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Review

RNA Viruses, Pregnancy and Vaccination: Emerging Lessons from COVID-19 and Ebola Virus Disease

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Abstract: Pathogenic viruses with an RNA genome represent a challenge for global human health since they have the tremendous potential to develop into devastating pandemics/epidemics. The management of the recent COVID-19 pandemic was possible to a certain extent only because of the strong foundations laid by the research on previous viral outbreaks, especially Ebola Virus Disease (EVD). A clear understanding of the mechanisms of the host immune response generated upon viral infections is a prime requisite for the development of new therapeutic strategies. Hence, we present here a comparative study of alterations in immune response upon SARS-CoV-2 and Ebola virus infections that illustrate many common features. Vaccination and pregnancy are two important aspects that need to be studied from an immunological perspective. So, we summarize the outcomes and immune responses in vaccinated and pregnant individuals in the context of COVID-19 and EVD. Considering the significance of immunomodulatory approaches in combating both these diseases, we have also presented the state of the art of such therapeutics and prophylactics. Currently, several vaccines against these viruses have been approved or are under clinical trials in various parts of the world. Therefore, we also recapitulate the latest developments in these which would inspire researchers to look for possibilities of developing vaccines against many other RNA viruses. We hope that the similar aspects in COVID-19 and EVD open up new avenues for the development of pan-viral therapies.

Keywords: COVID-19; Ebola; immune response; vaccine; pregnancy; SARS-CoV-2; RNA virus; lymphopenia; T-cell exhaustion

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1. Introduction

RNA viruses pose the greatest threat to public health, with the potential to cause global catastrophic biological events, necessitating the identification of attributes of these microorganisms so as to open up new therapeutic and prophylactic avenues. In recent times, we have come across many viral outbreaks, which put vulnerable individuals at high risk but differ in the vectors of transmission, rates of fatality and transmissibility. Certain viruses such as Dengue and Zika require an intermediate host for their transmission, while

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ORIGINAL RESEARCH

3D Structure Elucidation and Appraisal of Mode of Action of a Bacteriocin BaCf3 with Anticancer Potential Produced by Marine *Bacillus amyloliquefaciens* BTSS3

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Abstract

In the world of intense usage of antibiotics, the emergence of antimicrobial resistance necessitates research on alternative forms of antibiotics, antimicrobial peptides (AMPs), which are least known to induce resistance. The partial sequence of bacteriocin BaCf3, produced by marine *Bacillus amyloliquefaciens* BTSS3, derived from Matrix Assisted Laser Desorption Ionisation - Time of Flight Tandem Mass Spectroscopy (MALDI-ToF MS/MS) data was analyzed for amino acid composition and modelled *in silico* using TrRosetta. The mechanism of action of BaCf3 was studied *in vitro* on *B. circulans* NCIM2107 cell wall using microscopic techniques, such as confocal laser scanning microscopy, scanning electron microscopy, and high resolution transmission electron microscopy. Docking studies with cancer markers, glucose transporter protein, and mesenchymal-epithelial transition factor (MET) receptor tyrosine kinase were also conducted. BaCf3 was found to be rich in glycine and hydrophobic in nature, a characteristic property of cell wall acting AMPs. The structure of BaCf3 obtained from TrRosetta had antiparallel b-sheets resembling Laterosporulin. The bacteriocin BaCf3 has been found to act on the cell membrane of opportunistic pathogen *Bacillus circulans*, causing permeabilization and pore formation by dissipating the membrane potential. The microscopic examination also proved the mode of action of BaCf3 as cell wall acting. *In silico* docking studies with anticancer target proved that bacteriocin BaCf3 is also a possible anticancer drug candidate. *In vitro* anticancer assays such as 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide assay and acridine orange/ethidium bromide dual staining on lung carcinorma cell line A549 further prove the anticancer activity of the bacteriocin.

Keywords: bacteriocin; scanning electron microscopy; transmission electron microscopy; confocal laser scanning microscopy; anticancer

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Introduction

Antimicrobial resistance due to overuse and misuse of antibiotics causes untreatable infections to persist, thereby increasing the risk of contagion. In May 2017, World Health Organization adopted a global action plan to increase investment in new medicines, diagnostic tools, vaccines, and other interventions. Antimicrobial peptides (AMPs) are considered as good alternative for artificial antibiotics as they are more natural and biodegradable and are not known to induce resistance by

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On a Class of Bimodal Distributions and their Applications in Modelling Bimodal Error Data

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SUMMARY

A new family of bimodal distributions is introduced in this paper with an objective of using them for modelling error data sets. A new class of statistics arising from asymmetric distribution is proved to have distributions belonging to the family of the bimodal distributions introduced in this work. The information matrix is derived after addressing the problem of obtaining maximum-likelihood estimates for the parameters of generalized bimodal distribution. A simulation study is conducted to evaluate the properties of maximum likelihood estimators. The applications of the results in building bimodal distributions for some real life data sets are also illustrated.

Keywords: Error data; Symmetric distributions; Bimodal distributions; Maximum likelihood Estimate; Ordered density value induced statistics.

1. INTRODUCTION

Symmetry is one class of patterns occurring in nature wherein we could observe near repetition of the pattern, either by reflection or by rotation. The body of most of the multi- cellular organisms exhibit some form of symmetry. Similarly, measurements made on several biological variables follow statistical distributions which are symmetric in form. This makes "Symmetry in Biology" a largely discussed and studied subject of interest. The distribution of errors observed on measurements of orbit of heavenly bodies was observed as normal by Gauss (1857). Recently, Rao and Gupta (1989) have narrated how normal distribution is derived by Hersched's hypothesis on errors. They also described how normal distribution can be derived using Hagen's hypothesis on errors. The third Hagen's hypothesis states that each component of error has an equal chance of being positive or negative. This makes a deduction that the class Aof all error models satisfying third Hagen's hypothesis must be symmetrically distributed about zero. It is to be noted that, if X is a random variable with expected value μ, then observations on $X - \mu$ for known value of μ also constitute an error data. If the third hypothesis due to Hagen is seen satisfied on the above data, then in the problem of modelling a distribution to this data, we can limit our search for choosing an appropriate model from the family **A.** Though all models belonging to **A** are symmetrically distributed about zero, they need not have a unique mode. In a recent investigation, the authors come across data sets on errors which have two modes, of which one is positive and other is negative, whereas they are equidistant from the centre. This motivates the authors of this paper to deal with new bimodal distributions and to illustrate their applications to real life problems.

Eisenberger (1964) discussed about a variety of bimodal distributions arising out of a mixture of two normal distributions. Prasad (1954) as well as Sarma *et al.* (1990) discussed about bimodal distributions whose densities are similar to that of mixture of normal distributions. For a discussion on bimodal exponential power distribution see, Hassan and Hijazi (2010) and for details on bimodal skew-symmetric

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Pseudo computed tomography image generation from brain magnetic resonance image using integration of PCA & DCNN-UNET: A comparative analysis

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Abstract. MRI-Only Radiation (RT) now avoids some of the issues associated with employing Computed Tomography(CT) in RT chains, such as MRI registration to a separate CT, excess dosage administration, and the cost of recurrent imaging. The fact that MRI signal intensities are unrelated to the biological tissue's attenuation coefficient poses a problem. This raises workloads, creates uncertainty as a result of the required inter-modality image registrations, and exposes patients to needless radiation. While using only MRI would be preferable, a method for estimating a pseudo-CT (pCT)or synthetic-CT(sCT) for producing electron density maps and patient positioning reference images is required. As Deep Learning(DL) is revolutionized in so many fields these days, an effective and accurate model is required for generating pCT from MRI. So, this paper depicts an efficient DL model in which the following are the stages: a) Data Acquisition where CT and MRI images are collected b) preprocessing these to avoid the anomalies and noises using techniques like outlier elimination, data smoothening and data normalizing c) feature extraction and selection using Principal Component Analysis (PCA) & regression method d) generating pCT from MRI using Deep Convolutional Neural Network and UNET (DCNN-UNET). We here compare both feature extraction (PCA) and classification model (DCNN-UNET) with other methods such as Discrete Wavelet Tranform(DWT), Independent Component Analysis(ICA), Fourier Transform and VGG16, ResNet, AlexNet, DenseNet, CNN (Convolutional Neural Network)respectively. The performance measures used to evaluate these models are Dice Coefficient(DC), Structured Similarity Index Measure(SSIM), Mean Absolute Error(MAE), Mean Squared Error(MSE), Accuracy, Computation Time in which our proposed system outperforms better with 0.94 ± 0.02 over other state-of-art models.

Keywords: Computed tomography, deep convolutional neural network, magnetic resonance imaging, principal component analysis, pseudocomputed tomography

1. Introduction

Traditional therapy for radiation (RT) employs Computed Tomography(CT) images to draw up a therapy plan and place a patient in the treatment. Magnetic resonance imaging (MRI), due to its better contrast in soft tissue [1], is commonly utilised for reliable estimates of RT objective volumes. If both of these modalities are used simultaneously, the registration from both modes is required in the third step of CT [2]. The notion of MRI-Linac has recently gained popularity owing to its benefits in streamlining workflows and minimising systemic errors, and the use of radiation by means of magnetic resonance imaging alone, (MRI alone RT) i.e. MR-only RT and CT [3, 4].

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Plant Leaf Disease Detection using Computer Vision-A Review

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Abstract: **In an agriculture-based country like India, where economy is mainly based on it, early detection of plant infections is very essential, since it helps agriculturists to apply remedial measures at its emergence itself. This facilitates increased agricultural productivity, which in turn dictates the growth of economy. Though the diseases or pests in plant leaves can be diagnosed by human experts, it is very time-consuming and expensive. Moreover, severity of diseases or pests in farms cannot be accurately predicted. Applying the correct quantity of pesticides in the correct area is an important step in farming. Therefore, Computer Vision assisted detection is a boon for the farmer to reduce time and crop loss. Image detection methods developed by many researchers helped the farmers to speed up the early detection of diseases and facilitates timely intervention for application of suitable medication. This paper reviews the capacities of different methodologies of detecting plant leaf diseases.**

Keywords: Plant Leaf disease detection, Computer Vision, Machine Learning (ML), Deep Learning (DL), Convolutional Neural Networks (CNN)

1. INTRODUCTION

More than 70% of the Indian economy is based on agriculture. Unhealthy cultivation will result in a decline in production and eventually affect the economy. The technologies being used in the agriculture fields are changing drastically and majority of the farmers depend on these technologies for better yield.Computer vision is a technology that uses images of plants for detecting diseases and pests. Each disease of the plant leaves has a unique pattern of mark or lesions, which can be easily diagnosed by experts. To reduce human efforts, researchers have developed several machine learning and deep learning methods to be employed in agricultural fields. The computer vision-based plant diseases and pests' detection technologies have also been applied in agriculture and have replaced the traditional naked eye identification to some extent [1].

When plants become infected, symptoms appear in the form of coloured spots, or streaks that can occur on the leaves, stems, and seeds of the plant. As the disease progresses, changes occur in the colour, shape, and size of these symptoms Since the lesion area is very small compared to the plant background at the initial stage of the infection, it is tedious for the human experts to identify. This is a major challenge in disease and pests' detection. Hence, Computer Vision with machine learning and deep learning methods are now being employed for detection. Collection of a huge number of plant images in all weather and lighting conditions is the first step of this process. In the next step, which is image pre-processing, these images are converted to reduce pixel size, remove background and noise, followed by segmentation, and feature extraction. Image processing algorithms can be used for these tasks. Different architectures of Convolutional Neural Networks(CNN), which is a type of artificial neural network(ANN),have been developed and effectively applied for detection of pests and diseases. CNNs have powerful image processing capabilities often using deep learning and machine learning techniques for image classification and video recognition.

2. RELATED WORKS

The plant leaves disease and pest detection can be done through a course of action. The initial step is to collect images which is public or to collect directly from farms. The images are divided into two groups; training and testing after some pre-processing techniques and labelling. Finally, a novel architecture with high accuracy is to be developed to classify and identify the diseases or pests. Because of its relevance, many works have been done in this field.

Most of the papers have used the public dataset, the PlantVillage. 54306 images of 14 crops from this dataset was used by Sharada P. Mohanty *et. al* [2]. These images were labelled with 38 class labels; 26 diseases and 12 healthy leaves. The images were resized as 256 x 256 pixels and were converted to Gray scale colour model. Two CNN architectures, AlexNet and GoogleNet were employed to classify the classes. From the Colour, Gray scale and leaf segmented datasets, the training-testing set were distributed as 80% – 20%, 60% – 40%, 50% – 50%, 40% – 60% and 20% – 80%. For 80% -20% set, the accuracy of AlexNet was 85.53% and that of GoogleNet was 99.34%. But it reduced to 98.21% for 20% -80% set of GoogleNet, and the study concluded that GoogleNet architecture outperform AlexNet.

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REVIEW

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Aptamer-siRNA chimeras: Promising tools for targeting HER2 signaling in cancer

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Abstract

RNA interference is a transformative approach and has great potential in the development of novel and more efficient cancer therapeutics. Immense prospects exist in the silencing of HER2 and its downstream genes which are overexpressed in many cancers, through exogenously delivered siRNA. However, there is still a long way to exploit the full potential and versatility of siRNA therapeutics due to the challenges associated with the stability and delivery of siRNA targeted to specific sites. Aptamers offer several advantages as a vehicle for siRNA delivery, over other carriers such as antibodies. In this review, we discuss the progress made in the development and applications of aptamer-siRNA chimeras in HER2 targeting and gene silencing. A schematic workflow is also provided which will provide ample insight for all those researchers who are new to this field. Also, we think that a mechanistic understanding of the HER2 signaling pathway is crucial in designing extensive investigations aimed at the silencing of a wider array of genes. This review is expected to stimulate more research on aptamer-siRNA chimeras targeted against HER2 which might arm us with potential effective therapeutic interventions for the management of cancer.

KEYWORDS

aptamer, aptamer-siRNA, cancer, HER2, HER2 signaling, SELEX, siRNA, targeting, therapeutics

1 | INTRODUCTION

Human epidermal growth factor receptor 2 (HER2) overexpression in cancer has been implicated in progression, worse prognosis and treatment resistance. HER2 and its downstream signaling play vital roles in malignant transformation and is directly related to inadequate clinical outcomes in several cancers. An understanding of the various HER receptors, their corresponding ligands and signaling pathways is required to design novel therapeutic strategies in cancer.

The Human epidermal growth factor receptor (HER), also known as ErbB family of tyrosine kinases, located in the cell membrane plays major roles in regulation of cell proliferation, differentiation and migration, and abnormal activation of HER is implicated in the pathogenesis of many cancers. The family comprises of four members: HER1 (EGFR/ErbB1), HER2 (neu/ErbB2), HER3 (ErbB3), and HER4 (ErbB4) (Appert-Collin et al., 2015; Yarden & Sliwkowski, 2001), all of which are involved in the development, progression and metastasis of cancer. There are around 13 ligands that are reported to activate HER receptors (Rutkowska et al., 2019). However, all the HER family members are not similar in their ligand dependence; different HER receptors (HER1-4) and their respective ligands are illustrated in Figure 1. It

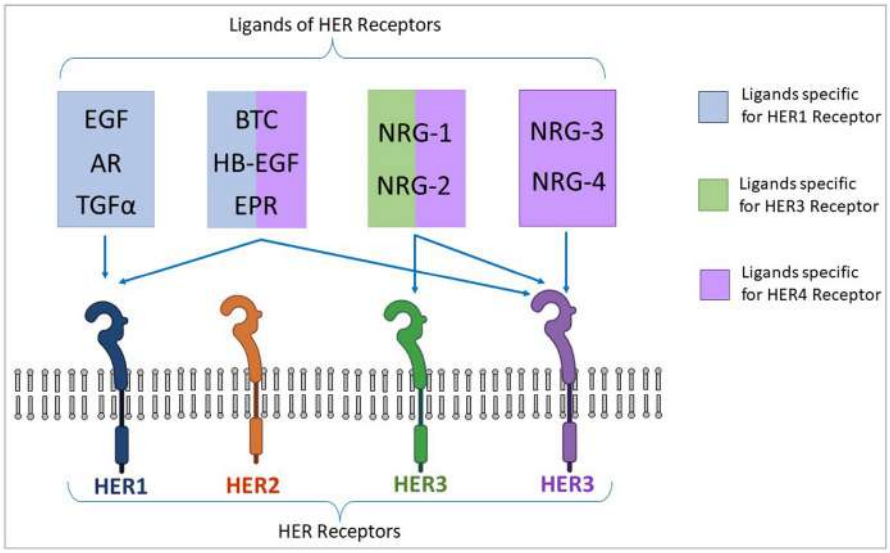

FIGURE 1 Preferred ligands for receptors of HER family. AR, amphiregulin; BTC, betacellulin; EGF, epidermal growth factor; EPR, epiregulin; HB-EGF, heparin-binding EGF; NRG, neuregulins; TGFα, transforming growth factor-α. Note that HER2 does not have any known ligand.

