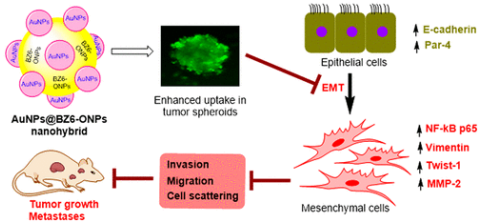
Sl. No.	IIT Ropar List of Recent Publications with Abstract Coverage: December, 2020
1.	A distribution-level PMU enabled Teager-Kaiser energy based islanding detector K Chauhan, R Sodhi - Electric Power Systems Research, 2020 **Abstract:** This paper proposes a simple yet effective Distribution Phasor Measurements based Islanding Detector (DPMID). The proposed detector relies on the voltage phasor measurements, obtained from the Phasor Measurement Unit (PMU), deployed at the respective Distributed Generator (DG) bus. Next, Teager-Kaiser energy of the positive sequence voltage is readily computed, which effectively discriminates the islanding scenarios from other non-islanding scenarios. The efficacy of the proposed method is verified through various PSCAD/EMTDC simulation, and Hardware-In-Loop (HIL) experiment using Real-Time Digital Simulator (RTDS) and DS1104 micro-controller. A detailed comparative assessment of the proposed method (PM) with recent islanding detection techniques preceded by online signal parameter estimation demonstrates the superiority of the PM with respect to various islanding detection standard such as IEEE 1547–2018, UL1741-SA.
2.	A Facile Transition Metal-free Ionic Liquid [BMIM] OH Mediated Regio-and Stereoselective Hydrocarboxylation of Alkynylnitriles C Kumari, A Goswami - European Journal of Organic Chemistry, 2020 **Abstract:** We report an efficient and straight forward access to nitrile substituted enol esters via ionic liquid [BMIM]OH mediated hydrocarboxylation of alkynylnitriles under mild conditions. This atom economical transition metal-free protocol gives an easy access to a variety of such enol esters with excellent regio and Z -stereoselectivity. Reusability of [BMIM]OH without losing of significant amount of yield is another noticeable feature of this article.
3.	A Miniaturized Wideband Antenna for Vehicular Communication, WiMAX, and WLAN Applications S Agarwal, A Sharma - International Conference on Radar, Antenna, Microwave, Electronics, and Telecommunications, 2020 **Abstract:** A compact wideband microstrip antenna operating over 5.45 GHz - 7.47 GHz bandwidth is reported. The design uses double rectangular type annular-ring structured patch, along with a circular arc at each corner acting as defected metal structure (DMS) and two triangular-shaped defects in the ground plane acting as defected ground structures (DGS). The annular ring contributes to increase bandwidth of basic microstrip antenna and further enhancement in bandwidth is achieved by combination of both DMS and DGS. The design is implemented on a RT/Duroid 5880 TM substrate. The overall design size is 14 mm×18 mm. The maximum simulated gain of the proposed antenna is 7.8 dBi. Hence, the proposed design is found suitable for vehicle to vehicle communication in Intelligent Transport System (ITS), WiMAX, WLAN, downlink of X-band and satellite communication and other applications operating in ultra wideband frequency range.
4.	A periodic development of BPA and BSH based derivatives in Boron Neutron Capture Therapy (BNCT) A Goswami, A Bandyopadhyay, M Lamba - Chemical Communications, 2020 **Abstract:** Boron Neutron Capture Therapy (BNCT) is a particular type of radiotherapy that requires selective and high concentration of boron accumulation in neoplastic cells. To distinguish the distribution between tumour and normal cells by boron compounds, multiple research groups have involved and successively innovated a wide variety of boron-based

	compounds. Despite the development of numerous boron compounds, only boronophenylalanine (BPA) and sodium mercaptoundecahydro-closo-dodecaborate (BSH) have emerged as effective in clinical trials. Here, we highlight the detailed progress in the molecular design of BPA and BSH derivatives from the historical perspective to the latest advancements in light of the widely accepted performance required for effective BNCT. In this report, we have provided an overview of a variety of derivatives of BPA and BSH including amino acids, peptides, polymers, monoclonal antibodies and chelate complexes and it is observed that such derivatives of BPA and BSH are the judicious choice for BNCT. Finally, we have summarised the critical issues of BPA and BSH that must be addressed if BNCT has to become a more widely accepted clinical modality.
5.	An End-to-End Network for Image De-Hazing and Beyond A Dudhane, PW Patil, S Murala - IEEE Transactions on Emerging Topics in Computational Intelligence, 2020 **Abstract:** Degradation in the quality of images that are captured in the hazy environment is mainlydue to 1) different weather conditions and 2) the attenuation in reflected light. These factors introduce a severe color distortion and low visibility in the captured images. To tackle these problems, we propose an end-to-end trainable image de-hazing network named as LIGHT-Net. The proposed LIGHT-Net comprises of color constancy module and haze reduction module. Among these, the color constancy module removes the color cast added in hazy image due to the weather condition. Whereas, the proposed haze reduction module, which is build using an inception-residual block, is aimed to reduce the effect of haze as well as to improve the visibility in the hazy image. Unlike traditional feature concatenation, in the haze reduction module, we propose a dense feature sharing to effectively share the features learned at initial layers across the network. In general, a major hurdle to train a convolution neural network for haze removal task is the unavailability of large-scale real-world hazy, and corresponding haze-free image (i.e. paired data). Thus, we make use of an unpaired training approach to train the proposed LIGHT-Net for image de-hazing. Extensive analysis has been carried out to validate the necessity and impact of each sub-block of the proposed LIGHT-Net. A large set of real-world hazy images captured in different weather conditions are considered to validate the proposed approach for image de-hazing. Also, the benchmark synthetic hazy image database is considered for a quantitative analysis of the proposed LIGHTNet for image de-hazing. Further, we have shown the usefulness of the proposed LIGHT-Net for underwater image enhancement. Experiments show that the proposed LIGHT-Net outperforms the other existing approaches for both image de-hazing as well as underwater image enhancement.
