# RESNOVAE

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# Challenges for Personalized Medicine in Bioinformatics

**Dr. Varsha Singh**

The verge of genomic era introduces robust techniques to access individual's genomic data and customize medical treatment. The concept of "one-pill-for-all" is now becoming obsolete. From researchers, to doctors to industrialists can now get an individuals' genomic variant markers to assess as to why one responds differently to a particular medicine as compared to another person. This is the trait information which will be deposited in future to have everyone's medical treatments customized.

Researchers around the world have now decoded and performed a complete clinical assessment of patients using personal genome, and in the coming years, the bioinformatics platform will be inundated with individual genomic data. The plethora of data introduces significant impact in medicine, however the community will be needing to address the challenges to introduce and tackle the robust data as the 2.9 billion base pairs of the haploid human genome correspond to a maximum of about 725 megabytes of data, since every base pair can be coded by 2 bits. Since individual genomes vary by less than 1% from each other, they can be lossless compressed to 4 megabytes. We can well imagine how much data needs to be handled when every individual will be considered. There are four main areas of the challenges:

1. Processing the large-scale genomic data.
2. Interpreting the functional part of the human genome variation among every individual.
3. Data integration and relating its phenotypic interactions.
4. Translating the data variation for clinical utility

The last decade has seen many advances towards benefit of medicine, including the Human Genome project, International HapMap project and genome wide association the interpretation of single nucleotide polymorphisms (SNPs) lead to the recognition as the main cause of human genetic variability and answering the question that despite 99% similarity, what makes the individuals different in that 1% of the genome. Therefore, by combining individual's life history, life style and genetic variations, personalized medicine can tailor the regular practice and treatments to the patients' specific genotypes. This way, there could be more specificity in diagnosing certain diseases.

Despite all advancements, many challenges tend to bring personalized medicine into reality and better prioritize diagnosing or prognosing a disease in more individualized manner. By addressing the challenges, bioinformatics can create tools and relate studies to define individuals' genome in a more specific way.

**Challenge 1. Processing the large-scale genomic data.**

After the genomic data was thoroughly analyzed, its genetic variants still remain to be decoded. The statistical associations of SNPs and their variants still have not been completely decoded from the available information. The functional relationship and the phenotypic traits still remain enigmatic. High-quality sequence reads must be placed into their genomic context to identify the variants and matched and identified for false positive rate. This is one of the challenges which is making information limited to decode despite all information available from the genome sequenced.

**Challenge 2. Interpreting the functional part of the human genome variation among every individual.**

Only certain missense mutations are being interpreted and predicted. New methods are needed to evaluate

the impact of insertion, deletion and synonymous SNPs. Without predicting the functional region in the genome of an individual, the effect of intronic SNPs can be analyzed along with promoter regions and splicing sites which are involved in making mRNA and cellular proteins. However, the methods are fast growing in predicting the functionally annotated genomes and their impact on non-coding variants.

**Challenge 3. Data integration and relating its phenotypic interactions.**

The information generated through GWAS and Human genome database, phenotypes associated with the SNPs is what makes data integration a complexity for personalized medicine. As a result of this complexity, a drug-response phenotype of interest also depends on many genes and environmental factors. Basic information of GWAS integrated with pharmacogenomics has seen some success of integrating the data with the variations found among individuals, but the challenge is how many genes can be associated with how many phenotypes and *vice versa.* The challenge is faced by insufficient sample size, selection bias of patients and their genetic variants, environmental interactions, and how multiple gene-gene interactions are involved in unexplained effects. For this the bioinformatics should build drug-drug, drug-gene target as a global mapping to interlink phenotypic traits, disease indication and protein-gene networks analysis.

**Challenge 4. Translating the data variation for clinical utility and medical practices.**

This is the ultimate challenge to apply the methods designed and results interpreted. Bringing this challenge to clinical utility will foresee improved patient care. Much of the research discussed above still awaits translation to clinical utility. Genetic variation once predicted, can be utilized for a pharmacogenomics approach to influence drug selection based on every individuals' genome. The genome variation can also decide the dosing and adverse effectys along with the prediction of therapeutic benefits of bringing this tailored approach for clinical trials. Selection matrices to bringing data of individuals' variation is now the biggest challenge especially into clinical practice. The current state of medical practice needs to be updated to include genetic testing as one of the utmost priorities while educating and training physicians.

