CURIN
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Research & Innovation
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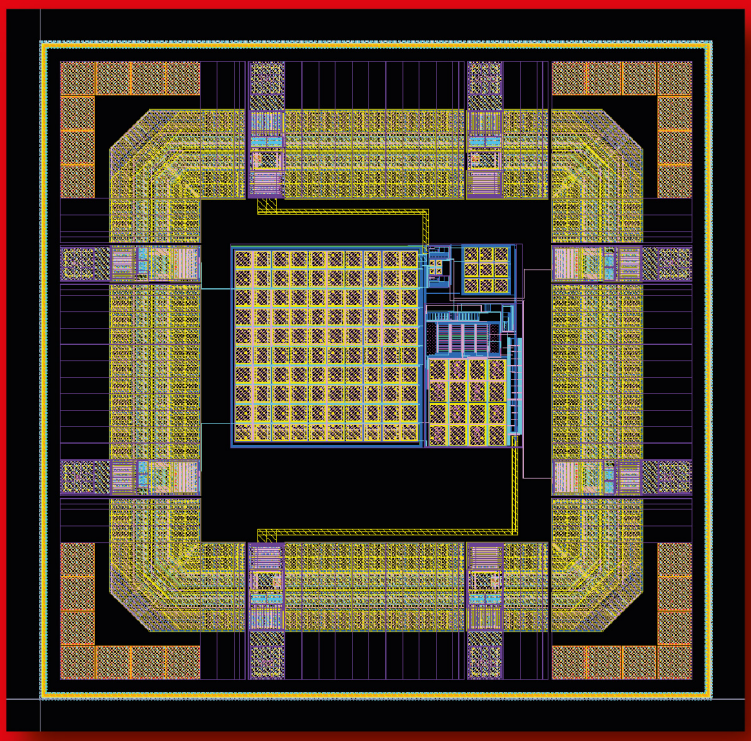
RES NOVAE

CURIN Research and Development News

Cover Story
Semiconductor Chip Fabricated
by Chitkara University



Vol. 2020, Issue 3
R&D Activities
During Oct – Dec 2020

BOSCH
Industry-Academia
Collaboration Centre

Highlights of the Quarter

- **55** Patents Filed
- **10** Patents Granted
- **10** Consultancy Projects Completed
- **55** Scopus Indexed Research Publications

CONTENTS

EDITORIAL

Being an Electronics Engineer myself I am fully aware how challenging it is to do end to end semiconductor chip design and fabrication. Therefore, I want to begin by congratulating Dr. Kulbhushan Sharma and Dr. Rajnish Sharma who have successfully achieved this feat! The cover story of this issue is on the same subject, I hope you will find it useful.

Likewise, there are many more individual achievements of CURIN faculty members that have been covered in this issue of the newsletter. Some of these achievements include – three edited books published by Dr. Abhishek Kumar, Dr. Varsha Singh has been selected as Early Career Fellow by a prominent international society, Dr. Pankaj Kumar has delivered expert talk in a prominent national conference, Dr. S.N. Panda has chaired paper presentations session in a prominent IEEE conference etc.

During October – December 2020 we conducted a multi-disciplinary international conference, TEQIP sponsored workshop, faculty development program etc. In addition, CURIN faculty members were also invited to deliver lectures, workshops at multiple forums. We filed 55 patents and did 55 research publications during October – December 2020. We also completed 10 consultancy projects during the same time period! You will find all these details in this issue.

Lastly, I encourage you to read Research@CURIN section where we have briefly summarized top 5 high impact research articles published by CURIN faculty members and scholars during October – December 2020.

If you have any feedback for us, please do write. We will be happy to hear from you.

Sagar Juneja
Editor – Res Novae

Semiconductor Chip Fabricated by Chitkara University

Very few academic institutions in the country has this capability and expertise

Cover Story by – Dr. Rajnish Sharma (Consulting Editor, Res Novae) and Sagar Juneja (Editor, Res Novae)

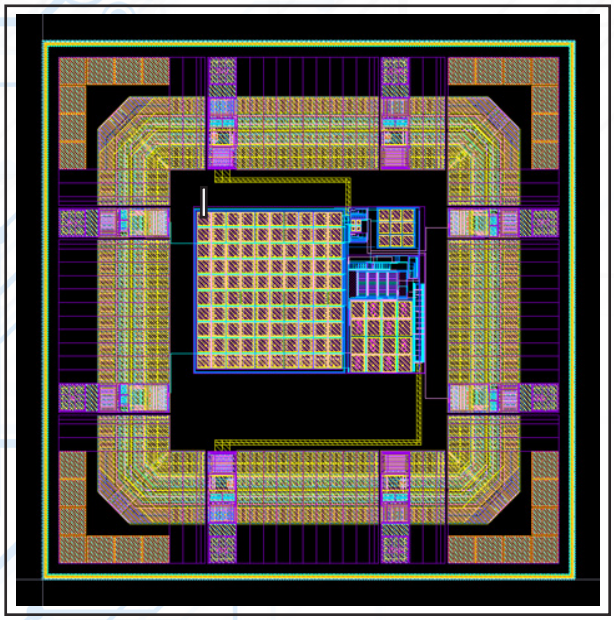
Introduction

Pick-up any electronic gadget today, be it a simple TV remote to a multifunctional and advanced smart phone, you will find different types of semiconductor integrated circuits in it. Semiconductor integrated circuit is commonly referred to as IC and it is a device that has a set of electronic components on a single tiny substrate (mostly silicon). ICs are designed to perform specific task upon application of suitable power supply and input signals and they require very few external electronic components for their operation.

In India end-to-end chip designing is done by many VLSI companies, research labs as well as academic institutions, but actual chip fabrication in the country for commercial purposes is a rarity. We have Government run fab lab that does chip fabrication for defense, space and strategic purposes only. Therefore, getting a chip fabricated in the country is a challenge. Chitkara University has successfully overcome this challenge and has fabricated a semiconductor chip that only a very few top academic institutions in the country has done.

The VLSI Centre of Excellence (CoE), Chitkara University, Punjab, India in collaboration with Semiconductor Laboratory (SCL), Mohali, Punjab, India has designed and fabricated a low-voltage low-noise neural amplifier silicon chip in 0.18 µm technology which would be useful for possible diagnosis of various chronic diseases like Parkinson, Spinal cord injuries, Epilepsy and Paralysis. The work carried out to design and fabricate neural amplifier chip was accomplished in two parts. The first part focused on circuit designing which was completed in VLSI CoE, Chitkara University, Punjab, India and the second part related to the tape-out implementation, fabrication and packaging was completed in SCL, Mohali, Punjab, India.

Dr. Kulbhushan Sharma under the supervision of Dr. Rajnish Sharma (Lead, VLSI Center of Excellence) from Chitkara University, and SCL team led by Shri. H. S. Jatana accomplished this wonderful achievement.



Layout of the proposed chip

The optimization of noise-power and noise-stability tradeoffs in neural amplifier design were major challenges faced by the team of researchers associated with this work. However, with a well planned systematic approach, a great optimization between these parameters could be obtained and finally the chip was designed for noise and power of approximately 2.6 uVrms and 10 uW respectively.

The 8 pin neural amplifier chip is currently in testing phase before it is being deployed in in-vitro and in-vivo experimentations. Industry partner of Chitkara University i.e. NXP semiconductors hugely appreciated the work and committed to provide any kind of future support as well for further work in this direction. Collaborating with researchers working with in-vitro and in-vivo experimentations for amplifying real time neural spikes is future prospect of this work.

VLSI CoE is engaged in design and simulation of next generation electronic devices and their possible applications in digital and analog circuits. VLSI CoE is also working on finding out the best possible materials for highly efficient solar cell structures. More details about the center and its achievements can be found at - https://curin.chitkara.edu.in/vlsi/

Three Edited Books Published

By Dr. Abhishek Kumar, Assistant Professor, CURIN

Dr. Abhishek Kumar has edited three books in the field of IoT, cloud computing and machine learning and their applications in various domains with more specific focus on healthcare applications.

The first book is titled Swarm Intelligence Optimization, Algorithm and Applications and is published by SP & JOHN WILEY, USA. The idea behind this book was to simplify the journey of those who aspire to understand resource optimization in the IoT. To this end, included in this book are various real-time/offline applications and algorithms/case studies in the fields of engineering, computer science, information security, and cloud computing, along with the modern tools and various technologies used in systems, leaving the reader with a high level of understanding of various techniques and algorithms used in resource optimization.

The second book is on Internet of Things Use Cases for the Healthcare Industry and it has been published by Springer Nature, Switzerland. The book explores the best strategies for the practical implementation of IoT in the healthcare industry with a focus on IoT systems security. It provides emphasis on possibly diverting and transformative healthcare-specific use cases that are made possible by the latest developments in the IoT technology and Cyber-Physical Systems (CPS).

Finally, the third book has been published by Chapman and Hall and CRC Press, Taylor & Francis. It is titled Machine Learning for Healthcare Handling and Managing Data and the features of this book include -

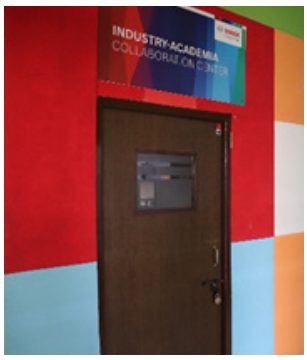
- A unique and complete focus on applications of machine learning in the healthcare sector.
- An examination of how data analysis can be done using healthcare data and bioinformatics.
- An investigation of how healthcare companies can leverage the tapestry of big data to discover new business values.
- An exploration of the concepts of machine learning, along with recent research developments in healthcare sectors.