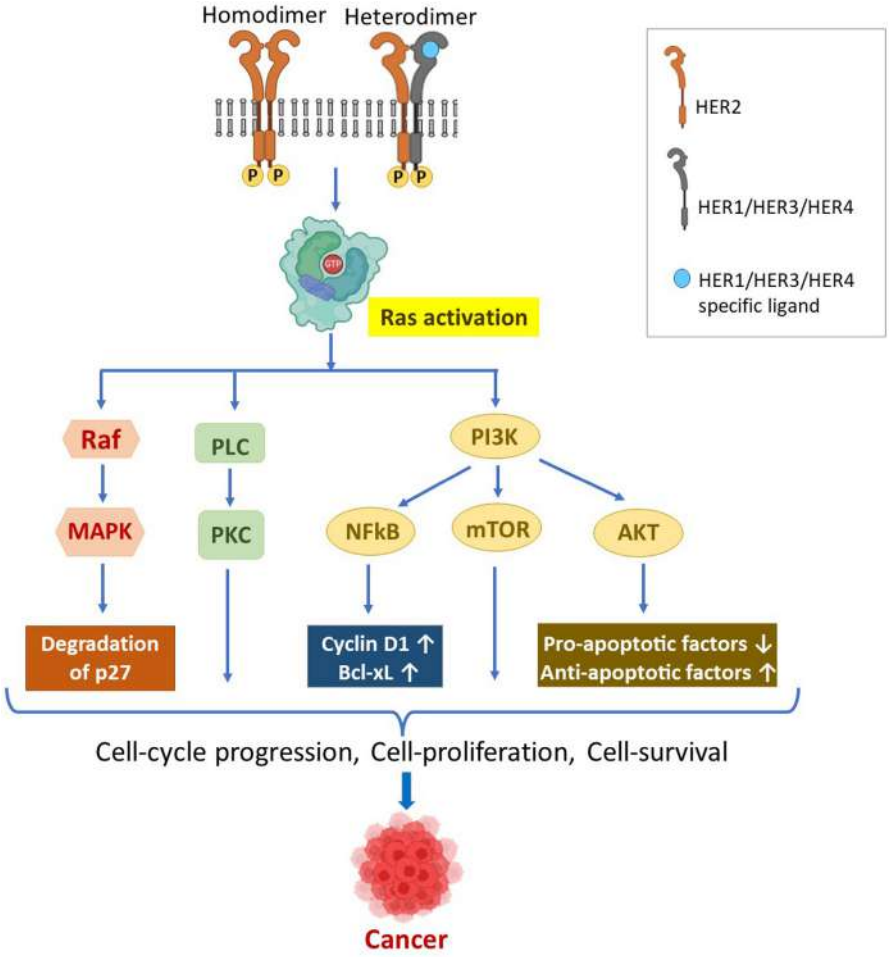

FIGURE 2 HER2 signaling pathways implicated in cancer. Overexpression of HER2 causes homo/heterodimerization of HER family receptors leading to phosphorylation of tyrosine kinase residues in the cytoplasmic domain of the receptor, thereby activating GTP binding proteins like Ras, Rac etc. Ras activates the PI3K/AKT pathway, Raf/MAPK cascade and the PLC/PKC network, which subsequently activates signaling pathways that lead to cytoprotective response mediated by anti-apoptotic proteins. PI3K/AKT signaling also involves effectors of apoptosis like NFkB and mTOR. All these pathways modify genes that are implicated in cell-cycle progression, cell-proliferation, cell-survival and enhanced metastatic potential.

is noteworthy that HER2 lacks a known ligand though structural studies reveal a ligand-activated state and dimerization (Gaviraghi et al., 2020). Simple overexpression of HER2, leading to homo/heterodimerization of HER family of receptors is sufficient for the concomitant activation of downstream signaling pathways (Elster et al., 2015; Iqbal & Iqbal, 2014; Karunagaran et al., 1996; Mercogliano et al., 2020; Moasser, 2007; Rivas et al., 2008; Schlam & Swain, 2021). Figure 2 shows the important signaling pathways involved in cancer that are activated by overexpression of HER2.

Upregulation of HER2 caused by genomic amplification of HER2 locus (17q12) is found in majority of breast carcinomas. Typing of breast cancer made

Synthetic Computed Tomography and Brain Radiation Therapy: Where are we today?

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Abstract- MRI is a suitable imaging method for planning radiation treatment because it has greater soft tissue contrast than computed tomography(CT). A CT scan is also necessary for dosage computation and x-ray-based patient placement when using MR images for treatment planning. Due to inter-modality image registrations, this increases patient exposure to unnecessary irradiation, increases effort, and increases uncertainty. While MR images alone would suffice, a technique for developing electron density maps and patient positioning reference images using a synthetic CT(sCT) or pseudo CT(pCT) is needed. For generating sCT from MRI ,an accurate and effective model is required as deep learning is used in so many fields. In this paper, we review various sCT Generations from Brain MRI. Also, the paper consists of research work that was proposed by various research specialists over the past year (2010-2022) over the topic.

Keywords: Convolutional Neural Network, Principal Component Analysis, Pseudo Computed Tomography, Synthetic Computed Tomography.

I. Introduction

In radiotherapy, precise patient positioning is important. A faulty radiotherapy setup may result in an excessive quantity of radiation being administered to healthy tissue, putting the desired dosage at risk. Because tumor position changes often due to inhalation, filling of empty organs, and more sophisticated changes like calorie restriction and tumor regression, target location fluctuation is a major problem in external beam radiation treatment practice [1].

Due to inter-modality image registrations, this increases patient exposure to unnecessary irradiation, increases effort, and increases uncertainty. As a result, accurately matching CBCT with sCT is difficult. Second, MRI employs non-ionizing radiation and offers real-time imaging capabilities [9]. A recent study found that using accurate MR-guided radiotherapy to treat pancreatic cancer might reduce radiation exposure to even more [10]. Multi-modality registration is more difficult than mono-modality[11][12] alignment. Soft tissue-based registration for IGRT may suffer as a result of registration across multiple modalities, according to Morrow et al. [14].In terms of mono-modality registration, Zachiu et al. observed that MRI/CT registration performed better. To resolve the multi-modality image registration problem, many studies [7-14] generated Computed tomography images from Magnetic Resonance Image images. The Gaussian mixture regression [16], the random forest regression[17], segmentation-based [18-20], atlas-based [21,22], and learning-based [23-30] are some of the models available.

However, because effective image registration necessitates the presence of suitable anatomical characteristics, the loss of such information in CT images makes registration problematic, as shown in [31]. As a result, in this article, we provided a strategy for reducing

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Chelated calcium 1D coordination polymer: Crystal growth, characterization and Z scan studies

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ABSTRACT

Calcium acetamido iminodiacetate single crystals with third order nonlinear optical activity have been synthesized by silica gel diffusion method. The structure of the compound was confirmed by elemental analysis, FT – IR, FT-Raman spectroscopy and single crystal X-ray diffraction method. Thermogravimetry was used quite strategically to establish the thermal stability. The compound belongs to orthorhombic space group Pbac, having cell parameters a = 9.4805(6) Å, b = 9.9256 (7) Å, c = 20. 4046 (14) Å, $\alpha = \beta = \gamma = 90°$ Optical parameters for the crystals were examined using UV–Visible spectroscopy. Z scan technique has been utilized to find out nonlinear refractive index, nonlinear absorption coefficient and third order susceptibility. Procured results of Z scan support the suitability of the grown crystal for photonics and laser assisted uses.

Introduction

N-(2-Acetamido)iminodiacetic acid, ADA (Fig. 1) is addressed by masses as the most important linker pertaining to biological importance [1]. It behaves as a biological buffering agent in the conceptual fields of buffers, actively participating in the physiologically compatible pH range [2]. Adding to the already dynamic applications, it has been implemented and expressed in good ways as an analytical chelating agent for the spectrophotometric determination of metal ions [3–5]. Many metal complexes of ADA ligand have been reported so far. However, no complex of ADA, grown using the silica gel diffusion method, has been reported. So, we have attempted silica gel diffusion method for growing CaADA crystals.

Crystals can be made into large, flamboyant dispersed and nucleated fields of applications causing them to be of incredible value and deliberate demand. Cumulative crystal growth can be considered as the crowned jewel and is quickly being used in industries like semiconductors, capacitors, optics etc. [6]. The field of optoelectronics has crystals showing non-linear response to thank for the validity of their respective applications [7–8]. The same goes for photonics.

Organometallic and coordination compounds with third order NLO properties are quite promising in electro-optical devices and optical data processing. In comparison to organic NLO materials, coordination compounds provide remarkable additional flexibility. NLO properties of chelated metal complexes are still an impending venture of study and understanding. In the current investigation, we focus on the growth of single crystals of calcium acetamido iminodiacetate and exploration of the third order nonlinear optical properties pertaining to it.

2. Experimental details

2.1. Materials and methods

Silica hydrogel method [9–13] was used to synthesise calcium acetamido iminodiacetate crystals at room temperature. Gel density and pH can influence the gel structure [11]. Experiments were carried out at different gel densities (1.03 −1.06 g /cm^3) and at various pH values (6 −7.5). Gel is prepared by mixing 0.5 M ADA solution with sodium metasilicate solution of variable density (1.03 −1.06 g /cm^3). The pH of the metasilicate solution was set to 6.0, 6.5, 7 and 7.5 using acetic acid. Definite amount of this solution was taken in several test tubes. 0.5 M calcium chloride solution was introduced to each of the test tube with utmost care after it was gelled. The test tubes were tightly sealed to prevent contamination. The calcium acetamido iminodiacetate crystals were appeared within a fortnight in the test tube in which the pH is

Abbreviation: ADA, - N-(2-Acetamido)iminodiacetic acid; CaADA, – Calcium acetamido iminodiacetate; NLO, - Nonlinear optical; C A, - Closed aperture; DKDP, - Deuterated potassium dihydrogen phosphate; OLT, - Optical limiting threshold.

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AN OPTIMIZED EXTREMELY RANDOMIZED TREE MODEL FOR BREAST CANCER CLASSIFICATION

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ABSTRACT

Breast Cancer is a non-communicable disease seen primarily in women population. As per the statistics published by the World Health Organization, it is presently ranked, globally, as number one in incidence. It can principally affect women of any age, and can be diagnosed in any of the five stages of the disease, but chances of cancer survival become more difficult when diagnosis is made in advanced stages of the disease. Mortality rate of cancer is seen to be high in developing countries than in developed countries. Owing to this fact breast cancer prediction, diagnostic and therapeutic facilities need to be urgently improved in this extent. Henceforth, development of clinical decision support systems for early and precise detection of the disease gains significance and is the need of the hour. The study aims in building a model for precise classification of breast tumors with minimum misclassification of labels. In this paper the potential of extra tree classifiers for breast cancer classification into malignant or benign tumors is examined. A model for breast cancer classification is proposed using extremely randomized tree classifier. Hyperparameter optimization is applied. Identification of important features aids in model performance. Features relevant to disease detection are identified and ranked by importance using 3 techniques- impurity based, permutation based and Shap values. The most important four features identified are Size Uniformity, Shape Uniformity, Bare Nucleoli and Normal Nucleoli. Performance of the optimized model is analyzed using training-testing partitions and k fold stratified cross validation with k as 5 and it was observed that they produced an accuracy of 99.27% on the test set and 97.3 % on the cross validated model respectively. The study reveals the suitability of the extra tree classifier for breast cancer classification. The model is compared with other state of art models and it was seen to be superior in performance. Furthermore, extremely randomized tree classifiers are perceived to be suitable in developing models for breast cancer classification with minimal misclassification of instances.

Keywords: *Breast Cancer, Classification, Extremely Randomized Tree Classifier, Feature Importance, Machine Learning*

1. INTRODUCTION

The statistics on cancer published by the World Health Organization delineates the top priority that should be ascertained in cancer eradication, which is yet to be attained. A predominant cancer affecting women, globally, being Breast Cancer requires urgent attention. Presently, it has moved to top position among all cancers as the one mostly affecting women [1]. It is also a life threatening and second leading cause of deaths in females [2]. Early detection of the disease provides a higher likelihood for survival and the patients would have a better chance of recovery. Hence, significant focus is to be provided for strategies involving early detection of the disease. Breast Cancer is the uncontrolled growth of cells in the ducts, lobules or connective tissues of the breast. Primarily seen in the ducts or lobules it manifests as clumps of cells that grow uncontrollably and are denoted as tumors. Tumors can be malignant, (harmful) or benign, (not harmful). The principal concern is to identify malignant tumors precisely. The tumors are graded by stages that are determined by the characteristics of the cancer, size of the cancer, involvement of lymph nodes, tumour grade, involvement of Her2 protein, oestrogen- progesterone receptor status and metastasis. The stages are graded based on the American TNM staging and are indicated by a number on a scale of 0 to 4 ranging from stage 0 as non- invasive cancer to stage 4, invasive cancers [3]. The more advanced the stage is, less are the chances of survival. In countries like India where breast cancer incidence is high and, on the rise, almost

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Appositeness of Hoeffding tree models for breast cancer classification

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Abstract

Supervised machine learning models have been shown to be effective in disease-related classification and prediction tasks by employing several classifiers. A prominent category among the set of supervised machine learners is decision trees. Decision Trees comprises of an assortment of tree classifiers. Each of these types of decision trees are extensively used as supervised learners for various classification problems. In this paper, to deal with the classification of breast cancer tumours into malignant or benign types, a subcategory of decision trees so called Hoeffding Trees are employed. Hoeffding Trees is a type of decision tree classifier that are usually effective when working with data streams. In this paper, we explore the performance and appropriateness of Hoeffding trees in building models to classify breast cancer tumours as either benign or malignant. Individual and ensemble models using Hoeffding trees are implemented for classification of breast cancer. In the work proposed here a class-balancer Hoeffding Tree model is realized and it was seen demonstrating the best performance among the different Hoeffding Tree models employed. The proposed model yielded an accuracy of 97.9%. Several other performance measures are also used to evaluate the performance of the implemented Hoeffding tree models. This work highlights the appositeness of Hoeffding tree models for breast cancer classification.

Keywords: *bagging; boosting; breast cancer (BC); class balancer (CB); decision tree (DT); ensemble; Hoeffding tree (HT).*

1. Introduction

Breast cancer otherwise known as the neoplasm of the breast is the cancer affecting the breast. The breast comprises of three main parts - the lobules, glands that produce milk, ducts, tubes that transport milk to the nipple and connective tissue, that surrounds and holds the elements together. Breast cancer occurs when there is uncontrolled cell growth, and is usually found, mostly, in the lobules and ducts of the breast. This uncontrolled growth causes a mass of cells termed as, tumours, to form. The tumours can be either benign or malignant. Malignant tumours are deadly and can spread the cancer throughout the body, whereas benign tumours are not problematic. Malignant tumours need to be identified and treated as early as possible to curb the spread of the cancer. Being prevalent in women and rare in men, breast cancer is presently considered to be the most commonly diagnosed cancer. Globocan (2020) reports that it has now surpassed lung cancer to be the one with most incidence. In 2020, there were an estimated 2.3 million new breast cancer cases, amounting to an 11.7% share of all cancers detected (Sung et al., 2021). Breast cancer remains the first or second leading cause of death in women before age 70 in 112 out of 183 countries and ranks third or fourth in another 23 countries, with a worldwide share of 6.9% of death cases. By 2040, the global cancer burden is expected to rise by 47% (Sung et al., 2021). Incidence rate in India is of no exception. Breast cancer comprises 34% of the total cancer cases in India (Sathishkumar et al., 2021) and still continues its upsurge.