Ultimately, bioinformatics should develop methods that interrogate the genome variation for clinic output and make it easier for clinicians to use personalized medicine as part of their daily routine.

## By:

**Dr. Varsha Singh** is a PhD in Molecular Biology and Biochemistry and is currently working as an Assistant Professor | Research in CURIN. Her areas of interest are Bioinformatics, Cardio-Renal diseases, Personalized medicine, Advanced Molecular Techniques, Animal modelling and Biomarker network analysis.

## PUBLICATIONS

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## PATENTS

- **ORAL FAST DISSOLVING FILMS COMPRISING NOVEL NATURAL POLYMER AND METHOD OF PREPARATION THEREOF**
  Date: - 1/10/2019 No. 201911001177
  **Inventors: -** Sandeep Arora, Rajni Bala, Richa Madaan, Ritima Sharma, & S. Garg

- **A DRIVING TEST SIMULATION APPARATUS**
  Date: - 1/16/2019 No. 201911001972
  **Inventors: -** Shivam Sharma, Neha Tuli, Narinder pal Singh, & Archana Mantri

- **SOLID DISPERSION FORMULATION OF LAMOTRIGINE**
  Date: - 2/4/2019 No. 201911004379
  **Inventors: -** Manju Riya & Gurjeet Geeta

- **AUGMENTED REALITY BASED ZONE SIMULATION APPARATUS**
  Date: - 2/14/2019 No. 201911005921
  **Inventors: -** Narinder Pal, Singh Neha, Tuli Ravinder Singh, Shivam Sharma & Gurvinder Singh

- **A DEVICE FOR MONITORING HEALTH PARAMETER**
  Date: - 2/22/2019 No. 201911007068
  **Inventors: -** S. Rani & D. Garg

- **ANTIMICROBIAL POLYHERBAL SOAP COMPOSITION**
  Date: - 2/26/2019 No. 201911011586
  **Inventors: -** Rakesh K Sindhu, Mansi Chitkara Gagandeep Kaur, A. Kaur, Sandeep Arora & IS Sandhu

- **A SNAKE TRAPPING APPARATUS**
  Date: - 2/28/2019 No. 201911007999
  **Inventors: -** Sachin Ahuja, Huma Naz, S N Panda & Nancy

- **A SYSTEM FOR PICKING AND COLLECTING OBJECTS**
  Date: - 3/14/2019 No. 201911010042

**Inventors: -** S. Gupta, Rupesh Gupta, Param Gupta & Udit Jindal

- **NOVEL N-HETEROCYCLIC SCAFFOLDS AS ANTINEOPLASTIC AGENTS**
  Date: - 4/1/2019 No. 201911013055
  **Inventors: -** Mohit Kapoor, Ming Hua, Hsu Jen & Kun Chen

## Invited Talk's

**Dr Rajnish Sharma was invited as an Expert Panelist on 'Doordarshan's Vigyan Prasar Channel on January 7, 2019'.**

Dr Rajnish Sharma, Dean Research CURIN Chitkara University was invited to be an Expert Panelist to share his views on 'Nai Shiksha Nai Taqneeq' at Doordarshan's Vigyan Prasar Channel. He talked about and discussed the new age education and how the world has changed with Technology involved in teaching pedagogy. He was joined by Dr. Neeraj Saxena, another Panelist from AICTE for this Panel Discussion. The full episode can be viewed at https://www.indiascience.in/videodetails?id=5c29b96f5e3ca


**Dr. SN Panda delivered keynote address on IOT and Deep Learning at TEQIP workshop hosted by UIET Kurukshetra University on January 16,2019.**

Dr. SN Panda Director Research CURIN has delivered keynote address on Internet of Things and Deep Learning in a Ministry of HRD Govt. of India sponsored Workshop TEQIP hosted by UIET Kurukshetra University on 16th Jan 2019. In this event Mr. Rajesh Kaushal and Mr. Vishal had shown live demo of IOT based Portable Intensive Care Unit PICU machine that was developed in the research Centre of Chitkara University Punjab.