Bosch Industry-Academia Collaboration Centre Set-up at Chitkara University

Investment of INR 10 Lacs made by Bosch

Industry connect has always been a top priority for Chitkara University. We have numerous industry connects with the leadings companies of the world for a large number of diverse activities including trainings, knowledge sharing, resource sharing, research collaboration, joint projects etc. In the month of December 2020, we joined hands with Bosch Limited for setting-up of Industry-Academia Collaboration Centre at Chitkara University. The Centre is located on the Second Floor of Babbage Block.

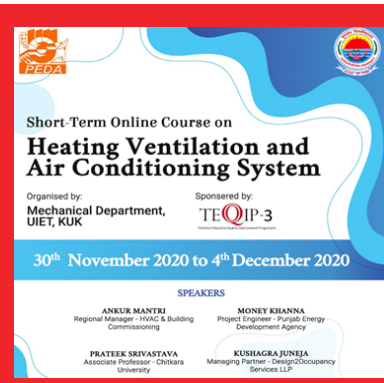
We have GoI sponsored Technology Enabling Centre at the university, where our prime objective is to develop an ecosystem in which universities' research/technologies can be used by the MSMEs in addressing various challenges. Bosch has MSMEs Capacity Building as one of their verticals under their industry-academia collaboration program. This common link enabled Bosch and Chitkara University to join hands for the setting up of Industry-Academia Collaboration Centre at the university.



Technology Enabling Centre at Chitkara University is headed by Dr. Archana Mantri – Vice Chancellor, Chitkara University and is coordinated by Mr. Sagar Juneja – Assistant Dean, CURIN along with Dr. Gurjinder Singh and Dr. Prateek Srivastav – Assistant Professors, CURIN. Sagar Juneja under the guidance of Dr. Archana Mantri remained instrumental is reaching out to Bosch Limited, India for the setting-up of this Centre at the university. Bosch has made an investment of INR 10 Lacs for the Centre.

Expert Lectures Delivered

Dr. Prateek Srivastava – Assistant Professor, CURIN delivered three expert lectures on the topic Psychrometrics, Heat load calculation and Chilled water system during the one week online course on Heating Ventilation and Air Conditioning System organized by Mechanical Engineering Department, UIET Kurukshetra University during November 30 to December 4, 2020. The program was attended by 70+ participants from all over the country.



Research@CURIN

Top 5 High Impact Research Papers Published by CURIN during Oct - Dec 2020

Following 5 articles have been written by our PhD scholars around top-five research papers published by CURIN researchers during October – December 2020. Each of these articles is respectively going to summarize each of the top-five research papers.

A complete list of publications by CURIN faculty members and scholars during October - December 2020 is presented in a separate section.

Automatic speech recognition for children's speech signal in Punjabi language

By: Puneet Bawa - ME Scholar

This article is based on the research paper entitled as Noise robust in-domain children speech enhancement for automatic Punjabi recognition system under mismatched conditions published by Puneet Bawa and Dr. Virender Kadyan from Centre of Excellence for Speech and Multimodal Laboratory, Chitkara University, Punjab in Elsevier journal entitled Applied Acoustics.

Success of any commercial automatic speech recognition (ASR) framework relies on availability of its training set information. Despite the fact that the performance of such commercial system gets degraded because of absence of signal processing characteristics in low resource language corpora. Therefore, adequate development of Punjabi Children ASR framework is one such challenge where nearly-zero resource conditions and inter-speaker variations corresponding to children voice data occurs because of slower speaking rate and difference in vocal tract length in comparison to adult speech data. Other significant issues in ASR for children speech signal are the immediacy and more prominent etymological variation of children's discourse in comparison to adults' speech resulting in the creation of a lot of extraneous discourse and related ASR framework issues. Overall, the methodology of children machine communication utilizing unconstrained speech is shockingly unique in relation to that of adult and should be concentrated in detail.

In the present work, the widely spoken North Indian language- Punjabi has been chosen. Despite the fact that the total population of Punjabi speakers is 105 million worldwide yet there still exists technological gaps mainly the lack of resources which makes developing Punjabi-ASR a challenging task. Moreover, no major work on the Punjabi children ASR has been published to date. In the case of Punjabi, the child's speech work is almost zero because children's speech information is not available. Three methods have been developed to address these problems:

- By analyzing variations that are more applicable to children's speech between established adult speech corpuses through gender based selection of adult data.
- By implementation of in-domain data expansion, the use of original signals and noise-induced synthetic data is used for handling minimal data scenarios.
- By indulging tonal characteristics were extracted and later normalization of test systems was carried out using the VTLN methodology.

Finally, the acoustic and linguistic differences among children's speech and adult's speech are studied for adequate development of a robust children ASR system performance where the acoustic heterogeneity is described as a significant obstacle to the development of high-performance ASR applications for children. Likewise, test dataset has been normalized on enough adult and sparse children augmented training model with different combinations

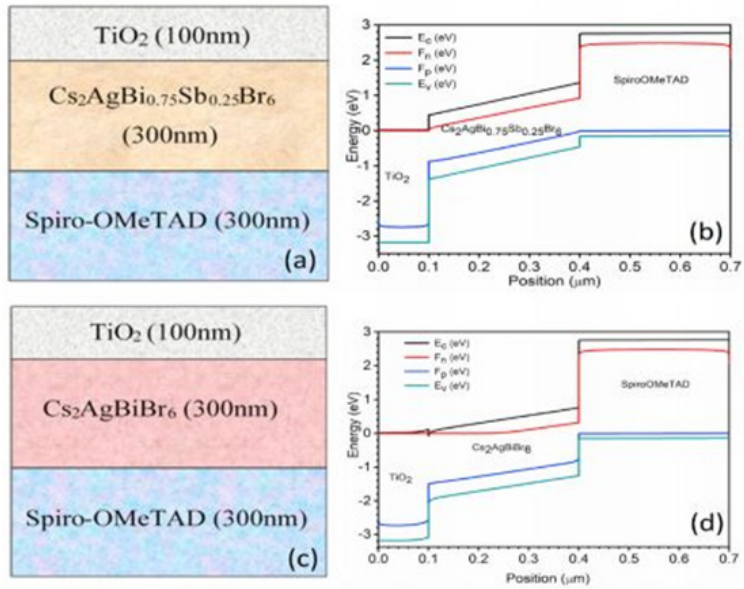
of real-life noises being injected at different SNRs values. Consequently, robust feature extraction techniques of Mel Frequency Cepstral Coefficient and Gammatone Frequency Cepstral Coefficients have been explored for the demonstration of an efficient Punjabi children's ASR system under mismatched conditions. Further, hybrid acoustic model constituting Deep Neural Network and Hidden Markov Model is further evaluated for the full utilization of Neural Network (NN) efficiency on artificially pooled training corpus under such degraded conditions. Thus, the presence of such acoustic feature exhibits the tonal characteristics among both the train and test speakers where evaluation has resulted into an enhanced performance of the children's speech recognition system under mismatched conditions.

Lead-free and wide band-gap material for future solar cells

By: Savita - PhD Scholar/ JRF, VLSI CoE

This article is based on the research paper titled Numerical simulation and proof of concept for performance assessment of cesium based lead-free wide-bandgap halide solar cells published by Sakshi Sharma (ME Scholar), Dr. Rahul Pandey, Dr. Jaya Madan, and Dr. Rajnish Sharma from Chitkara University, Punjab, India in Elsevier Journal entitled as Optical Materials.

Nowadays, researchers have been looking for alternative sources of energy other than fossil fuels. Many technologies have been explored to fulfill the requirements like for example solar energy, wind energy, nuclear energy etc. Out of all these, solar energy has been considered to be the most safe and relatively inexpensive, and is generated from the photons of light falling on the surface of the solar cell. Perovskite solar cells have been proving their worth to meet the possible requirements for a good solar cell with higher efficiency and low cost. However, lead-based perovskite solar cell has some challenges like stability, toxicity which create an opportunity to investigate new materials. Lead-free halide perovskite remains a top contender for a possible replacement for these lead perovskites.



The illustration has been borrowed from the paper

A research team in VLSI Centre of Excellence, Chitkara University, Rajpura, Punjab, India, comprising of Sakshi Sharma (ME Scholar), Dr. Rahul Pandey, Dr. Jaya Madan, and Dr. Rajnish Sharma have proposed a cesium based lead-free halide perovskite solar cells with wide band-gap halides such as $CS_2AgBi_{0.75}Sb_{0.25}Br_6$ with band-gap of 1.82 eV and $CS_2AgBiBr_6$ with band-gap of 2.01 eV. These wide band-gap materials show high stability under atmospheric conditions like heat, air, humidity, and illumination. In this article, device optimization is done in terms of absorber layer thickness and by employing different materials as ETL and HTL layer. Wide band-gap materials-based solar cells with an optimized absorber layer thickness of 300 nm reflected 12.39% and 8.43% conversion efficiency with TiO_2 (ETL)/Cu_2O (HTL) and MZO (ETL)/ Cu_2O (HTL) respectively. The analysis reported in this work may open a new path for the single-layer lead-free halide perovskite solar cells in the research community.

