of Education invited Dr. Amanpreet Kaur - Assistant Professor, CURIN to deliver an expert session on the Introduction to Innovative and Disruptive Technologies: Augmented Reality, Virtual Reality, Mixed Reality and Metaverse. This session was conducted as part of a training module for the new batch of B.Ed and M.Ed students.

  Dr. Amanpreet Kaur - Assistant Professor, CURIN attended the inauguration ceremony of the International Virtual Reality Film Festivals 2022 on July 1 in an online mode. Dignitaries from different parts of the world attended this event, where Metaverse experience was also demonstrated.

- Dr. Gurpreet Singh Saggu – Assistant Professor, CURIN presented a paper on Sustainable Approach for the Textile Wastewater Treatment by Photo-Fenton and Biological Process Optimization in the International Conference on Sustainable Energy Solutions for a Better Tomorrow (SESBT 2022) held on July 23 -24, 2022 at Vellore Institute of Technology, Chennai.
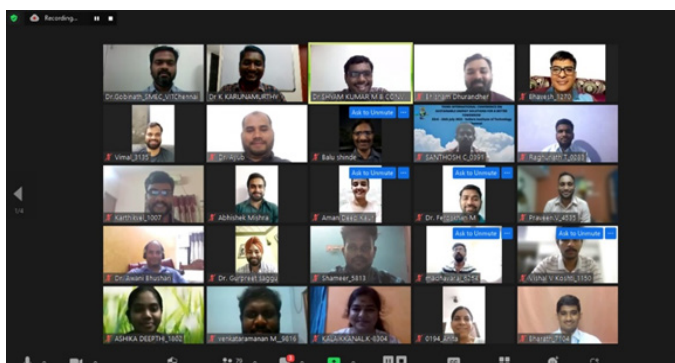
Dr. Gurpreet Singh Saggu completed a four-day training on Low Carbon Pathways for Industrial Sectors organized by the Centre for Science and Environment, New Delhi during August 23 -26, 2022 at Anil Agarwal Environment Training Institute (AAETI), Nimli, Rajasthan. The major topics discussed in the training were: Inventorization for greenhouse gases for industrial and power sector; Climate crisis - science and policy developments; Biomass co-firing in coal thermal power plants in Delhi NCR region; Blended cement; Implementation analysis of cleaner fuels in industries in Alwar

and Bhiwadi; Decarbonizing cement sector; Hydrogen - a promising alternative; Industries role and contribution to greenhouse gases; Implications on greenhouse gas reduction from thermal power plants etc.

- Dr. Anoop Kumar Singh (Professor, CURIN) and Dr. Ankit Sharma (Assistant Professor, CURIN) attended a workshop on Clinical Validation of Medical Devices on July 30 at PGIMER Chandigarh. The event was focused on biomedical instruments and devices and their clinical validation.

- Shagun Sharma – PhD Scholar, CURIN under Dr. Kalpna Guleria (Associate Professor, CURIN) presented a paper titled Deep Learning Model for Early Prediction of Pneumonia using VGG19 and Neural Networks in the 3rd International Conference on Mobile Radio Communications & 5G Networks – 2022, organized by the Department of Electronics & Communication Engineering, University Institute of Engineering & Technology, Kurukshetra University, Kurukshetra, Haryana, India during August 5-6, 2022.

- Shagun Sharma presented a paper titled A Deep Learning based Model for the Detection of Pneumonia from Chest X-Ray Images using VGG-16 and Neural Networks in the International Conference on Machine Learning and Data Engineering (ICMLDE-2022) organized by UPES, Dehradun, Uttarakhand, India during September 7-8, 2022. The paper will be sent for publication in Procedia Computer Science journal published by Elsevier.