**Dr Jyotsana Professor CURIN was invited as a resource person on Social Cultural and environmental Practice at Govt College Panchkula on 14th February, 2019.**

Dr Jyotsana Professor CURIN was invited as a resource person for sharing her experiences along with other prominent speakers in a State level workshop on Social Cultural and environmental Practice at Govt College Panchkula.

**Dr S N Panda Director Research and Dr Sachin Ahuja Director Research CURIN were invited for an expert lecture on smart devices on 15th February, 2019.**

Dr S N Panda Director Research and Dr Sachin Ahuja Director Research CURIN were invited for an expert lecture on smart devices and IPR in CSI Regional convention organised by Department of Computer Applications.


**Dr S N Panda Director Research CURIN delivered 3 hrs. extension lecture on Project based Research to college and university cadre teachers in UGC HRDC Punjabi University Patiala on 25 Feb 2019.**


## Events

**Chitkara University organised a workshop on Intellectual Property Rights on January 21, 2019.**

Chitkara University Punjab in association with Intellectual Property Office and ASSOCHAM organised a workshop on Intellectual Property Rights. Mr. Vijay Shivpuje from ASSOCHAM, Mr. Vikas from IP Office India and Mr. Rahul Taneja DST Haryana along with Dr. Sachin Ahuja & Dr. Inderbir Singh shared their experience on various topics on IPRs including patent filing process in India, myths about patent filing, need of IPR in economy, importance of IPR in accreditation of Indian University and latest initiatives in IPR in by Gov. The representative from Intellectual Property Office congratulated on achieving top 10 position in terms of patent filing in India and promised for more fruitful association in future.


**CURIN, Novate+ was organised in Surge 0.1 at Chitkara University, Himachal Pradesh on 19th February, 2019.**

NOVATE+ is the largest show case of Northern India for Product Ready ideas, having good market potential, and looking forward to start the journey of Technology-driven commercialization and entrepreneurship. CURIN, Novate+ was organised in Surge 0.1 at Chitkara University, Himachal Pradesh. Event became competitive with 115 top notch product

or prototype entries from all around India. In grand finale top 35 prototype or products were showcased by innovators and entrepreneurs at splendid show in morning of 19th Feb 2019. After a mind-boggling session with the innovators / competitors, NOVATE+ jury members break their heads on making probably the toughest decisions of their lives - declared winners of NOVATE+. Finally, top 14 innovators had been awarded with 2.5 lakh. Valedictory was graced by the presence of our honorable Pro-VC Dr Archana Mantri, CU Punjab, VC Dr Varinder CU, HP, team CURIN and our Novate+ jury members.

**CURIN conducted the 2nd Annual IPR Workshop on Feb 2019.**

IPR Cell of Chitkara University, H.P. set-up by HIMCOSTE and OPFLC, CURIN conducted the 2nd Annual IPR Workshop on Feb 19. The workshop was delivered by Mr. Yogesh Khullar - Patent Attorney, Khurana & Khurana Advocates and Dr. Man Singh - Dean (Chemical Sciences), Central University of Gujarat. It was attended by about 70 faculty members, research scholars, students of Chitkara University and from neighboring institutions in the region.

**Smart India Hackathon was held on 3-4 March 2019.**

Dr S S Sandhu, Addl Secy, Technical Education, MHRD, Dr Mohit Gambhir, Chief Innovation Officer, MHRD, and Mr R K Soni, Regional Officer, AICTE, Chandigarh, visited Chitkara University, Punjab to overview the preparations and proceedings of Smart India Hackathon. They met with the Vice Chancellor and also sat through the interaction with the Prime Minister.

A glittering Valedictory Ceremony complimented with beautiful cultural performances brought the event to a close, on a high note at Chitkara University. Applauding the innovative ideas of Smart India Hackathon 2019 winners, Dr. Madhu Chitkara, Hon'ble Vice Chancellor, Chitkara University, facilitated the winners - First category, Team Cyborg, Team JAPNAS and Team Agronomists were presented Rs. 1 lakh. Second category, Team Backstreet Hackers and Team Clay were presented Rs. 75,000. Third category, Team NEPER and Team Versatile were presented Rs. 50,000.