Performance optimization using backtracking algorithm in delay tolerant networks

By: Meena Rani - PhD Scholar

This article is based on the research paper titled Performance optimization in delay tolerant networks using backtracking algorithm for fully credits distribution to contrast selfish nodes published by Dr. Nitin Goyal, Dr. Kalpna Guleria from Chitkara University in Springer Nature journal entitled The Journal of Supercomputing.

In delay tolerant network (DTN), nodes use store, carry, and forward principle for delivering messages from source node to destination node. Using intermediate nodes to forward messages can lead to security issues in the network because there may exist few selfish nodes. These intermediate nodes affect the performance of the DTN due to their limited resources. To handle this problem, it is necessary to decrease the degree of the selfishness of the nodes. In this article, a credit-based mechanism has been proposed that is based on Combined Trust Value (CTV) in DTN. In this proposed work, an agent is used to compute each node's trust value grounded on the number of messages relayed by sensor nodes. The trust value is used to distribute credits to the nodes without any partiality with nodes in a distributed manner. The distribution of credits is fair because credits are distributed to central nodes as well as boundary nodes using backtracking. The results show that in the proposed mechanism delivery ratio is high in comparison to existing techniques. The results also exhibit that the packet dropping rate, overhead ratio, and average message delay is low as compared to existing techniques. This flow chart illustrates the proposed performance optimization mechanism using backtracking in DTN.

The illustration has been borrowed from the paper

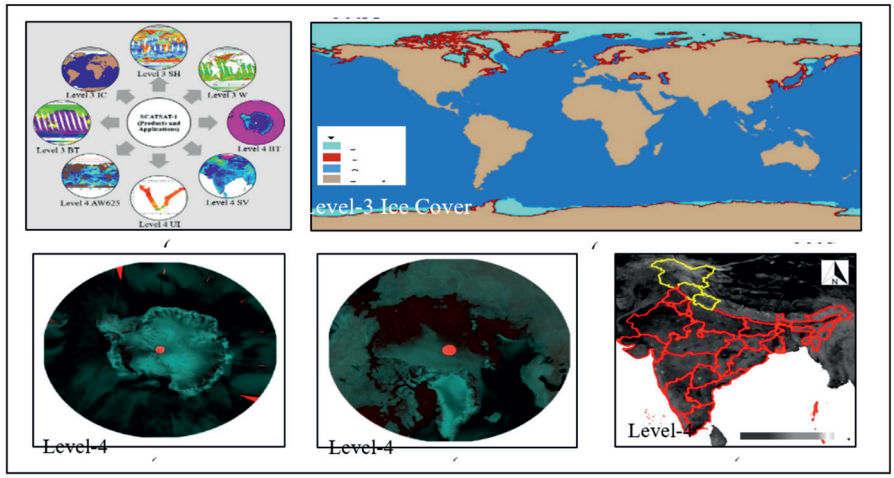
Potential applications of ISRO's scatterometer satellite (SCATSAT-1)

By: Neelam Dahiya

This article is based on the research paper titled Potential applications of SCATSAT-1 satellite sensor: A systematic review published by Dr. Sartajvir Singh and Dr. Vishakha Sood from Chitkara University in the IEEE Sensors Journal.

The ISRO's (Indian Space Research Organisation) SCATSAT-1 is a Ku-band (13.53 GHz) based active earth observation satellite sensor. It was launched on Monday morning at 9:12 hrs (IST) on 26-September-2016 by India's Polar Satellite Launch Vehicle, in its thirty-seventh flight (PSLV-C35), at 720 km altitude with an inclination of 98.1 degrees. The life span of the SCATSAT-1 mission is five years. The SCATSAT-1 was primarily designed for weather forecasting, cyclone detection, and tracking services. But due to the availability of its large range of data products and continuous development,

the SCATSAT-1 has found many potential applications in various emerging scientific domains such as agriculture, land hydrology, cryosphere studies, and the study of ocean dynamics. More specifically, it is useful in the estimation of rice crops, river water level indication, weather forecasting, cyclone prediction, and snow/ice monitoring.



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As an active microwave sensor, SCATSAT-1 offers various advantages such as penetration through the heavy clouds, night imaging capability, wide swath, and global coverage. Such advantages can be proven as significant to solve societal issues such as forecasting and monitoring natural hazards. In this paper, the numerous emerging applications of SCATSAT-1 sensor for remote observation of ocean as well as for land use and land cover area are discussed at the global level. This paper has summarized the historical scatterometers launched by various countries, the technical specifications of the SCATSAT-1 mission, the summary of different SCATSAT-1 data products along with their applications in major domains such as ocean dynamics, cryosphere, agriculture, and land hydrology.

This paper has presented a critical review on SCATSAT-1 data products along with their applications. This study will be helpful to provide new insight into the applicability of SCATSAT-1. In the future, this work can be extended for the various land cover region with the help of ancillary data from other sensors. It is also suggested that different parameters of snow or ice can be explored with the help of the neural network and some advanced techniques based on deep learning can be used to improve the accuracy over inaccessible areas such as Himalayas or Antarctica. Also, such type of satellite sensors is helping the researcher community to provide near-real-time monitoring and forecasting services to the user.

Review on MOF adsorbents for the elimination of toxic heavy metals from aqueous solutions

By: Lata Rani - PhD Scholar

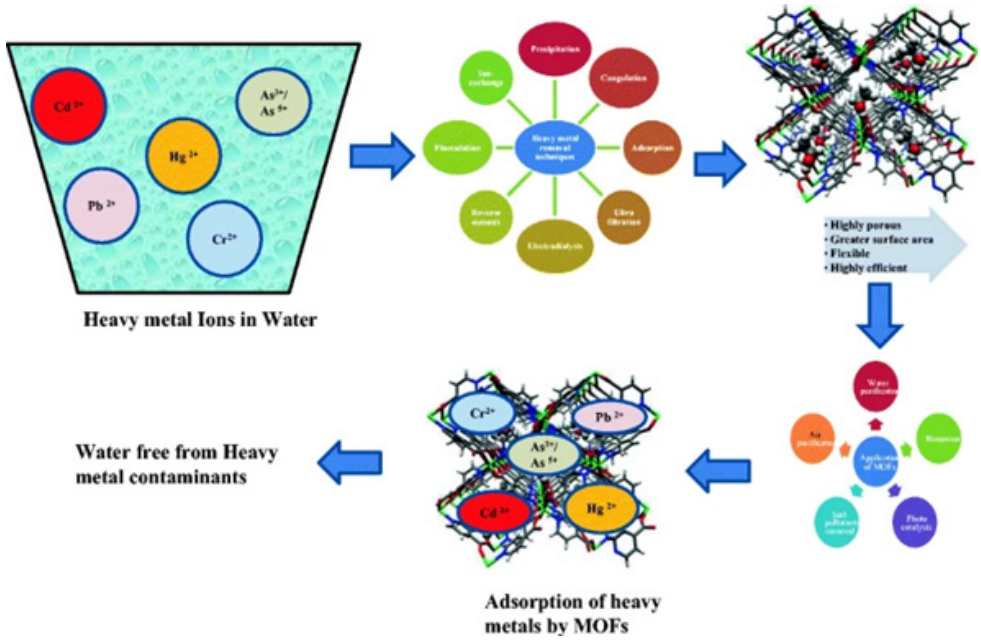
This article is based on the research paper titled Recent developments in MOF adsorbents for the elimination of toxic heavy metals from aqueous solutions: A Critical review published by Lata Rani, Jyotsana Kaushal, Arun Lal Srivastav and Pooja Mahajan in Springer journal titled Environmental Science and Pollution Research.

Effective and substantial remediation of contaminants especially heavy metals from water is still a big challenge in terms of both environmental and biological perspectives because of their adverse effects on the human health. Many techniques including adsorption, ion-exchange, co-precipitation, chemical reduction, ultrafiltration etc. are reported for eliminating heavy metal ions from the water.

Adsorption is the best techniques for the elimination of heavy metals from contaminated water due to its low cost, easy to operate and environmentally friendly. Conventionally, different adsorbents such as carbon, mineral, macro-molecule and biomass are employed for the removal of heavy metals. The major disadvantages of these adsorbents are poor selectivity. Additionally, the adsorption kinetic is relatively quiet minimal due to the random pore which can obstruct the effective carrying of target metal ion. Several types of adsorbents are observed and documented well for the purpose. Recently, an urgent need has arisen to develop efficient, economically and green adsorbent

for the elimination of heavy metals.

Therefore, metal-organic framework (MOFs) are considered the promising adsorbents owing to their unique characteristics like greater surface area, highly porous structure and better functionality. Recently, highly porous metal-organic framework (MOFs) were developed by incorporating metals and organic ligands together and claimed as potent adsorbents for the remediation of highly toxic heavy metals from the aqueous solutions due to of their unique features like greater surface area, high chemical stability, green and reuse material etc. MOFs are the porous crystalline substance or porous coordination polymer (PCPs) and formed by coordination of metal ions with ligand or organic substance). They are new group of porous material of inorganic nature or hybrid organic which permit the properties of inorganic as well as organic. Furthermore, treatment is required for the metal ion like acidification and impregnated the some unique group which increase the adsorption capacity and selectivity because of their feeble coordination chemistry with metal ion. Few elements are used for the formation of MOFs as they are recognised highly poisonous for example Cd(II) and Co(II) or costly for example Ag(I) and Eu(III) though they are helpful for the knowledge of the basic chemistry of the MOFs. Because of familiar liability of metal complexes, the construction of coordination bond between the metal ions and the linker may be reversible, which facilitate the rearrangement of ligand and metal ions throughout the route of polymerisation to construct framework structures. Caboxylates, phosphate, sulfonates are the organic ligands which are responsible during the formation of MOFs.