6.	β Decay of V 61 and its Role in Cooling Accreted Neutron Star Crusts WJ Ong, EF Brown, J Browne, S Ahn, K Childers…SS Gupta…- Physical Review Letters, 2020 **Abstract:** The interpretation of observations of cooling neutron star crusts in quasipersistent x-ray transients is affected by predictions of the strength of neutrino cooling via crust Urca processes. The strength of crust Urca neutrino cooling depends sensitively on the electron-capture and β-decay ground-state-to-ground-state transition strengths of neutron-rich rare isotopes. Nuclei with a mass number of A=61 are predicted to be among the most abundant in accreted crusts, and the last remaining experimentally undetermined ground-state-to-ground-state transition strength was the β decay of ^{61}V. This Letter reports the first experimental determination of this transition strength, a ground-state branching of $8.1^{+4.0}_{-3.1\%}$, corresponding to a log ft value of $5.5^{+0.2-0.2}$. This result was achieved through the measurement of the β-delayed γ rays using the total absorption spectrometer SuN and the measurement of the β-delayed neutron branch using the neutron long counter system NERO at the National Superconducting Cyclotron Laboratory at Michigan State University. This method helps to mitigate the impact of the pandemonium effect

	in extremely neutron-rich nuclei on experimental results. The result implies that A=61 nuclei do not provide the strongest cooling in accreted neutron star crusts as expected by some predictions, but that their cooling is still larger compared to most other mass numbers. Only nuclei with mass numbers 31, 33, and 55 are predicted to be cooling more strongly. However, the theoretical predictions for the transition strengths of these nuclei are not consistently accurate enough to draw conclusions on crust cooling. With the experimental approach developed in this work, all relevant transitions are within reach to be studied in the future.
7.	Benzimidazole-Based Organic–Inorganic Gold Nanohybrids Suppress Invasiveness of Cancer Cells by Modulating EMT Signaling Cascade V Dhanwal, A Katoch, D Nayak, S Chakraborty…N Singh… - ACS Applied Bio Materials, 2020 **Abstract:** Over the past few years, nanotechnology-based approaches have emerged to override drug resistance owing to their superiority over other formulations because of their diverse therapeutic advantages such as target-specific drug delivery, enhanced bioavailability, biodegradability, and minimal off-target effects. Hybrid nanomaterials as a formulation of anticancer drugs with gold nanoparticles (AuNPs) have adequately proven efficacious in controlled release as well as disintegration into ultrasmall nanoparticles dragging the drug to penetrate deep into tumor tissues and consequently getting cleared from the body. In this study, to achieve better antitumor responses, we engineered self-assembled organic nanoparticles of potent anticancer compound BZ6 (BZ6-ONPs), BZ6-gold nanoparticle conjugates (BZ6-AuNPs), and organic–inorganic nanohybrids involving amalgamation of AuNPs with BZ6-ONPs (AuNPs@BZ6-ONPs) and comparatively analyzed their physicochemical as well as biological activities. The epithelial–mesenchymal transition (EMT) is a critical biological event that facilitates metastatic spread of cancer cells and contributes to chemoresistance. AuNPs@BZ6-ONPs consistently suppressed EMT characteristics including invasion, cell scattering, and migration abilities of aggressive breast cancer (MDA-MB-231) and pancreatic adenocarcinoma (PANC-1) cells much more efficiently than BZ6-ONPs and BZ6-AuNPs. Western blotting and immunocytochemistry analysis unveiled that the nanohybrids downregulated expression of the key mesenchymal markers NF-κβ p65, Twist-1, vimentin, and MMP-2, meanwhile augmenting epithelial marker E-cadherin and tumor suppressor Par-4. The in vivo syngenic mouse tumor model demonstrated remarkable reduction of tumor growth (84.3%) and metastatic lung nodules (66.1%) following 14 days of treatment without any adverse effects. Finally, the facile and ecofriendly method of synthesis of AuNPs@BZ6-ONPs demonstrating promising antitumor/antimetastatic efficacies suggests its therapeutic implication for the treatment of advanced cancers. 
8.	Boronic acid based dynamic click chemistry: recent advances and emergent applications S Chatterjee, EV Anslyn, A Bandyopadhyay - Chemical Science, 2020 **Abstract:** Recently, reversible click reactions have found numerous applications in chemical biology, supramolecular chemistry, and biomedical applications. Boronic acid (BA)-mediated cis-diol conjugation is one of the best-studied reactions among them. An excellent understanding of the chemical properties and biocompatibility of BA-based compounds has inspired the exploration of novel chemistries using boron to fuel emergent sciences. This topical review

	focuses on the recent progress of iminoboronate and salicylhydroxamic–boronate constituted reversible click chemistries in the past decade. We highlight the mechanism of reversible kinetics and its applications in chemical biology, medicinal chemistry, biomedical devices, and material chemistry. This article also emphasizes the fundamental reactivity of these two conjugate chemistries with assorted nucleophiles at variable pHs, which is of utmost importance to any stimuli-responsive biological and material chemistry explorations.