## Achievements

**Dr. Nitin Saluja and Mr. Varinder Singh invited at Vibrant Gujrat Summit from January 17-22, 2019.**

Dr. Nitin Saluja from CURIN and Mr. Varinder Singh from Dept. of Mech. Engg. were invited to showcase the innovations from the laboratory at esteemed event Vibrant Gujrat summit 2019 from Jan 17-22, 2019 at Gandhinagar, Gujarat. Vibrant Gujrat summit 2019 was in its 9th edition this year with 25000+ companies and 35000+ delegates from 16 countries. It was inaugurated by Prime Minister of India.


**Dr Varsha Singh was awarded Life Time Membership by IISC, Bangalore for Society of Biological Chemists India (SBCI) on March 10, 2019.**

Dr Varsha Singh was awarded Life Time Membership by IISC, Bangalore for Society of Biological Chemists India (SBCI), a statutory body of FAOBMB (Federation of National Societies of Biochemistry and Molecular Biology) in the Asian and Oceanian Region of 21 countries. The society awards memberships to deserving scientists

**3 projects of CURIN researchers were displayed in Innotech 2019 in Pushpa Gujral Science City Kapurthala on 18-19 March 2019.**

3 projects of CURIN researchers were displayed in Innotech 2019 in Pushpa Gujral Science City Kapurthala on 18-19 March 2019. A total of 60 projects were shortlisted out of 1800 and our 2 projects within 60 shortlisted projects have been further competed with other techno minds. In final round our project ECG System got first prize which was represented by Mr Vishal Verma ME scholar CURIN.


**Dr Jaya Madan Assistant Professor CURIN received commendable research award from Delhi Technological University on March 21, 2019.**

Dr Jaya Madan Assistant Professor CURIN received commendable research award from Delhi Technological University, as an appreciation of research work published in IEEE Transactions on Nanotechnology and Applied Physics A in the year 2018. Another feather added in the cap of VLSI COE contributed by Dr. Jaya again who won outstanding thesis award at DTU on 30 March 2019.

**Chitkara University presented their grand pitch in Global Entrepreneurship Congress on 16 April, 2019.**

Global Entrepreneurship Congress at Bahrain - Both the finalists from Chitkara University were in the top 6 grand finalists. Kartik (CSE final year student) and Varinder Singh (ME faculty) under the mentorship of Dr. Nitin Saluja presented their grand final pitch CURIN Researchers to showcase their ideas.

## Conferences

**Mr. Rajesh Kaushal, Amit Sundas and Mr. Naveen Kumar, Research scholars CURIN have presented their research papers in International Conference on Intelligent Machine, ICIM 2019 on March 18,2019.**


**Members from Liquid Crystal Nano Physics Research Laboratory CURIN presented their work in the International Conference on advances in basic sciences at GDC college at Haryana held from February 7-9,2019.**

Dr Pankaj Kumar (Professor and Dean), Vandna Sharma (DST INSPIRE-SRF) and Mrs. Reena Kumari (Part time PhD Scholar) along with other team members from Liquid Crystal Nano Physics Research Laboratory,CURIN, have presented their research work in the International Conference on advances in basic sciences held from February 7-9, 2019 at GDC college, Bahal (Haryana). Five different papers were presented during the conference. All manuscript will be published in AIP proceeding (SCOPUS indexed) having h-index of 54.

**Dr Rajnish Sharma and Kulbhushan Sharma participated in 3rd IEEE International conference DevIC 2019 held at Kalyani Government College, Kolkata from 23rd to 24th March, 2019.**

Dr Rajnish Sharma and Kulbhushan Sharma participated in 3rd IEEE International conference DevIC 2019 held at Kalyani Government College, Kolkata from 23rd to 24th March, 2019. While Kulbhushan Sharma presented 3 research papers coming in from VLSI Center of Excellence, Dr. Rajnish was invited to deliver a keynote address and chair a session.


**Mr. Vinay Mehta Director research curin attended the tech and IP commercialization conference at New Delhi being organized by Intellectual property office, UK high Commission on 18 March 2019.**

**Dr Panda met with the Governor of Odisha to discuss his innovations on February 2,2019.**

Dr Panda and his wife met with the Governor of Odisha Prof Ganeshi Lal. He interacted with him and discussed his innovations. He appreciated PICU,E - deweeder and other innovations. He assured Dr Panda to visit Chitkara University, whenever he comes to Haryana. He already knew about our Hon'ble Chancellor and Hon'ble Vice Chancellor and the academic excellence of our University.

