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Abstract of Accepted Papers

A Deep Learning-based Approach with Image-driven Active Contour Loss for Medical Image Segmentation

Minh-Nhat Trinh, Nhu-Toan Nguyen, Thi-Thao Tran and Van-Truong Pham

Hanoi University of Science and Technology, Viet Nam

Abstract. Medical image segmentation based on deep learning techniques has been more and more prevalent in recent years. The primary reasons lead to success of those methods are radical techniques in improving deep learning model or global loss functional such as Cross Entropy (CE), Dice loss. However, it is still a challenging problem because medical images are normally affected by complex noises, intensity inhomogeneity, or occlusion. To effectively solve those issues, utilizing local image information for segmentation is demonstrated as the potential way. Therefore, in this paper, we propose a new region-based loss functional based on level set method and extend to the case of multiphase segmentation. It allows our deep learning model to train end-to-end and also segment multiclass simultaneously with high accuracy instead of binary segmentation. Our proposed method is evaluated on 2017 ACDCA dataset and 2018 ISIC Challenge dataset. The experiments illustrate that our new loss functional achieves the promising results in term of Dice coefficient and Jaccard index. This highlights the efficiency of our approach in multiclass segmentation for medical images.

Comparative Analysis of Semantic Segmentation by using Deep Learning Models on Retinal Vessel

Twinkle Tiwari and Mukesh Saraswat

Jaypee Institute of Information Technology, Noida

Abstract. Retina vessel segmentation plays an important role in the field of clinical imaging for the detection of ophthalmologic and cardiovascular diseases like hypertension, glaucoma, diabetic retinopathy, and choroidal neovascularization. Automatic segmentation of the retina blood vessel results in earlier detection of these diseases which helps in early treatment. Various deep learning models have been proposed for the semantic segmentation of the images. In this paper, five efficient and popular deep learning models have been trained and tested for the purpose of semantic segmentation. These five models are U-Net, ENet, SegNet, U-Net with ResNet34, and U-Net with ResNet18. The models have been compared on three vital parameters of segmentation, namely IoU-Score, Accuracy, and Loss functions. During training ENet performs better but suffers from the problem of overfitting during testing and validation phase. U-Net with ResNet 34 has outperformed during testing, achieving 96.4% accuracy and 89.75% IoU-Score.
Literature Review on Land Area Calculation of Land Maps in Land Surveying Using Deep Learning

Akram Pathan and Nagaraj Dharwadkar

Rajarambapu Institute of Technology, Sangli, Maharashtra, India

Abstract.
There is a land survey office for each taluka and district, where all land records of the specific region are stored. These records are in the form of maps, papers and nowadays in digital format available. Maps of the land are developed by surveyor, officer or map developer person on the paper. This map development work is now going towards the digital phase but still old physical formats have major demand. In such maps land boundaries shown using property line, also land division work, or may be some changes after real estate transaction. So, the area of land is also mentioned in the maps to valuation of property. Using image recognition and image processing, this process may be completed faster than before. As well as it decreases the complexity of the work. Users just have to capture the image of the map in front of the camera and after processing the system will show the result that is the area of land. This is applicable in City Survey offices, Municipality and in private survey sectors. There is no such system till date available in surveying offices. So, implementation of this and usage of this may be the advantage to the surveyor, officers in the civil field.

Data Mining Approach for Predicting the Status of Water Pumps

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¹Bennett University, India
²Sri Ramakrishna Engineering College, India

Abstract.
As water is an essential resource of life and available in limited quantity on our planet, it is important for us to estimate the available man-made sources of drinking water and their condition for maintenance purpose in future. Data Mining can be used to find the patterns or correlations among the fields in large databases to get valuable information. In this research work, Data Mining has been used to find the patterns in the dataset provided by the Tanzanian Ministry of water and to predict the status of the water pumps in Tanzania. The study implements the Random Forest Classifier (RFC) which is a type of ‘Bagging’ ensemble model that leverages a collection of several Decision Trees in the model. The random forest classifier outperformed the other methods and gives the best result when applied with Recursive Feature Elimination and Cross-Validated (RFECV) feature selection method to select the best features. The Random Forest Classifier with RFECV has 80.90% accuracy. The outcome of the research can be useful for the Tanzanian authorities to make data-backed decisions while significantly reducing the cost of
the overall project by reducing the expense on manual inspection of every water pump for the project. The data can be used by the operators for inspection, maintenance, or planning of future water pumps.

Detect Image Malware Steganography Using Deep Transfer Learning Model

Iyas Alodat¹ and Mohammad Alodat²

¹Jerash University, Jerash, Jordan
²Sur College University, Sur, Oman

Abstract. The malware would offer the attacker or an un-legitimate user to access the device without authorization as a legitimate user. In this paper, we will discuss how malware hides inside images which can transfer between computers in the background of any system. Also, we will discuss how deep transfer learning will detect malware that hides under images. Lastly, we will make a comparison between deep transfer’s models to detect malware in images. We also conclude which model is the best to use in the system to detect malware.

QoS Parameter Analysis of TCP and UDP Traffic over Open flow Enabled Software Defined Network

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¹Chouksey Engineering College Bilaspur, India
²International Institute of Information Technology, Naya Raipur, India

Abstract. Software Defined Network (SDN) is a network architecture which is used to improve the control and flexibility of the network. It separates the control plane which is used to manage the network and the Data plane in which the data flows. In recent scenario SDN is majorly used in cloud computing environment, enterprise data centres etc. because it offers flexible, dynamic and programmable functionality of network system. This paper provides an implementation, analysis and evaluation of the QoS Parameters of SDN traffic produced from host to the target based on the TCP and UDP flow. We have considered the packet level arrival of the TCP and UDP packets. The controllers have been run in centralized manner and the performance measuring parameters like throughput, jitter, packet loss and delay have been evaluated for both TCP and UDP. Mininet is used as emulator to build the infrastructure and DIT-G is used as traffic generator tool.
The Challenges of Data Analytics Implementations: A Preliminary Literature Review

Sunet Eybers, Milica Milicevic

University of Pretoria, South Africa

Abstract. Data analytics projects have brought countless benefits and solutions to the world. As a result, many organizations have attempted to adopt data analytics in order to reap the benefits of these implementations and move forward with projects that involve big data or data science. However, research has shown that more than 50% of these projects fail – either due to incomplete projects or lacking expected business value. Data analytics is often perceived as a complex concept due to the focus on big data, which is characterized by large, disaggregated volumes of data, velocity, and the variety of data (to name a few). The objective of this study was to identify the challenges associated with data analytics projects being implemented. The contribution lies in the fact that, if organisations can identify potential challenges, precautions can be made to diminish the chance possible pitfalls, therefore improving chances of successful project implementation. A Systematic Literature Review was done in order to identify academic publications relating to selected search terms, followed by a thematic analysis on the search results to identify challenges associated with data analytics projects. The major, most prevalent challenges identified included poor data quality, lack of management support, and miscommunication.

In depth opinion mining and sentiment analysis of Twitter data

Eashan Sharma, Aryan Gaur and Shefali Singhal

Manav Rachna international institute of Research and studies, India

Abstract. In today’s high-tech world opinion mining and sentiment analysis has become a major topic which is growing day by day and is utilized in many real-world applications. Nowadays instead of gathering feedback from friends and family for purchasing a specific item, we determine the opinions of various Individuals across the world by micro blogging data. A very popular social media platform where we can express our opinions and interact with other people is twitter. The tweets posted on twitter based on their emotional content can be categorized into positive, negative or irrelevant with the help of various classifying algorithms. In this paper we train a sentiment classifier which can help us in accomplishing various tasks.
An Extensive Review on: Low Noise Amplifier for Millimeter and Radio Frequency Waves

Nitin Agarwal, Manish Gupta and Manish Kumar

Department of Electronics and Communication Engineering GLA University Mathura, India

Abstract. In today’s world, radio receiver system is a prevailing wireless technology in that the major part is Low Noise Amplifier (LNA) which widely used to improve weak signals in many applications with millimetre and radio frequency waves such as optical communication, multimode transceivers and measurement instrumentations. The real drawbacks of LNA is that it fails to maintain specific properties in critical conditions like as minimum power consumption, provide low noise figure, input matching and linearity. Additionally, promoted by various application demands, design methods and control methods must require to improve performance of LNA. The performance of LNA can be improved by adding extra components in basic circuit by proper arrangement for millimetre and radio frequency waves. The review paper provides information about design methodology, optimization techniques and control techniques. The different design of LNA is reviewed and analysed such as 3-stage near-mm Wave LNA, 5-stage near-mm Wave LNA, common-gate amplifier, shunt-feedback amplifier, Resistor-terminated common-source amplifier, Traditional inductor-less amplifiers, cascode connection and double common source. This review paper also provides the information about design circuit diagram. The performance improvement of LNA can be achieved with the help of different techniques and our review based on optimization and control techniques with parameter tuning. Finally, the direction for the future study is presented based on review analysis of LNA.