9.	Counting Active S-Boxes is not Enough O Dunkelman, A Kumar, E Lambooij, SK Sanadhya - International Conference on Cryptology in India: Part of the Lecture Notes in Computer Science book series, 2020 **Abstract:** Inspired by the works of Nyberg and Knudsen, the wide trail strategy suggests to ensure that the number of active S-boxes in a differential characteristic or a linear approximation is sufficiently high, thus, offering security against differential and linear attacks. Many cipher designers are relying on this strategy, and most new designs include analysis based on counting the number of active S-boxes. Unfortunately, this analysis is not always accurate and needs to be performed in a very delicate manner. To counter the common approach, we give an example of a 4-round Feistel construction with a very large number of active S-boxes that is expected to resist differential and linear cryptanalysis. However, we show that S-box counting arguments are insufficient in cases where one can find many differential characteristics with the same input and output difference. Namely, we show for a "provably" secure 128-bit block, 4-round Feistel with at least 36 active AES S-boxes, that one can construct differential characteristics with probability 2^{-118} much higher than the bound of 2^{-216}. Even if we compare this 4-round Feistel construction to a random permutation we obtain a 10x factor in the probability of the characteristic.
10.	Design, Synthesis, and Biological Evaluation of Benzo [d] imidazole-2-carboxamides as New Anti-TB Agents TM Dhameliya, KI Patel, R Tiwari, SK Vagolu…AK Chakraborti - Bioorganic Chemistry, 2020 **Abstract:** Tuberculosis is the leading cause of death globally among infectious diseases. Due to the development of resistance of Mycobacterium tuberculosis to currently used anti-TB medicines and the TB-HIV synergism the urgent need to develop novel anti-mycobacterial agents has been realized. The drug-to-target path has been the successful strategy for new anti-TB drug development. All the six drug candidates that have shown promise during the clinical trials and some of these being approved for treatment against MDR TB are the results of phenotype screening of small molecule compound libraries. In search of compounds belonging to novel pharmacophoric class that could be subjected to whole cell assay to generate new anti-TB leads the benzo[d]imidazole-2-carboxamide moiety has been designed as a novel anti-TB scaffold. The design was based on the identification of the benzimidazole ring as a prominent substructure of the FDA approved drugs, the structural analysis of reported anti-TB benzimidazoles, and the presence of the C-2 carboxamido functionality in novel bioisoteric anti-TB benzothiazoles. Twenty seven final compounds have been prepared via NH4Cl-catalyzed amidation of ethyl benzo[d]imidazole-2-carboxylates, as the required intermediates, obtained through a green "all water" one-pot synthetic route following a tandem N-arylation-reduction-cyclocondensation procedure. All of the synthesised target compounds were assessed for anti-TB potential using H37Rv ATCC27294 strain. Thirteen compounds were found with better MIC (0.78-6.25 µg/mL) than the standard drugs and being non-cytotoxic nature (< 50% inhibition against RAW 264.7 cell lines at 50 µg/mL). The compound 8e exhibited best anti-TB activity (MIC: 2.15 µM and selectivity index: > 60) and a few others e.g., 8a, 8f, 8k and 8o are the next best anti-TB hits (MIC: 1.56 µg/mL). The determination and analysis of various physiochemical parameters

	revealed favorable druglike properties of the active compounds. The compounds 8a-l and 8o, with MIC values of ≤ 6.25 μg/mL, have high LipE values (10.66-11.77) that are higher than that of the suggested value of > 6 derived from empirical evidence for quality drug candidates and highlight their therapeutic potential. The highest LipE value of 11.77 of the best active compound 8e with the MIC of 0.78 μg/mL indicates its better absorption and clearance as a probable clinical candidate for anti-TB drug discovery. These findings highlight the discovery of benzimidazole-2-carboxamides for further development as new anti-TB agents.
11.	Detection and validation of spatiotemporal snow cover variability in the Himalayas using Ku-band (13.5 GHz) SCATSAT-1 data S Singh, RK Tiwari, V Sood, HS Gusain - International Journal of Remote Sensing, 2020 **Abstract:** The present study evaluates the potential of Ku-band Scatterometer Satellite-1 (SCATSAT-1) for quantification of spatiotemporal variability in snow cover area (SCA) over Himalayas (Himachal Pradesh) India. The SCA has been measured using dual-polarized (HH and VV) backscattered SCATSAT-1 data. Two classification approaches, i.e., Linear Mixer Model (LMM) and Artificial Neural Network (ANN) model have been used for the present study. Both available backscatter coefficients sigma-naught σ^0 and gamma-naught γ^0 have been considered for the estimation of SCA. To compute the seasonal snow cover trends for winter (2016–2017 and 2017–2018), a post-classification comparison (PCC) based change detection approach has been demonstrated on the classified dataset (LMM and ANN). The SCA maps have been validated using reference snow cover maps generated from the Moderate-resolution Imaging Spectroradiometer (MODIS) sensor. The final change-category maps have effectively mapped the snow cover variations with accuracy in between 83.01% and 95.33%. The results indicate the suitability of SCATSAT-1 for estimating the magnitude of snow extent over the Himalayas.