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Different types of metals are used in the MOFs such as aluminium, chromium, zirconium which have been investigated as effective adsorbents for the removal of inorganic and organic pollutants from the water. Porous structure of MOFs helps in dispersion of pollutants to the active sites, that bring faster consumption and flexibility of the functional group will be able to easily regulate the adsorption. Even inorganic anionic pollutants are removed by the MOFs node via pseudo ion exchange method in this feebly bind organic ligands which are replaced by the succeeding contaminate. On the other hand, encapsulated organic based contaminates are firstly removed by noncovalent such as hydrogen, π-π, Vander Waal's and hydrophobic interaction. If chemical and physical structure of the node and binding MOFs are correctly selected that increase the probability of multiple covalent interaction sites. The most toxic contaminants present in the water are heavy metal ions because these cause serious health problems like cancer, heart failure, kidney damage, liver failure. Therefore it is highly demanded to eliminate the heavy metal ion from water/ waste water. MOFs are excellent adsorbent for the heavy metals because of high surface area, highly porous structure and high efficiency. In this review we discussed the various MOFs for the removal of most toxic metals such as arsenic, chromium, lead and cadmium.

Multi-disciplinary International Conference Organized

By Doctoral Research Centre (DRC), Chitkara Business School (CBS) in virtual mode

During October 14 and 15, 2020 DRC, CBS, Chitkara University, Punjab organized an online Multi-disciplinary International Conference in collaboration with Ajinkya D.Y. Patil University, India; Savitribai Phule Pune University, India; National Institute of Personnel Management, India and Daffodil International University, Bangladesh and it was titled **Transformation and Survival Post Pandemic**. The conference represented an occasion to provide contributions towards a multidisciplinary communication framework. Participants in this conference represented a way of inter-personal and inter-institutional communication based on research themes and also got an opportunity to connect in the respective domains. Theme areas of the conference included Healthcare and Wellbeing, Environment and Sustainable Development, Technology for Future, Community and Livable Societies, and Entrepreneurship and Innovation. Different perspectives of transformation and survival of business organizations were presented by researchers from different countries in the conference. As many as 15 research scholars and faculty members from Chitkara University also presented their papers in the conference.

Faculty members of DRC, CBS delivered lectures at multiple external forums

8 October – Dr. Urvashi Tandon delivered a session on 'Analyzing case study for employability: A job interview' in an event organized by ICFAI University, Himachal Pradesh. The event aimed to offer different approaches of analyzing business cases at the time of job interview

8 – 12 November - Department of Applied Sciences, Chitkara University, Punjab organized a 'National workshop on SPSS in research and data analysis'. This workshop aimed to build an understanding about the different statistical techniques and their use for data analysis using SPSS. It was delivered by Dr. Deepika Jhamb

22 December – MHRD, Government of India organized a faculty members' capacity building program at MD University, Rohtak, Haryana in which Dr. Amit Mittal was invited to deliver a lecture on 'Problem selection and theoretical framework of research'.

Participation in different external events

Dr. Pawan Kumar Chand participated in three events titled 'What is ethical research?' (Organized by Dr. B.R. Ambedkar University Delhi on December 12), 'Effective methods and strategies for quality research paper writing and academic publishing' (Organized by Swami Rama Himalayan University, Dehradun on October 24) and Outcome based curriculum planning, mapping and measurement (Organized by Sri Krishna College of Technology, Coimbatore & AICTE during November 2-7). This last event was also attended by Dr. Deepika Jhamb, Dr. Urvashi Tandon and Dr. Shashi.

Dr. Varsha Singh – Assistant Professor, Centre for Life Sciences, CURIN has been selected as Early Career Fellow for the year 2021 by the American Society for Biochemistry and Molecular Biology. This society, founded on December 26, 1906, is one of the oldest societies known for advancing biochemistry and molecular biology research, and for providing education support to researchers entering the scientific workforce.


CERTIFICATE
OF MEMBERSHIP
PRESENTED TO
Varsha Singh
for participation as a member of the American Society for Biochemistry and Molecular Biology and for contributions to continuing the advancement of the molecular life sciences.
Through Calendar Year 2021
Gerald W. Hart, Ph.D.
President
ASBMB
Barbara Gordon
Executive Director

Patents Filed by CURIN

55 Patents Filed During October – December 2020

During October - December 2020, 10 patents have been granted to Chitkara University. 3 of them are utility patents and 7 are industrial design.

List of Utility Patents

S. No.	Title	Applicants	Application No.
1	A MOUNTING APPARATUS FOR A FAN TO REDUCE RISK OF DISASTER DUE TO EXCESS LOAD	Keshav Kumar, K. R. Ramkumar, Amanpreet Kaur	202011044105
2	ALERTING AND DISINFECTING DEVICE	Neha Tuli, Shivam Sharma, Archana Mantri	202011054774
3	AN APPARATUS FOR AIDING REMOTE TEACHING	Jaya Madan, Rahul Pandey, Chanpreet Singh	202011044570
4	APPARATUS AND METHOD FOR MEASURING GROWTH OF USER	Shagun Sharma, K.R. Ramkumar	202011050091
5	APPARATUS FOR DECONTAMINATION OF OBJECTS USING SANITIZER	Ramneet, Deepali Gupta, Madhukar Mani, Mudita, Sheifali Gupta, Kamali Gupta, Shalli Rani, Sachin Ahuja, Rupesh Gupta, Raman Gupta, Jotesh Gupta	202011044941
6	APPARATUS FOR DISPENSING LIQUID SANITIZER	Surya Narayan Panda, Prabin Kumar Panigrahi, Naveen Kumar, Rajesh Kumar Kaushal, R.P. S. Bedi, Simranjeet Singh	202011054146
7	APPARATUS FOR PROVIDING UNINTERRUPTED SUPPLY OF POWER	Rajiv Kumar, Nitin Goyal, Ajay Kumar Sharma, Daljeet Singh, Renu Popli, Kalpna Guleria, Ashok Kumar	202011046474
8	AUTOMATED WASTE RECEPTACLE	Nitish Kumar, Abhishek K, Lipika Gupta, Srishti K, Swedika Sharma	202011045721
9	BALLISTIC PROTECTION DEVICE	Puneet Bawa, Harmanpreet Singh, Parnav Garg, Virender Kadyan	202011054101
10	COMPOSITE PARTIAL POSITIVE FEEDBACK BASED SYSTEM	Kulbhushan Sharma, Rajnish Sharma	202011043680
11	COOKING APPLIANCE	Sakshi, Chetan Sharma, Prasenjit Das, Sachin Ahuja, Shaily Jain, Shankar Shambhu	202011049181
12	DEVICE FOR DETECTION OF TEMPERATURE OF ONE OR MORE ENTITIES	Deepak Kumar, Kamlpreet Singh Bhangu, Amandeep Singh Bhatia	202011042718
13	DEVICE TO FACILITATE MONITORING AND DETECTING BLOOD LOSS	Neha Sharma, Tarandeep Kaur Bhatia, Sonam Mittal	202011054775
14	DEVICE TO TRACK THE PREGNANCY ON A DIGITAL CALENDAR	Bhanu Sharma, Narinderpal Singh, Shubham Gargrish, Naveen Kumar, Prabhnoor Bachhal, Archana Mantri, Amanpreet Kaur, Amandeep Kaur, Krishan Dutt Sharma	202011047302
15	DIGITAL LOCK AND SECURITY SYSTEM AND DEVICE	Neha Sharma, Geetanjali, Sonam Aggarwal, Srishti Priya Chaturvedi	202011054100
16	DOOR OPENING AND CLOSING DEVICE	Ajay Goyal, Abhishek K, Aditi Chandel, Gurmohan Singh, Sudesh	202011049295