LNA Topologies for UWB applications and bird eye view on high frequency LNA applications

Archana Archana, Manish Kumar and Aasheesh Shukla

GLA University, Mathura, India

Abstract. This paper presents a review on different available low noise amplifier (LNA) topologies for ultrawide band and other higher frequency band (K-band, E-band, W-band) applications. The design metric of LNA is gain, noise figure (NF), linearity, bandwidth, chip area and power dissipation with broadband wide band input impedance matching. To optimize the performance of LNA trade-off exists with different topologies. This paper gives a insight to optimize the LNA design metric for different topology and a bird eye view for a very high frequency ranges. In this paper, Noise Figure (NF), band width, power dissipation, supply voltage, S_21 and other design metric is used to compare all LNA parameters.
Semantic Tree Structured Representation for Visual Question Answering System
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Abstract. Visual Question Answering (VQA) System is a multi-discipline research task in the domain of Natural Language Processing. An image and a textual query are given as input to the VQA system. It tries to find the correct answer by combining the visual elements of the image and inference collected from input textual queries. It is essential to interpret and retrieve the accurate answers from the visual reasoning queries. Recent studies have made use of parse tree construction on input queries which lead to poor performance due to lack of semantic interpretation. This work is proposed to achieve comprehensive reasoning by following a semantic representation of the parsed tree construction. The proposed model, semantic tree based Visual Question Answering system (STVQA) captures the local visual evidence of each word parsed from the textual query and combines the visual evidence of its child nodes. The result obtained is transported to the parent nodes in the parse tree. Thus, the STVQA proposed system aims to fulfil global reasoning interpretation from the image and textual query. The VQA system is applicable to various domains such as Image Retrieval System, Surveillance and hence act as an aid for visually impaired people. The STVQA system is explored on a publicly available benchmark challenging dataset: Clever. It is shown that the model is computationally-efficient and data-efficient and achieving a new state-of-the-art 90% accuracy.

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Generating Data for Real World Time Series Application with GRU based Conditional GAN

Priyanshi Khare, Rajesh Wadhvani, Manasi Gyanchandani and Banalaxmi Brahma
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Abstract. The access to sufficient amount of data has always challenged researchers to productively effectuate their solutions. One of the promising solution can be generation of data using Generative Adversarial Networks (GAN). This paper is focused on generating realistic data for different time series applications using GAN. The approach adopted here uses GRU based GAN with conditional input for data generation. The data generated using GAN can contribute in the formation of larger datasets. The time component plays a major role in forecasting in various domains so it is crucial to target data related to time series. The competence of the data generated has been judged by using it to train the most prominent time series forecasting models and then testing it using real data. The Linear regression model, ARIMA model and GRU based forecasting model are chosen for carrying out the experiment. The similarity between the actual data and generated data is also demonstrated using Wilcoxon signed-rank test as the datasets used here are non-parametric. The experimentation has been executed on three real world datasets from different domains.

COVID-19 Detection using Radiography images based on Transfer Learning with DenseNet

Abhinav Shubham and Rashmi Sinha
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Abstract. COVID-19 spread has now nearly come to a halt, despite of daily increase in positive cases in India. It has deeply affected daily lives, public health, and the economy of the whole world. A vital step in tackling COVID-19 is a successful screening of infected patients as soon as possible and treating them. There is a need for supplementary diagnostic tools apart from RT-PCR, which is easy to use and less contagious. Significant findings have proven that Chest X-rays (CXR) in combination with Deep Learning algorithms for Images, like pre-trained CNNs are vital in finding features that are related to COVID-19. Using pre-trained networks, so called Transfer Learning can extract features from CXR images which can help detect COVID presence. In this work, CXR images were analysed using one of the advanced CNN architectures, DenseNet201 using MATLAB. This architecture is 201 layers deep, capable to classify into 1000 classes. The last layers have been modified so that DenseNet201 can be used to properly predict COVID+VE and COVID-VE CXR images.
Ocean Wave Modeling from Satellite images using Data Assimilation

Sai Pravallika M, Naga Varun B, Vasavi S, Sandeep N, Jaya Priya M and Sashikanth Sarma A

VR Siddhartha Engineering College, India

Abstract. Due to wave-induced problems such as surface currents and buoyancy, internal ocean waves, especially large non-linear ones, may have a major effect on ship and submarine operations. Thus, a predictive system is needed by the navy will determine the potential effects of internal waves in their area. Data assimilation is a process in which information from multiple sources are typically or entirely interpreted and adapted. Numerical prediction models are frequently used in weather forecasts for estimating future conditions of the atmosphere, which depend on exact initial state. The consideration is that because of the methodology or other factors, the actual conditions of model mostly differ from the observation. Therefore, data assimilation is considered initially to be a process in which the data observed are interpreted and processed and correspond to certain space and time distributions, so that the initial fields for numerical predictions are as accurate as possible. The data assimilation methods include function fitting, the stepwise correction, the optimal interpolation, the variability method, and the ensemble Kalman filtering. Although various methods of data assimilation are listed, statistical and mathematical analysis is ultimately used to find the final solution for such methods. This paper proposes a system to model ocean waves using image processing and data assimilation techniques.

Design of a Laser Projection System for Intelligent Learning Environments

Svetozar Ilchev, Alexander Alexandrov and Zlatoliliya Ilcheva

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Abstract. In this paper, the design and implementation of a laser projection system for use in intelligent learning environments is presented. Such a system has the advantages of drawing interesting, bright and vivid laser animations, which draw the attention of students better than most standard display technologies. In addition, the projection may be done on actual physical items standing in front of the students, which opens up many possibilities for gamification and augmented reality use cases in education. Besides the hardware of the laser projection system and the associated firmware, we also designed, created and tested our own desk-top software that optimizes and prepares the data for projection. Our goal is to enable the creation of high-quality laser animations while reducing the time and efforts needed by teachers to prepare them. Our experimental results show that our concept has good potential
and that the hardware and firmware of the system perform very well. Our data optimization strategies implemented through the desktop software also gave excellent results. This means that intelligent learning environments may employ laser animations successfully and let students benefit from this new approach to presenting information.

Medical Image Enhancement: A Review

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Abstract. Medical imaging modalities plays a crucial part in the process of medical diagnosis. The medical images such as X-ray, CT (Computed Tomography), MRI (Magnetic Resonance Imaging) need to undergo the enhancement process which aids the medical specialists for the precise identification of illness in the patients. The enhancement techniques are worked on these medical images to improve the visual display for clear medical examining. Cardiac disease is one of the major health problems affecting the people globally. Cardiac Magnetic Resonance (CMR) imaging modality lead to early detection of the cardiac related ailments in the patients. Hence it is needed to enhance these CMR images for the precise diagnosis by the medical experts. This paper explores the variety of enhancement methods to betterment the contrast, suppress the noise, enhance the edges and to retain the naturalness of the medical images. The paper also reviews the enhancement techniques implemented in both spatial domain and frequency domain. Review and analysis of these techniques pave way for making decision to find the optimal algorithm suitable for enhancing the medical images.

A Computer Vision Approach Towards Maturity Stage Classification of Tomatoes Using Second Order Wavelet Features

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\textsuperscript{3}Electronics Engineering, Jadavpur University, India

Abstract. Computer vision is a popular surveillance mechanism in food and agro industries for its non-destructive nature. In this work a computer vision framework has been presented for maturity stage-wise classification of tomatoes. The results have been presented with two different species for three stages of maturity based on ripening. The wavelet transformation coefficients up to third level decomposition
along with the auto regressive (AR) model coefficients obtained by Burge and Piyuler models have been used as the features. The PCA and K-means clustering have been used to analyse the separability between the classes. Two classifiers i.e., BPMLP trained ANN and multiclass SVM have been explored in this work. Results show that more than 95% classification accuracy can be achieved with presented method. Based on the performance, the presented model can be considered as a possible addition to the existing methods.

**Issues in Machine Learning Testing**

**Swati Jain and Dr Shyam Sunder Pandeya**

Dayananda Sagar University, India

Abstract. Quality and reliability are two most important terms in any software development which can be assured only by software testing. It is an important part of the Software Development Life cycle. Testing is required to determine efficiency and capabilities of a software. Due to high quality needs, testing has become a huge challenge in product development. It needs to be handled with efficient approach and techniques in both pre and post development. Effective software testing can be described as detecting more defects with a small number of test cases. Most of the testing processes are expensive and very complex if done manually, so to avoid it researchers proposed a method to automate software testing. There are traditional systems which uses a set of fixed steps to perform software testing using code but now an ad hoc approach is growing interest which use data for software testing known as machine learning (ML). ML algorithms have provided important core functionality to support solutions in many scientific computing applications. There has been a rapidly growing interest in applying ML to automate various software testing processes. This ML testing is also having its own challenges. The findings reveal various issues and challenges in this phase of product development. In ML, there are various algorithms used for test-case generation, refinement, and evaluation. In this paper we are comparing ML systems and conventional systems. Further, this paper highlights few prominent challenges of ML algorithms.