- A National Seminar on Quality Assurance in Higher Education was organized by Chitkara University Accreditation and Quality assurance Cell, Chitkara University, Punjab, on September 2-3, 2022, which was sponsored by National Assessment and Accreditation Council (NAAC), India and Tata Tele Business Services. Original and content rich abstract of minimum 200 words were invited and the accepted and presented papers will be published in a book with an ISBN number. Dr. Deepali Gupta (Professor, CURIN) and some of the PhD scholars, Monica Dutta, Mudita Uppal, Ramneet and Sheena Angra submitted their papers in this program.

Monica Dutta, Mudita Uppal, and Ramneet – PhD Scholars, CURIN attended an online one week program on Entrepreneurship, Innovations & Digital Skills in New Era of Artificial Intelligence, which was organized by Moradabad Institute of Technology, Moradabad during July 25-29.

Events Organized by CURIN

During July – September 2022

- Chitkara University is empaneled as a Spoke Centre under the Future Skills Program, which is a joint initiative by the Ministry of Electronics & Information Technology (MeitY) and IT industry led by NASSCOM. The program offers a robust blended learning platform hosted on cloud to encourage any-time, any-where, self-paced learning. The existing pan India presence and skilling capabilities of training facilities (SSC NASSCOM, CDAC, NIELIT) can be leveraged through blended-learning framework in a Hub-n-Spoke model. C-DAC Mohali is the National Lead Resource Centre for the Social and Mobile domains out of the 10 futuristic technologies depicted by NASSCOM. Under this initiative, students of Chitkara University were introduced to the benefits of this program by an expert team from C-DAC in an event that was organized at Chitkara University on July 20. Around 70 students from Computer Science and Engineering and Computer Applications departments attended the session and expressed their interest in this program. From CURIN, the session was coordinated by Dr. Meenu Khurana, Dr. Sudesh Kumar Mittal – Professors and Dr. Amanpreet Kaur – Assistant Professor.

- A brainstorming session on the disruptive applications of Metaverse was organized on July 28, wherein eminent scientists from DRDO and professionals from industry shared their valuable insights. Different layers of Metaverse and its connectivity with AI & Digital Twin were explored for applications in Education, Health and Defense sectors. At CURIN, the session was headed by Dr. P. K. Khosla – Pro-VC, Research with support from Dr. Amanpreet Kaur – Assistant Professor, CURIN. Close to 20 faculty members and scholars participated in the session.

- On July 30, an interactive session with the faculty members of Chitkara School of Health Sciences was organized and it was about offering the university consultancy services to industry as well as society for mutual benefits. The session was attended by 20+ faculty members, wherein Dr. Gurjeet Singh - Dean, Chitkara College of Pharmacy and Mr. Varinder Singh from Easy Consultancy Policy (ECoP) team interacted with the participants. There was a

healthy discussion and brainstorming on ideas and methods to promote consultancy services in the fields of Optometry, Hematology and Physiotherapy.

- Chitkara University Central Instrumentation (CUCIF), Chitkara University organized a tutorial on the topic Game Development for VR on August 3. The session was delivered by Ms. Shinnu Jangra – PhD Scholar, CURIN and she was assisted by a team from CUCIF. 25 students from different departments and backgrounds attended the session in order to learn the fundamentals of virtual reality and game development using Unity and C# programming language. The session also featured a demonstration of Oculus Quest, which is a VR headset.

- On August 4, CUCIF organized a session titled Recognize the Human Emotions and Component Analysis using EEG Signals, which was attended by 27 students and faculty participants. They learned about the fundamentals of EEG signals, electrical activities of the brain and various applications using the EEG signals including working with VR and EEG. The same session was repeated on September 13, which was attended by close to 20 students and faculty members.