S. No.	Title	Applicants	Application No.
17	GESTURE CONTROLLED ROBOT TO PRINT LANES ON ROAD	Ashwani Singh, Bhanu Sharma, Karan Aggarwal, Suryadeep	202011043678
18	GRILLING APPARATUS	Manpreet Singh, Gurdyal Singh, Ramgopal, Amit Wadhera, Rupesh Gupta, Varsha Singh, Shefali Gupta, Deepali Gupta, Jaswinder Singh, Kanwardeep Singh	202011051778
19	HAND-OPERATED MASSAGER WITH FLUID APPLICATOR	Taniya, Virender Kadyan, Pranav Garg	202011045912
20	HEALTH MONITORING AND SANITIZING SYSTEM FOR NON HUMAN ENTITY	Jasminder Kaur Sandhu, Prateek Srivastav, Deepam Goyal	202011049713
21	HYBRID IMAGE ADAPTIVE WATERMARKING SYSTEM AND METHOD	Preeti Sharma, Kulbir Singh, Neeru Jindal	202011052108
22	NAIL CLIPPING DEVICE	Ravneet Kaur, Ramandeep Singh, Ashish Gera	202011052723
23	NUTRACEUTICAL FOOD COMPOSITION	Sachin Bhogal, Sushil Kalra, Gurjinder Singh	202011053499
24	PLASMONIC BASED PHOTO DETECTOR	Savita Kashyap, Rahul Pandey, Jaya Madan, Rajnish Sharma	202011043679
25	PROCESS OF PREPARING CALCIUM-DEPOSITED THREE-DIMENSIONAL CARBON FOR ENERGY STORAGE FROM WASTE PAPER AND EGG SHELLS	Partha Khanra, Pankaj Kumar, Harjeet Singh, Muthu Malaravel, Mohit Kapoor	202011043463
26	REUSABLE ADSORBENT PAD	Adhish Singh, Tarandeep Kaur Bhatia, Neha Sharma, Ankit Rai Dogra, Mir Salim Ul Islam	202011048390
27	SCREWDRIVER WITH MULTIPLE BIT ASSEMBLIES	Puneet Bawa, Pranav Garg, Virender Kadyan, Pranav Kumar	202011052427
28	SECURITY SYSTEM FOR LAND	Shiva Sharma, Anil Kumar Sharma, Sachin Ahuja	202011048591
29	SMART BRAKING SYSTEM IN VEHICLES	Sagar Juneja, Chanpreet Singh, Kritika Kapoor	202011054149
30	SUPERWIDEBAND MULTIBAND ANTENNA FOR APPLICATIONS INCLUDING BLUETOOTH/LTE2600	Manish Sharma, Rakesh Ahuja, Rajeev Kumar	202011054564
31	SYSTEM AND DEVICE TO FACILITATE CONTROLLING TEMPERATURE OF A SPACE	Ashok Kumar, Resham Arya, Mir Salim Ul Islam	202011045494
32	SYSTEM AND METHOD FOR AUTHENTICATION OF USER SESSION	Prasenjit Das, Sachin Ahuja, Sahily Jain, Chetan Sharma, Shambhu Shankar	202011045180
33	SYSTEM AND METHOD FOR EMBEDDING DIGITAL INFORMATION USING KURTOSIS TO SECURE AN IMAGE	Preeti Sharma, Kulbir Singh, Neeru Jindal	202011052426
34	SYSTEM AND METHOD FOR MONITORING A COMPUTING DEVICE	Prateek Srivastav, Jasminder Kaur Sandhu, Deepam Goyal, Meena Pundir, Ankush Bedyal	202011053005
35	SYSTEM AND METHOD FOR PROVIDING SPEECH ENABLED QUERY	Aashish Kumar, Pertik Garg, Inderjit Singh Sandhu, Mansi Chitkara, Sachin Ahuja	202011045178
36	SYSTEM AND METHOD FOR REMOTE ECG MONITORING AND DISEASE CLASSIFICATION	Sachin Ahuja, Huma Naz, Prabhnoor Bachhal, Narendra Kumar, Pramod Kumar Yadav, Piyush Bhushan Singh	202011044103
37	SYSTEM AND METHOD FOR SMART BILLING	Ramkumar Ketti Ramachandran, Vaishali Bhatia	202011049930
38	SYSTEM FOR ACCOMMODATING AND MONITORING PETS	Tarandeep Kaur, Arshdeep Singh, Sarvesh Tanwar	202011049180
39	SYSTEM METHOD AND DEVICE FOR FACILITATING AUDITING OF ELECTRICAL MACHINES	Sumit, Gagandeep Kaur, Prateek Srivastav	202011049515
40	SYSTEM TO CONTROL APPLIANCE	Harshit Sharma, Sheifali Gupta, Vikas Sainin, Aniket Nayak, Rupesh Gupta, Jaskaran Singh, Rohan Sahni, Lakshay Goyal, Mohit Kumar, Deepali Gupta	202011046836

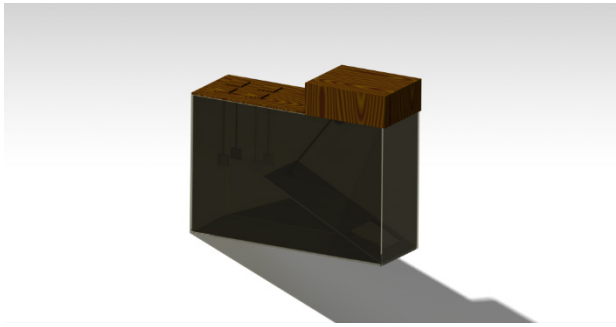
S. No.	Title	Applicants	Application No.
41	SYSTEM TO FACILITATE DETECTING AND ANALYZING MOVEMENT DEVIATION	Sarang Sharma, Sheifali Gupta, Deepali Gupta, Rupali Gupta, Rakesh Ahuja	202011053498
42	THERMOELECTRIC STORAGE DEVICE	Shabnam Chaudhary, K.R. Ramkumar	202011045493
43	WATER LEVEL MONITORING SYSTEM	Shalli Rani, Divya Gupta, Himanshi Babbar, Sahil Garg, Jyoteesh Malhotra	202011043914

Industrial Design Registrations

CORROSION TESTING APPARATUS UNDER TIDAL WAVE CONDITION

By - Rakesh Goyal, Aaishwarika Raj Sharma, Nikhil Sharma

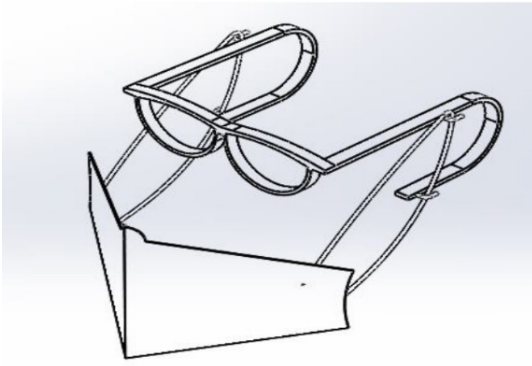
Application No. - 334780-001



EYEWEAR FRAME WITH A FACILITY OF HOLDING FACE MASKS THROUGH THEIR LASHES

By - Shalom Akhai, Shaveta Mala, Prateek Srivastava Amit Bhatia, And Venktesh Sharma

Application No. - 335075-001



FLEXI HAND HELD WINDOW GLASS CLEANER FOR HIGH RISE BUILDINGS

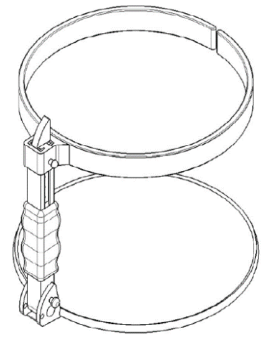
By - Jyotsna, Vishal Verma, Aakriti Saini, Amandeep Singh

Application No. - 336048-001

INDUCTION BASE MULTIPURPOSE UTENSIL HANDLER

By – Sarthak Pathak, Jaswinder Singh, Aaishwarika Raj Sharma, Maninderjeet Singh

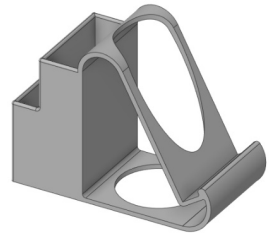
Application No. - 334564-001



MOBILE PHONE AND PEN STAND

By - Aaishwarika Raj Sharma, Chanpreet Singh, Sagar Juneja

Application No. - 334564-001



MOBILE STAND

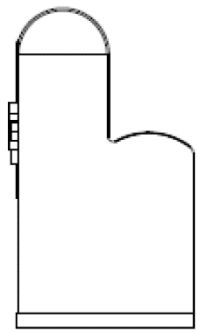
By - Chanpreet Singh, Sagar Juneja and Aaishwarika Raj Sharma

Application No. - 335533-001

MULTIPURPOSE FOOD & BEVERAGE KIT

By - Sachin Ahuja, Sushil Kalra, Sachin Bhogal, Anoop Aggarwal, Gurdyal Singh and Pranav Aggarwal

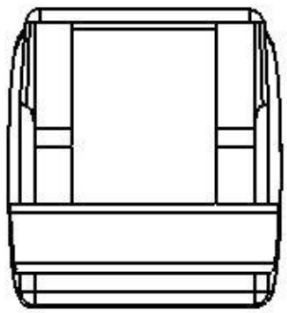
Application No. - 335680-001



REAL TIME REFLECTING DEVICE

By - Neha Tuli, Shivam Sharma, Gurpreet Singh, Gurwinder Singh, Archana Mantri and Narinder Pal Singh

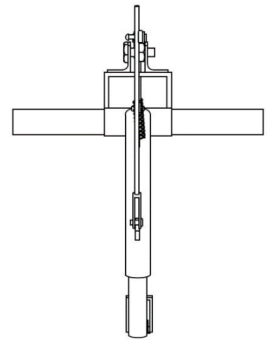
Application No. - 334119-001



SINGLE TOUCH LEVER BRAKE FOR THE MANUAL RICKSHAW

By - Ankit Sharma, Vishal Dhiman, Atul Babbar and Rajeev Kamal Sharma

Application No. - 334845-001



SMART DUSTBIN

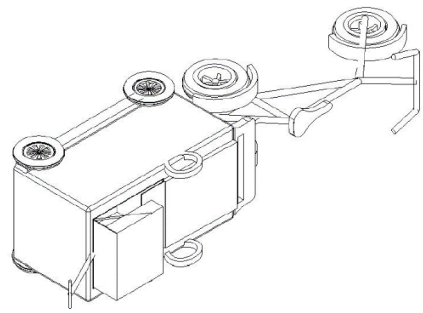
By - Bhanu Sharma, Ashwani Singh and Archana Mantri