**Unsupervised Sentiment classification for hotel review rating using LSTM autoencoder**

**Ratnakanth G and Poonkuzhali S**

Rajalakshmi Engienering College, Chennai, India

Abstract. In the era of artificial intelligence, research problems belong to many diverse fields is provided with the optimized solution. In this regard, recently Tourism industry too seeks tremendous attention to sat- isfy their needs through data analytics approach. One of the significant smart tourism demands is giving preference or response to the online user ratings. In this work, hotel online reviews are considered for sentiment classification to identify positive and negative reviews in the provided dataset. This objective is achieved by the implementation of LSTM
autoencoder or Text autoencoder in an unsupervised way. The proposed model is trained and evaluated using the dataset of 51,500 customer reviews of the hotels across the region of Europe. The performance of the deep learning technique is measured in terms of various quality metrics such as accuracy, precision, recall and F1-Score.

Vigorous deep learning models for identifying tomato leaf diseases

Rajeev Karothia and Manju K Chattopadhyay

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Abstract. Identifying and detecting a plant disease is a prime challenge in the farming segment. Specifically, for tomato farming: Early Blight, Late Blight, Mosaic Virus, Target Spot, Yellow Leaf Curl Virus (YLCV), Bacterial Spot, Leaf mold, Septoria leaf spot, and Two-spotted spider mite are nine general diseases that severely affect the yield. In this work, we propose convolutional neural networks (CNNs) based Deep learning model for the tomato leaf diseases identification. In our study, we take the Tomato Leaf Disease Dataset (TLDD) consisting of 18160 images of the infected and the healthy tomato leaves from PlantVillage. We first selected the most appropriate and accurate DL models for disease identification experiments. Four popular models viz. SqueezeNet, ResNet50, InceptionV3, and DenseNet are chosen for the analysis. Lastly, using ImageAI library on Google Colaboratory (Colab), we have trained all four models on the collected tomato-leaf-image dataset to identify the presence of above mentioned nine common tomato leaf diseases. Results from our experiments on the comparative study of the selected deep learning models identify nine different tomato leaf diseases. Thus, we infer that the InceptionV3 model provides the highest accuracy of 99.64%. Our chosen model provides faster detection with higher accuracy as compared to the other models. In future work, we intend to modify the algorithm to develop our own model for disease identification for other crops as well.

Comparative micro blogging news analysis on the COVID-19 pandemic scenario

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2Islamic University, Bangladesh

3Prime University, Bangladesh

Abstract. The coronavirus outbreak (COVID-19) was followed by a significant
number of false and unreliable content, particularly on a social media forum like Twitter, Facebook, or news portal. The Covid 19 pandemic has triggered havoc all over the planet, but the propagation of false news, termed rumor, correlates with this global fatal pandemic. The dissemination of rumors on social networking sites is quicker than the spreading of Corona Virus among people and may have heavy harmful health implications in a tragedy like COVID-19. This is compounded even during a pandemic. Therefore, such rumors may be described as a major concern for our social life. Fake news can be classified and not published on social media in order to shield users from these rumors. We tried to build a model in this paper to filter false news of Twitter. Towards this purpose, experimental evaluation on eight different machine learning models like Support Vector Machine, and different deep learning models like glove embedding or lstm on the Twitter dataset of 8560 tweets to distinguish false news regarding Covid-19 is conducted. We also employed context learning and summarization of the dataset. This research (fake news identification) allows people to get solid information and recognize those spread rumors.

**Sentiment Analysis of Real-Time Breast Cancer tweets using Hadoop Eco System**

Anu Barathi B U and Poonkuzhali S Rajalakshmi Engineering College, India

Abstract. In the context of Web 2.0, people often share their perspectives, reviews, articles, and other popular knowledge with social media. They exchange knowledge about the film reviews, enthusiastic sharing about restaurants, sports discussions, or general health issues. The speed and accessibility of communication are greater than ever due to social media sites such as Facebook, Instagram, Twitter, Whatsapp, Snapchat, and many more, where thousands of websites, millions of tweets, and billions of emails are entered every day. Among all these social media sites, Twitter is one of them that is gaining high visibility every day. It offers a simple and effective way to evaluate topics relevant to several domains that are used to establish sentiment analysis. Even though Twitter has a massive amount of data, storage and the analysis of this data is a complicated task. Hadoop is massive data storage and processing tool for analyzing with large volume, variety, and velocity. In this proposed work, we are ultimately exploring the sentiments of twitter’s breast cancer tweets by integrating them into the Big Data platform. Apache Flume was used to collect tweets in real-time. The study will be carried out using Hadoop ecosystem methods such as Apache Hive and its queries to provide sentiment data based on the groups that have identified in the Hive Query Language (HQL). We also classified the sentiment analysis into three categories, such as tweets of positive, neutral, and negative comments.
Analysis of Indian Estuarine Data of Flora & Fauna
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²West Bengal Biodiversity Board, India

Abstract. Estuaries represent the transitional ecosystem between freshwater and marine environment. Being dominated by both kinds of aquatic realms, it offers one of the most diverse ecosystems. However, Indian estuaries need a more exhaustive survey for the proper management of the wetlands as the estuarine ecological niche of flora and fauna is at risk. Mainly anthropogenic movements including trading, industrial as well as recreational activities, are the underlying reasons behind the deteriorating estuarine ecosystem and biodiversity. Comprehending the importance of the estuarine ecosystem, this article is concentrating on the Indian estuarine data analysis of flora & fauna and reveals an efficient use of data mining tool for retrieving information from such kind of analysis.

Automatic distress analysis using Text Mining
Ayushi Asthana and Prajakta Soman

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Abstract. Depression or Distress is a serious health condition that is being addressed worldwide. It is possible to find if a person is distressed on the basis of his speech, particularly the words spoken. In this paper, the authors have used Simple Linear SVM algorithm to detect if a participant is distressed or not. They have also developed a chatbot to interview the participants. The model is trained on Distress Analysis Interview Corpus Wizard of Oz, published by USC University of Southern California. This system can be used widely by local Indian Clinics as well, since the analysis depends on text spoken.

Prediction of student’s performance in an academic using data science and machine learning
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Abstract. The field of Data Science is drastically expanding with new possibilities and reaches into every field and industry. With the change in the digital transformation around the world, data science is used to enhance the services and methods for the analysis of the huge amount of data to make the better decision. It
is used to predict the data to solve the existing problems. This study shows the application of data science for understanding student’s skills and performance in engineering education. Most of the engineering students choose the engineering by chance not by choice hence it is needed to figure out their activities to understand their interest in the engineering education so that it can be predict to analyze their mental state. This study has taken the set of data set on the different parameters and tried to find out reasons behind their poor performance in the academic.

**Forecasting and Analysis of NPA of Banks: Study on Indian Banks**

*Jatin Singh, Saransh Garg and Aman Kalra*

Delhi Technological University, India

Abstract. The study examines the data for 10 Public Sector Union (PSU) banks and 9 Private commercial banks (PCBs) in India with 17 specific financial ratios of individual banks and 3 global variables which together, reflect operating capability, solvency, liquidity, profitability, capital adequacy and business developmental capacity aspects across Indian banks that affect non-performing assets (NPAs) for ten years (2010 to 2020). All PSUs and PCBs were clubbed together to formulate Public Sector Banking System and Private Sector Banking Sector, respectively. Exploratory data analysis using Correlation Heat Map, Scatter plots and Feature importance using Gini impurity coefficients. A thorough analysis of the importance of each parameter was discussed, along with recommendations. 10 most significant parameters were then used to model and predict NNPA using Generalized Additive Model. Furthermore, a unique statistical study about NPA awareness in India was carried in the scope of the research paper. The implications and its significance were further highlighted. Python and R were extensively used to compute the model coefficients and compare them with other models. Finally, NNPA values for the year 2021 were predicted for all 19 banks which reflects the sorry state of the Indian economy and its possible future implication.

**An efficient Local Binary Pattern texture descriptor method for quick detection of COVID-19 using a deep learning algorithm**

*Prerna Saurabh and Rajkumar Soundrapandiyan*

Vellore Institute of Technology, India

Abstract. This study has proposed An efficient Local Binary Pattern (LBP) texture descriptor method for quick detection of COVID-19 using a deep learning algorithm. The texture analysis had become an intensive approach for research since the 1960s due to their distinctive characteristics and low computational complexity. LBP showed significant efficacy in the texture classification and segmentation
compared to state of the art. In this paper, the network-based convolution neural network or CNN architectures are used. CNN is pre-trained on the ImageNet and trained end-to-end using LBP featured x-ray images to detect COVID-19. The experiment involved four-class classification models, such as Vgg16, and Resnet50V2, Xception; InceptionResnetV2 gave the best promising result. These images have been trained using the proposed LBP model and have achieved 91.7%, 93.85%, 97.6%, 97.7% for Vgg16, Resnet50V2, Xception, InceptionResnetV2, respectively over 50 epochs and a batch size of 10.