12.	Digitized Frequency Modulated Thermal Wave Imaging for Detection and Estimation of Osteoporosis A Sharma, R Mulaveesala, G Dua, V Arora, N Kumar - IEEE Sensors Journal, 2020 **Abstract:** In recent decades active infrared thermography gained vital importance in the field of non-destructive testing and evaluation. It is non-invasive, non-ionizing, reliable, quantitative and qualitative imaging modality for estimation of properties of surface and subsurface abnormalities in various biomaterials. Recently introduced non-periodic thermal excitation schemes for the active infrared thermography gained attention in thermal imaging community by providing a solution to overcome the constrains associated with the traditional pulse and lock-in infrared thermography methods. Among these thermographic methods, digitized frequency modulated thermal wave imaging is one of the imaging modality which supports the principle of pulse compression to overcome constrains associated with traditional methods. This work proposes an analytical solution for digitized frequency modulated thermal wave imaging, which is used for estimation of osteoporosis stages in multilayer human bone model. In order to validate the proposed analytical approach, the results obtained from the analytical approach has been compared with the numerically obtained results from a commercially available simulator (COMSOL Multiphysics) by taking correlation coefficient as a figure of merit.
13.	Direct Measurement of Accumulated Space Charge using External Currents AK Upadhyay, P Johri, CC Reddy, A Sandhu - IEEE Transactions on Instrumentation and Measurement, 2020 **Abstract:** In last few decades, immense contributions have been put in by researchers to measure the accumulation of space charge in dielectric materials. At the same time, the direct measurement of amount of space charge in materials has been completely neglected, probably due to the difficulties in measuring currents at high voltage electrode. Although, the amount can

	be measured indirectly with the available methodologies, but the measured results suffer from accuracy issue. Also, the indirect measurements involve complex, post measurement mathematical analysis, like deconvolution, filtering etc. to get the amount of accumulated charge. Keeping the lacunas in mind and contrary to the basic approach of present methodologies, a novel wireless system is developed which separately monitors the ultra-low, volumetric, electrode-currents flowing into and out of the material at both high voltage and ground electrodes. The obtained current data is further processed to observe the accurate temporal variation in accumulated charge using the fundamental concept of charge conservation law. Some more parameters have been also identified which unmistakably determine the presence of the packet-like-charge phenomenon in dielectric materials like low density polyethylene. Furthermore, for comparing the results of proposed electrode system, space charge measurements have been done using pulsed electroacoustic system. Based on comparison of the results it is concluded that the newly developed electrode system not only monitors the charge accumulation closely but also with less effort and complexity.
14.	Dynamically Optimal Self-adjusting Single-Source Tree Networks C Avin, K Mondal, S Schmid - Latin American Symposium on Theoretical Informatics: Part of the Lecture Notes in Computer Science book series, 2020 **Abstract:** This paper studies a fundamental algorithmic problem related to the design of demand-aware networks: networks whose topologies adjust toward the traffic patterns they serve, in an online manner. The goal is to strike a tradeoff between the benefits of such adjustments (shorter routes) and their costs (reconfigurations). In particular, we consider the problem of designing a self-adjusting tree network which serves single-source, multi-destination communication. The problem has interesting connections to self-adjusting datastructures. We present two constant-competitive online algorithms for this problem, one randomized and one deterministic. Our approach is based on a natural notion of Most Recently Used (MRU) tree, maintaining a working set. We prove that the working set is a cost lower bound for any online algorithm, and then present a randomized algorithm RANDOM-PUSH which approximates such an MRU tree at low cost, by pushing less recently used communication partners down the tree, along a random walk. Our deterministic algorithm MOVE-HALF does not directly maintain an MRU tree, but its cost is still proportional to the cost of an MRU tree, and also matches the working set lower bound.
15.	Effect of peripheral heat conduction in salt-gradient solar ponds A Kumar, R Das - Journal of Energy Storage, 2020 **Abstract:** In this work, a detailed investigation on the effect of heat dissipation from side walls of a salt gradient solar pond on its various thermal aspects has been carried out. Both time-dependent and steady solutions have been reported. Finding the optimum thickness of side insulation is a challenge when it comes to setting up a solar pond system, as it requires a significant expenditure in the beginning. Here, the effects of side wall insulation on variable size of different zones and area of cross sections are studied using validated analytical and finite difference-based numerical approaches. Present study indicates that the heat extraction efficiency of a solar pond varies asymptotically with respect to the insulation thickness installed on the side walls, and the role of heat conduction within the middle layer is more than the radiative intensity reaching a given layer. It is highlighted that for a given insulation, there is always a unique value of non-convective zone where the pond's performance under a given operating condition becomes maximum. But, such optimal size does not exist for upper and lower convective zones, and beyond a certain value, further change in these zones is not useful. For a given insulation and other operating parameters, a circular cross section should always be selected for designing vertical-walled solar ponds. The impact of insulation is also found to depend on the radiative intensity and temperature profiles of a given location. The present work proposes cardinal

	guidelines regarding the suitability and the unsuitability of insulations along with appropriate selection of solar pond's design.
16.	Electrochemical Access to Benzimidazolone and Quinazolinone Derivatives via in situ Generation of Isocyanates D Saha, IM Taily, S Naik, P Banerjee - Chemical Communications, 2020 **Abstract:** Isocyanates are the key intermediates for several organic transformations towards the synthesis of diverse pharmaceutical targets. Herein, we report the development of an oxidant-free protocol for electrochemical in situ generation of isocyanates. This strategy highlights expedient access to benzimidazolones and quinazolinones and eliminates the need for exogenous oxidants. Furthermore, detailed mechanistic studies provide strong support towards our hypothesis of in situ isocyanate generation.