Tissue and Tumor Epithelium Classification using Fine-tuned Deep CNN Models

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***Abstract*—The field of Digital Pathology (DP) has become more interested in automated tissue phenotyping in recent years. Tissue phenotyping may be used to identify colorectal cancer (CRC) and distinguish various cancer types. The information needed to construct automated tissue phenotyping systems has been made available by the introduction of Whole Slide Images (WSIs). One of the typical pathological diagnosis duties for pathologists is the histopathological categorization of epithelial tumors. Artificial intelligence (AI) based computational pathology approaches would be extremely helpful in reducing the pathologists ever-increasing workloads, particularly in areas where access to pathological diagnosis services is limited. Investigating several deep learning models for categorizing the images of tumor epithelium from histology is the initial goal. The varying accuracy ratings that were achieved for the deep learning models on the same database demonstrated that additional elements like pre-processing, data augmentation, and transfer learning techniques might affect the models' capacity to attain better accuracy. The second goal of this publication is to reduce the time taken to classify the tissue and tumor Epithelium. The final goal is to examine and fine-tune the most recent models that have received little to no attention in earlier research. These models were checked by the histology Kather CRC image database's nine classifications (CRC-VAL-HE-7K, NCT-CRC-HE-100K). To identify and recommend the most cutting-edge models for each categorization, these models were contrasted with those from earlier research. The performance and the achievements of the proposed preprocessing workflow and fine-tuned Deep CNN models (Alexnet, GoogLeNet and Inceptionv3) are greater compared to the prevalent methods.**

***Keywords*—Colorectal cancer; deep learning; CNN; tumor epithelium; Alexnet; GoogLeNet; Inceptionv3**

I. INTRODUCTION

Historically, pathologists have examined the micro-anatomy of cells and tissues under a microscope. The development of Digital Pathology (DP) imaging in recent years has given pathologists an alternative method to perform the same analysis on a computer screen [1]. The current inquiry methodologies for breast cancer include mammography, magnetic resonance imaging (MRI), and pathology examinations. The histopathological scans are recognized as a golden standard to improve the diagnostic accuracy for patients who also had other investigations, such as mammography [2]. Additionally, a histopathological examination can offer more thorough and trustworthy information to detect cancer and to evaluate, how it affects the tissues around it [3]–[5]. The new modality, digital pathology imaging, now makes WSI (Whole Slide Imaging) a reality. Through WSI, the images may be shared, viewed on a digital display, and can be controlled/ examined on a screen [6]. Tumor architecture in Colorectal Cancer (CRC) evolves as the disease progresses [7] and is associated with patient prognosis [8]. Therefore, it is important for histopathologists to quantify the tissue composition in CRC. Inter-tumor heterogeneity and intra-tumor heterogeneity are both forms of tumor heterogeneity. By the different signals that cells pick up from their microenvironment, the tumor microenvironment (TME) really plays a significant role in the establishment of intra-tumor heterogeneity (ITH) [9]. The third most common cancer type to cause mortality is colorectal cancer (CRC), which is ranked as the fourth most common cancer [10]. In fact, treating patients and saving their lives depends on early-stage CRC diagnosis [11]. For the classification and prognostication of cancer, the study of tumor heterogeneity is crucial [12]. In-tumor heterogeneity can help to clarify, how TME affects patient prognosis and can also be used to spot new aggressive phenotypes that may be potential targets for future therapies [13]. Although most present histological analysis relies on the pathologists' subjective assessments, a critical need for automating the various processing techniques arises, that can provide good quantitative analysis and throughput of the digital pathology images for precise identification and assessment of various tumor epitheliums.

Deep convolutional neural networks (CNNs) algorithms automatically analyse images for handling classification and detection tasks, reducing the amount of manual labour necessary for the feature-extraction operations [14]. The lack of a suitably sizable annotated data set for training is a significant barrier to applying deep learning to many biological domains. Transfer learning, which makes use of deep CNNs that have already been trained on a significant amount of natural scene data, may be used to circumvent the need for sample size, nevertheless. This approach is based on the notion that the characteristics discovered by deep CNNs to identify classes in a dataset may also be useful for clinical data sets with marginally worse performance.

In medical domain there are currently three approaches in deep learning: (i). Acquiring features learned in the training phase of deep CNN with numerous natural images, then the features acquired are used for classifier training [15], [16], and [17], (ii) fine-tuning a small number of network layers are fine tuned in the pre-trained CNN on a desired data set [18], (iii)

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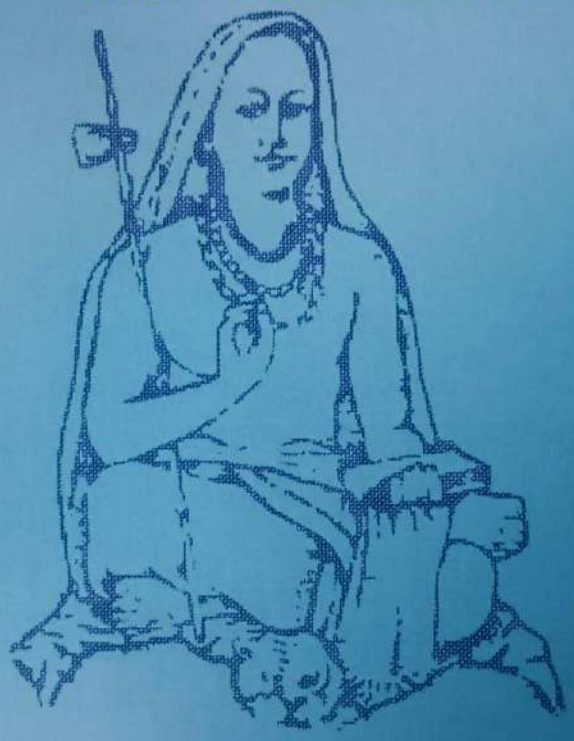

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Authoritative Works on Rājayoga - A Brief Reflective

Sunitha S[1]

Abstract

Patañjali's Yogasūtra stands out to be the most formidable treatise on yoga philosophy and practice. The Aṣṭāṅgās, the eight-fold limbs/ paths as ascribed in Yogasūtra, forms the basic tenets of all the different tributaries and ramification of Yoga traditions developed as of today. Essentially the most important writings on Rāja yoga are those on the Yogasūtra and the Aṣṭāṅgās in it. These works come under two chronological categories, the first by authors during the middle of the first millennium CE, consisting of 'Bhāṣyas' (commentaries) and 'Vivaraṇas' (sub-commentaries) on Yogasūtra. These are mostly in Sanskrit. Vyāsabhāṣya is quite elaborative in its word by word analysis of Yoga sūtra. The second category of Yogasūtra commentary works predominantly emerges from the later part of the 2nd millennium CE. Swami Vivekananda's 'Rāja yoga' is generally ascribed as the flagship of such a fleet of subsequent works. The most profound among the recent works on Patañjali's Yogasūtra has been B.K.S. Iyengar's 'Light on Yogasūtras of Patañjali'.

Key Words

Patañjali, Yogasūtra, Aṣṭāṅgās, Rāja yoga, Bhāṣyās, Vivaraṇās

Introduction

The eternal quest of men, the enquiry towards existential essence and immortality is an innate quality. The question is whether it is limited to his/her earthly fame and name or extended beyond to life after life. Every culture has its own answers and solutions for actualization that have eventually been systematised to verbal and textual codes. These are mainly compositions of the teachings of a single Master (prophet)

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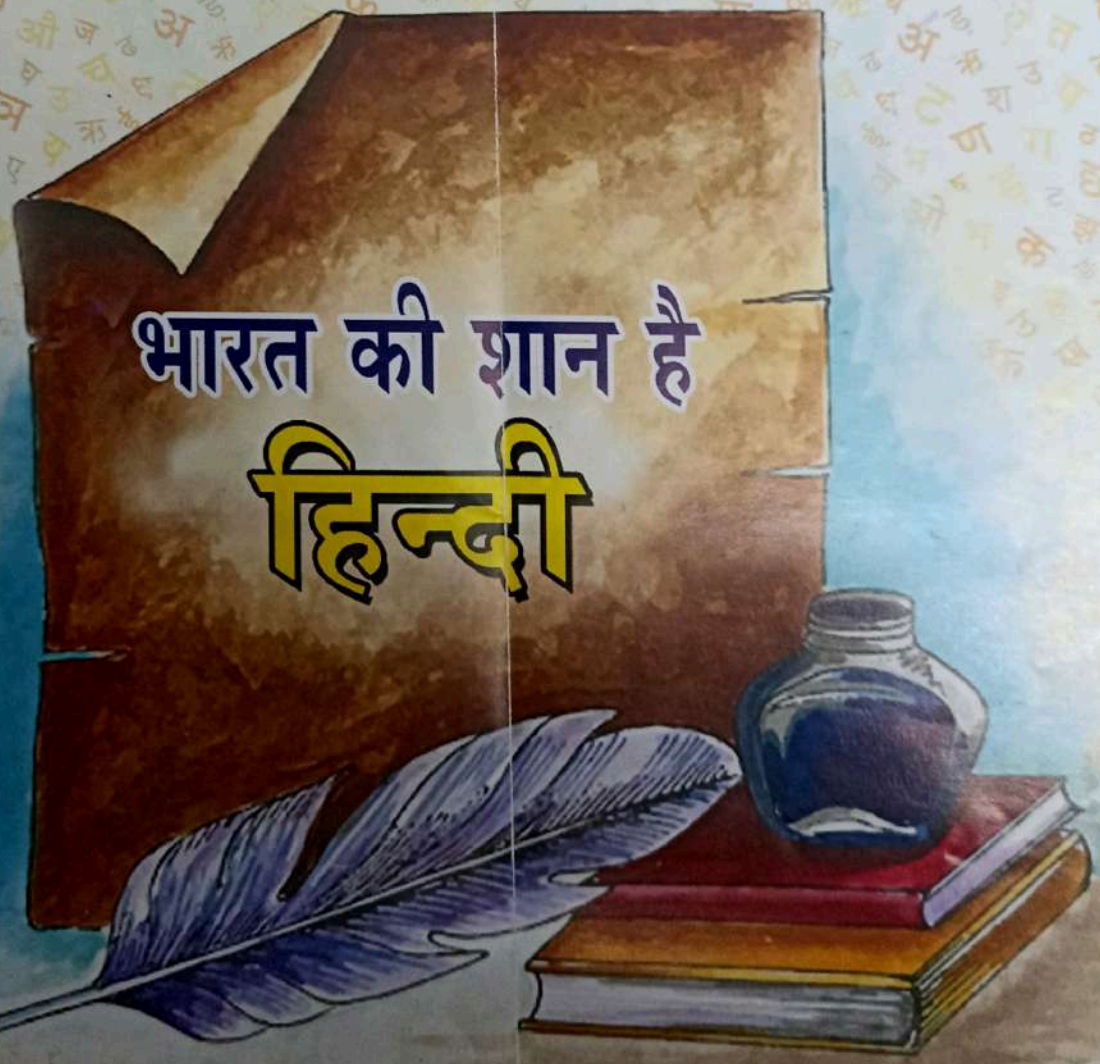
हिन्दी दिवस



भारत की शान है हिन्दी

हिन्दी विद्यापीठ (केरल) तिरुवनन्तपुरम

इस अंक में....

वज्रसूची की प्रतिबद्धता एवं परंपरा

डॉ.प्रकाश.ए.

अश्वघोष ने 'वज्रसूची' की रचना की शुरुआत शास्त्रविधि के अनुसार गुरुवंदना के साथ की है। तद्युगीन मान्यताप्राप्त प्रामाण हैं - वेद, श्रुति, स्मृति और महाभारत इनके कथनों को उद्धृत करके अश्वघोष ने ब्राह्मण के जन्म, ब्राह्मणत्व, ब्राह्मण की श्रेष्ठता आदि पर अनेक प्रश्नों को छेड़ा है।

अश्वघोष कृत 'वज्रसूची' और 'वज्रसूच्युपनिषद' इन दोनों रचनाओं में आकार-प्रकार और प्रतिपाद्य में काफ़ी भिन्नता है। एक ब्राह्मण की श्रेष्ठता पर प्रश्न चिह्न लगाती है और दूसरा ब्राह्मण के वर्णवादी आदिनायकत्व का समर्थन देती है।

जेर्मन पण्डित वेबर एवं आस्ट्रिया के पण्डित मोरिस विंटर्निट्स जैसे विदेशी इंडोलॉजिस्टों के मतों के प्रामाणिक खंडन करके और सुजित कुमार उपाध्याय जैसे अन्य भारतीय विचारकों के मतों के बल पर डॉ.रूपा कुलकर्णी निर्णय लेती हैं कि "यह तर्क युक्तियुक्त लगता है कि अश्वघोष का प्रभाव समाप्त करने के उद्देश्य से उन्हीं के ग्रंथ का 'ब्राह्मण संस्करण', 'वज्रसूच्युपनिषद' नाम से रचा गया हो। पता नहीं कि उपनिषद का रचयिता शंकराचार्य है या कोई और। लेकिन इतना सही है कि इस उपनिषद की रचना अश्वघोष के बाद की है। इन दो ग्रंथों के भिन्न-भिन्न उद्देश्य भी स्पष्ट दृष्टिगोचर होते हैं। (वज्रसूची, पृ.सं.-१८)

'वज्रसूची' और 'वज्रसूच्युपनिषद' दो विरोधी विचारधाराएँ हैं। रामधारी सिंह दिनकर के शब्दों में "बुद्ध के समय से ही यहाँ दो तरह की विचारधाराएँ चलती आ रही हैं। एक वह, जो जातियों का भेद नहीं मानती और भारत के सभी मनुष्यों को एक समाज में बाँधना चाहती है। दूसरी वह जो वर्णाश्रम-धर्म का समर्थन करके विभिन्न जातियों को अपनी अपनी जगह पर कायम रखना चाहती है। ...दूसरी धारा के नेता ब्राह्मण आचार्य हुए हैं।" (संस्कृति के चार अध्याय, पृ.सं.१९९)

कहा जा सकता है कि अश्वघोष ने तद्युगीन सत्ता की छाया में पनपनेवाली जाति-प्रथा के शोषण के खिलाफ बगावत की। सर्वसाधारण को लूटने में धूर्त पुरोहित और निरंकुश राजा (शासन) का गठबन्धन की कहानी बहुत पुराने समय से चली आ रही है। "शासक श्रेणी समाज केलिए व्यवस्था निश्चित करते समय, ईश्वर के प्रतिनिधित्व का अधिकार अपनाकर अपने हित को ही न्याय की कसौटी मान लेती है।" (यशपाल के निबन्ध, खण्ड-

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Effect of acute cold exposure on cardiac mitochondrial function: role of sirtuins

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Abstract

Cardiac function depends mainly on mitochondrial metabolism. Cold conditions increase the risk of cardiovascular diseases by increasing blood pressure. Adaptive thermogenesis leads to increased mitochondrial biogenesis and function in skeletal muscles and adipocytes. Here, we studied the effect of acute cold exposure on cardiac mitochondrial function and its regulation by sirtuins. Significant increase in mitochondrial DNA copy number as measured by the ratio between mitochondrial-coded COX-II and nuclear-coded cyclophilin A gene expression by qRT-PCR and increase in the expression of PGC-1α, a mitochondriogenic factor and its downstream target NRF-1 were observed on cold exposure. This was associated with an increase in the activity of SIRT-1, which is known to activate PGC-1α. Mitochondrial SIRT-3 was also upregulated. Increase in sirtuin activity was reflected in total protein acetylome, which decreased in cold-exposed cardiac tissue. An increase in mitochondrial MnSOD further indicated enhanced mitochondrial function. Further evidence for this was obtained from ex vivo studies of cardiac tissue treated with norepinephrine, which caused a significant increase in mitochondrial MnSOD and SIRT-3. SIRT-3 appears to mediate the regulation of MnSOD, as treatment with AGK-7, a SIRT-3 inhibitor reversed the norepinephrine-induced upregulation of MnSOD. It, therefore, appears that SIRT-3 activation in response to SIRT-1–PGC-1α activation contributes to the regulation of cardiac mitochondrial activity during acute cold exposure.