**Dr. Madhu Chitkara addressed a panel focused on "innovation led growth prospects for Chandigarh region" in presence of H.E. Governor of Punjab Sh. Badnore happening at ISB Mohali, on March 8,2019.**

" If there is a failure, we are there to support our young entrepreneurs, we have been doing that since 2009. If we talk about the Chandigarh region independent working facilities for young entrepreneurs and researchers remain a challenge and can definitely improve with better collaboration amongst Industry, academia and the government" quotes Dr. Madhu Chitkara as she addresses a panel focused on " innovation led growth prospects for Chandigarh region" in presence of H.E. Governor of Punjab Sh. Badnore happening at ISB Mohali today, a CRIKC & Niti Aayog policy Initiative on entrepreneurship & innovation growth.


**Dr. Varsha Singh represented Chitkara University and her Start-up at prestigious Falling Walls Lab India 2019 at Manipal Karnataka in March 2019.**

Dr. Varsha Singh represented Chitkara University and her Start-up at prestigious Falling Walls Lab India 2019 at Manipal Karnataka. Together with Top 16 Finalists, Dr. Varsha was shortlisted among 144 applicants after three round scrutiny with 29 women and 115 men applicants. The DWIH - German Centre for Research and Innovation New Delhi and the DAAD - German Academic Exchange Service, with the Manipal Academy of Higher Education, Karnataka, brought together the FallingWallsLab2019 India. This initiative was supported by the Federal Foreign Office, Germany for young researchers and entrepreneurs a platform to present their research project business plan or social initiative.

**Chitkara University added a new dimension in research by opening new Centers for research in Basic Sciences, namely Life Sciences and Water Sciences on 2nd April 2019.**

"Look deep into nature, and then you will understand everything better Albert Einstein". Chitkara University added a new dimension in research on 2nd April 2019 by opening new Centers for research in Basic Sciences,

namely Life Sciences and Water Sciences. Hon'ble VC Ma'am inaugurated the Centre for Life Sciences in Babbage block and Centre for Water Sciences in Turing Block. Dr Varsha leading the Centers for research in Life Sciences and Dr Jyotsna Kaushal along with Dr Pooja Mahajan is leading the research at the Centre for Water Sciences.


**CURIN hosted the India Innovation Growth Program, IIGP2.0 Road Show on 12th April,2019.**

Chitkara University Research and Innovation Network (CURIN), hosted the India Innovation Growth Program, IIGP2.0 Road Show. Mr. Nikhil Chachra, Joint Director, FICCI spoke about IIGP, its mission, application process and selection criteria. Around 105 Researchers, Professors and Scholars, from in and around the city, were in full attendance at the event. The event was sponsored by FICCI, New Delhi

**Mr Vinay Mehta Director Tech Commercialization CURIN attended the BIRAC IKP event at IMTech on 12 April 2019 along with Dr Navita and Dr Varsha.**

**Chitkara University Organized its 3rd Annual Problem Solving Challenge NOVATE 2019 on 2nd April 2019**

# STEAM SCHOOL 2019

The Valedictory function of STEAM school concluded with 15 workshops / courses offered and with 327 students in the period of August - Oct 2018. The Vice Chancellor – Dr. Madhu Chitkara congratulated the faculty and students for their voluntary efforts. The learnings were immense and so were the teachings. Immediately after she conducted a meeting with the Deans of all the schools and encouraged them to offer skill workshops under STEAM school. All the Deans instantly came up with various ideas and agreed to offer courses. With the support coming from all over, we hope to make it bigger and better.