17.	Emotiw 2020: Driver gaze, group emotion, student engagement and physiological signal based challenges A Dhall, G Sharma, R Goecke, T Gedeon - Proceedings of the 2020 International Conference on Multimodal Interaction, 2020 **Abstract:** This paper introduces the Eighth Emotion Recognition in the Wild (EmotiW) challenge. EmotiW is a benchmarking effort run as a grand challenge of the 22nd ACM International Conference on Multimodal Interaction 2020. It comprises of four tasks related to automatic human behavior analysis: a) driver gaze prediction; b) audio-visual group-level emotion recognition; c) engagement prediction in the wild; and d) physiological signal based emotion recognition. The motivation of EmotiW is to bring researchers in affective computing, computer vision, speech processing and machine learning to a common platform for evaluating techniques on a test data. We discuss the challenge protocols, databases and their associated baselines.
18.	End-to-End Recurrent Generative Adversarial Network for Traffic and Surveillance Applications P Patil, A Dudhane, S Murala - IEEE Transactions on Vehicular Technology, 2020 **Abstract:** In video frame segmentation, many existing deep networks and contemporary approaches give a remarkable performance with the assumption that the only foreground is moving, and the background is stationary. However, in the presence of infrequent motion of foreground objects, sudden illumination changes in the background, bad weather, dynamic background, the accurate foreground object(s) segmentation is a challenging task. Generative adversarial network (GAN) based training shows fruitful results in various fields like image-to-image style transfer, image enhancement, semantic segmentation, image super-resolution, etc. The limited results of hand-crafted approaches for moving object segmentation (MOS) and the robustness of adversarial training for a given task inspired us to propose a novel approach for MOS. In this context, an end-to-end generative adversarial network (two generators) with recurrent technique is proposed for MOS and is named as RMSGAN. The proposed RMS-GAN is able to incorporate foreground probability knowledge with residual and weight sharing based recurrent technique for accurate segmentation. The recurrent technique helps us to exhibit the temporal behaviour between successive video frames, which is more prominent for any video processing applications. Also, to enhance the spatial coherence of the obtained foreground probability map using the generator- 1 network, the cascaded architecture of two generators is proposed. The effectiveness of the proposed approach is evaluated both qualitatively and quantitatively on three benchmark video datasets for MOS. Experimental result analysis shows that the proposed network outperforms the existing state-of-the-art methods on three benchmark datasets for MOS.
19.	Existence of Best Proximity Pairs and a Generalization of Carathéodory Theorem

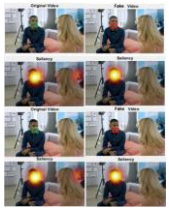
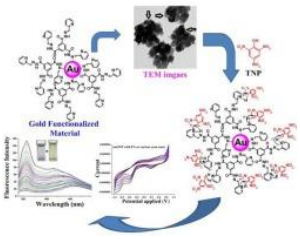
	A Digar, GSR Kosuru - Numerical Functional Analysis and Optimization, 2020 **Abstract:** A new class of mappings, called relatively continuous, is introduced and incorporated to elicit best proximity pair theorems for a non-self-mapping in the setting of reflexive Banach space. As a consequence we obtain a generalization of Carathéodory extension theorem for an initial value problem with L 1 functions on the right hand side.
20.	Experimental investigation of the influence of Reynolds number and buoyancy on the flow development of a plane jet in the transitional regime PR Suresh, T Sundararajan, K Srinivasan, SK Das - Journal of Turbulence, 2020 **Abstract:** Heated horizontal plane jets find wide applications in engineering appliances such as air curtains and discharge of industrial effluents. In the present study, experimental investigations are conducted on a heated horizontal plane jet with the Reynolds numbers in the transitional regime, using a hotwire anemometer. In the far to very far-field ($20 < x/d < 100$) centreline velocity decay and jet spread increases faster with the decrease of Reynolds number. This is because, with the increase of Reynolds number, the turbulent kinetic energy is distributed on a broadband of scales. As a result, larger scales, which are responsible for increased entrainment, get weaker. The shifting of the centre plane generally occurs in the far region for low Reynolds number jets. A comparison with the result of an isothermal jet at similar Reynolds numbers from the literature at identical conditions shows that the turbulence intensity is decreased due to heating. Centreline velocity decays slowly and half-width increases marginally for a heated jet when compared with an isothermal jet. The effect of heating is prominent for low Re jets. Spectral development shows a delayed transition due to heating. Probability density function plots reveal lack of equilibrium and presence of large-scale eddies in the flow field.
21.	Hybrid control strategy for effective frequency regulation and power sharing in multi-terminal HVDC grids AS Kumar, BP Padhy - IET Generation, Transmission & Distribution, 2020 **Abstract:** This study proposes a hybrid control (HC) strategy for improved frequency regulation and power sharing in multi-terminal HVDC (MTDC) integrated AC grids. The proposed method uses the topology of bi-polar converters in the MTDC system to improve power sharing and frequency regulation. In this methodology, the two voltage source converters (VSCs) in a bi-polar topology are operated with individual specified control methods. In the proposed HC method, one of the converters operate in voltage square frequency droop (PV2f) and another in power frequency droop (Pf) control methods. This HC strategy is implemented for grid side voltage source converters in MTDC grids. Further, the performance of frequency regulation and autonomous power sharing of the proposed HC technique is compared with the conventional voltage and frequency droop (PVf) and improved PV2f control methodologies. In order to validate the proposed method, two AC-MTDC systems are considered. In both the systems, mesh typed MTDC CIGRE B4 DC test system is in common, it is integrated with two-area power system and New England IEEE 39-bus system to form two different AC-MTDC systems.