Keywords Acute cold exposure · Mitochondrial function · Sirtuins · PGC-1α · Acetylome · Adaptive thermogenesis

Abbreviations

BAT	Brown adipose tissue
NE	Norepinephrine
SNS	Sympathetic nervous system
Tfam	Mitochondrial transcription factor A
UCP-1	Uncoupling Protein-1
SOD	Superoxide dismutase

Introduction

Prolonged exposure to low temperatures causes mortality and morbidity [1–6]. It has been reported that chronic exposure to cold developed significant elevation in blood pressure, tachycardia, and cardiac hypertrophy [7–9]. Elevation in blood pressure is an adaptive response to cold. But constantly elevated blood pressure could result in cardiovascular damage [7, 10–12].

The number of mitochondria in each cell changes due to the fission and fusion of mitochondria, two processes that play an important role in maintaining mitochondrial function [13]. Mitochondrial DNA copy number is a measure of the number of mitochondrial genomes per cell [14]. It is a biomarker of mitochondrial function and has been associated with several age-related diseases, including cardiovascular disease [14]. Mitochondrial proteins are encoded by nuclear and mitochondrial genomes [15]. The primary transcriptional regulator of mitochondrial biogenesis is PGC-1α which activates different transcription factors such as NRF-1, NRF-2, and Tfam [16, 17]. Cardiomyocytes have many mitochondria to meet their extra demand for ATP [18].

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MODCN: Fine-Tuned Deep Convolutional Neural Network with GAN Deployed to Forecast Diabetic Eye Damage in Fundus Retinal Images

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Diabetic Retinopathy (DR) and Glaucoma are two of the most common causes of vision loss world-wide. However, it can be averted if therapy is begun early enough. In biomedical applications, the use of digital image processing has assisted in the automated identification of some ailments at an earlier stage. To make this prediction generally neural network classifier models were previously used, but these models have the drawback of being unable to detect multiple illnesses that occur in the eye at the same time and require a big database for successful classifier training. As a result, a model is needed to reliably distinguish DR and Glaucoma in diabetic individuals more accurately and with minimum dataset images. In this view, this study introduced Mayfly Optimized Deep Convolutional Network (MODCN) model for automated disease detection in the fundus retina images. In the MODCN model, the images are initially preprocessed, segmented at generator in the GAN model then a discriminator readily gives synthesis of real images of the fundus retina, thus a wide database has been created and considered as training images for the MODCN classifier. MODCN classifier has a modified high-density layer as a transition layer to avoid overfitting and the errors are minimized by tuning the hyperparameters using Mayfly Optimization Algorithm. After feature mapping, the classes normal, DR and Glaucoma are labeled and stored. At the testing stage, images are preprocessed, feature mapped and classified in the MODCN model. Thus, the proposed MODCN model detects multiple illness such as Diabetic Retinopathy and Glaucoma at the same time even with a small amount of database that performs a successful classifier training. This model is then evaluated and gives an accuracy of 99% that was higher compared to previous models.

Keywords: Diabetic retinopathy; glaucoma; graph convolutional network; Mayfly Optimization; fundus retina images; and high-density layer.

1. Introduction

In the field of biomedical applications, digital image processing systems have been widely employed to identify disorders. It has a special position in healthcare

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Pseudo Computed Tomography estimation from brain MRI using anatomic signature and joint dictionary learning

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Abstract

Most research on using pseudo-computed tomography (pCT) on brain-imaging techniques relies on in-house methods. As performance as a whole increase, they pay particular attention when using MRI imaging. Methodologies for predicting CT values from MRI data are needed in radiation treatment (RT). Although the employment of dictionary-learning-based approaches for defining picture patches has not been considered, it has been found that Deep Learning (DL) offers increased opportunities in the medical domains. The stages of this paper CT estimation from MRI using Anatomic Signature and Joint Dictionary Learning (ASJDL) are as follows: a) data gathering from the RIRE image data and b) image pre-processing to remove anomalies. c) Using Gabor Filters for feature extraction to extract significant features d) The choice of anatomic signature traits is used to identify strong, illuminating characteristics that classify and identify objects. e) Development of the pCT through shared dictionary learning. Using cutting-edge techniques like Accelerated Simplified Swarm Optimization (ASSO), Particle Swarm Optimization (PSO), Simplified Swarm Optimization (SSO), SLA12, Intensity-based, Fast-patch based, and Coupled dictionary over measures like peak S/N ratio, MAE, normalized cross-correlation, SSIM, Accuracy, and Computation time, the evaluation of both feature selection and classification methods is compared. With values of 23.825.08 (PSNR), 83.327.05 (MAE(HU)), 0.920.03 (NCC), and 0.860.03 (SSIM), the suggested framework (ASJDL) performs better than all other methods.

Keywords: Anatomic Signature, Deep Learning, Joint Dictionary Learning, PseudoCT, Synthetic CT

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Article

Vindoline Exhibits Anti-Diabetic Potential in Insulin-Resistant 3T3-L1 Adipocytes and L6 Skeletal Myoblasts

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Abstract: Type 2 diabetes mellitus (T2DM) emerged as a major health care concern in modern society, primarily due to lifestyle changes and dietary habits. Obesity-induced insulin resistance is considered as the major pathogenic factor in T2DM. In this study, we investigated the effect of vindoline, an indole alkaloid of *Catharanthus roseus* on insulin resistance (IR), oxidative stress and inflammatory responses in dexamethasone (IR inducer)-induced dysfunctional 3T3-L1 adipocytes and high-glucose-induced insulin-resistant L6-myoblast cells. Results showed that dexamethasone-induced dysfunctional 3T3-L1 adipocytes treated with different concentrations of vindoline significantly enhanced basal glucose consumption, accompanied by increased expression of GLUT-4, IRS-1 and adiponectin. Similarly, vindoline-treated insulin-resistant L6 myoblasts exhibited significantly enhanced glycogen content accompanied with upregulation of IRS-1 and GLUT-4. Thus, in vitro studies of vindoline in insulin resistant skeleton muscle and dysfunctional adipocytes confirmed that vindoline treatment significantly mitigated insulin resistance in myotubes and improved functional status of adipocytes. These results demonstrated that vindoline has the potential to be used as a therapeutic agent to ameliorate obesity-induced T2DM-associated insulin resistance profile in adipocytes and skeletal muscles.

Keywords: obesity; T2DM; insulin resistance; vindoline; adipocyte; skeletal muscle

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1. Introduction

Insulin resistance (IR), an impaired response of peripheral tissues to insulin, is characterized by hyperinsulinemia, hyperglycemia, hypertension, dyslipidemia, visceral adiposity, hyperuricemia, elevated inflammatory markers, endothelial dysfunction and a prothrombic state. Chronic insulin resistance can result in metabolic syndrome, non-alcoholic fatty liver disease (NAFLD) and type 2 diabetes mellitus (T2DM). T2DM is the predominant consequence of insulin resistance. Muscle, liver and adipose tissue are the three primary sites of insulin resistance [1].

According to previous studies, one of the major causes of IR is chronic obesity [2]. Obesity associated IR is closely linked to adipocyte dysfunction [3], resulting in impairment of glucose and lipid homeostasis as well as inflammatory responses [4]. Adipose tissue regulates both glucose and lipid metabolism by releasing adipokines, pro-inflammatory cytokines, and free fatty acids. In respond to insulin, adipose tissue enhance differentiation of preadipocytes into adipocytes, storage of triglycerides, inhibiting lipolysis and thereby promoting the uptake of glucose and free fatty acids [5].

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Adenosine receptor activation promotes macrophage class switching from LPS-induced acute inflammatory M1 to anti-inflammatory M2 phenotype

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ABSTRACT

Lipopolysaccharide induced monocytes/macrophages exhibit a pro-inflammatory M1 phenotype. Elevated levels of the purine nucleoside adenosine play a major role in this response. The role of adenosine receptor modulation in directing the macrophage phenotype switch from proinflammatory classically activated M1 phenotype to an anti-inflammatory alternatively activated M2 phenotype is investigated in this study. The mouse macrophage cell line RAW 264.7 was used as the experimental model and stimulated with Lipopolysaccharide (LPS) at a dose of 1 μg/ml. Adenosine receptors were activated by treating cells with the receptor agonist NECA (1 μM). Adenosine receptor stimulation in macrophages is found to suppress LPS-induced production of proinflammatory mediators (pro-inflammatory cytokines, Reactive Oxygen Species and nitrite levels). M1 marker CD38 (Cluster of Differentiation 38) and CD83 (Cluster of Differentiation 83) were significantly decreased while M2 markers Th2 cytokines, Arginase, TIMP (Tissue Inhibitor of Metalloproteinases) and CD206 (Cluster of Differentiation 206) exhibited an increase. Hence from our study we observed that activation of adenosine receptors can program the macrophages from a pro-inflammatory classically activated M1 phenotype to an anti-inflammatory alternatively activated M2 phenotype. We report the significance and a time course profile of phenotype switching by receptor activation. Adenosine receptor targeting may be explored as a therapeutic intervention strategy in addressing acute inflammation.

1. Introduction

Inflammation is defined as the protective response against pathogens and is very crucial for the restoration and regeneration of damaged tissues after injury (Chen et al., 2017). Inflammatory response in the host is important for the interruption and resolution of the disease, while also often responsible for the visible signs and symptoms (Sansbury and Spite, 2016). However, unregulated progression of inflammation can lead to an inflammatory shock and in extreme cases result in mortality. A common cause of inflammation is the outset of systemic infection (bacteremia) leading to the development of acute inflammatory cascade conditions which if left unregulated can result in adverse consequences referred to as septic shock. One of the main causative agents of septic shock is the gram negative bacterial endotoxin Lipopolysaccharides (LPS) which is present in the cell wall of gram negative bacteria. LPS once enters the cell is recognized by the immune system as a pathogen associated molecular pattern (PAMP) which stimulate the immune system followed by a local or systemic immune response (Yucel et al., 2017).

LPS being a PAMP, activates monocytes/macrophages (Tucureanu et al., 2017) by specifically binding to Pattern Recognition Receptors (PRRs) expressed on their surface (Fig. 1A). Hence macrophages are found to have an important role in the initiation, maintenance and resolution of inflammation (Zhang and Mosser, 2008). Depending on the stimuli they are exposed to, macrophages can change their gene expression pattern and be activated/differentiated into a classically activated phenotype which is pro-inflammatory in nature or as an alternatively activated phenotype which is anti-inflammatory in nature. Classical activation occurs in a Th1 environment and such macrophages are known as M1 macrophages, whereas alternative activation occurs in a Th2 environment and such macrophages are known as M2 macrophages (Gordon, 2003).

The purine nucleoside adenosine released from macrophages upon LPS induction can act as a physiological modulator of inflammation (Ohta and Sitkovsky, 2001). During the time of injury/inflammation, there will be enhanced production of intracellular ATP, which is

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AKADÉMIAI KIADÓ

Intermittent cold exposure upregulates regulators of cardiac mitochondrial biogenesis and function in mice

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ABSTRACT

Hypothermic conditions enhance the incidence of cardiovascular diseases due to increased blood pressure. Cold-induced adaptive thermogenesis increased mitochondrial biogenesis and function in skeletal muscles and adipocytes. Here, we studied the effect of intermittent cold exposure on the regulators of cardiac mitochondrial biogenesis, function, and its regulation by SIRT-3. Intermittent cold exposed mice hearts showed normal histopathology with increased mitochondrial antioxidant and metabolic function, as evidenced by an increase in the activity and expression of MnSOD and SDH. A substantial increase in mitochondrial DNA copy number and increase in the expression of PGC-1α and its downstream targets NRF-1 and Tfam indicated the possibility of enhanced cardiac mitochondrial biogenesis and function on intermittent cold exposure. Increased mitochondrial SIRT-3 level and decreased total protein lysine acetylation indicate increased sirtuin activity in cold exposed mice hearts. *Ex vivo* cold mimic using norepinephrine showed a significant increase in PGC-1α, NRF-1, and Tfam levels. AGK-7, a SIRT-3 inhibitor, reversed the norepinephrine-induced upregulation of PGC-1α and NRF-1, indicating the role

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AKADÉMIAI KIADÓ

Oxidized LDL-mediated upregulation of ADAMTS-4 in monocytes/macrophages involves ROS-NF-κB-SIRT-1 pathway

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ABSTRACT

Background and aims: ADAMTS-4 is a protease enzyme involved in vascular remodeling and atherosclerosis. It was found to be upregulated in macrophages seen in atherosclerotic lesions. This study aimed to investigate the expression and regulation of ADAMTS-4 in oxidized LDL-induced human monocytes/macrophages system. *Methods:* Peripheral blood mononuclear cells (PBMCs) isolated from human blood, and treated with oxidized LDL (50 μg mL^{-1}) were used as the model system for the study. mRNA and protein expressions were studied by PCR, ELISA, and western blot analysis. ROS production and cell viability were determined by DCFDA staining and MTT assay, respectively. *Results:* In the presence of oxidized LDL, monocytes get differentiated into macrophages, which were confirmed by the increased expression of macrophage differentiation markers and pro-inflammatory cytokine TNF-α. Oxidized LDL increased the mRNA and protein expression of ADAMTS-4 in monocytes/macrophages. N- Acetyl cysteine, ROS scavenger, downregulate the protein expression of ADAMTS-4. The expression of ADAMTS-4 was decreased significantly in the presence of NF-κB inhibitors. SIRT-1 activity was significantly downregulated in the macrophages and was reversed in the presence of the SIRT-1 agonist, resveratrol. Acetylation of NF-κB and hence the expression of ADAMTS-4 were significantly

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Journal Pre-proof

Sesamol inhibits LPS induced angiogenesis via downregulating VEGFA/VEGFR2 signalling both in vitro and in vivo

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Sesamol inhibits LPS induced angiogenesis via downregulating VEGFA/VEGFR2 signalling both *in vitro* and *in vivo*

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Abstract

Background

Knowing the nutritional and pharmacological significance of foods enables the deeper understanding of their role against several diseases. Sesame (*Sesamum indicum)* has been used in traditional Chinese medicine to combat aging and age-related diseases. Sesamol is a natural polyphenolic compound isolated from sesame seed oil that was reported to possess various therapeutic potentials including anti-inflammatory, antioxidant and anticancer properties. Pathological angiogenesis is a hallmark of many diseases such as rheumatoid arthritis, atherosclerosis, diabetic retinopathy and cancer. But the role of sesamol in angiogenesis is not yet studied.

Methods

We studied the effect of sesamol on LPS induced angiogenesis using Rat Aortic Endothelial Cells (RAECs). Wound healing assay was used to study the effect of sesamol on cell migration and tube formation assay was used to evaluate the effect of sesamol on tubulogenesis. Western blot, ELISA and qPCR analysis were carried out to study the expression of proangiogenic factors such as VEGFA, VEGFR2, MMP-9 and cell adhesion molecules.