Performance Enhancement by Tuning Hyperparameters of Random Forest Classifier for Hardware Trojan Detection

Matli Nishanth Reddy, Latchmana Kumar M R, Pusarla Bhaskara Sai Kumar, Thirumalai S and Nirmala Devi M
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Abstract. Security threats are a huge concern in our world as technology advances every day. As the proliferation of IoT devices is observable across various wide range of applications, it becomes necessary to ensure the hardware security in these devices to build a secure infrastructure. Especially, products designed from IC market are prone to potential threats in the form of hardware trojans, as outsourcing of components increases. As most of the smart devices possess IC as an integral part, it becomes necessary to detect hardware trojans before the product reaches the market to ensure customer safety as well as company’s reputation. We utilize machine learning algorithms like Random Forest classifier, AdaBoost classifier and Gradient Boosting classifier to detect hardware trojans. For which, we utilize features extracted from gate-level netlists to train the models. We obtain improved performance metrics by tuning hyperparameters of the models. We make a comparative study over the performance of several algorithms. We propose decision fusion in order to further enhance the detection of hardware trojans.

Low Complexity Hybrid Beamforming Technique for Massive MIMO System

Rajpreet Singh and Paras Chawla
Chandigarh University, India

Abstract. Hybrid beamforming for massive MIMO systems is considered as fundamental backbone to enhance system capacity of 5th generation communication systems to meet the increasing demands of data traffic in near future. The conventional fully digital beamforming used for MIMO systems can provide optimal performance for massive MIMO systems also, but it becomes impractical for implementation due to high power consumption, high cost and complexity
involved. The prominent state of art hybrid beamforming techniques in the existing literature produces near optimal performance but these also suffer from high computational complexity. In this paper, a comparatively low complexity technique is proposed which produces near optimal performance in terms of spectral efficiency as well as avoids nested loop architecture used by most state of art algorithms. The proposed technique needs less computational resources, which in turn results faster processing, lower cost and lower power consumption and makes it more suitable for practical implementation.

**Short-Term Solar Irradiance Forecasting using Long Short Term Memory Variants**

Anindita Das Bhattacharjee\(^1\) and Ashes Roy Chowdhury\(^2\)

\(^1\)Swami Vivekananda Institute of Science and Technology, India

\(^2\)Capgemini Technology Services, India

Abstract. Efficient Solar irradiance forecasting influences consistent operation and better planning to yield revenue-generative means for Photovoltaic (PV) installer. Solar irradiance-based applications and their functional ability profoundly reliant on Ir-regular variations of Solar irradiance. Accurate prediction of Solar power output needs precise forecasting of one of the critical factor Solar irradiance. In this work, variants of Long Short-Term Memory (LSTM) are used in Global Horizontal Irradiance (GHI) (W/m\(^2\)) forecasting. Variants of LSTM with Stateless Stacked (LS-I), and MLP-Autoencoder (HLS-I) are designed and verified on Benchmark data (Source: National Renewable Energy Laboratory (Denver, Colorado)).

Correlation analysis is performed for suitable auxiliary feature selection. We observe enhanced performance of LS-I and HLS-I with R score 0.971 and 0.970 respectively, better than traditional LSTM (0.962) and LSTM-MLP (0.964) on lag hour-12. HLS-I shows better precision values on RMSE for complicated weather conditions (Cloudy and Partially Cloudy) than LS-I in most of the cases. Number of critical days is proven to be different for two successive (May, June) months. Hence, clustering based weather classification becomes necessary, for better model evaluation on unknown test observations. In addition, clearness-index is used to identify the weather types and threshold ranges of observed climatic dissimilarity.

**A Highly Efficient and Broadband Doherty Power Amplifier Design for 5G Base Station**

Sukhpreet Singh and Paras Chawla

Chandigarh University, India

Abstract. In this paper, the design of high efficiency and broadband Doherty power amplifier (DPA) with an optimized broadband matching network is presented which fulfills the demand of next-generation base station communication systems for
wideband coverage. The proposed DPA is designed using CGH40010 GaN HEMT transistor provided by CREE which shows the saturated output power greater than 42.7 dBm in the 3.4 to 4.2 GHz frequency range. Additionally, the saturated drain efficiency of DPA is between 67 -78% and 6 dB back-off efficiency is above 41.5% within the entire bandwidth of operation with an average gain of 10.5 dB.

A Time-Dependent SEIRD Model for Forecasting the Transmission Dynamics in Infectious Diseases: COVID-19

Taarak Rapolu, Brahmani Nutakki, Sobha Rani T and Durga Bhavani S

University of Hyderabad, India

Abstract. The spread of a disease caused by a virus can happen through human-to-human contact or could be from the environment. Many mathematical models extend the standard SIR model to capture disease spread and estimate the infections, recoveries, and fatalities that may result from the disease. An estimation is crucial to make policy decisions and plan for the medical emergencies that may arise. Many epidemiological models are being used to make such an estimation. One major factor that is important in the forecasts using the models is the dynamic nature of the disease spread. Unless we can come up with a way of estimating the parameters that guide this dynamic spread, the models may not give accurate forecasts. The main principle is to keep the model generic while making minimal assumptions. In this work, we have derived a data-driven model from SEIRD, where we attempt to forecast Infected, Recovered and Deceased rates of COVID-19 for the next 21 days. A method for estimating the dynamic change in the parameters of the model is the crucial contribution of this work. The model has been tested for both India at district level and United States at the state level. The mean absolute percentage error (MAPE) obtained for predicting active/fatalities for day 7 is between 4-5%, by day 14 is about 8-10% and 12-15% for day 21. A dashboard has been developed based on the proposed model showing the predictions for active, recovered and deaths at the district level in India. We believe that these forecasts can help the governments in planning for emergencies such as ICU requirements, PPEs, hospitalizations during the spread of the infectious diseases.

Artifact removal of visual evoked potentials in Autism spectrum disorders

Priyalakshmi Sheela and Subha Puthankattil

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Abstract. Over the past few decades, Visual evoked potential (VEP) signals have evolved as an appealing and powerful tool to decipher the brain dynamics in Autism
Spectrum Disorders (ASD). But the quality of these signals is degraded due to the presence of multitudes of artifacts including powerline noise and other physiological disturbances. The physiological artifacts include Electrooculography (EOG) artifacts and interference, caused due to sweat, muscle, heart and respiratory activities. These artifacts severely obscure and hinder the subsequent analysis of these signals. This triggered copious research towards the development of an appropriate artifact removal method that can eliminate the noise components while retaining relevant information in the data. In this study, the denoising efficacy of different Total variation denoising (TVD) techniques such as Sparsity assisted signal smoothing, Moreau-enhanced TVD and Transient Artifact Reduction Algorithm (TARA) are tested on the VEP signals measured from ASD group. These signals are freed of EOG artifacts with the aid of Independent Component Analysis (ICA). To eliminate the remaining artifacts, TVD variants are employed. The quality of these methods is assessed in terms of sample entropy and signal-to-noise ratio (SNR). The simulation results exhibit TARA as a superior method compared to other versions of TVD. These results are further verified through statistical analysis. Thus, TARA is found to be the appropriate method that could be used in conjunction with ICA for denoising the VEP signals in ASD thereby highlighting its ability to preserve pertinent information.

Design and Performance Analysis of Chromatic Dispersion Compensation for 16×10Gbps DWDM Optical Transmission Systems

Rajkumar Gupta and Madan Lal Meena
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Abstract. In this paper, proposed modal evaluates the performance of 16-channels dense wavelength division multiplex (DWDM) optical transmission system through different chromatic dispersion compensation techniques. Chromatic dispersion compensation techniques confine the pulse widening effects of transmitted signal in optical fiber communication systems (OFCS). To overcome chromatic dispersion (CD) effect; Pre-compensation, Post-compensation, Symmetric-compensation and Distributed dispersion compensation techniques are modeled, evaluated and compared to examine the performance of DWDM optical transmission systems. The proposed model is designed for 16×10Gbps using return-to-zero (RZ), non-return-to-zero (NRZ), and Gaussian modulation schemes using Erbium-Doped-Fiber-Amplifier (EDFA) through a length of 180km single mode fiber (SMF) and 36km Dispersion-Compensation-Fiber (DCF) using Opti-System7.0 simulator. The performance of designed model is explored and compared in terms of eye-diagram (eye-shape), maximum quality-factor (Q-Factor) and minimum bit-error-rate (BER). It is observed that the Symmetrical-dispersion compensation having NRZ pulse-generator technique gives the best performance as chromatic dispersion compensator for proposed optical transmission systems.
COVID-19 Outbreak Prediction in the Context of Bangladesh
Md Omar Faruque, Monira Islam and Md Salah Uddin Yusuf
Khulna University of Engineering & Technology, Bangladesh

Abstract. Like many other countries, COVID-19 has become a major concern recently in Bangladesh. In this research, a robust SEIR model was developed that was not confined to S, E, I and R compartment only, but extended to Critical State (C) and Death (D) addressing all probable mutual transition between compartments as well as deployed for COVID-19 outbreak prediction regarding Bangladesh considering all possible factors such as number of available ICU beds, lockdown and unreported cases. Since Bangladesh is going through almost lock-down circumstances closing educational institution, hence this is a burning question that whether Bangladesh will get over it after end of winter i.e., from March-April or not. The re-search also analyzes this very important problem. Besides XGBoost, ADABoost, Random Forest, Decision Tree, K-neighbours and of course voting regressor with various combination of base estimators were also used to compare with developed SEIR model.