22.	Interference Reduction in Directional Wireless Networks M Basappa, S Mishra - International Conference on Distributed Computing and Internet Technology: Part of the Lecture Notes in Computer Science book series, 2020 **Abstract:** In a wireless network using directional transmitters, a typical problem is to schedule a set of directional links to cover all the receivers in a region, such that an adequate data rate and coverage are maintained while minimizing interference. We can model the coverage area of a directional transmitter as an unit triangle and the receiver as a point in the plane. Motivated by this, we first consider a minimum ply covering (MPC) problem. We propose a 2-approximation

	algorithm for the MPC problem in $O((opt+n)^{m14opt+1}(logopt))$ time, where m is the number of transmitters and n is the number of receivers given in the plane, and opt is the maximum number of triangles, in the optimal solution, covering a point in the plane. We also show that the MPC problem is NP-hard, and is not $(2-\epsilon)$ -approximable for any $\epsilon>0$ unless P = NP. We also study channel allocation in directional wireless networks by posing it as a colorable covering problem, namely, 3-colorable unit triangle cover (3CUTC). We propose a simple 4-approximation algorithm in $O(m^{30}n^2)$ time, for this problem.
23.	Modelling and analysis for active infrared thermography for breast cancer screening R Mulaveesala, G Dua, V Arora, A Sharma - Modelling and Analysis of Active Biopotential Signals in Healthcare, Volume 2, 2020 **Abstract:** Chapter 15 deals with numerical analysis for the active infrared thermographic technique to spot the presence of hidden tumors inside a simulated breast sample and frequency domain based phase and time domain based phase and amplitude thermal images are produced using post-processing analysis of the obtained data from the numerical simulation of the proposed models.
24.	Modified Absorption and Emission Properties Leading to Intriguing Applications in Plasmonic–Excitonic Nanostructures V Kumar, N Nisika, M Kumar - Advanced Optical Materials, 2020 **Abstract:** Hybrid nanostructures composed of metal and semiconducting nanocrystals have drawn tremendous attention owing to their extraordinary absorption and emission properties. The energy transfer in metal–semiconductor hybrids as a result of synergetic plasmon–exciton interactions leads to numerous applications in the field of solar energy harvesting, photocatalytic reactions, imaging, photonics, sensing, and many more. Various breakthroughs in advanced characterization techniques over the past decade have disclosed several factors affecting the energy transfer processes leading to modified absorption and emission properties in metal–semiconductor hybrids. Herein, various theoretical and experimental methodologies are summarized, covering numerous advancements in metal–semiconductor nanostructures with greater emphasis on identifying parameters such as nanostructure size, shape, surface, distance between nanocrystals, and many more, which influence the optical properties of these hybrid nanocrystals. In addition, the impact of these parameters on the performance of various applications is also illuminated. Several challenges and future opportunities in the field are discussed, that will not only increase the performance and practicality of current applications, but also pave the way for future applications.
25.	On Camera Pose Estimation for 3D Scene Reconstruction AT Reji, SS Jha, E Singla - 8th ACM IKDD CODS and 26th COMAD, 2021 **Abstract:** Three-Dimensional (3D) scene reconstruction using depth cameras is ubiquitous in Augmented Reality, Robotics, and Medical Imaging. Although many gradient-based highly computational reconstruction methods have been proposed in the literature, there is hardly any attempt at using meta-heuristic optimization techniques like the Genetic Algorithm (GA) for performing global camera pose estimation in a scene reconstruction framework. In this paper, we develop a 3D scene reconstruction framework that uses a combination of local image features and outlier removal technique (RANSAC) for performing local camera pose estimation. Further, we formulate a GA based global camera pose estimation approach. The 3D model is represented using an efficient and salable voxel-based representation. The paper presents the influence of various parameters on the local and global camera pose estimation techniques and the prescription for best-suited parameter values to achieve near-optimal performances.

26.	Optimal Architecture Planning of Modules for Reconfigurable Manipulators A Dogra, SS Padhee, E Singla – Robotica, 2020 **Summary:** Modules are requisite for the realization of modular reconfigurable manipulators. The design of modules in literature mainly revolves around geometric aspects and features such as lengths, connectivity and adaptivity. Optimizing and designing the modules based on dynamic performance is considered as a challenge here. The present paper introduces an Architecture-Prominent-Sectioning (APS) strategy for the planning of architecture of modules such that a reconfigurable manipulator possesses minimal joint torques during its operations. Proposed here is the transferring of complete structure into an equivalent system, perform optimization and map the resulting arrangement into possible architecture. The strategy has been applied on a set of modular configurations considering three-primitive-paths. The possibility of getting advanced/complex shapes is also discussed to incorporate the idea of a modular library.
27.	Optimizing the performance parameters of injection-molded polymer spur gears PK Singh, AK Singh, Siddhartha, P Sarkar - Proceedings of the Institution of Mechanical Engineers, Part L: Journal of Materials: Design and Applications, 2020 **Abstract:** This research focuses on the optimization of the performance parameters namely, surface temperature, wear rate, and transmission efficiency of polymer gears. Three different polymers namely, acrylonitrile butadiene styrene, high-density polyethylene, and polyoxymethylene are selected for manufacturing the gears. A total of 27 experiments are carried out to test these gears at different torque and speed conditions. The torque values are taken as 0.8, 1.2, and 1.6 Nm, whereas the speeds of 600, 900, and 1200 r/min are chosen for the study. The optimal setting of operating parameters (gear material, speed, and torque) is obtained by using a hybrid multi-criteria decision-making approach that includes the analytical hierarchy process and technique for order of preference by similarity to ideal solution. The optimal setting of performance parameters is obtained with polyoxymethylene gear running at the torque and speed conditions of 0.8 Nm and 900 r/min, respectively.