Results

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Structural studies of a novel tautomeric Schiff base derived from 4-(*N*,*N*'-diethylamino)salicylaldehyde and 2-amino-4-methyl phenol: An experimental and theoretical study

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Highlights

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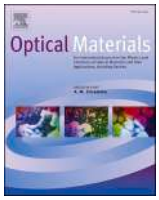

Research Article

Dielectric, nonlinear optical and optical limiting properties of chelated bimetallic metal-organic framework

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ABSTRACT

Single crystals of the chelated bimetallic metal-organic framework (MOF) of strontium and calcium of the ligand EDTA, with dielectric and nonlinear optical properties have been grown by gel diffusion technique. The compound belongs to the monoclinic space group C 2/c with unit cell parameters a = 19.597(3) Å, b = 11.5595(19) Å, c = 16.010(3) Å, α = 90°, β = 95.646(5)° and γ = 90°. Further characterization of the crystal was done by CHN analysis, FT–IR, FT-Raman spectroscopy and thermogravimetry. Using UV–visible spectroscopy, optical parameters of the MOF were investigated. The frequency dependence of dielectric loss and dielectric constant of the crystal were studied. Z scan studies have been applied to find out third order nonlinear optical parameters of the grown MOF. Optical limiting threshold of the compound was also studied.

1. Introduction

Nonlinear optical materials have sundry applications in cutting edge technology like excessive pace transmitting optical fibres, optical modulators, etc. [1–3]. They maintain vital use in photonics and optoelectronics [4–6]. Nonlinear optics is significant for a multitude of aspects, including the development of components and devices in the scientific, military, and medical domains [7–13]. Quick feedback and high non-linearity are qualities of aromatic NLO crystals which have gained interest in the past few years. Still, their physicochemical instability, softness and tendency of being cleaved, hinder applicative progress [14–16]. In order to make best of its advantages and exorcise its weaknesses, semi-organic crystals have been developed contrary to organic ones [17–19]. The fact that NLO research is a pioneering technology for frequency shifting, lasers, fibres, optical memorisation, optical modulation etc. has instilled our curiosity towards NLO studies.

Metal-organic-frameworks (MOFs) have been widely studied for their applications in drug delivery, gas storage, catalysis etc. [20,21]. Even then, the NLO properties of MOFs in optical and microelectronic devices have yet to be thoroughly explored. In the present study, we focus on evaluating NLO and dielectric behaviour of the chelated bimetallic MOF, SrCaEDTA grown through the gel diffusion technique. Even though crystal structure of the grown crystal was reported earlier [22], this is the pioneer report of synthesis of the compound through the gel diffusion method. The crystals that fulfil low dielectric loss, as well as a lower value of dielectric constant at higher frequencies, have enhanced NLO properties, making them suitable for diverse optical applications [23]. Thus, we monitored the dielectric behaviour of the compound with the change in frequency at room temperature.

2. Experimental section

2.1. Crystal growth

Single gel diffusion method [24–26] was adopted for synthesising SrCaEDTA single crystals (Fig. 1). AR grade sodium metasilicate dissolved in double distilled water was taken for preparing silica gel of density varying from 1.02 to 1.05 gcm^{-3} [27]. A definite amount of ethylenediaminetetraacetic acid (Fig. 2) dissolved in NaOH solution is added to the above metasilicate solution to prepare 0.1–0.5 M solution. By adding acetic acid, the pH of the solution was adjusted between 6.0 and 8.5 [28]. The setting of the solution was done by transferring it into various boiling tubes. After the gel was set, a specific quantity of 0.1–0.5 M calcium chloride and 0.1–0.5 M strontium chloride solutions were introduced over the gel. Contamination of the solution was prevented by covering the tubes with a plastic film. After 7 days, well-defined and optically transparent crystals have grown at a gel density of 1.05 gcm-^{3}

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RECENT COMPUTATIONAL TRENDS IN HUMAN BRAIN SIGNAL ANALYSIS OF ELECTROENCEPHALOGRAPHIC DATA

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Abstract - Human brain is one of the most wondrous organs that distinguish us from all other organisms. The ability to feel, adapt, reason, remember, make decision and communicate makes human beings intelligent. Human brain is capable of processing billions of bits of information per second with the help of approximately hundred billion neural connections. The latest trend in unlocking the mysteries of the mind is with the recent advancement in brain-computer interface (BCI) systems. Scientists are emphasizing their research on whether BCI can be augmented with human computer interaction (HCI) to give a new aspiration for restoring independence to neurologically disabled individuals. There are invasive and noninvasive methods for brain signal acquisition such as electroencephalography (EEG), functional MRI (fMRI), electrocorticography (ECoG), calcium imaging, magneto encephalography (MEG), functional near-infrared spectroscopy (fNIRS) and so on. Electroencephalography signals, which are small amounts of electromagnetic waves produced by the neurons in the brain are one of the most popularly used signal acquisition techniques in the existing BCI systems due to their non-invasiveness, easy to use, reasonable temporal resolution and cost effectiveness compared to other brain signal acquisition methods. Electroencephalography is essential for the diagnosis of epilepsy and useful in characterizing various neurological diseases such as Parkinson's disease, Alzheimer's disease etc. and also helps in monitoring sleep related disorders. This paper discusses the EEG data processing mechanisms using machine learning techniques and reviews the achievements in this field.

Keywords - Brain-Computer-Interface, Brain Signal, Deep Learning, EEG, Human-Computer-Interaction

I. INTRODUCTION

Nearly one billion people in this world are struggling with several neuromuscular disorders. Human brain research studies can be very beneficial which enables to record and analyse brain signal patterns and convert into useful commands. The brain computer interface systems ensemble the gap between humans and intelligent electronic devices. The brain signals provide possible means to human –computer interaction by training the computer to recognize and classify EEG signals thereby accomplishing what they really want to do. The roots of brain –computer interaction starts with Hans Berger's discovery of the electrical activity of the human brain and the invention of electroencephalography in 1924 [1]. Berger was the first to record human brain signals with the help of EEG. Even though there exist several invasive and non-invasive brain signal acquisition techniques; EEG become the most popularly used signal acquisition technique due to its cost effectiveness, reasonable temporal resolution, less frequency, portability and ease of use. Non-invasive techniques include fMRI, fNIRS, MEG etc. Functional near infrared spectroscopy (fNIRS) measures the brain activity using near infrared spectroscopy for functional neuroimaging [2]. The functional magnetic resonance imaging (fMRI) maps the neural activity by imaging the hemodynamic responses which relies on the blood flow. The primary form of fMRI uses blood-oxygen-level dependent (BOLD). Magnetoencephalography (MEG) is the measurement of magnetic field generated by the electrical activity of neurons [3]. Though MEG may detect more restricted groups of sources than EEG [4], high cost and non-portability reduces its use. Electrocorticography (ECoG) is an invasive method in which electrical activities of the brain are recorded from cerebral cortex. ECoG has been used to localize epileptic zones during pre-surgical planning by placing the electrodes directly on the surface of the brain [5]. This degrades the scope of the method. The summary of the brain acquisition methods is tabulated in table 1

Method	Acquisition technique	Measured activity	Portability	Advantage	Disadvantage
EEG	Non-invasive	Electrical	Portable	Easy, safe, less cost	Non stationary
MEG	Non-invasive	Magnetic	Non-portable	Have wider range of frequency	Expensive
fMRI	Non-invasive	Metabolic	Non-portable	high temporal and spatial resolution	Slow data acquisition
NIRS	Non-invasive	Metabolic	Portable	High spatial resolution	Less temporal resolution
ECoG	Invasive	Electrical	Portable	High spatial resolution	Sampling time is limited
Intracortical neural recording	Invasive	Electrical	Portable	High spatial resolution	Medical issues

Table 1. Brain signal acquisition techniques and their features.

Wireless Networks
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ORIGINAL PAPER

Novel STD-ACP for detecting energy and threshold value in the network

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Abstract
Primary User Emulation Attack (PUEA) is the most serious concern in Cognitive Radio (CR). The PUEA are malevolent users attempt to imitate primary signals and confuse CR users to prevent them from accessing vacant frequency bands. The proposed technique detects energy and assigns an appropriate threshold value for identifying attackers in the network using unique Smart Threshold detection (STD). The free space propagation model and two ray ground models are considered for finding the attacks. The authentication confirmation process (ACP) is carried out for detecting multiple PUEAs; ACP uses DNA sequencing using Binary to Excess One (BEO). The objective of this paper is to identify the PUEAs from the network and not providing the vacant frequency bands to the PUEAs and the frequent bands should be used by the primary and the secondary user efficiently. Here the secondary user will find out whether the PUEA or primary user is accessing the vacant bands using the STD-ACP technique. The simulation process is executed in the MATLAB platform. The Proposed STD-ACP finds out the attack strength, probability of detection, probability of error, probability of false alarms, and identifies the number of PUEAs. By simulating the performance of the primary user will be increased while the PUEAs can be detached from the network. The proposed STD-ACP approach is compared with attack-aware threshold selection (AATS), optimal voting rule, and K-out-of-N rule methods respectively.

Keywords Cognitive radio (CR) · Smart threshold detection (STD) · Authentication confirmation process (ACP) · Primary user emulation attack (PUEA) · Binary to excess one (BEO)

1 Introduction

A cognitive radio (CR) is a wireless conduit that is configured and periodically updated in its direct proximity to prevent congestion and interruption. The CR will reliably detect available radio frequency streams and adjust its broadcast or receiving characteristics to facilitate more simultaneous wireless connections in a particular frequency range at a single place. Energy detection is a channel estimation technique that identifies the existence or lack of transmission simply by evaluating the energy generated [1]. CR will react to better accessibility by monitoring the surroundings, such as whether the band is accessible or not while remaining unobtrusive to the user. A CR may effectively identify whether any part of the band is in use and use it momentarily avoiding disrupting other users' broadcasts. Cognitive Radio Networks (CRNs), which are made up of cognitive communicating devices or nodes that have cognitive capabilities, result in better

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LUNG CANCER CLASSIFICATION USING EXTREME-ANFISWITH RED FOX OPTIMIZATION ALGORITHM

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Abstract

Lung cancer is the prevalent malignancy, despite the great breakthroughs in detection and prevention and it remains the important cause of death. In recent days, artificial intelligence has exploded in all fields of science. The use of artificial intelligence in medical science has improved in accuracy and precision of predicting this infestation in the initial stages. In this study, a novel RFO-EANFISis used to classify small cell lung cancer (SCLC), non-small cell lung cancer (NSCLC) and normal by using Chest X-ray images. These images are pre-processed by Histogram equalization and Gaussian smoothing to reduce the noise from the CXR images. The features are extracted from the pre-processed images using GLCM and the Extreme-ANFIS is used for classification. The classification results were optimized by RFO algorithm that normalizes the parameters of the network to achieve better results. The proposed RFO-EANFIS achieves a high accuracy range of 97.58%, 94.45% and 96.12% for classifying normal, NSCLC and SCLC respectively. The proposed RFO-EANFIS model was compared with traditional machine learning classifiers like SVM, RF, DT and NB. The performance analysis evidently shows that the proposed network outperforms than the other state-of-art models.

Key Words: Lung cancer, Chest X-rays, Classification, Extreme-ANFIS, Red fox optimization(RFO) algorithm.

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Introduction

Lung cancer is one of the most familiar tumours, despite significant advances in identifying and reporting and it remains the primary reason of death [1]. It is one of the most frequent cancerous tumours that results a threat in human health, and it begins in the cells that line the bronchi and other regions of the lung, such as the bronchi and alveoli [2,3]. This cancer doesn't cause signs or symptoms in the initial stage but in advanced stage with common signs such as fever, coughing with blood, chest pain and difficulties in breathing [5]. In the current statistics about 235,760 individuals were diagnosed with lung cancer in worldwide, the prevalence and morbidity of lung cancer are at the top of the priority chart and the tendency is rising annually [9]. Lung cancer is a very diverse epithelial tumour with unique clinicopathological characteristics. The main two classifications of lung cancer are SCLC (small cell lung cancer) and NSCLC (non-small cell lung cancer) [10]. SCLC is the cancer with a poor prognosis and a fast rate of growth. NSCLC contributes for more over 80% of lung cancer incidences [11]. SCLC is almost exclusively found in chain smokers and rarer than NSCLC and it is an umbrella term for various natures of lung cancers [12]. The NSCLC has various types that include squamous cell carcinoma, adeno carcinoma and large cell carcinoma.It is very essential to prognosis the infection of lung cancer in a short time period with high accuracy [13].

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The various machine learning and deep learning techniques were used to detect the early stages of this infection. The most common and effective techniques to diagnosis lung cancer disease in prior is chest X-rays (CXR) [14], reverse transcription polymerase chain reaction (RTPCR) test and computed tomography (CT) images.Deep learning and machine learning playa vital part in the

Breast Cancer Classification Using an Extreme Gradient Boosting Model with F-Score Feature Selection Technique

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***Abstract*—Breast cancer is considered the most problematic of all cancers affecting women. With high incidence and mortality rates, it is ranked as the primary and most significant health hazard for women globally. Early detection of the disease is the key to ensure the survival of the patient. Several medical techniques comprising of Mammography, Magnetic Resonance Imaging, Thermography and many more are available to detect the disease. But these techniques create much stress and pain, besides employing harmful rays for detection, to the patient undergoing them. Hence for early detection other categories of techniques can be implemented. Machine- learning assisted detection and classification is one such alternative. In this paper a hyper parameter optimized extreme gradient boosting model implemented along with F-Score feature selection is proposed and the model is used for classification of the breast tumor as either malignant or benign on the Wisconsin Breast Cancer dataset. The implementation of feature importance is investigated using F-Score and this is used for selecting the most relevant features that influence the target variable and classification is based on this. Experimentation is done using different training-testing partitions and the best performance of 99.27% accuracy score was shown by the 80−20 partition by the proposed XGBoost and F-Score Model.**

***Keywords*—breast cancer, classification, extreme gradient boost, feature importance, F-score**

I. Introduction

Cancer is presently the foremost or second most contributor to premature mortality in almost all countries of the world. Considering the current trends and statistics, the incidence of all cancers combined, is presumed to double by 2070 relative to 2020 [1]. Hence it is critical that, countries instigate prevention methods and programmes through urgent action and advocacy. Study on prediction of the breast cancer burden is taken on so that a snapshot of the magnitude and distribution of the key cancer categories will be obtainable and thus will help to play a major role in the design of plans and means for supporting future Health-care Programmes. A key issue is detection of cancer at the earliest. Several medical technologies and modalities exist for detection of cancer yet, each have their own pros and cons. Availability of more hassle-free solutions will help the medical community in early diagnosis. The motivation for this study is the alarming rate at which new cancer cases are increasing worldwide [2].

Designing alternate techniques will provide additional support to the existing medical modalities. Determining the appropriate techniques and methodologies for the early detection of cancer still remains, among the scientific community, as an unresolved and open research problem [3]. State of art disciplines providing support to medical diagnosis, prediction and classification are Machine Learning (ML) [4] and Data Mining (DM). ML and DM techniques have found widespread use in the healthcare field [5, 6]. Several Machine Learning techniques are seen to be implemented and applied for disease diagnosis [7, 8]. These disciplines are part of a broader domain Artificial Intelligence (AI). AI is a ubiquitous, omnipresent and advancing technology in our present day lives. Artificial Intelligence can play a pivotal role in Oncology and in the near future it may be considered as the sixth sense for an oncologist [9].

A major concern in cancers affecting women is Breast cancer. Breast cancer is a non-communicable. predominant type of cancer in women and currently the first in incidence and mortality in almost all countries of the globe. Primarily affecting women, it is curable, and survivability can be ensured if detected at the earliest. As an assistive practice, machine learning techniques, specifically supervised learning methods, are seen to be suitable for breast cancer detection, prediction [10] and classification process [11]. Many techniques like Support Vector Machines [12], Logistic Regression [13], Artificial Neural Networks, *k*-NN [14], Decision Trees [15, 16] and many more have been applied for Breast cancer classification. These techniques have generally seen to be capable in distinguishing the benign and malignant breast tumours, Hence AI assisted techniques such as Machine Learning and Data Mining tools can constitute a technological armamentarium for medical practitioners. These techniques are capable and central in formulating clinical decision support systems.