- A workshop on Skill Development was conducted by the STI hub, Chitkara University, Punjab on September 14 for the students of Senior Secondary School, Jhansla. More than 65 students attended the workshop. Dr. Rajesh Kaushal, Dr. Jyotsna Kaushal – Professors, CURIN and Dr. Naveen Sharma – Associate Professor, CURIN explained the topics like IoT technology based devices for domestic animals, water cleanliness and e-dispensary, respectively. Mr. Ravinder, Instructor of the Carpentry Shop at Chitkara University, Punjab explained the basics of carpentry and the applications of several carpentry tools to the students. Then, students experienced the carpentry basics with augmented reality technology using My Carpenter application. Dr. Bhanu Sharma – Assistant Professor, CURIN coordinated the workshop with her team. The workshop helped in enhancing the knowledge of the students and well as their teachers in the various aspects of technologies and their applications.

- The Office of PhD Programme, CURIN, Chitkara University, Punjab organized an two-day online workshop on Reference Management using Mendeley Software during 23 – 24 September, 2022. The workshop focused on managing references, research papers, annotating PDFs, citing while writing, automatically creating bibliographies, and much more. The resource persons were Dr Arun Upmanyu, Associate Professor, CURIN and Dr. Deepam Goyal, Assistant Professor, CURIN. The workshop was convened by Dr. Pankaj Kumar, Dean PhD Programme, CURIN and was coordinated by Dr. Deepali Gupta, Professor, CURIN.

List of Publications
112 publications by CURIN in Q3

CURIN faculty members and scholars have published research papers/book chapters in SCI and Scopus indexed journals, conferences, and books. This alphabetically sorted list contains those publications that have been indexed in Scopus during July- September 2022.

1. Raj Sharma and R. Goyal, "Immersion studies of Al2O3 – 13% TiO2 and Cr2O3 coatings on ship hull plate in simulated seawater environment in laboratory," *Materials Today: Proceedings*, vol. 48, pp. 946–951, 2022.

2. Kumar, M. Chitkara, G. Dhillon, and N. Kumar, "Facile synthesis and structural, microstructural, and dielectric characteristics of SnO 2 -CeO 2 semiconducting binary nanocomposite," *ECS Transactions*, vol. 107, no. 1, pp. 3739–3747, 2022.

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4. P. Kaur, A. Singh, R. Sachdeva, and V. Kukreja, "Automatic speech recognition systems: A survey of discriminative techniques," *Multimedia Tools and Applications*, pp. 1–33, 2022.

5. Kumar, S. Singh, and R. Pandey, "Computational modelling and optimization of a methylammonium-free perovskite and Ga-free chalcogenide tandem solar cell with an efficiency above 25 %," *ChemistrySelect*, vol. 7, no. 32, p. e202200667, 2022.

6. Rana, A. Taneja, and N. Saluja, "Accelerating IoT applications new wave with 5G: A review," *Materials Today: Proceedings*, 2021.

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8. Ankita and S. Rani, "Machine learning and deep learning for malware and ransomware attacks in 6G network," Proceedings - 4th International Conference on Compu*tational Intelligence and Communication Technologies (ICCCT)*, pp. 39–44, 2021.

9. Ankita, A. Zaguia, S. Rani, and A. K. Bashir, "Analysis of machine learning and deep learning in cyber-physical system security," *Lecture Notes in Networks and Systems*, vol. 394, pp. 355–363, 2022.

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16. Bag, R. Pandey, S. Kashyap, J. Madan, and J. Ramanujam, "The influence of top electrode work function on the performance of methylammonium lead iodide based perovskite solar cells having various electron transport layers," *Chemical Physics Letters*, vol. 806, p. 140009, 2022.

17. Mangla, S. Rani, N. M. Faseeh Qureshi, and A. Singh, "Mitigating 5G security challenges for next-gen industry using quantum computing," *Journal of King Saud University - Computer and Information Sciences*, 2022.

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22. D. Thakur, K. Sharma, and R. Sharma, "Design of a low-noise low-power fourth order complementary super source follower filter for EEG applications," *ECS Transactions*, vol. 107, no. 1, pp. 10969–10975, 2022.

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32. Seth et al., "A taxonomy and analysis on internet of vehicles: Architectures, protocols, and challenges," *Wireless Communications and Mobile Computing,* vol. 2022, 2022.

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