28.	Paraoxonase Mimic by a Nanoreactor Aggregate Containing Benzimidazolium Calix and L-Histidine: Demonstration of the Acetylcholine Esterase Activity A Singh, S Saini, M Mayank, N Kaur, A Singh, N Singh… - Chemistry: A European Journal, 2020 **Abstract:** An anion-mediated preorganization approach was used to design and synthesize the benzimidazolium-based calix compound R1 ·2ClO 4 – . X-ray crystallography analysis revealed that the hydrogen bonding interactions between the benzimidazolium cations and N,N-dimethylformamide (DMF) helped R1 ·2ClO 4 – encapsulate DMF molecule(s)A nanoreactor, with R1 ·2ClO 4 – and L -histidine (L -His) as the components, was fabricated using a neutralization method. The nanoreactor could detoxify paraoxon in 30 min. L -His played a vital role in this process. Paraoxonase is a well-known enzyme used for pesticide degradation. The Ellman's reagent was used to determine the percentage inhibition of the acetylcholinesterase (AChE) activity in the presence of the nanoreactor. The results indicated that the nanoreactor inhibited AChE inhibition.
29.	Passive Knee Exoskeleton Using Brake Torque to Assist Stair Ascent R Chaichaowarat, V Macha, W Wannasuphoprasit - IEEE REGION 10 Conference, 2020 **Abstract:** Manipulating mechanical energy intelligently, passive exoskeletons can improve the energy efficiency of cyclic human motions. Aiming to reduce the energy cost of knee moment during stair ascent, this paper presents a concept of brake-torque support activated when the knee moment is required in the opposite direction to the angular velocity of the knee joint. Integrating

	an electromagnetic brake to a crossing four-bar knee joint with a compact design, the passive knee exoskeleton enables the polycentric knee center of rotation covering the wide range of knee angle during stair ascent. For preliminary validation, the surface electromyography (EMG) of rectus femoris (RF) and biceps femoris (BF) were studied on a healthy male volunteer wearing the exoskeleton on his right leg. The reduction of peak muscle activity is observed as the brake torque is applied during knee extension while the knee flexion moment is required.
30.	Proper effective temperature of nonequilibrium steady state H Hoshino, S Nakamura - Progress of Theoretical and Experimental Physics, 2020 **Abstract:** We define a proper effective temperature for relativistic nonequilibrium steady states (NESSs). A conventional effective temperature of NESSs is defined from the ratio of the fluctuation to the dissipation. However, NESSs have relative velocities to the heat bath in general, and hence the conventional effective temperature can be frame-dependent in relativistic systems. The proper effective temperature is introduced as a frame-independent (Lorentz-invariant) quantity that characterizes NESSs. We find that the proper effective temperature of NESSs is higher than the proper temperature of the heat bath in a wide range of holographic models even when the conventional effective temperature is lower than the temperature of the heat bath.
31.	Quantum Resource Estimates of Grover's Key Search on ARIA AK Chauhan, SK Sanadhya - International Conference on Security, Privacy, and Applied Cryptography Engineering: Part of the Lecture Notes in Computer Science book series, 2020 **Abstract:** Grover's algorithm provides a quantum attack against block ciphers by searching for a k-bit key using $O(\sqrt{2}k)$ calls to the cipher, when given a small number of plaintext-ciphertext pairs. Recent works by Grassl et al. in PQCrypto'16 and Almazrooie et al. in QIP'18 have estimated the cost of this attack against AES by analyzing the quantum circuits of the cipher. We present a quantum reversible circuit of ARIA, a Korean standardized block cipher that is widely deployed in government-to-public services. Firstly, we design quantum circuits for the main components of ARIA, and then combine them to construct the complete circuit of ARIA. We implement Grover's algorithm-based exhaustive key-search attack on ARIA. For all three variants of ARIA-{128, 192, 256}, we establish precise bounds for the number of qubits and the number of Clifford +T gates that are required to implement Grover's algorithm. We also estimate the G-cost as the total number of gates, and DW-cost as the product of circuit depth and width. To find the circuit depth of various circuits such as squaring, multiplier, and permutation layer, we implement them in an open-source quantum computing platform QISKIT developed by IBM.
32.	Resource efficient allocation of fog nodes for faster vehicular OTA updates M Al Maruf, A Singh, A Azim, N Auluck - Published in: 2020 International Symposium on Networks, Computers and Communications (ISNCC), 2020 **Abstract:** Despite reduced network latency and resilience, fog computing has not been leveraged for vehicular Over-the-Air (OTA) updates. Due to vehicle mobility and traffic, the resource utilization of fog nodes is almost non-deterministic, which increases the delay in communication and handover. In this paper, we propose an approach for distributing fog nodes by analyzing the vehicular traffic pattern in a region. The proposed method: (a) finds the optimal number of fog nodes for a specific time interval based on the traffic pattern of a region and (b) maximizes the net reserve resources enabling specific fog nodes. To do so, we use the k-means algorithm to identify traffic load and distribute the fog nodes using our proposed algorithm to maximize fog

	resource utilization. We present a case study of OTA updates that considers vehicle mobility, data transmission rate, propagation delay and handover delay to predict the required update time. The experimental results demonstrate that the proposed method of fog node allocation extends the net reserve resources by 30.92% on an average, and reduces the OTA update time.