Application No. - 336025-001

TRICYCLE WITH DETACHABLE GRASS MOWER

By - Sonam Mittal, Ramkumar K. R. and Manish Singla

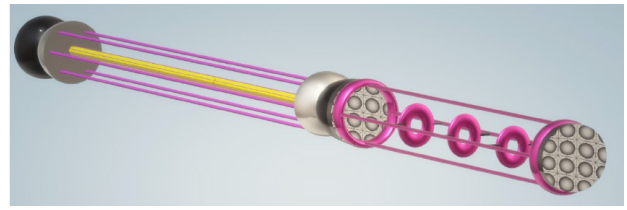
Application No. - 334281-001



VIRAL OBLITERATOR AC DUCT

By - Rakesh Ahuja, Yash Kumar and Akash Kakran

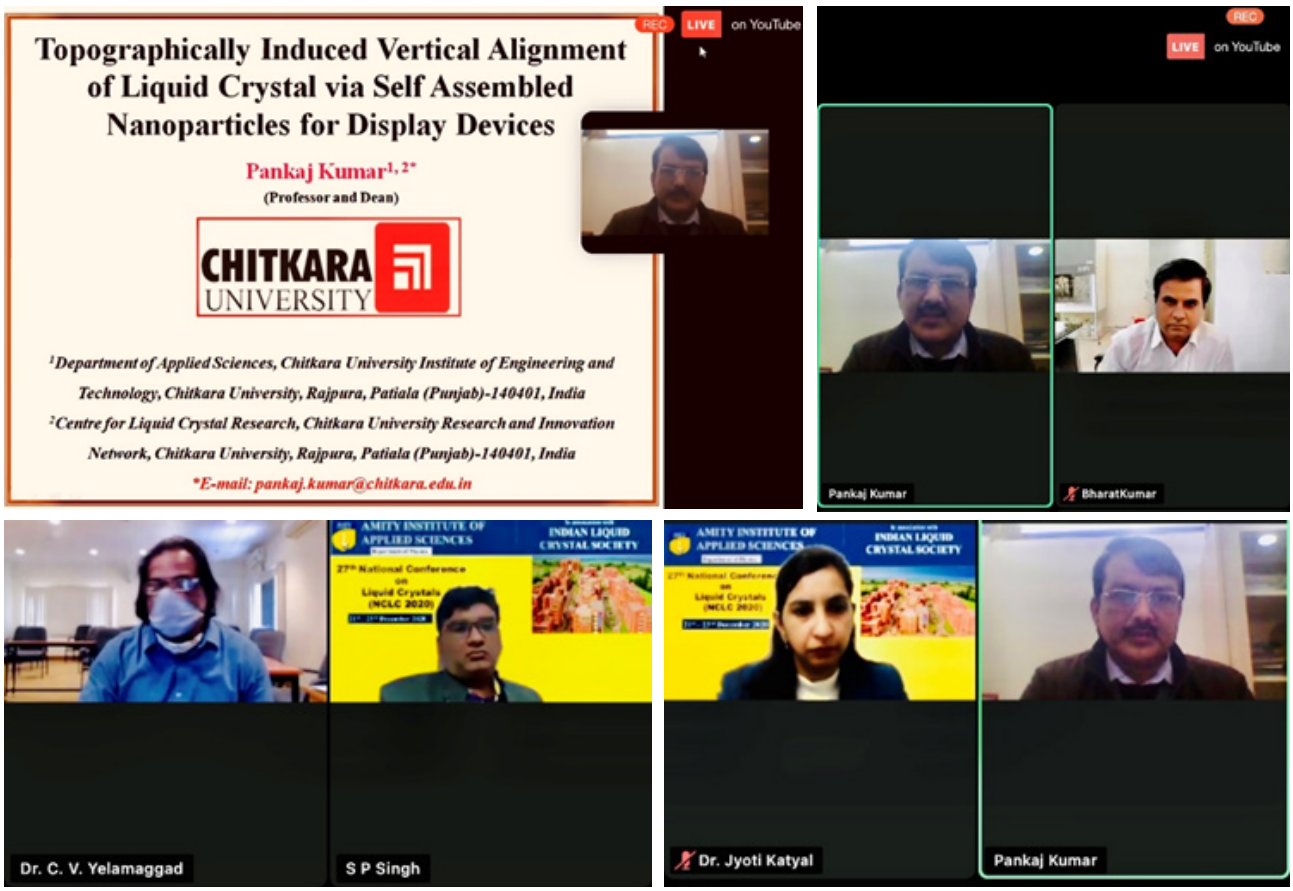
Application No. - 336024-001



Expert Talk in the National Conference

27th National Conference on Liquid Crystals (NCLC-2020)

Dr. Pankaj Kumar – Professor and Lead, Centre for Liquid Crystal Research (CLCR), CURIN, Chitkara University, Punjab was invited to deliver an expert talk in the 27th National Conference on Liquid Crystals (NCLC-2020). The conference was organized by Amity University, Noida in association with Indian Liquid Crystal Society during December 21-23, 2020. Dr. Pankaj delivered a talk on "Topographically Induced Vertical Alignment of Liquid Crystal via Self Assembled Nanoparticles for Display Devices".



Dr. C. V. Yelamaggad from the Centre for Nano and Soft Matter Sciences (CeNS), Bengaluru, India was Session Expert and a large number of research scholars, faculty members and scientists from India and abroad attended this session as well as discussed about the new areas of liquid crystals with the advancement in the methods and techniques to achieve vertical alignment of liquid crystal with inclusion of nanoparticles. In the same conference, Dr. Vandna Sharma, Mr. Ankit Rai Dogra and Ms. Ridhima Gahrotra from CLCR, Chitkara University also presented three research papers. Titles of these research papers are - Optical phase modulation characteristics of polymer dispersed liquid crystals, Frequency dependent transmittance state modulation of cholesteric liquid crystal based light shutter, and Studies of low operating vertically aligned liquid crystal on nanoparticles coated substrates.

Other activities of the group

- Dr. Vandna Sharma participated in "International E-Conference on Advanced Materials Science and Graphene Nanotechnology" during November 25-26, 2020 that was jointly organized by Southern Federal University, Russia and Penn State University, USA.

  Dr Vandna Sharma also attended a webinar on "Importance of Mathematics in Science and Technology" on the occasion of National Mathematics Day on December 22, 2020. It was organized by Math Tech Thinking Foundation (MTTF) - A Ministry of Corporate Affairs, GoI approved NGO.

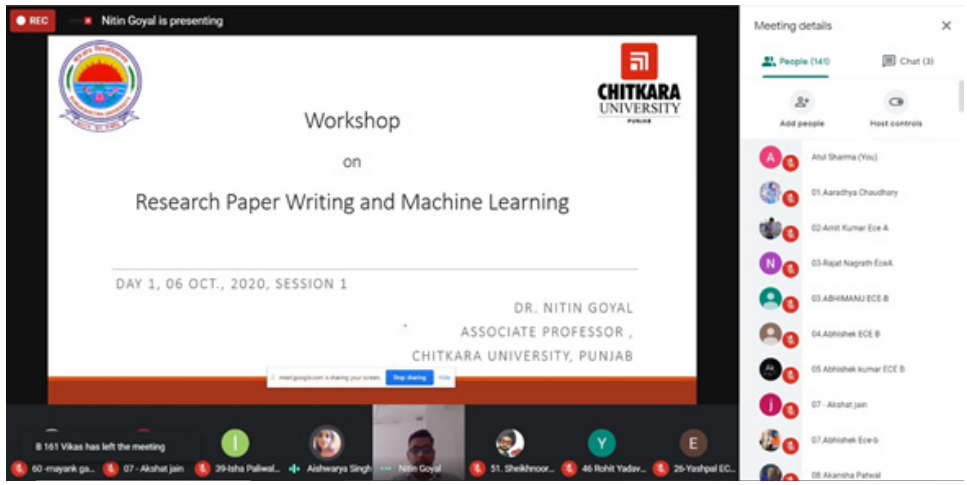
- Dr. Meenakshi Dhiman – Associate Professor, CURIN delivered an expert lecture on Physics and Nanotechnology during the two-day workshop on Scope of Contemporary Sciences in Recent and Advanced Trends-2020 organized by DAV Centenary College, Faridabad during 22 – 23 December, 2020. The objective was to give insight into the scope and need of different Physics disciplines in recent technological advancements. Her lecture was titled Journey of Nanotechnology-from Ancient to Modern Times and it was well appreciated by the participants and organizers.

Dr. S.N. Panda – Director, Research, CURIN was invited to chair a paper presentations track titled Technology Intervention to Build Future Ready Society in the prestigious 17th IEEE India Council International Conference entitled INDICON 2020 that was held during 11-13 December, 2020 and was organized by IEEE Delhi Section.

TEQIP Sponsored Five-day Workshop Delivered

Attended by 180 participants

Dr. Nitin Goyal and Dr. Kalpna Guleria (Associate Professors) together with Dr. Ashok Kumar (Assistant Professor), CURIN delivered a 5 day-workshop on Research Paper Writing and Machine Learning during October 6-10, 2020. There were ably supported by Mir Salim Ul Islam – PhD Scholar, Chitkara University. It was a TEQIP sponsored workshop and was organized by UIET, Kurukshetra University. More than 180 participants attended this workshop whose main focus was to provide insight into the principles and foundations of Machine Learning algorithms. Both supervised and unsupervised machine learning concepts were discussed during the sessions and the prime emphasis was on the implementation of classification and clustering methods, evaluation of learning algorithm, model selection etc.