**Java programming**

**Introduction to PCB designing using Fritzing Tool**


**Internet of Things**

**Session on power supply**

# INTERNATIONAL VISITS

**Dr Subhash Minocha Professor, Plant breeding and Genetics, New Hampshire University, USA visited CURIN labs Chitkara University on 9th Jan 2019.**


**A high level delegation from National Chung Cheng University, Taiwan visited Chitkara University on January 22,2019.**

A high level delegation from National Chung Cheng University, Taiwan visited Chitkara University on Jan 22nd. Besides deliberations on various key aspects, CCU established CoE in Artificial Intelligence at Chitkara University. This will be a triparty collaboration with CCU, Taiwan, IIT Ropar, and Chitkara University India. We look forward to high end AI solutions being generated in the areas of Travel, Fintech and Smart Living

**A high-end delegation from TATA center of Design, Massachusetts Institute of Technology, US (MIT, US) had an information exchange trip to Chitkara University, Punjab, on 24th January 2019.**

A high-end delegation from TATA center of Design, Massachusetts Institute of Technology, US (MIT, US) had an information exchange trip to Chitkara University, Punjab, on 24th January 2019. The visit unfolded the process for co-operation between two entities (MIT US and Chitkara University)

**GFF innovations became the first Indian Start up ever to win a title at Global Entrepreneurship Congress on 16th April,2019**

In the history of GIST, GFF innovations became the first Indian Start up ever to win a title. Mr Varinder Singh kept the Chitkara University's and India's flag high by winning third prize at Global Entrepreneurship Congress

# ICTIEE 2019

Chitkara University got an opportunity to host prestigious ICTIEE 2019 (The International Conference on Transformation in Engineering Education) on January 10-11, 2019, at their Punjab Campus. ICTIEE 2019 is an annual conference that provides a platform for international Engineering Educators to discuss and share new ideas with their Indian counterparts, and facilitate a great networking opportunity. Chitkara University in association with Indo Universal Collaboration for Engineering Education (IUCEE) has been continually working to improve Engineering Education ecosystem in India. Emphasizing the importance of CONNECT & SHARE, ICTIEE 2019 provided a platform to Engineering Educators to CONNECT with leaders from academia and industry from all over the world. Engineering Educators had an opportunity to SHARE their best practices which would eventually help in bringing about transformational changes in Engineering Education. ICTIEE 2019 was hosted at two locations sequentially in order to maximize its impact among institutions all over India. The first leg of the conference was conducted at Malla Reddy College of Engineering, Hyderabad, on January 7-8, 2019, followed by the second leg at Chitkara University, Punjab, on January 10-11, 2019. The ICTIEE 2019 theme had five parallel tracks – Electronics, Mechanical, Civil, Computer Science and other Engineering Education Research – with each track specifically dedicated to each major Engineering Disciple. Engineering Educators were invited to submit their extended abstracts sharing their Best Practices & Challenges specific to their disciplines in one of the sub-theme areas, provided beforehand.

At Chitkara University, the conference included Paper Presentations, poster presentations, Keynote Talks, Plenary Sessions, Panel Discussion, Workshops & Tutorials, with an opportunity to interact with leaders from academia & industry from around the world. The conference also included workshops and tutorials sessions for the conference authors, students and delegates, centered on the theme of ICTIEE 2019, including sessions like technical tools for teaching & research, innovative labs for better outcomes, AR/VR and virtual labs, problem-based learning models, inclusion of research practices in UG curriculum etc. The highlight of the conference was a presentation by Engineering faculty, who have already gained some experience in transforming their own curriculum, classrooms and programs. The IUCEE College Consortium was formed in 2010 and has 91 members in 2018. Members receive special assistance in establishing collaborations with international experts and institutions. Chitkara University is one of the consortium member institutions of IUCEE. The university shares similar vision and mission as IUCEE, and has been actively involved in spreading the message of IUCEE across the Northern Indian States. The institution was established in the year 2002 under the able guidance of Dr. Ashok K Chitkara and Dr. Madhu Chitkara, two academicians dedicated to the mission of spreading education. Through their diligence and inspiring leadership, they have helped create a learning environment that represents a unique blend of distinguished faculty, brilliant students and proactive collaborations with industry.