33.	Role of interactions in a closed quenched driven diffusive system B Pal, AK Gupta - Journal of Physics A: Mathematical and Theoretical, 2020 **Abstract:** We study the non-equilibrium steady states in a closed system consisting of interacting particles obeying exclusion principle with quenched hopping rate. Cluster mean field approach is utilized to theoretically analyze the system dynamics in terms of phase diagram, density profiles, current, etc, with respect to interaction energy E. It turns out that on increasing the interaction energy beyond a critical value, Ec, shock region shows non-monotonic behavior and contracts until another critical value Ec1 is attained; a further increase leads to its expansion. Moreover, the phase diagram of an interacting system with specific set of parameters has a good agreement with its non-interacting analogue. For interaction energy below Ec, a new shock phase displaying features different from non-interacting version is observed leading to two distinct shock phases. We have also performed Monte Carlo simulations extensively to validate our theoretical findings.
34.	Scale Invariant Fast PHT based Copy-Move Forgery Detection A Aimen, A Kaur, S Sidheekh - 11th International Conference on Computing, Communication and Networking Technologies, 2020 **Abstract:** Copy-Move forgery is a type of image forgery wherein a patch from the image is copied and pasted on the same image either to increase the occurrence of a particular object or to conceal some important detail in the image. This paper addresses the issue of copy-move forgery using the block-based method of feature extraction. In block-based methods of feature extraction, PHT is one of the competing solutions, but it is not much robust to scaling. This paper proposes Scale-Invariant Fast PHT (SIFPHT) algorithm to detect the copy-move forgery which uses Fast PHT [1] for extracting the features from the blocks. Fast PHT has a higher convergence rate than the traditional PHT, and the results prove that the speed-up of almost 4 is attained for detecting the forgery. Moreover, the Fast PHT features so obtained from the blocks are normalized before comparison due to which the scaled forged segments are also identified. Further, Fast K-Means clustering is used to estimate the similarity in the blocks and hence detect the copy-move forgery.
35.	Sprayable Thin and Robust Carbon Nanofiber Composite Coating for Extreme Jumping Dropwise Condensation Performance M Donati, CWE Lam, A Milionis…CS Sharma… - Advanced Materials Interfaces, 2020 **Abstract:** Condensation of water on metallic surfaces is critical for multiple energy conversion processes. Enhancement in condensation heat transfer efficiency often requires surface texturing and hydrophobicity, usually achieved through coatings, to maintain dropwise condensation. However, such surface treatments face conflicting challenges of minimal coating thermal resistance, enhanced coating durability, and scalable fabrication. This study presents a thin (≈2 μm) polytetrafluoroethylene–carbon nanofiber nanocomposite coating that meets these challenges and sustains coalescence-induced jumping droplet condensation for extended periods under highly demanding condensation conditions. Coating durability is achieved through improved substrate adhesion by depositing a submicron thick aluminum primer layer. Carbon nanofibers in a polytetrafluoroethylene matrix increase coating thermal conductivity and promote spontaneous surface nanotexturing to achieve superhydrophobicity for condensate microdroplets. The coating material can be deposited through direct spraying, ensuring economical scalability and versatility for a wide range of substrates. No other coating is known for metallic surfaces that is able to sustain jumping dropwise condensation under shear of steam at 111 °C flowing at ≈3 m

	s−1 over the surface for 10 h and dropwise condensation for an additional 50 h. Up to ≈900% improvement in condensation heat transfer coefficient is achieved compared to conventional filmwise condensation.
36.	The eyes know it: FakeET-An Eye-tracking Database to Understand Deepfake Perception P Gupta, K Chugh, A Dhall, R Subramanian - Proceedings of the 2020 International Conference on Multimodal Interaction, 2020 **Abstract:** We present FakeET -- an eye-tracking database to understand human visual perception of deepfake videos. Given that the principal purpose of deepfakes is to deceive human observers, FakeET is designed to understand and evaluate the ability of viewers to detect synthetic video artifacts. FakeET contains viewing patterns compiled from 40 users via the Tobii desktop eye-tracker for 811 videos from the Google Deepfake dataset, with a minimum of two viewings per video. Additionally, EEG responses acquired via the Emotiv sensor are also available. The compiled data confirms (a) distinct eye movement characteristics for real vs fake videos; (b) utility of the eye-track saliency maps for spatial forgery localization and detection, and (c) Error Related Negativity (ERN) triggers in the EEG responses, and the ability of the raw EEG signal to distinguish between real and fake videos. 
37.	Tripodal pyridyl-imine capped gold nano-aggregates for selective detection of picric acid in aqueous media G Singh, V Saini, G Lal, A Saraiya, N Singh - Materials Science and Engineering: B, 2021 **Abstract:** In the present investigation, we have design and develop pyridyl-imine capped gold nanoaggregates; fully characterized via various spectroscopic techniques. The photophysical and electrochemical studies revealed that the developed pyridyl-imine capped gold nanoaggregates are proven to be selective sensor for picric acid with remarkable low detection limit within nano-molar concentration (15.0 nM) based on 3σ/K; a common constituent of many powerful explosives. The quenching of fluorescence intensity at λ 357 nm occurs which may ascribe to the electron transfer phenomenon exhibited by the electron rich receptor and emergence of red shift in fluorescence spectroscopy (λem 464 nm) after gradual addition of picric acid; a selective phenomenon towards the most electron deficient nitroaromatic (picric acid) sensing. Additionally, the results obtained for the analysis of spiked samples in real water samples such as river and tap water, show that the developed PA sensor is potentially applicable in the determination of trace PA explosive without any interference. **Graphical Abstract:** 

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