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Microclimate monitoring system for irrigation water optimization using IoT

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ARTICLE INFO

Keywords:
IoT
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ABSTRACT

The new notion of Agri (from 'Agre', latin for Land) – Culture (latin for Cultivation) is what made the transition of human race from primitive hunter-gatherers to more civilized and ordered societies. The invention of agriculture can be regarded as a key point in the timeline and dawn of modern civilization as we know it today. With the advent of digital electronics, we are now capable of carefully device systems to make any processes more optimized and generate significantly higher output, this is also true for the agriculture sector and many works are carried out recently aimed towards this objective and even created a new domain of precision agriculture. In this research work, an IoT-based system was developed that enables the farmers to monitor various micro-climatic parameters and assess the irrigation water requirement. The soil moisture and temperature were sensed with the aid of sensors and were fed to the LoRA system, in the receiver side, data is analyzed for the estimation of evapotranspiration. The global evapotranspiration was estimated using Cropwat software. The sensor data were analyzed using Mcguinnes-Bordne formulation and the outcome of this research work paves the way towards the estimation of the evapotranspiration in the microclimate environment.

1. Introduction

The present world is characterized as the age of the fourth industrial revolution where artificial intelligence and robotic assistance are having a major role in industries as well as the daily life of a human beings. Nevertheless, India, dating back to prehistorian times up to the present world, preserves its agrarian culture. Technological advancements have created significant improvements in various fields like business and merchandise, finance, medicine, weather-calamities prediction models, education system, and communication systems. However, its contribution to agriculture as of now is comparatively less in the Indian context. The work, upon which this paper is based, attempts to optimize the amount of water to be delivered for irrigation and assists in decision-making on irrigation scheduling. Relying on the new paradigm of internet of things (IoT), the utilization of various sensor technologies is changing conventional agriculture into 'Smart Agriculture' techniques and the most noteworthy concepts in the field are briefed in the subsequent section. Many studies concerned with agriculture state that there will be an increase of 9.8 billion people by the year 2050, which increases the demand for food [1]. Each farmer is responsible for performing the sequence of actions in the field like sowing, weeding, watering, fertilizing, and finally harvesting. These manual, labour-intensive processes, consumes more time and resources. With this concern, researches over a large period of time have got evolved into a new domain of" Smart Agriculture" technology to meet today's environmental issues requirement by enhancing conventional agricultural techniques with the assistance of modern electronic technologies.

The concept of IoT is relatively new in the technological domain and there are a variety of ways in which it is conceived today. "The Internet of Things (IoT) describes the network of physical objects that are

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Adaptation of Ideal Typical Sequence Model in the Development of Modern Transportation in Kerala

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Abstract — The model by Taaffe, Morrill, and Gould in 1963 has a special significance because it deals with transport development in developing nations. The model undertook a comparative analysis of the development of transport in developing countries and they were able to show that certain broad regularities permitted a descriptive generalization of an ideal-typical sequence of transport development. They have identified six stages of transport development based on Ghana and Nigerian experiences. The same can be applied to the state of Kerala in India with the colonial past. The transport development in Kerala is deeply studied and accordingly, the Taffe model of transport development is applied. Six stages of transport development were also identified in the state. Besides the colonial occupation geographical factors like terrain condition, distribution of rivers, lagoons, and land use play important role in the transport development of Kerala. Some modifications based on the Kerala context are made in the paper. The future route of transport development and future mode of transport is also identified in stage 6.

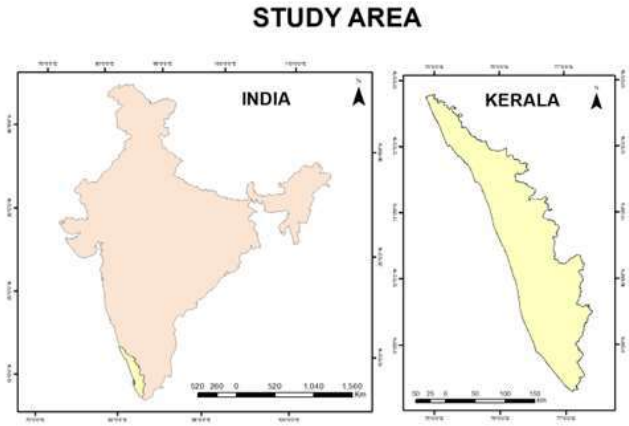
Keywords: Ideal Typical Sequence Model, Inland Waterways, Road, Railway, Transport Corridors

I. INTRODUCTION

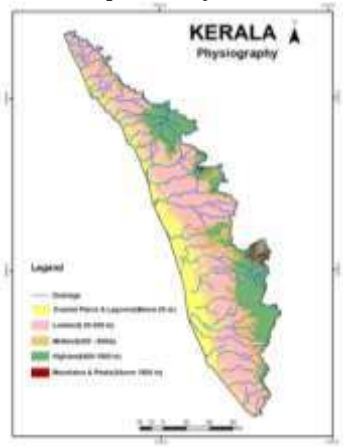
The Ideal-Typical Sequence Model was based on the conclusion that the expansion of a transport network is from its beginning a continuous process of spatial diffusion and at the same time an irregular or sporadic process influenced by many specific economic, social, or political forces. The model shows four sequences of development. The historical development of Kerala's transport system indicates variations in the spatial expansion of waterways, road, and rail transport. Kerala established international trade relations in historic times and waterways played an important role in the movement of tradable commodities from the hinterlands. This gave rise to port settlements. As the resources were distributed all through Kerala and rivers provided a direct connection between the hinterland and port, the entire operation was in decentralized mode and dominated by waterways. (Chattopadhyay S,2021). Later it was dominated by road and rail transport.

II. STUDY AREA

Kerala, the southernmost State of India lies between 8°18' and 12°48' latitude and 74°52' and 72°22' longitude. Kerala is bestowed with an expansive body of brackish waters, the different sectors which are referred to as backwaters, lagoons, estuaries, etc. From South to North, they are named as Veli, Kadinamkulam, Paravoor, Ashtamudi, Kayamkulam, Vembanad, Cranganore, Valiyangadi, Korapuzha, Valiyapaattanam and Kavvayi. This chain of backwaters is extensively connected by an extensive network of canals that facilitate the transport of people and materials. These backwaters have played a significant role in Kerala's socio-economic and cultural history. (Gopalan U.K. and et. Al, 1983). Kerala is endowed with a combination of distinct altitudinal variations, three natural regions namely, lowlands, midlands highlands, and four major rock formations namely crystallines, sedimentaries, laterites, and recent and sub recent formations. Relief distribution in Kerala is asymmetric. As much as 62% of the total geographical area is below 100 m (Chattopadhyay and Mahamaya, 1995). Backwaters excluding the canals are found either as coast-parallel or coast perpendicular in their plan form. The coast-parallel backwaters have developed due to transgression/ regression activities. Five large lakes lie parallel to the Arabian sea coast and extend half the length of the state. These lakes are linked by canals, which are fed by 38 rivers that cross the state.



Map 1: Study Area



Map 2: Kerala Physiography

III. TRANSPORT AND SPATIAL ORGANISATION

Transport is one of the most significant human activities. From a geographical viewpoint, transport plays a very substantial role both in the society and in the system of the

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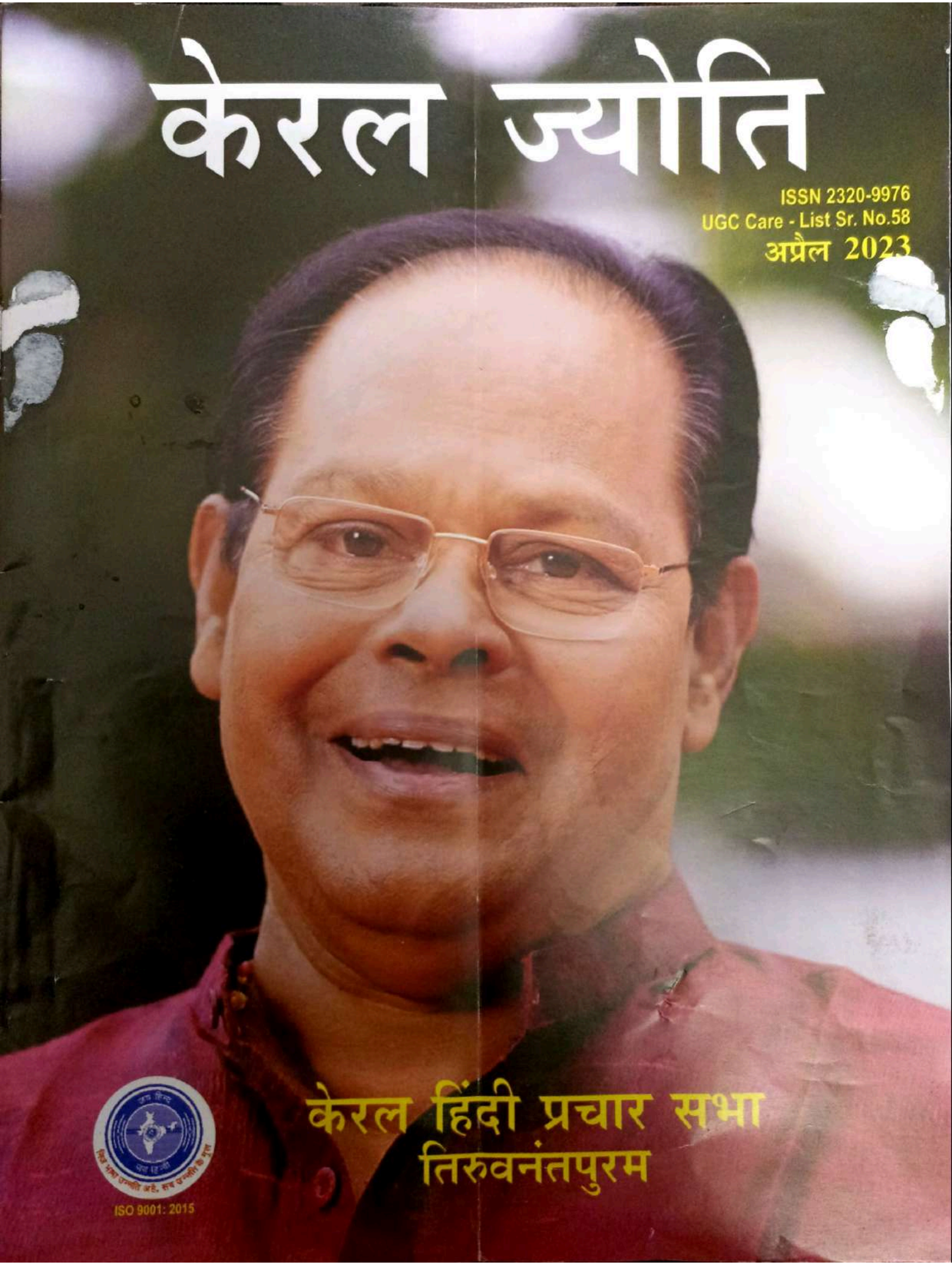

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पुष्प : 60 दल : 1 अंक: अप्रैल 2023

अनुक्रमणिका

मुखचित्र : महान अभिनेता इन्नॉसेंट

दर्शनों का समन्वय एवं दलित मुक्ति की संभावना

डॉ. प्रकाश.ए

सारांश : वर्तमान जीवन-परिस्थितियों की संकटग्रस्तता से व्यस्त और त्रस्त लोगों की संकीर्ण मानसिकता एवं संपूर्ण समस्या को समग्रता में विश्लेषितकर समाधान प्रस्तुत करने लायक एक सक्षम सैद्धांतिक पद्धति का आविष्कार अभी तक नहीं हुआ है।इसलिए भारत के हाशिएकृतों की बहुस्तरीय एवं बहुमुखी समस्याओं के निवारण के लिए सभी दर्शनों के सारतत्वों को समेटनेवाली एक विचारप्रणाली एवं क्रांतिचेतना को विकसित करना दलित साहित्यकर्मियों का ऐतिहासिक दायित्व है।

बीजशब्दः दार्शनिक पक्षधरता, अंदरूनी विरुद्धता, साकल्यवादी दृष्टि, संकल्पबद्धता

"समकालीन हिन्दी दलित कविता भाग-1" नामक संकलन में दलित साहित्य के सभी मानदंडों पर खरी उतरनेवाली कविताओं को संग्रहीत किया गया है । देवचंद्र भारती 'प्रखर द्वारा संपादित इस संकलन में पचास कवियों के सौ से अधिक कविताएँ संग्रहीत हैं जिनमें डॉ.संताराम आर्य,हरपाल सिंह 'अरुष', आर.जी.कुरील 'रसिक',मोहनदास नैमिशराय,शामलाल राही,डॉ.नीरा परमार, कँवल भारती, सुशीला टाकभौरे जैसे वरिष्ठ कवियों से लेकर बच्चालाल उन्मेष, अंजली, प्रियंका'हंस,एवं ए.के गौतम् जैसे युवा-पीढी के कवि भी शामिल हैं। प्रस्तुत संकलन के संपादकीय वक्तव्य में 'प्रखर' जी ने दलित साहित्य के भाव और शिल्प पक्ष की विशेषताओं से संबंधित अनेक बातों पर प्रकाश डाला है। प्रस्तुत संकलन में संग्रहीत कविताओं के पूर्वाग्रह से मुक्त तटस्थतापूर्ण अध्ययन से विदित होता है कि ये कविताएँ अम्बेद्करी विचार धाराओं से प्रेरित होकर वर्णाश्रमधर्मी ताकतों के विरुद्ध आवाज़ बुलंद करनेवाली जज़्बाती नारे ही नहीं, बल्कि प्रत्येक रचनाकारों की विचारधारात्मक-अस्तित्व को घोषित करनेवाले राजनैतिक चिंतन-मनन की सर्जनात्मक परिणतियाँ भी हैं। समूचे दलितों के सामजिक-राजनैतिक जीवन संघर्ष के साथ आत्म-संबद्धता प्रकट करनेवाली इन कविताओं की खासियत का विश्लेषण निम्नांकित उपशीर्षकों में सकता है।

अस्तित्वों की खोज और दार्शनिक पक्षधरता

मानव अपने भौतिक अस्तित्व और भावनात्मक अस्तित्व के बीच के संघर्ष को स्वयं झेलते हुए अपनी उपस्थिति को प्रमाणित करने के उपलक्ष्य में जिस बौद्धिक एवं वैचारिक न्याय का सहारा लेते है उसे विचारधारा की संज्ञा दे सकता है। अस्तित्ववान होने का अर्थ है प्रामाणिक ज़िन्दगी जीना- यानी अपने चुनाव और निर्णय की जिन्दगी जीना। दूसरों द्वारा निर्धारित मार्ग का अनुसरण अप्रामाणिक है। (पृष्ठ-18,आधुनिक हिन्दी आलोचना के बीज शब्द ; बच्चन सिंह)दलित साहित्य के बैनर के पीछे पंक्तिबद्ध होकर खड़े कवियों की सृजनात्मक पद्धति में आम्बेदकरी विचारधारा का प्रभाव होना एक ज़रूरी शर्त है।लेकिन मुक्ति-संग्राम के मार्ग में ये रचनाकार अपने जन्माजात वैशिष्ट्य एवं परिवेशगत दबावों के कारण किसी न किसी अन्य विचारप्रणाली से भी प्रभावित होते हैं-यह एक 'प्राकृतिक विधि है या नैसर्गिक न्याय की सहजता की बात है, क्योंकि भारत के दलितों की समस्याएँ बहुमुखी एवं बहुस्तरीय भी हैं। 'विचारप्रणाली' -विचारों और दृष्टिकोण की एक पद्धति है जिसके तहत लोग वास्तविकता तथा अपने पारस्परिक सम्बन्धों को पहचानते और सामाजिक समस्याओं और संघर्षों का मूल्यांकन करते हैं ।इसके माध्यम से एक दी हुई सामाजिक व्यवस्था को क्रम देने या बदलने का एक सामाजिक कार्यक्रम भी तैयार किया जाता है। (पृष्ठ-106,आधुनिक हिन्दी आलोचना के बीज शब्द:बच्चन सिंह) प्रस्तुत संकलन की कुछ कविताओं के अध्ययन से विदित होता है कि ये कवि एक समतामूलक समाज के निर्माण के लिए कटिबद्ध होकर उद्पीडित दलित-समाज से आत्म-संबद्धता प्रकट करते हुए, अपनी जीवन-परिस्थितियों की संकीर्णता की आलोचना एवं मूल्यांकन कर रहे हैं। उनकी रचनाधर्मिता में अंतर्भूत दार्शनिक-पक्षधरता को रूपायित करने में इन दो तथ्यों की अपनी भूमिका भी होती है कि निजी जीवन-परिस्थितियों की संकट-ग्रस्तता से उद्भूत स्वानुभूति की तीव्रता और उद्पीडितों को शोषणयुक्त