Machine Learning Approach to Classify Toxic Comments on Social Media Platforms
Sakshi Gupta, Mugdha Goel and Nisha Rathee
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Abstract. Social networking has become a significant component of life for all. With increasing accessibility to the internet, there is a huge amount of hatred and toxicity also being spread on all online platforms. People tend to post toxic comments, hiding behind anonymous identities. Therefore, it is very much required to filter out the toxicity and avoid unnecessary hate on online social media platforms so that the actual purpose of these platforms, which is to facilitate effective conversations among communities and expressing oneself freely, can be fulfilled. The research work aims to build and train various classification models namely: SVM, Logistic Regression, Naive Bayes, XGBoost and bidirectional LSTM (Long Short-Term Memory) which assist in classification of toxic comments in different sub categories. A comparative evaluation of these classification models, using two datasets is done on the basis of their accuracy. With the help of these classification models, we can prevent online harassment and abuse and create a safer environment on the internet.
Parameter estimation and early dynamics of COVID-19 disease

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Abstract. In this article, we have considered nine countries where the epidemic shows steady-state or has a rising trend and used the traditional SEIR model to estimate the parameter for COVID-19 disease. These parameters are contact rate, removal rate, basic reproduction number, initial doubling time, point of inflection, and epidemic rate. In another part of the work, we have considered five countries where the epidemic trend has not settled and used exponential smoothing technique to forecast the infected cases. The study reports a magnifiable concern for reducing the transmission rate in order to combat the disease.

Prophecy of Ground water level using Hybrid ANFIS-BBO approach

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Abstract. Accurate and reliable prediction of groundwater level (GWL) fluctuations is very significant for improving water-use efficacy and water resource management. Therefore, properly understanding potential of groundwater is crucial to ensure its sustainable usage. The groundwater system is too complex which involves several uncertain and nonlinear factors. So, in present study, potential of adaptive neuro-fuzzy inference system (ANFIS) and biogeography-based optimization (BBO) algorithm coupled with ANFIS (ANFIS-BBO) model were investigated to predict GWL in Nuapada watershed located in Odisha, India. So as to assess performance of models, root mean squared error (RMSE), coefficient of determination, and coefficient of efficiency (COE) were utilised. Values of statistical indices revealed that the robust hybrid model achieved better prediction results than simple ANFIS model. The hybrid ANFIS-BBO model proved to be appropriate in forecasting GWL fluctuations.
Optimal Storage Planning in Active Distribution Network

Considering Uncertainty of Wind Energy System

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Abstract. This paper proposes an optimal location for Battery Energy storage system (BESS) and Wind Energy System (WES) targeting to minimize the power loss of the distribution system. The penetration of Distributed Generation (DG) is greatly increased in active distribution networks (ADNs). In Distributed generation, Renewable and Non-Renewable Energy resources are used for Power Generations. Renewable DGs such as Wind, Solar, tidal, etc., are Environment friendly sources. Among all Renewable Energy sources, wind energy has more attention because it provides larger power in the distribution system. The intermittent nature of wind speed increases the risk of secure and economical operation of Distribution network. To solve this problem storage units or conventional DGs can be used. The IEEE 34-node three phase unbalanced radial distribution system is taken as a test system. The distribution power flow analysis for unbalanced radial system is simulated with DIgSILENT power factory. The optimal location for WES and BESS is determined for the three-phase unbalanced radial distribution system.

Probing the mass composition of primary cosmic rays from the effect of the geomagnetic field on EAS muons: A simulation study

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Abstract. The distribution of the muon content of highly inclined Monte Carlo cosmic ray showers is affected by the influence of Earth's geomagnetic field. It is found that the shapes of the positive and negative muon distributions get affected/modified by the influence of the Earth's geomagnetic field. Such a correlation between the earth's geomagnetic activity and the cosmic ray (CR) air shower muons is found sensitive to the primary cosmic ray mass composition.
A comparative study of firefly and BAT algorithm based Maximum Power Point Tracking for Partially Shaded Photovoltaic Systems

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Abstract. There has been tremendous increase in solar based power generation in the recent years due to the economic viability and the environment friendly nature of these systems. One of the major problems encountered with these systems is that their output is sensitive to variations in environmental conditions. Over the years several algorithms have been developed to ensure that maximum power is extracted from the panel. Conventional algorithms fail to track maximum power point (MPP) under partially shaded conditions. Hence several intelligent algorithms have been adapted to extract maximum power from the photovoltaic (PV) systems. Nature inspired algorithms mimic the behavior of biological entities in nature, which exhibit good adaptability to changing surroundings. One such algorithm is the bat algorithm which is based on the echolocation used by bats for locating their food. This paper presents the comparative study of bat algorithm with firefly and conventional Pertub and Observe algorithm for MPP tracking under partial shading conditions.

Automatic Railway Detection and Tracking Inspecting System

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Abstract. The Railway system plays an important role in India transportation. The checking of railway tracks is done regularly by the inspection team for every two days in a week. In India, about 90% of the track inspection is done with the help of manual operation. In-spite of regular inspections and maintenance schedule is done by the inspection team; there may be some defects in tracks. This paper is implemented by a robot running on the track which will detect the damage. When the damage is detected in the track and it will send the location of the place to the inspection team. The video of the damaged track will be recorded and it can be sent to the inspection team by its IP address, whenever crack is detected by GPS receiver. This crack detection information is submitted to the railway authority using GSM program. The robot will be stopped once the crack is identified and the live video transmitted to the railway authority's controlling station via Wi-Fi camera.
MLP-WOA is a Successful Algorithm for Estimating Sediment Load in Kalahandi Gauge Station, India

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Abstract. Prediction of suspended sediment load in rivers plays a significant part in managing hydraulic structures and water resources problems. The main purpose of this study is to use Multilayer Perceptron (MLP) for predicting suspended sediment load (SSL) of Kalahandi station, India. Back-propagation is the most prevalent technique to minimize errors in a MLP model. Yet, this technique has some shortcomings like becoming trapped in local minima and low convergence speed. Therefore, present study aims at applying an innovative new hybrid model integrating whale optimization algorithm (WOA) with MLP (MLP-WOA) for minimizing errors and improving prediction accuracy of simple MLP model. Quantitative performance indices co-efficient of determination ($R^2$), root mean square error (RMSE) and Willmott index (WI) were used for assessment of proposed models. Conclusive results indicate that developed hybrid model is highly effective and produces considerably better accurateness than simple model. It was also concluded that WOA algorithm can increase prediction accurateness of MLP model.

A Comparison of Cultivation Techniques NFT-I, FR and Soil: An IoT Monitoring Approach

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Abstract. This article compares the production and growth times of three types of lettuce and in three cultivation systems NFT-I, RF and soil with Worm Humus. Additionally, it describes the NFT-I cultivation system, which is a cultivation technique supported by the Internet of Things (IoT). NFT-I allows to measure and store the data of three parameters: ambient temperature, pH level and electrical conductivity; the advantage is that this system allows notifying the farmer about the current status of each variable and notifying through the social network Telegram (through bots). The methodology used was to start the planting process in the three systems on the same day, then the NFT-I system was saving data read by the sensors, and later measurements were made of the time and growth of each of the planted lettuces. The results show that this system can reduce electricity consumption by 91.6%; on the other hand, it helps farmers monitor plant growth. On the other hand,
regarding the harvest time, it can be verified that the RF system, NFT-I and land were harvested in 61, 69 and 105 days respectively, which shows that RF is the most efficient; In terms of size, the number of leaves, length and width, RF is also of better size than the NFT-I crop and soil. Finally, in these times of confinement due to the coronavirus disease (COVID-19), in which the economy has slowed, and the needs are multiple, this NFT-I system could help people create their vegetable growing system of quickly and cheaply.