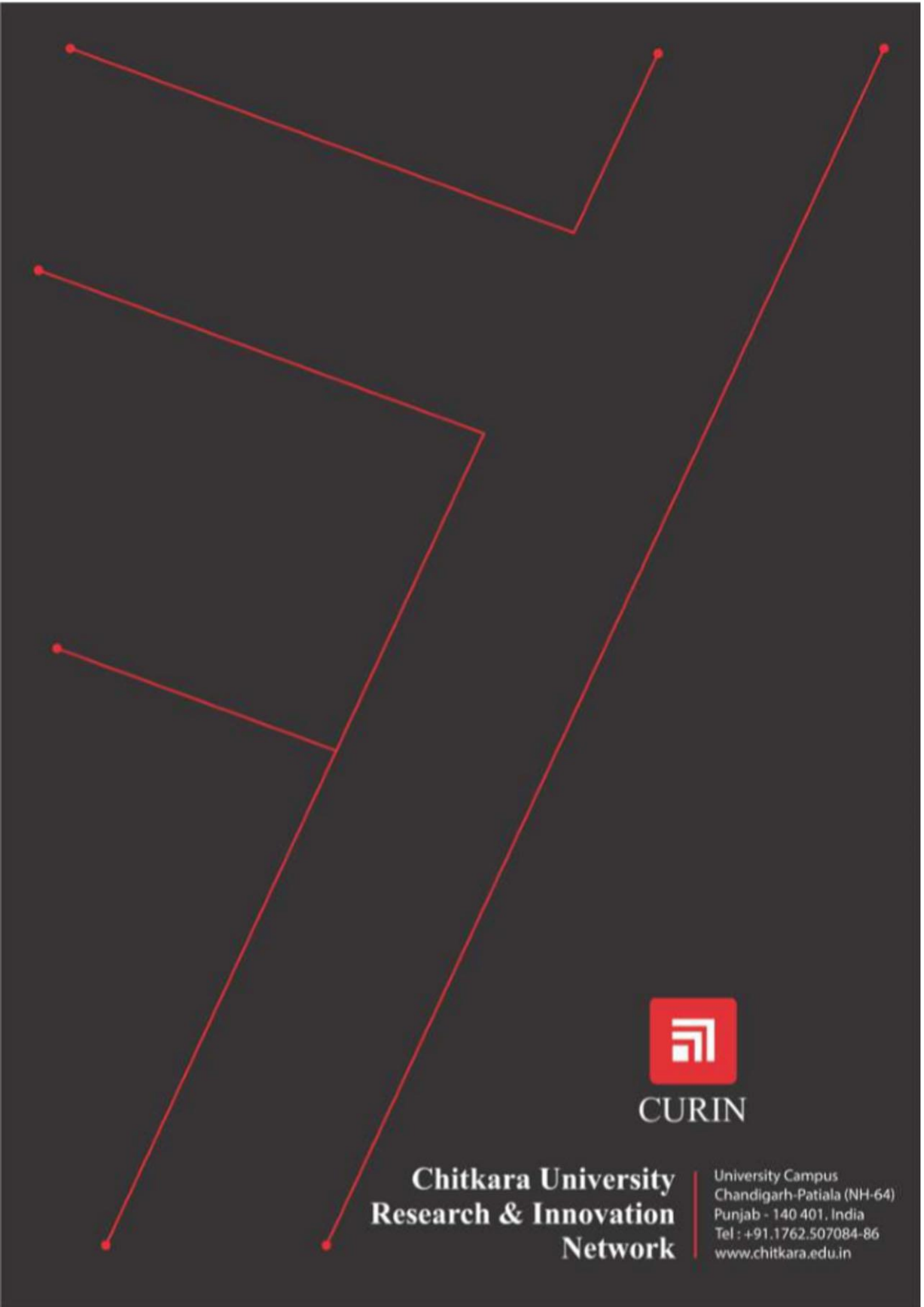
## UPCOMING EVENTS

### 26th National Conference on Liquid Crystals

26th National Conference on Liquid Crystals (26th NCLC – 2019), being the most innovative event, aims to provide open and stimulating scientific and recent advancements in the field of liquid crystals. Conference will also provide the opportunity to all the young and senior researchers from nationally and internationally reputed institutions to discuss and share emerging interdisciplinary areas of soft matter, nanotechnology and biological systems.


### Indo-Taiwan ICAN2020

Computing in the simplest of words is use of computers or computer systems. The task that requires computer systems – hardware and/or software is computing. We do a lot of computing in our day to day life like – withdrawing money from ATM, swiping card to get access to secured/guarded areas, using smart phones, accessing emails, downloading stuff from the internet etc. For a particular genre of human beings, computing is like breathing in today's age.



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