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जनवरी 2024

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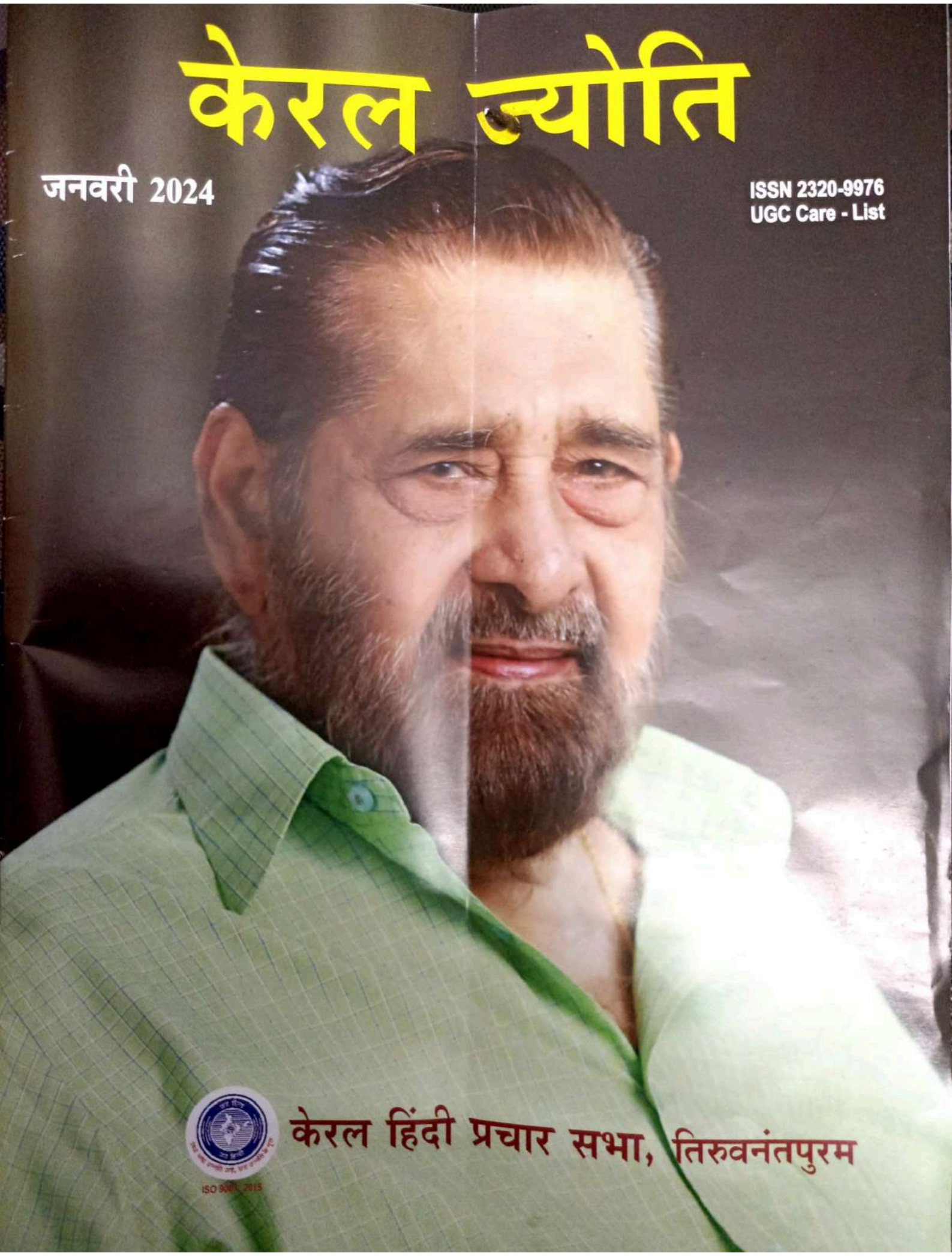

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की मुख पत्रिका
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वित्तीय सहायता से प्रकाशित)

सूचना : लेखकों द्वारा प्रकट किये गये मत उनके अपने हैं। उनसे संपादक का सहमत होना आवश्यक नहीं।

पुष्प : 60 दल : 10 अंक: **जनवरी 2024**

अनुक्रमणिका

मुखचित्र : विश्वविख्यात अभिनेता पद्मश्री मधु

'नरसिंह कथा' में प्रतीकात्मक युगचेतना

डॉ. प्रकाश.ए

सारंश: जनवादी साहित्य एक स्तर पर जनता की कर्मठता और संघर्षशीलता से प्रेरणा लेता है,दूसरे स्तर पर जनता को शिक्षित तथा जाग्रत करते हुए उसके आकांक्षित जीवन को समग्र चित्रमयता तथा पैनेपन के साथ प्रस्तुत भी करता है। अपने इस व्यापक और पुष्ट जनाधारित रचना-धर्मिता के कारण जानवादी-साहित्य किसी भी समय तथा किसी भी युग में शोषक शासक वर्ग के समक्ष चुनौती बन जाता है।

मूलशब्दः प्रतीकात्मकता,अधिनायकवाद, स्वेच्छाचारिता, रचना-धर्मिता, पक्षधरता

डॉ.लक्ष्मीनारायण लाल एक रंगचेता समर्पित नाटककार है, आपकी 'नरसिंह कथा' नामक जनवादी नाटक पौराणिक कथा को प्रतिपाद्य विषय बनाकर प्रतीकात्मक ढंग से आधुनिक संदर्भ में लोकतांत्रिक मूल्यों के संरक्षण के लिए जनता को प्रेरणा देता है। मानवसभ्यता के क्रमिक विकास में शासक और शासितों के बीच के मतभेद की शुरुआत तब से हुई होगी जब से शासन व्यवस्था की स्थापना हुई होगी। शासन या सत्ता के विरुद्ध जो लोग खड़े होते हैं वे हमेशा जनता के पक्ष में रहेंगे। कहने का तात्पर्य यह है कि भारत के कुछ जनवादी नाटककार भारतीय शासन-तंत्र से पहले से ही असंतृप्त थे उन्होंने आपातकाल के दौरान और उसके बाद भी जनता के साथ खडे होकर सत्ता के मुखौटे को भी बेनकाब करने में ज़रा भी विमुखता नहीं दिखाई। श्री लक्ष्मीनारायण लाल ने देश के तद्युगीन राजनीतिक संकट की प्रतीकात्मक अभिव्यक्ति के लिए 'नरसिंह कथा' नाटक की रचना सन् 1975 में की थी। प्रतीकों के प्रयोग द्वारा सामान्य बात में भी कवि, विशिष्ट अर्थगौरव का समावेश कर देते हैं। प्रतीकों के प्रयोग से सूक्ष्म एवं विशिष्ट अनुभूतियों को सहज और ग्राह्य बना दिया जाता है। (हिंदी आलोचना की पारिभाषिक शब्दावली; डॉ.अमर्नाथ ;पृष्ठ-230) यह नाटक रंगभूमि पर प्रस्तुत होने से पूर्व ही प्रकाशित हो गया और आपातकाल के दौरान इसके प्रस्तुतीकरण में रुकावट आ गया क्योंकि यह नाटक आपातकालीन राजनैतिक, सामाजिक वातावरण में मौजूद अभिव्यक्ति हीनता की स्थिति की ओर संकेत करने के साथ प्रतीकात्मक ढंग से तानाशाही सत्ता के शासन के रवैये को उद्घाटित भी करता है।

पौराणिक कथा की प्रतीकात्मकता : 'नरसिंह कथा' नाटक के पाँच अंक होते हैं और ग्यारह पात्रों की इर्द-गिर्द में नाटक की कथावस्तु विकसित होती है। नाटक की कथावस्तु नरसिंह अवतार की वही पौराणिक कथा ही है,लेकिन आपात्काल की स्थिति में देश की शासन-व्यवस्था के स्वरूप और विविध कोनों से उभर आई सत्ताविरोधी विचारधाराओं के प्रति उनकी प्रतिक्रियाओं का परिचय लेने के लिए 'नरसिंह कथा' की कथावस्तु का सक्षिप्त परिचय देना संगत है।

हिरण्य कशिपु, प्रह्लाद, शुक्राचार्य, हुतासन और कयाधू इस नाटक के प्रमुख पात्र हैं। हिरण्यकशिपु एक अत्याचारी शासक है,वह अपने आपको ईश्वर, संपूर्ण एवं सर्वशक्तिमान समझता है । वह अपने को राज्य का पर्याय बना देना चाहता है। हिरण्यकशिपु और कयाधू का पुत्र प्रहलाद ईश्वर का परम भक्त है । प्रह्लाद आमजनता का प्रेमपात्र और स्वतंत्रता-कामी भी है। वह आम जनता के साथ खड़ा होकर न्याय और सत्य की रक्षा के लिए अपने पिता का विरोध करता है। हिरण्यकशिपु का अत्याचार बढ़ता जाता है, जनता त्राहि-त्राहि करने लगती है। हिरण्यकशिपु की तानाशाही प्रवृत्तियों एवं निरंकुश शासन से त्रस्त होकर सारी जनता प्रह्लाद के पक्ष में आ जाती है। हिरण्यकशिपु प्रह्लाद को मारने के लिए अनेक उपाय करता है हिरण्यकशिपु की बहन होलिका, जिसे एक वरदान प्राप्त था कि वह आग में जल नहीं सकती है, प्रह्लाद को लेकर आग में बैठती है, परंतु प्रह्लाद बच जाता है। प्रह्लाद को मारने के लिए भेजी गयी विषकन्या भी अंत में प्रह्लाद का पक्ष लेती है और राजा के सारे करतूतों को अहितकारी कहती है। राजनर्तकी होने पर भी यह विषकन्या प्रह्लाद के सामने भक्तिभाव से झुक जाती है। प्रहलाद की माँ कयाधू और गुप्तचर विभाग का आला अफसर- वज्रदंत वे दोनों

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Surface adsorption of adenine on pristine and B/N/O/P-doped coronene as a biosensing substrate for DNA detection- DFT study

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ABSTRACT

Nucleobase detection is crucial for the exploration of specific nucleotide sequences. Inspired by the recent realization of two dimensional nanomaterials as DNA detectors as well as sensors, the interactions of pristine and B/N/O/P-doped coronenes with adenine nucleobase have been studied on the basis of Density Functional Theory. Optimal configurations, the corresponding adsorption energies, charge transfer and electrical properties have been calculated for each complex. The adsorption strength and charge transfer in doped coronene have been found larger than that in the pristine coronene. AIM-RDG study suggests that non-covalent interactions existing in the associated interactive region are responsible for the stability of the complexes. The change in electrical conductivity of coronenes after the adsorption indicates its sensitivity towards DNA bases. The predicted energy gap and the prolonged recovery time for adenine-coronene configurations imply that pristine/doped coronene has potential applications in DNA detection.

1. Introduction

Guanine and Adenine are two important purine nucleic acid bases of fundamental biochemical importance [1]. Alterations in these two nucleic acid bases weaken or mutate immune system, which can lead to a number of diseases including cancer, epilepsy, Parkinsonism, AIDS and liver disorders [2]. In the field of biomolecular analysis and disease diagnosis, detection of deoxyribonucleic acid (DNA) and ribonucleic acid (RNA) has great importance, since the detection of nucleic acids is crucial for the exploration of specific nucleotide sequences, the early diagnosis of a diseased state and the monitoring of its treatment [3]. Even though several analytical techniques such as fluorescence [4], gas chromatography [5], capillary zone electrophoresis [6] and infrared reflection absorption spectroscopy [7] have been developed for the detection of DNA or RNA, these methods are relatively slow. Compared to the above mentioned analytical techniques, electrochemical sensors are faster and less expensive for simple evaluation [8].

Carbon-based biosensors have been widely used due to their biocompatibility and low cost [9,10]. With the recent advances in nanotechnology, ultrahigh sensitive and specific detection of nucleic acids are possible with the help of two dimensional nanomaterials based bioassays [11], which have unique electronic, optical and mechanical properties [12,13]. From the previously reported studies, it has been understood that single nucleobase molecule detection using pure 2D nanomaterials has its own limitations. A large number of studies were carried out by modifying graphene surfaces to improve graphene sheet's sensitivity towards biomolecules [14–17]. One of the most practical ways to alter the characteristics of graphene is heteroatom doping [18]. It has been reported that structural and electronic properties of carbon-based 2D nanomaterials are significantly improved by doping with

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RESEARCH ARTICLE

Polymer COMPOSITES WILEY

Construction of a percolation zone for electrostatic discharge in EPDM/CB composites: A comprehensive mechanism to attain the optimum physico-mechanical properties

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Abstract

Electrostatic discharge (ESD) is a critical issue in the automobile industry. ESD can occur due to the rubbing of dissimilar materials, potentially damaging sensitive components. Automakers must use ESD protection to safeguard the reliability of the components. In this scenario, the automotive industries demand for suitable materials to address this problem. The present study focuses on the development of EPDM rubber composites with low-volume resistivity and optimized physico-mechanical properties, which are the vital parameters to be addressed in electrostatic discharge for automotive applications. EPDM rubber composites were cured by sulfur and peroxide with a special-grade conductive carbon black (CB). These composites were analyzed by Fourier Transform Infrared Spectroscopy (FTIR), Thermo gravimetric analysis (TGA), and Differential Scanning Calorimetry (DSC). The dispersion of conductive CB in the polymer matrix was examined using scanning electron microscopy (SEM) and transmission electron microscopy (TEM). The BET adsorption technique was employed to investigate the specific surface area and porosity of CB. The ESD behavior of the composites was evaluated by measuring the volume resistivity(ASTM D257). The Studies reveal that the developed material has moderate physico-mechanical properties and consistent thermal stability. Above all, the conductivity offered by the composite is adequate for ESD applications.

Highlights

- Developed sulfur-cured EPDM rubber composite with low-volume resistivity.
- Peroxide cured EPDM rubber has higher thermal stability than sulfur-cured one.
- Carbon black (CB) with a high surface area can easily form a conductive network.
- A good conductive network is formed at the percolation zone.
- The hardness of the EPDM composite increases with the loading of CB.

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RESEARCH ARTICLE

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Construction of a rough surface in EPDM/CB composite through peroxide curing: A mechanism for optimizing physico-mechanical properties in automotive paint-compatible applications

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Abstract

This study investigates the profound impact of vulcanization methods on ethylene–propylene–diene monomer (EPDM) composites, with a particular focus on elucidating significant findings and achievements. Exploring eight composites, including sulfur and peroxide-cured variations, we conducted an in-depth evaluation of the crucial physico-mechanical properties of the composites. The study extends to encompass the effects of vulcanization on heat aging parameters, providing a comprehensive understanding of the materials' resilience. Utilizing thermogravimetric analysis, differential scanning calorimetry, and Fourier transform infrared spectroscopy, our research delves into the processes, revealing critical insights into the thermal behavior and composition of the composites. Paint compatibility, a pivotal aspect in automotive applications, was rigorously examined through four different test methods. Surface morphology, investigated through scanning electron microscopy and atomic force microscopy, yielded valuable findings on the role of vulcanization in shaping surface roughness and enhancing paint compatibility. Additionally, the quantitative measurement of surface energy using the sessile drop method provided a deeper understanding of the adhesion properties. The findings distinctly underscore the superiority of peroxide-cured composites, marking a significant stride toward their potential to revolutionize automotive applications. This research not only contributes to the knowledge base but also sets a foundation for advancements in EPDM composite materials, positioning them as key players in driving innovation within the automotive industry.