**Modeling of Patterns with Spectral Data and Time-varying PSO to identify Concealed character strokes of Historical Manuscripts**

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Abstract. Digitization of palm-leaf manuscripts can be carried out either by flat-bed scanning or camera-capturing. In such digitization processes distortions due to motion blur, uneven background, low illumination, etc. are obvious. Despite the conventional photography of the manuscripts are less damaging, they do not aid to decipher the faded or unreadable text. Decomposing the articulated parts of camouflaged text regions embedded in an unstructured background is far reaching. In the present study, fragile historical manuscripts are digitized using a contact-type profilometer and the unstructured noise is eliminated by adopting Time-varying PSO. The spectral feature captured with profilometer is robust to identify the concealed strokes of the character. By partitioning the character patterns into fixed and fuzzy boundary regions, the most relevant attributes are extracted for classification. The patterns modeled with the proposed model outperformed compared to conventional approach.

**Obstructive Sleep Apnea Severity Detection Using Pan-Tomkins Algorithm and Fisher Feature Selection**

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Abstract. Obstructive Sleep apnea (OSA) is a typical rest problem brought about by strange relaxation on breathing. The seriousness of OSA can prompt numerous manifestations, for example, unexpected heart failure. Polysomnography (PSG) is the highest quality level for OSA determination. It archives numerous signs as of the patient's body intended in any event one entire evening then ascertains the Apnea-Hypopnea Index (AHI) which is quantity of apnea or hypopnea rates every time. This worth is then used to group patients into OSA seriousness levels. OSA is
an undeniably normal, constant, rest related breathing issue. OSA is described by occasional narrowing and impediment of the pharyngeal aviation route during rest. In this paper the OSA has been detected by lessening clamor in ECG chronicles, the first ECG signal was separated through a pan-Tompkins algorithm and fisher feature selection. OSA severity classification using KNN using Transfer Learning. The primary preferences of our proposed strategy incorporate simpler information securing, immediate OSA seriousness discovery, and successful element extraction without area information from the ability. The data has been collected from piconet and the simulation has been carried out using MATLAB. In this there are 92 instances available, the 72 data used for training and remaining 20 has taken into testing purpose. The outcome of the proposed method shows Accuracy98.6%, Sensitivity at 97.3%, and Specificity has achieved by 100%.

**Coalescing Image Steganography and Cryptography for Information Security**

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Abstract. Steganography is the process by which we hide a secret message within a larger text or image in such a way that the presence or contents of the hidden message are not noticeable. Cryptography is a technique of securing information by making it unreadable. The information is secured using keys so that only the intended people can understand the data, thus preventing access to any unauthorized people. Using steganography alone could expose the secret message in case of a security breach and using cryptography alone would garner unnecessary suspicion. Hence, we propose a new technique by combining the two state of art techniques to ensure an improved version of information security that will care for the requirements of security and robustness in transmitting important information over open channels.

**Shadow Detection and Removal Using Dynamic Thresholding Approach for Driverless Car**

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Abstract. Road detection is an important aspect of autonomous vehicle navigation system i.e., Driverless Car. One of the greatest challenges for vision-based road detection is the presence of shadows. Shadows can cause a significant problem in road detection since shadow boundaries may be incorrectly recognized or simply hinder the road detection process leading to a higher false rate decrease in the
amount of light rejected by a surface towards the observer. Most shadow detection and segmentation methods based on image analysis. The existing methods use recursive thresholding algorithm which is too time consuming. The proposed model considers image processing techniques such as colour conversion and thresholding. This model uses a dynamic thresholding approach which is time efficient with high accuracy rate.

Applying Variational Circuits in Deep Learning Architectures For Improving Discriminative Power of Speaker Embeddings

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Abstract. Recently, the advancement in quantum technologies has had massive impact on the development of quantum algorithms on near-term quantum devices. Variational circuits, a combination of both quantum and classical algorithms has been very useful in these advancement on near-term quantum devices. Despite these advances, most quantum applications in machine learning (deep learning) especially in transfer learning has been proof-of-concept in the qubit system and very little in the continuous-variable space but no or little application to audio data. This study applies variational circuits to practical real-life speaker data for the first time in the continuous-variable system.

Discrete Wavelet Transform based approach for Touch less Fingerprint Recognition

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Abstract. The Fingerprint based Human recognition is very much popular and commonly used approach. Currently employed fingerprint-based biometrics system are contact or touch based. Touch based systems has problems like elastic deformation, hygiene, maintenance, low contrast samples. One of alternative to this is touch less fingerprint recognition. Due to current situation of covid-19 outbreak touch less recognition is very much safe. Several researchers have carried out work in this area but still it needs improvement in performance. In Con-tactless fingerprint recognition fingerprint images are captured using cameras without any direct contact. Existing touch-based fingerprint systems are limited in performance due to variations in contrast, illumination and magnification. In case of current touch-based fingerprint system are having less efficiency in ex-traction of reliable minutiae. Proposed research work presents a touch less fingerprint recognition system. The proposed touch-less fingerprint recognition system uses fingerprint images acquired from digital camera. Proposed system employs discrete wavelet transform based
feature extraction algorithm. Finger photo features are extracted by applying wavelet decomposition using 6 different wavelet families and 26 respective wavelet family members. Hamming distance-based classifier has been used for matching of wavelet transform based features. Proposed touch less fingerprint identification system has been evaluated on Hong Kong Polytechnic University database. We have achieved better results for our proposed system as FAR = 0.27, FRR= 3.91 with Genuine Accept Rate of 96.09.

A Novel method for Analyzing Best pages generated by Query term Synonym combination

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Abstract. Returning a page of relevance to a user has become a question of concern in recent times. Even a normal search engine fails to return very specific information. The other eye raising aspect is the return of too many pages. To address the problem of finding the best page a method of using synonyms of terms in the query can prove to be useful. A combination of synonyms of the terms in a query given by a user when fired to a search engine has proved to return more relevant and a smaller number of pages. The present paper concentrates on novel approaches to analyses these pages generated by combining the crossed synonyms of the query terms and sending these combinations to search engines. The pages returned when analyzed by novel techniques are fewer, more relevant and at a better ranking as compared to those returned by individual search engines.

Estimation of Ultimate Load of Shell Foundation: Neural Network model and Sensitivity Analysis

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Abstract. Geotechnical problems are complex and its underlying concepts are analysed with prior assumptions. Artificial Neural Networks (ANNs) are a form of artificial intelligence which attempt to mimic the human brain and nervous system which has shown a certain degree of success to determine the structure and parameters of the geotechnical models. ANN’s are proved effective in analysing dynamic and non-linear data especially when the underlying relationship among the data is unknown. In this study, ANN is used to estimate the ultimate load of shell foundation. To understand the relative importance of input parameters, sensitivity analysis using various methods are presented. Neural interpretation diagrams are developed to know the relation between input and output. Empirical equations are developed using the connection weight and biases of the trained ANN model with reasonable accuracy.
SecHDFS-AWS: A Novel Approach to Design Efficient and Secure Data Storage Model over HDFS Enabled Amazon Cloud

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Abstract. The term Big Data is associated to the enormous and indistinct nature of the data that get generated at a tremendous rate. In this era, data gets generated from multiple sources in various formats like, CSV, TSV, JSON, images, videos, audio, pdf, text documents etc. Most of the organizations generate terabytes or petabytes of data. Acquiring data by any organization is merely an issue, but what these organizations do with large amount of information is a decisive concern. The HDFS (Hadoop Distributed File System) is an open source, reliable and user-friendly system plays vital role in handling huge volume of generated data with least fault tolerance. The Apache Hadoop is well designed to procure and process huge data but is unable to guarantee the data security when acted solely. Thus, to ensure the same, several encryption techniques have been developed and are in developing phase that certifies the effective security of consumer’s data claiming guaranteed protection of sensitive information. This paper deals with designing of secure HDFS for efficient and secure data storage. The designed system inherits implementation of symmetric cryptographic algorithms i.e., AES, RC6, Blowfish which earns transparent end-to-end data encryption. These algorithms are tested individually, and the performance gained from all these algorithms is compared later in this paper.

A Review for Predicting the Diabetes Mellitus Using Different Techniques and Methods

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Abstract. The evaluation of computer-aided detection and diagnosis systems has become popular in all the major and important zones in the medical sciences. Early prediction of any disease required to be exact to protect human life. To achieve this goal, intelligent systems based on some techniques which are capable to learn from previous experience and are found to be an important tool for diagnosis and treatment planning of various diseases are being employed. Artificial Intelligence, Machine Learning, and Deep Learning are among the key techniques which have
fully revolutionized the whole of science and hence life. These provide efficient results to extract facts by developing the predicting models from diagnostic medical datasets along with the patient’s records. This paper provides a literature review on the prediction of the DM (Diabetes Mellitus) and accuracy rate of the algorithms basically through these techniques involving supervised, unsupervised and semi-supervised learning algorithms. This paper puts the spotlight on recent developments in the machine and deep learning methods and techniques which have made significant impacts in the prediction and diagnosis of diabetes.