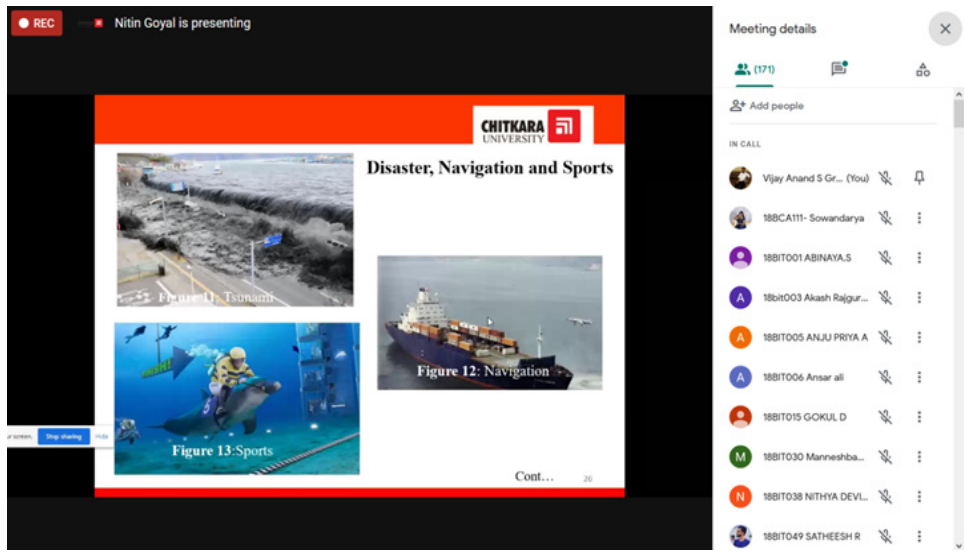
The key learnings for the participants in this workshop were how to implement classical models in machine learning; how to analyse the data, identify the problems, choose the relevant models and usage of statistical methods in machine learning etc.

In addition to this, topics like how to write research project proposals, how to file patents, and skills of writing good research papers were also discussed in the workshop.

Other activities by the group

- Dr. Nitin Goyal delivered a session in another TEQIP sponsored workshop titled Innovation and Entrepreneurship that was held on October 27, 2020. Topics covered in the workshop included understanding the basic needs, qualities, challenges of start-ups as well as fund raising strategies for them. The workshop was supported by Start-up Haryana and was organized by UIET, Kurukshetra University.

  On November 20, 2020 Dr. Nitin Goyal delivered a session in National Level Online Symposium on Challenges in Underwater Networks that was organized by Dr. G R Damodaran College of Science, Coimbatore, Tamil Nadu and was attended by about 200 participants.



  On December 25, 2020 Dr. Nitin Goyal chaired a session in the National Conference organized by UIET, Kurukshetra University. The conference was supported by Springer and the proceedings to be published in Springer book series titled Algorithms for Intelligent Systems

  Dr. Nitin participated in a two-day workshop titled Digital Forensic during October 16-17, 2020 and was organized by SAGE University, Indore. He also participated in a course on Recent Advances of Machine Learning in Software Engineering that was organized by NIT Jalandhar during November 23-27, 2020.

- Amandeep Sharma, M.Tech student and research scholar of Dr. Kalpna Guleria presented a paper titled Prediction of Diabetes Disease using Machine Learning Model in the International Conference on Communication, Computing and Electronics Systems (ICCCES 2020) on 28 October, 2020. The conference was organized by PPG Institute of Technology, Coimbatore, India. The paper proposed a machine learning model which utilizes various supervised learning techniques including Naïve Bayes, Logistic Regression, Artificial Neural Networks (ANN) and Decision Tree for the prediction of diabetes.

10 Consultancy Projects during October –December 2020

CURIN facilitated 10 consultancy projects that have been carried out by various faculty experts from different departments of the university. Titles of some of the prominent consultancy projects that were done during this period are - COVID-19 UNICEF CRA Project, SEO Services to Klick Media Labs, People Management Services for Elnio Fitment Private Limited, Residence Interior Design and Fundamental Analysis and Value Investing.

As per the consultancy policy of Chitkara University, 90% of the consultancy fee is retained by the project heads.

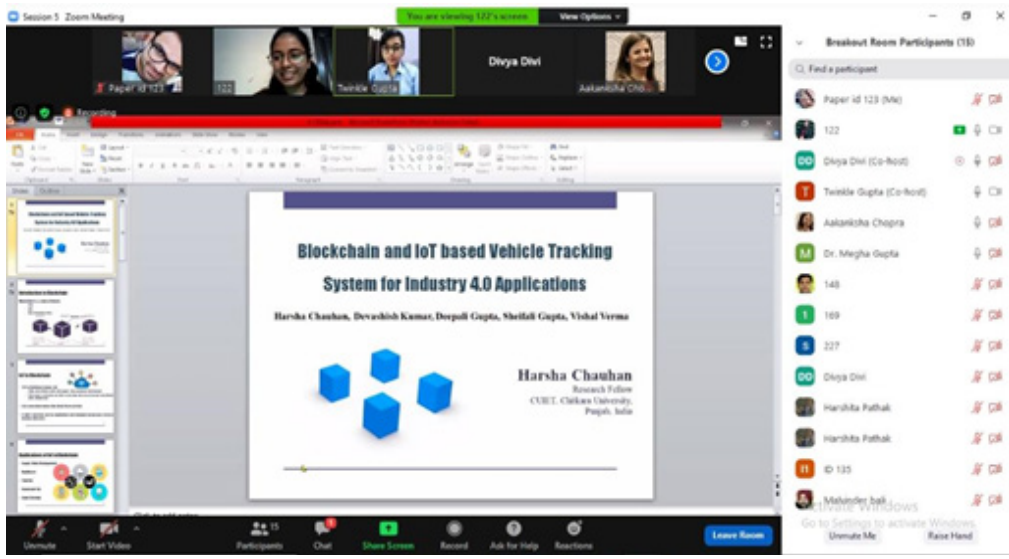
Faculty Development Program on Blockchain

Titled 'Blockchain 0 to 1'

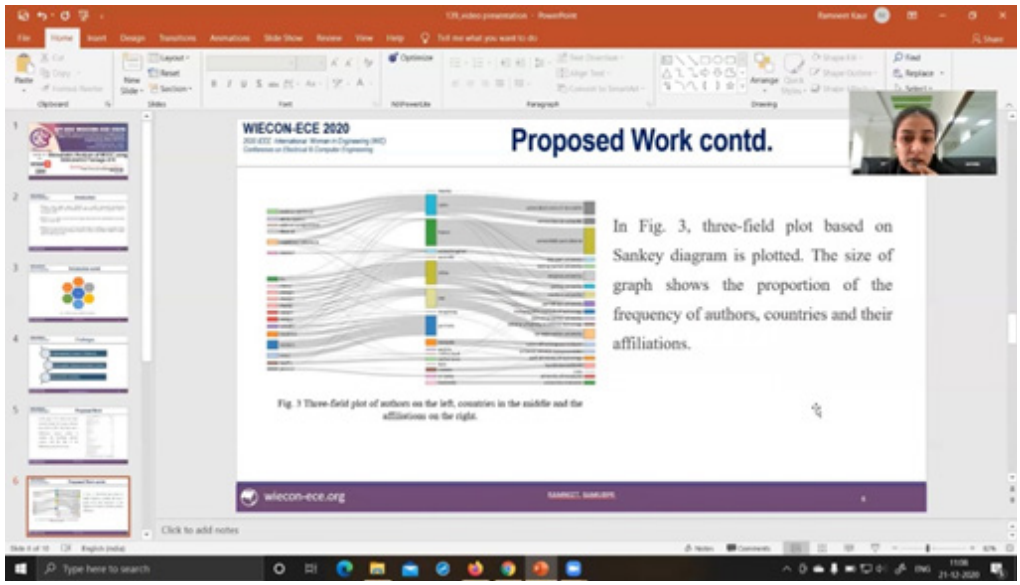
Dr. Deepali Gupta and Dr. Sheifali Gupta – Professors, CURIN organized a two-day Faculty Development Program on Blockchain 0 to 1. The program was attended by more than 50 participants from all over the country and the topics that were covered during the workshop included Introduction to Blockchain, Smart Contracts and Deployment of Smart Contract on Blockchain Network. The other resource persons of the workshop were Mr. Devashish Kumar – Founder, CodroidHub and Ms. Harsha Chauhan – Research Scholar, CURIN. The workshop was very comprehensive and was appreciated by the participants.

Other activities of this group

- Dr. Deepali Gupta and Dr. Sheifali Gupta were invited to chair a technical session on Emerging and Multidisciplinary Approach to IoT, Software Engineering and Machine Learning in the 1st International Conference on Computational Research and Data Analytics (ICCRDA-2020) that was jointly organized by Suleyman Demirel University, Kazakhstan, Isparta Applied Sciences University, Turkey and College of Engineering Roorkee, India on October 24, 2020. In the same conference, five research scholars of Dr. Deepali and Dr. Sheifali Gupta presented their research papers. Names of these research scholars are Harsha Chauhan, Vishal Verma (M.E. Scholars), KanwalPreet Kaur, Sheetal Sharma and Amanpreet Singh (PhD Scholars).