Highlights

- Developed a peroxide-cured EPDM rubber composite with a rough surface.
- A rough surface is more paint-compatible than a smooth surface.
- The roughness of peroxide-cured EPDM is greater than that of sulfur-cured one.
- Peroxide curing introduces more polar functional groups and cross-links.
- Peroxide-cured EPDM has higher thermal stability than sulfur-cured EPDM.

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RESEARCH ARTICLE

Classical and Bayesian Estimation of the Vitality and Geometric Vitality Function of Pareto Distribution.

Parvathy Sobhanan[1] · **E. I. Abdul Sathar**[1]

Accepted: 18 May 2023

Abstract
In the present article, we consider classical and Bayesian estimations of some survival time parameters, the vitality, and geometric vitality function of the Pareto distribution. We obtained the Maximum Likelihood estimator and Uniform Minimum Variance Unbiased Estimator in the classical setup and studied their properties. We also carry out Bayesian estimation procedures based on symmetric and asymmetric loss functions. The precision of the estimators is obtained under different sample sizes via Monte Carlo simulation. In addition, the estimators are obtained for an actual data also.

Keywords Pareto distribution · Vitality function · Geometric vitality function · Squared error loss function · Entropy loss function · Lindely's approximation

1 Introduction

The vitality function (VF) is a handy tool in modeling lifespan data. The hazard rate reflects lifetime risk of sudden death, while VF provides a more direct measure to describe the failure pattern. If X is a non-negative random variable with an absolutely continuous distribution function F and a probability density function f, then its VF is defined as,

$$v(t) = E(X|X \geq t). \tag{1}$$

As the threshold value t increases, the VF decreases, which means that the average life expectancy of components whose age exceeds t decreases. VF is closely

Parvathy Sobhanan and E. I. Abdul Sathar have contributed equally to this work.

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A Conceptual Framework for Cloud Load Balancing of data in Remote Health Monitoring Systems

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Abstract. Cloud load balancing is essential for improving the efficiency and dependability of remote health monitoring systems. Remote health monitoring systems have become essential in today's interconnected society since they allow for the monitoring and enhancement of healthcare results. These systems consistently gather and send an extensive quantity of data from diverse sensors and devices, such as wearables and IoT devices, to healthcare practitioners or centralized databases for analysis and decision-making. Cloud load balancing is the process of evenly distributing incoming data traffic among different resources or servers in a cloud environment. Monitoring devices manage the large volumes of data processed and acquired by sophisticated medical sensors, while simultaneously ensuring performance factors such as throughput and latency. Load balancing is utilized to effectively manage large amounts of data through the use of centralized and distributed methods. Through the integration of cloud load balancing into remote health monitoring systems, healthcare organizations can guarantee the efficient distribution of data processing and analysis across numerous servers. This prevents any single server from becoming overwhelmed, thereby ensuring the system's high availability and responsiveness. Furthermore, cloud load balancing helps optimize the utilization of computing resources, ensuring that each server handles an appropriate amount of workload. This not only improves the performance and response time of the system but also enhances scalability, allowing the system to handle increasing data loads with more patients and devices. Hence, it is necessary to allocate the burden of the intelligent operational devices to avoid any possible lack of response. This study presents a cloud-based framework that aims to equally divide the burden among fog nodes. The system is designed to cater to the communication and processing requirements of intelligent real-time applications.

Keywords: Cloud, Data Traffic, Healthcare, Load Balancing, Remote Health Monitoring

1. Introduction

Cloud load balancing is applicable in remote health monitoring systems to distribute the burden among different servers in the cloud [1]. This can aid in guaranteeing that the system is capable of managing the influx of traffic and demand that accompanies the monitoring of substantial quantities of patients from a distance. An effective approach to incorporate cloud load balancing into remote health monitoring systems is by utilizing a load balancer service offered by prominent cloud providers like Amazon Web Services (AWS) or Google Cloud Platform (GCP). These services commonly include functionalities like automatic scaling, traffic routing, and health checks to guarantee that the burden is evenly and efficiently spread among the available resources. While dealing with sensitive health data, it is crucial to consider security and regulatory factors while choosing a cloud provider and implementing load balancing [2].

Load balancing is essential in the Internet of Things (IoT) for several reasons. Firstly, it significantly enhances system performance by evenly distributing network traffic among several devices. This solution alleviates traffic congestion and ensures timely access to essential healthcare apps and services for users at all times. Moreover, load balancing enhances system dependability by reducing the susceptibilities associated with isolated instances of failure. In the event of a device failure, traffic may be seamlessly redirected to alternative devices, ensuring uninterrupted service delivery. Moreover, load balancing plays a vital role in improving security measures [2]. By employing load-balancing techniques to distribute network traffic over numerous devices, the concentration of prospective attackers on a single device is significantly hindered, hence reducing the probability of unauthorized access and safeguarding vital data [3]. Moreover, load balancing optimizes resource utilization by efficiently managing the allocation of traffic, therefore averting the risk of any individual device experiencing excessive workload. Consequently, there are financial benefits and improved capacity to

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Forecasting and Analyzing Crime Data Using Prophet, Auto – Arima and Holt – Winters

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ABSTRACT

Crimes are growing rapidly day by day. Proper crime analysis and forecasting is needed to identify those crimes. Crime analysis is the analysis of crime patterns and trends. It also helps in the research and planning required for the functioning of tactical units and administrative services. Crime forecasting is a unique ability to forecast future crimes, up to years in the future, to increase prevention efforts and locate resources in more heavily affected locales. It can help to prevent recurring crimes in an area by identifying the patterns of crimes committed in the past or identifying the most common types of crime. Machine learning plays a major role in forecasting crime data in a very efficient manner nowadays.

Keywords: Auto ARIMA, Crime Forecasting, Holt – winters exponential smoothing method, Prophet.

INTRODUCTION

Crime analysis refers to the set of systematic, analytical processes that provide timely, pertinent information about crime patterns and crime trend correlations. Crime is classically unpredictable. It is not necessarily random; neither does it take place persistently in space or time. A good theoretical understanding is needed to provide practical crime prevention solutions that are equivalent to specific places and times. Crime analysis takes past crime data to predict future crime locations and time. Crime prediction for future crime is a process that finds out crime rate change from one year to the next and projects those changes into the future [2, 4].

The prime objective of crime analysis is to apprehend criminals. The next objective is the prevention or curtailment of crime. The third is to reduce disorder in society. The last objective is to help in the creation and evaluation of organizational procedures. Dealing with the crime is a major concern for many government organizations. They are using different advanced technology to tackle such issues.

Machine learning techniques are widely used for analyzing and forecasting data. Machine learning is a technique in which computers make decisions without any human intervention. It has been applied to many fields like self-driving cars, speech recognition, web search and an improved understanding of the human genome. Machine learning based crime analysis usually involves data collection, classification, pattern identification, prediction and visualization. The machine learning methods can be used for classification and forecasting on time series problems.

This paper deals with applying the most popular time series models- Auto-ARIMA, Holt-Winters and Prophet Model for forecasting the crime data in Vancouver and has performed a comparison of these methods using their calculated error value.

PROPOSED METHODOLOGY

This work is implemented on Jupyter Notebook platform using Python language. The data is collected from the Kaggle website and the dataset used is the Crime in Vancouver and it contains 530652 records from 2003-01-01 to 2017-07-13. Each entry has 12 featured attributes and they are- Type, Year, Month, Day, Hour, Minute, Hundred_Block, Neighborhood, X, Y, Latitude and Longitude. From these attributes, the DATE is parsed using:

pharmaceuticals

MDPI

Review

Peptide Vaccines as Therapeutic and Prophylactic Agents for Female-Specific Cancers: The Current Landscape

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Abstract: Breast and gynecologic cancers are significant global threats to women's health and those living with the disease require lifelong physical, financial, and social support from their families, healthcare providers, and society as a whole. Cancer vaccines offer a promising means of inducing long-lasting immune response against the disease. Among various types of cancer vaccines available, peptide vaccines offer an effective strategy to elicit specific anti-tumor immune responses. Peptide vaccines have been developed based on tumor associated antigens (TAAs) and tumor specific neoantigens which can also be of viral origin. Molecular alterations in HER2 and non-HER2 genes are established to be involved in the pathogenesis of female-specific cancers and hence were exploited for the development of peptide vaccines against these diseases, most of which are in the latter stages of clinical trials. However, prophylactic vaccines for viral induced cancers, especially those against Human Papillomavirus (HPV) infection are well established. This review discusses therapeutic and prophylactic approaches for various types of female-specific cancers such as breast cancer and gynecologic cancers with special emphasis on peptide vaccines. We also present a pipeline for the design and evaluation of a multiepitope peptide vaccine that can be active against female-specific cancers.

Keywords: female-specific cancers; peptide vaccine; HER2; non-HER2; HPV vaccine; prophylactic cancer vaccine; therapeutic cancer vaccine

1. Introduction

For many years, the gold standard in cancer treatment is conventional methods like radiation therapy, chemotherapy, and surgery [1,2]. Consistent scientific effort has resulted in the development of a number of alternative potential treatment strategies to circumvent the therapeutic limitations of the current conventional methods [2–5]. Cancer cells are unique in their ability to bypass the immune system for their survival [6]. Activating the immune system to recognize and tackle tumors is a potentially effective therapeutic strategy against cancer. Several immunotherapeutic modalities for cancer include monoclonal antibody

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Ensemble Residual Network with Iterative Randomized Hyperparameter Optimization for Colorectal Cancer Classification

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Abstract: - The analysis of WSI images is widely acknowledged as a method, for identifying stages of cancer and evaluating the spread of cancer cells in tissues. In histopathology image analysis deep learning models are gaining increasing importance. To enhance the effectiveness of these models it is crucial to train and fine-tune Convolutional Neural Network algorithms by adjusting hyperparameters like batch size, convolution depth, and learning rate (LR). However, determining the hyperparameters can be challenging as they significantly impact model performance. This study examines how hyperparameters influence cancer classification, in histopathology images using the CNN architecture. A method called iterative randomized hyperparameter optimization is proposed, which gradually reduces variations over time by adjusting parameters after each network layer. The combination of hyperparameters is applied to version 1 of ResNet18, ResNet50, and ResNet101 models and version 2 of ResNet50, ResNet101, and ResNet151. The results are then combined using the Adaptive Boosting algorithm. The results are quite promising on ensemble version 1 residual networks, achieving an accuracy of 98.7% when tested on nine tissue classes.

Keywords: Adaptive boosting, Deep learning, Ensemble, Hyperparameters, Optimization, Residual network.

I. INTRODUCTION

Colorectal Carcinoma is a prevalent form of cancer, its composition undergoes significant changes as the disease progresses [1]. It is therefore crucial to identify the various tissues that exist with tumor cells during a pathological colonoscopy examination. In this work, multiresolution techniques using deep learning are employed on Whole-Slide Images (WSI) of CRC tissue. Histological images, also known as Whole-Slide Images (WSI), provide microscopic views of tissue structures. Pathologists typically examine stained samples on slides using a microscope. Hematoxylin-eosin staining is commonly employed to enhance the visualization of specific tissue components. Once the tissue is converted into a digital image, a Whole Slide Image is generated. With advancements in computing capability as well as the modern image processing models, deep learning models for image processing have rapidly progressed [2]. The usage of digital image histopathology, enabled by modern slide scanners, has become increasingly relevant in tumor diagnosis. Li et al. in [3] recently provided an overview related to diagnosis options for histopathological image classification, using deep learning models. Deep learning has significantly impacted the diagnosis as well as the treatment of histopathological classification. Colorectal cancer, in particular, has witnessed a surge in scientific publications due to the adoption of algorithms based on deep learning. However, despite its potential to yield drastic changes in results, the adjusting of hyperparameters in Deep Learning has received limited attention, as evident from [3]. Batch size, learning rate, and convolution depth are crucial hyperparameters in training deep neural networks, and govern the extent of model adjustments with each update of model weights in response to estimated errors. Selecting an appropriate batch size, learning rate, convolution depth, etc. is challenging since a too-small value can prolong the training process or lead to stagnation, while a too-high value can result in suboptimal weight sets learned too quickly. Although there have been various contributions to hyperparameter optimization, this still remains an open research problem that heavily depends on the nature of the data and the problem being addressed in [4-6]. In most classification systems studies related to histopathological images for diagnosing colorectal cancer highlighted in [7-8], deep learning models are typically employed with default parameters, without conducting a detailed analysis of hyperparameter influence on system behavior.

This paper introduces a framework, for optimizing hyperparameters as well as ensemble the residual network in the Whole Slide Image (WSI) image classification system specifically focusing on the network. The research emphasizes the importance of selecting hyperparameters to improve accuracy. By conducting experiments, the paper compares the performance of Residual Networks version 1 and 2 using optimized hyperparameter combinations for

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Solvent effects and Raman enhancement during the adsorption of atrazine on pristine Ag, Au, Cu and mixed clusters

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ABSTRACT

Investigation of the adsorption properties of a herbicide, atrazine (6-chloro-4-*N*-ethyl-2-*N*-propan-2-yl-1,3,5-triazine-2,4-diamine) (CPD) with Ag, Au, Cu and their mixed clusters are presented using density functional theory (DFT) analysis. With metal clusters, it is found that CPD forms stable clusters, the drug-cluster complexation energy is maximum in CPD-Au_2Cu (−38.69 and −45.79 kcal/mol) in vacuum and aqueous phase in comparison with other clusters. Dipole moment of the CPD-metal systems is higher than that of CPD. Clustering of CPD with metal cages enhances the Raman signals due to surface enhanced Raman scattering (SERS) activity. The exothermic processes and fluctuations in entropy during the processes were altered for all clusters as a result of CPD adsorption to the cages, indicating a change to a more ordered structure. Wavefunction based analysis indicated that there are significant non-covalent interactions (NCIs) between the system and the metal clusters.

1. Introduction

To satisfy the demands of agricultural productivity, the use of pesticides and herbicides is rising yearly. They are a significant source of environment deterioration that directly affects the water supply before it reaches people [1]. Herbicidal pollutants need to be properly mitigated because of their harmful effects on the environment and people. This has been acknowledged for many years as a major issue in many nations [2]. It is classified as a symmetric triazine and has reasonably good water solubility [3]. They are frequently used in lawns and are used to prevent the grassy weeds in important crops including maize, sugarcane, and corn. With an average use of 70,000 to 90,000 tons/year in 1980s, it is a very efficient and affordable herbicide. It is typically utilized in the US at 20,000–35,000 tons per year, while in China at 2700 tons by early [4]. They have a half life from 4 to 50 weeks and are extremely persistent in the environment. CPD degrades slowly than others because triazine ring impede microbial digestion. It is rather mobile and moved in ground water as a result of its lower values of partition coefficients. Thus, it is one of the most contentious herbicides since it contaminates environment [5].

Due to atrazine's widespread and unavoidable presence in surface and ground water, the European Union prohibited it in 2003. However, the majority of nations, like the United States, India, and China, still utilize it extensively. In the United States, the maximum allowable concentration of atrazine (CPD) in drinking water is 3 ppb, whereas in the European Union, it is just 0.1 ppb [6]. Atrazine is an endocrine disruptor that alters the balance of hormones, interfering with human growth, development, and reproduction. It causes reversible photosynthetic inhibition, bio-accumulates less, is somewhat stable, and breaks down into abiotic and biotic components extremely slowly [7]. It is possible to treat water using conventional procedure however atrazine cannot be removed from the water using these methods. Many techniques have been used to remove CPD from water, including adsorption and nano-filtering [8]. In chemical sciences, density functional theory (DFT) computation has had a significant impact [9]. Surprisingly, recent developments have made it possible to do DFT calculations of chemical characteristics not only efficiently but also frequently with accuracy levels that are comparable to those of high-level wave function

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