COVID-19/SARS B-cell Epitope Prediction

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Abstract. The COVID-19 pandemic has hit the world hard and it poses a major challenge to an average person to go about their day to day lives. There has been a surge of cases all over the world and the rate of infection has only gone up over the last few months. To curb this high rate of infections, the governments have imposed strict lockdowns and it has become necessary to maintain social distancing. So, to build such a predictive machine learning model to cross-validate on the datasets to predict B-cell epitopes based on several attributes and help with the production of a vaccine for the Virus. (SARS-CoV-2). We combine various attributes to identify relevance to the data set and build an accurate predictive model. Our proposed methodology will enable the vaccine makers to make an effective decision on appropriate protein and peptide related to the SARS-CoV-2 virus and hence helps in the vaccine production.

Autonomous Water Quality Monitoring System Using Lorawan For Smart Cities

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Abstract. In this paper, a real-time and scalable water quality monitoring system is proposed for smart cities using Long-Range Wide Area Network (LoRaWAN). It detects water’s pH, turbidity and dissolved oxygen levels after specified time interval. The developed prototype sends the gathered information to the base station. At the base station the collected data is analysed. When the water parameters are under the limit, it will open the supply of water and the water will be supplied to homes, but if the water parameters are not within the range, an E-mail alert is sent to the authorities concerned. Then, water supply is closed and the water will be transferred for the process of filtration. The entire scenario is simulated using CupCarbon U-One 4.2 Simulator.
Interval-Valued Credibilistic Real Options Modelling under Optimism-Pessimism Level
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Abstract. Fuzzy real option analysis has advanced greatly in the last ten years, specifically, through the development of so-called fuzzy pay-off techniques. The practicality and intuitiveness of these methods allow their straightforward integration into any spreadsheet or other evaluation systems for easy applications of real options thinking to real investments and strategies in industry and to public policy. Real option valuation models are able to capture the effects of flexibility, i.e. the optionality inherent in long-term investments and policy settings, which cannot be evaluated properly, e.g. with the traditional net-present-valuation models. Fuzzy modelling is shown to account for high uncertainty and imprecision under which an expert evaluation is conducted. This paper extends the credibilistic pay-off method for real option valuation with interval-valued fuzzy numbers, IVFNs, using \(m\lambda\)-measure for the optimism-pessimism level of a decision maker. The \(m\lambda\)-measure is built on necessity and possibility measures to correspond to the optimism-pessimism of a decision maker. Real option values, ROVs, both in a crisp form and as a range, can be generated using fuzzy numbers and the \(\lambda\)-parameter. Similarly, ROVs are obtained using IVFNs. This paper presents a new credibilistic real options model, which incorporates the optimism-pessimism measure and IVFNs and compares the model outcomes to the original credibilistic real option model in a numerical merger and acquisition context.

Enhanced Bag of Features using AlexNet and Henry gas solubility optimization for Soil Image Classification
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Abstract. The automated methods for the prediction of soil quality are very important for the growth of the crops. Therefore, the advancements of these methods are the prime focus of the agricultural research. In this paper, an automated image classification method based on bag-of-features framework is presented for the classification of soil images. In the proposed method Alexnet is used in feature extraction phase and the efficiency of the codebook construction phase is improved by Henry gas solubility optimization by selection the optimal visual works. For the performance validation of the proposed classification method soil image dataset with seven classes has been considered and experimental results shows the better performance of the proposed method as compared to other considered methods. The performance is analyzed in terms of classification accuracy, sensitivity, precision,
and F1-score.

SeAbOM: Semi-Supervised Learning for Aspect based Opinion Mining

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Abstract. Opinion rich information generated by social media users plays a vital role in today's market economy. The impact exists from understanding the current fashion trend to the product failure anatomy. It helps to decide the plans for the growth of an industry. To address this issue, business analysts want a detailed aspect-based analysis of user opinion. Many researchers either tried for a supervised or unsupervised approach for the same. The literature review showed that the outcome of the state-of-the-art method is impacted by the weak structuring of the corpus. This paper illustrates the semi-supervised method to extract and summarize the aspect and sentiments associated with the user reviews. We proposed a mechanism to learn aspect related terms (ART) for the seed aspect terms (AT) from the corpus. We used the customer review dataset and SemEval Reviews-English to test the working and performance of our system. The results show that the proposed system achieves a recall of 0.88 for the review corpus.

Deep Learning Algorithm for Identification of Ear Disease

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Abstract. This era has opened up a lot of opportunities for a wide range of image analysis. Imaging techniques especially in the field of medicine have improved many folds. Providing solutions through image analysis has always been challenging. Ear disease identification using image analysis is a field where many algorithms have yet to identify. Ear and mastoid disease can easily be treated by early detection and appropriate medical care. Ear infections are painful because the inflammation and build-up of excess fluid increase pressure on the eardrum. There are a shortage of specialists and relatively low diagnostic accuracy calls for a new way of diagnostic strategy, in which deep learning may play a significant role. In this communication three major ear disease identification has been focused namely normal, myringosclerosis, earwax plug, and chronic otitis media. In this paper VGG19, architecture is used and compared with some exciting algorithms and an accuracy of 97% is obtained and is compared with other existing algorithms.
Extrapolating Z-axis data for a 2D Image on a Single Board Computer

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Abstract. As we are in the era of the Internet of Things, the importance of lightweight devices is increasing. It is expected that applications that can run on a wide range of devices have the highest appeal to customers. For this reason, a voxels-based translation from 2D to 3D representation of objects in the input image is implemented and its suitability of deployment on resource-constrained devices is analysed based on execution time on raspberry Pi 3B and Beagle Bone, considered as Single Board Computers. Our analysis showed that i) Single Board Computers are suitable alternatives to host voxels-based image reconstruction techniques ii) number of cores in the processor alters the performance of the application iii) Execution time on single board computers is comparable with regular mainstream computers.

Impact Evaluation of Deep Learning Models in the context of Plant Disease Detection

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Abstract. Automatically and accurately identifying the disease of plants is still a major challenge in the field of agriculture. Early diagnosis can control the spread of infection and ensure the healthy agriculture productions. Recognition of disease symptoms occurring on parts of the plant such as leaf, fruits, flowers and stems has been addressed by many researchers. Deep learning is a subset of machine learning has gained much popularity in the research area of plant disease detection in recent years. It works like the neural structure of the human brain and has layers with optimizers to build a reliable model to provide higher accuracy in terms of detecting the plant disease. It has self-learning technique to accommodate larger data in order to visualize symptoms and to locate disease regions in leaf, flowers, fruits and stem. This model quickly and accurately diagnoses the disease to prevent the loss and quality of agriculture produce. In this paper, the impact evaluation of various Deep Learning architecture network viz., AlexNet, GoogLeNet, VGGNet DenseNet, SqueezeNet, ResNet and MobileNet employed for plant disease was done. The DenseNet gave 99.75% and GoogLeNet resulted 98.78% average accuracies. Due to increased accuracy levels and greater efficiency, these models are currently playing a vital role for early detection and classification of plant diseases.
Analysis of a Novel Adaptive Beamforming Algorithm with Varied Inter-element Spacing for Smart Antennas

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Abstract. In this paper, the performance analysis of a Novel Normalized Leaky Variable Step Size Algorithm for smart antennas is presented. Uniform linear array antenna of 8, 12, 16, and 32 element geometric configurations with various inter-element spacing is used as experimental setups. The proposed algorithm improves the convergence rate and mitigates the interference effects by producing deeper nulls in the respective direction of interferences. To analyse the behaviour of algorithms, inter-element spacing is varied in comparison with Variable step size LMS, Leaky LMS algorithms. It is observed that varying the distance between the antenna elements produce deviations in the placement of nulls which cannot cancel out the interfering signals in the existing algorithms. No deviations are observed for the proposed method. This is most suitable for Smart antenna application.

A Novel Method for Suitable Hyper-Parameter Selection in an Accurate Convolutional Neural Network Architecture

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Abstract. The deep convolutional neural network (CNN) models are of great use in many areas and applications such as image processing and computer vision etc. The hyper-parameter optimization in the CNN architectures is essential for an efficient implementation of model on software or hardware or ‘software-hardware co-design’ platform to achieve better characteristics. In this paper we have proposed CNN architecture models trained using MNIST dataset that explores the selection of various hyper-parameters and their impact on the accuracy to achieve the hyper-parameter optimization. The work presents thorough evaluation of various hyper-parameters which offers a higher accuracy and keeps the architecture simple as compared with other published results.

Employee Attrition Prediction using Machine Learning Algorithms

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Abstract. In any corporation, if a significant number of employees leave their job with a short notice period, it may lead to a reduction in overall throughput which in turn will certainly have an impact on the turnover. Companies need to spend additional efforts in terms of time and cost to fill up the vacant position without any substantial loss to the ongoing business. To avoid these situations, we can use machine learning techniques to predict employees who are planning to leave the company with the help of some related data. One more way is to identify the features which inspire employees to leave their job. Refining such features in the company also will result in reducing the employee attrition rate of the company. In this paper, we attempted to predict employee attrition rate using the classification algorithms, Decision tree, Random Forest, K Nearest Neighbourhood, Neural Networks, eXtreme Gradient boosting and Ada-Boosting. We also have applied regularization for every algorithm to find the precise parameters to predict the employee’s attrition rate considering the HR data set from Kaggle website which consists of 35 features with 34 independent and one dependent feature which is our attrition feature with Yes/No values in it. In this paper, we are going through different steps to finally obtain an accuracy of 88% with good precision and recall values.