- Two research scholars - Ramneet (Ph.D Scholar) and Vishal Verma (M.E. Scholar) presented their research papers under the supervision of Dr. Deepali Gupta and Dr. Sheifali Gupta in the 6th IEEE International Women in Engineering (WIE) Conference on Electrical and Computer Engineering (IEEE WIECON-ECE 2020) that was organized by IEEE Bhubaneswar subsection on 26-27 December 2020.



- Dr. Deepali Gupta and Dr. Sheifali Gupta conducted a STEAM School on topic Make Your First Integrated Project on IoT, Blockchain and Machine Learning during 2-6, November 2020. The topics covered during the STEAM School were introduction to IoT, cloud computing, blockchain, smart contracts and deployment of smart contract on blockchain network, machine learning and training of a model. They were ably supported by their research scholars - Vishal Verma, Harsha Chauhan, Mudita and Ramneet in delivering this workshop.

Other Activities

Workshops, Conferences, Webinars attended by our faculty members and research scholars

- Ravneet Kaur – Assistant Professor, CURIN attended an interactive session on PhD: The Emotional Journey on November 10, 2020. It was delivered by Dr. Daniela Kaleva from Deakin University, Australia and it focussed on topics like the emotional barriers, ups and downs experienced by scholars during their journey, reactions when scholar is under stress and how scholar can remain consistent in his/her research work etc. The session gave opportunity to all the participants to share their experiences.

  She also successfully completed the international short-term course on Implementing Workspace Innovation that was held on November 5, 2020 and was organized by Deakin University, Australia.


Certificate of Completion

This is to certify that

Ravneet Kaur

has successfully completed a short course in

Implementing workplace innovation

Designed by DeakinCo. & Navitas Professional

Date completed:
05 November 2020

Glenn Campbell, CEO
DeakinCo.

DEAKINCo.

Certificate No: CERT27647

Issued by DeakinCo.
a corporate division of
Deakin University, Australia

- Dr. Shalli Rani - Associate Professor, CURIN attended a program titled Digitally Skilled Teacher as a Transformational Leader during 25-26 June, 2020 which was organized by ICFAI Business School.
- Divya Gupta – Research Scholar, CURIN attended various webinars and workshops during October – December 2020. Titles of some of these events are - Webinar on Cloud Computing (by Surendra Institute of Engineering and Management, West Bengal), Interdisciplinary Webinar on Machine Learning in RF Devices (by PSG institute of Technology and Applied Research, Coimbatore), FDP on Python Programming through INFYTQ Platform (by Infosys Limited).
- Dr. Mohd. Junedul Haque, Assistant Professor-cum-Program Manager, CURIN participated in the faculty development program titled Vision-Based Intelligent Systems: Design and Challenges and that was held during 26-30 October 2020. The FDP highlighted topics like introduction to artificial intelligence and computer vision, applications and challenges, use of machine learning for computer vision, concept of deep learning for vision-based intelligent system, integration of artificial intelligence with augmented/virtual reality based applications, utilization of MATLAB for computer vision applications etc.
- Shabnam Choudhary, ME Scholar CURIN presented a paper titled A Detailed Analysis of Artificial Intelligence Support to Measure Negative Impacts Created by the Abnormal Growth of Prosopis Juliflora: A Review in the 3rd International Conference on Intelligent Sustainable Systems (ICISS 2020) organized during December 3-5, 2020 by SCAD Institute of Technology at Palladam, India.


IEEE

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ICISS

SCAD INSTITUTE OF TECHNOLOGY

Approved By AICTE, Affiliated to Anna University

CERTIFICATE OF PRESENTATION

This is to certify that

Shabnam Choudhary

has successfully presented a paper entitled

tailed Analysis of Artificial Intelligence Support to Measure Negative Impacts Create by the Abnormal Growth of Prosopis Juliflora: A Review

in the

3rd International Conference on Intelligent Sustainable Systems (ICISS 2020)

organized on December 3-5, 2020 by SCAD Institute of Technology at Palladam, India.

SESSION CHAIR

ORGANISING SECRETARY

CONFERENCE CHAIR

List of Publications

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 all those publications that have been indexed in Scopus during October – December 2020.

- A. S. Bhatia and S. Zheng, "A quantum finite automata approach to modeling the chemical reactions", Frontiers in Physics, 2020.
- A. Sharma, N. Goyal and K. Guleria, "Performance optimization in delay tolerant networks using backtracking algorithm for fully credits distribution to contrast selfish nodes", Journal of Supercomputing, 2020.
- A. Sundas and S. N. Panda, "An introduction of cloud sim simulation tool for modelling and scheduling," in 2020 International Conference on Emerging Smart Computing and Informatics (ESCI), pp. 263-268, 2020.
- A. Sundas and S. N. Panda, "IoT based integrated technologies for garbage monitoring system," in 2020 8th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO), pp. 57-62, 2020.
- D. Ahlawat, A. Kaur and D. Gupta, "Enhancement of the accuracy and QoS in clustering of data," 2020 8th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO), Noida, India, pp. 849-853, 2020.
- D. P. Mahato, J. K. Sandhu and G. K. Dutta, "Distributed routing for underwater wireless sensor networks using cuckoo search-ant colony optimization", Proceedings of the 21st International Conference on Distributed Computing and Networking, Kolkata, 2020.
- H. Bhatia, S. N. Panda, and D. Nagpal, "Internet of things and its applications in healthcare- A survey," in 2020 8th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO), pp. 305-310, 2020.
- H. Faridi, N. Tuli, A. Mantri, G. Singh and S. Gargish, "A framework utilizing augmented reality to improve critical thinking ability and learning gain of the students in physics", Computer Applications in Engineering Education, vol. 29, no. 1, pp. 258-273, 2020.
- J. Singh, B. Duhan, D. Gupta and N. Sharma, "Cloud resource management optimization: taxonomy and research challenges," 2020 8th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO), Noida, India, pp. 1133-1138, 2020.
- K. K. Mishra, "Study on structural, mechanical, electronic, vibrational, optical and thermo-dynamical behaviour of ZB Structured BeZ (Z= S, Se and Te) using ATK-DFT," Metallurgical and Materials Engineering, vol. 26, pp. 253-278, 2020.
- K. Kumar, A. Kaur and K. R. Ramkumar, "Effective data transmission with UART on kintex-7 FPGA," 2020 12th International Conference on Computational Intelligence and Communication Networks (CICN), Bhimtal, India, pp. 492-497, 2020.
- K. Kumar, K. Ramkumar, and A. Kaur, "A design implementation and comparative analysis of advanced encryption standard (AES) algorithm on FPGA," in 2020 8th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO), pp. 182-185, 2020.
- K. Ramkumar and M. Juneja, "Multi signature authentication and key management system to ensure reliable paths for payload delivery," in 2020 Indo–Taiwan 2nd International Conference on Computing, Analytics and Networks (Indo-Taiwan ICAN), pp. 194-201, 2020.
- K. Sharma, R. K. Tripathi, H. Jatana, R. Pandey, J. Madan, P. Sharma, and R. Sharma "Current reference circuit operable at low voltages using composite MOS triode resistor," in 2020 IEEE VLSI Device Circuit and System (VLSI DCS), pp. 313-316, 2020.
- L. Rani, J. Kaushal, A. L. Srivastav, and P. Mahajan, "A critical review on recent developments in MOF

adsorbents for the elimination of toxic heavy metals from aqueous solutions," Environmental Science and Pollution Research, pp. 1-26, 2020.

- L. Rani, K. Thapa and N. Kanojia "An extensive review on the consequences of chemical pesticides on human health and environment", Journal of Cleaner Production, vol. 283, pp. 124657, 2021.
- M. A. Ghorbani, F. Salmasi, M. K. Saggi, A. S. Bhatia, E. Kahya and R. Norouzi, "Deep learning under H_2O framework: a novel approach for quantitative analysis of discharge coefficient in sluice gates", Journal of Hydroinformatics, vol. 22, pp. 1603-1619, 2020.
- M. Dassi, J. Madan, R. Pandey, and R. Sharma, "A novel source material engineered double gate tunnel field effect transistor for radio frequency integrated circuit applications," Semiconductor Science and Technology, vol. 35, p. 105013, 2020.
- M. Kapil and M. Sharma, "Superwideband dual notched band MIMO hexagonal slot antenna for wireless applications," in 2020 Indo–Taiwan 2nd International Conference on Computing, Analytics and Networks (Indo-Taiwan ICAN), pp. 225-229, 2020.
- M. Khurana, C. Ramakrishna, and S. Panda, "Antenna diversity scheme for multipath mitigation in vehicular adhoc networks on urban roads," in 2020 Indo–Taiwan 2nd International Conference on Computing, Analytics and Networks (Indo-Taiwan ICAN), pp. 317-324, 2020.
- M. Malarvel and H. Singh, "An automatic assessment of histogram mode on x-radiography weld image using non-maxima suppression," 2020 Third International Conference on Smart Systems and Inventive Technology (ICSSIT), Tirunelveli, India, pp. 529-534, 2020
- M. Pal, S. Sehgal, H. Kumar and D. Goyal, " Use of nickel filler powder in joining ss304-ss316 through microwave hybrid heating technique", Metal Powder Report, 2020.
- M. Saxena and S. Ahuja, "Comparative survey of machine learning techniques for prediction of Parkinson's disease," in 2020 Indo–Taiwan 2nd International Conference on Computing, Analytics and Networks (Indo-Taiwan ICAN), pp. 248-253, 2020.
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