Heart Anomaly Classification using Convolutional Neural Network
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Abstract. A lot of people suffer from heart-related diseases. It is necessary to detect these problems in the early stages so that proper treatment can be administered to the patients. Deaths in rural India have overtaken deaths in urban India due to heart related diseases. The rural areas lack proper medical facilities and doctors and it makes the detection of heart diseases difficult. In this paper, an effective deep learning-based automatic approach for heart anomaly detection has been proposed to ease the process of heart anomaly detection. It is capable of taking heart sounds recorded through smart phones as an input. The heart sounds are pre-processed (framing, artifact removal and denoising), then converted into a Mel-spectrogram i.e. visual approach for representing the heart signal over time at different frequencies present in an oriented waveform. The Mel-spectrogram was used as image for feature extraction, and then fed to a CNN for classification. It achieved an accuracy of 93.76% to diagnose multiple heart anomalies and such technology can be integrated for heart disease screening in remote areas.
Adaptive Signal Processing Algorithm Applied to the Design of Smart Antenna in a Cellular Network Considering Phase Quantization Error

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Abstract. Smart antenna is one of the key antenna technologies used in 4G and 5G cellular communication. The basic feature of smart antenna is production of retrodirective radiation beam towards the mobile user after estimating direction of arrival (DOA) of the user signal. Smart antenna generates beam towards the user and null towards the interferer resulting huge power saving and enhancing security and adaptive signal processing algorithm is used for this purpose. In practice, due to the finite number of phase quantization levels, digital phase shifters cannot provide perfectly the desired phase, required to achieve desired beam and null directions. This error in phase shifter, known as phase quantization error, causes a severe degradation of performance of smart antenna in a cellular network. In this paper, the effects of phase quantization error on the radiation properties of smart antenna are investigated for different quantization levels using adaptive signal processing algorithm.

Explorative Study of Explainable Artificial Intelligence Techniques for Sentiment Analysis Applied for English Language

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Abstract. Sentiment analysis or opinion mining for English language is a crucial machine learning task which enables various AI applications. Different machine learning models have been optimized to achieve breakthrough performances on the sentiment analysis task. Recently, most machine learning models are going through scrutiny in the AI industry to ensure their faithfulness in their decision-making process. Artificial neural network (ANN) based models are particularly labeled as black-box models due to their lack of transparency. Various explainable artificial intelligence (XAI) techniques have been developed to explain the decision-making process of the artificial neural network-based models. In this work, we explore one pedagogical XAI technique (LIME: Local Interpretable Model-Agnostic Explanations) and one decompositional XAI technique (LRP: Layer-wise Relevance Propagation) on artificial neural network (black-box) based sentiment
analysis model and compare their performance quantitatively based on simulatibility test. The results indicate that both techniques are capable of increasing the human understanding of the black-box sentiment analysis model, thus highlighting their important role in bringing faithfulness to the model.

**Classification of brain tumor images using enhanced deep learning based methodologies**

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Abstract. Brain tumor is abnormal increase in number of cells present inside brain. The tumor can be classified into various types like Glioma, Meningioma and Pituitary based on their location and severity. If the brain tumor is detected in the early stages, it makes it easier for a patient to get proper treatment. Deep learning especially in the field of CNNs have performed really well in detecting brain tumor. In this paper, a pretrained CNN model RESNET-50 is implemented using the technique of transfer learning on the Figshare dataset. Contrast stretching and Histogram Equalization techniques separately were implemented on the input images and their performances have been compared in terms of precision and recall with similar techniques [20]. RESNET-50 with Contrast Stretching attained the highest accuracy of 99.15% for classification.

**A Combination of Decision Trees with Machine Learning Ensembles for Blood Glucose Level Predictions**

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Abstract. Type-1 diabetes (T1D) patients must closely monitor their insulin injection doses to prevent serious health complications. If one can accurately predict a patient's future blood glucose levels (BGLs), an effective regimen may be designed. Researchers have developed many patient-specific physiological and machine learning (ML) models. For example, neural networks (NNs) and long short-term memory (LSTM) networks have often been used for this task. However, less is known on how traditional ensemble and non-ensemble ML algorithms can be combined to predict BGLs. This research's primary objective is to evaluate various ensemble ML models for generalized BGL prediction, and evaluate their novel
combination with the decision tree (DCT) models. Twenty-four-hour data of 40 patients at 15-minute intervals were generated using the Automated Insulin Dosage Advisor (AIDA) simulator. Eighty percent of each patient's data were used for model training, and the remaining twenty percent of data were used for model testing. The decision tree (DCT), random forest (RF), extra trees (EXT), gradient boost (GBoost), Adaboost (ABoost), and bagging models were evaluated on the data. A new two-stage model using decision tree (DCT) and Adaboost (DCT-ABoost) was developed, where the predictions from the DCT model were fed as an extra input to the ABoost model for final BGL prediction. The results revealed that the DCT-ABoost model outperformed the traditional models (DCT, RF, EXT, GBoost, ABoost, and bagging) and other new two-stage models (DCT-EXT, DCT-Bagging, DCT-RF, and DCT-GBoost) designed in this research. This research highlights the utility of developing new multi-stage models for generalized BGL prediction of T1D patients.

Performance Enhancement of DFIG System using PSO Based Optimized PID Controller
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Abstract. This paper describes an optimized PID controller for DFIG type wind energy conversion system. Firstly, the behavior of the DFIG type wind energy conversion system, converter is discussed and its performance without controller is studies. Different MATLAB based techniques are used to purpose PID controller for the DFIG system to improve its sluggish nature. Then well-known PSO technique is used optimize the controller parameter obtained using Ziegler Nichols Technique to boost the performance characteristics of the DFIG system. The performance of the proposed technique has been certified with the MATLAB based controllers by comparing their step responses.

A comparative study of machine learning and deep learning techniques in forecasting air pollution levels
Amartya Choudhury, Asif Middya and Sarbani Roy
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Abstract. Time series forecasting has gained enormous research significance and has vast applications in the field of monitoring environmental air pollution and meteorological conditions. In this context, this work presents a comparative study of some machine learning and deep learning techniques for forecasting two air pollutants (NO2 and O3) and two meteorological parameters (relative humidity and solar radiation). The study is conducted with five well-defined models such as K-Nearest Neighbour Regression (KNN), Support Vector Regression (SVR), Hidden
Markov Models (HMM), Convolutional Neural Networks (CNN), and Long-Short Term Memory (LSTM) networks. The models are evaluated based on the real-world air pollution and meteorological data collected from the government set-up monitoring station in Kolkata, India. The Root Mean Squared Error (RMSE) and Symmetric Mean Absolute Percentage Error (SMAPE) are used as metrics for performance evaluation. The findings reflect that the methods such as SVR and KNN outperform in terms of RMSE and SMAPE values over other methods. The study also shows that HMM fails to capture the pattern in the air pollution and meteorological time series data.

**Using Deep Unsupervised Method for Stock Prediction**

**Thanh Hung Bui**

Thu Dau Mot University, Vietnam

Abstract. Nowadays with the development of stock market globally, it enables the deployment of the resources in the economy which has played a significant role in the modern society. The stock prices are driven by a variety of factors due to the supply and demand at the point in time in the market. With its advantages to process data efficiently in the wide range of sectors, deep learning is also widely used in the financial field such as: stock market prediction, optimal investment, information processing and transaction strategies. With that being said, stock market prediction is deemed to be one of the most popular and most valuable aspects in the financial sector. In this study, we propose a Generative Adversarial Network (GAN) unsupervised deep learning methodology in stock price prediction. The GAN model consists of 2 layers, Bidirectional Long Short-Term Memory (Bi-LSTM) which is used for the Discriminator and the Long Short-Term Memory (LSTM) which is used for prediction of stock prices (Generator). LSTM is based on traded stock data and produces fake data like distributed data; while the differentiation layer is designed by Bi-LSTM algorithm to differentiate real stock data and fake stock data. We did the experiment on the AMZN (Amazon) index that had a wide range of trading days and used it to forecast daily closing prices. Experimental results show that our proposed GAN method could achieve better results in predicting stock prices in comparison to many other predictive models.

**Python, A Demanding Language for Data Science**

**Pallavi Raj and Rakhi Garg**

Banaras Hindu University, India

Abstract. Now a days, data is ruling the world, in almost every second extensive amount of data are being generated by various devices. The generated data are huge and needed some approach to store and processed data so that meaningful information can be extracted. Data Science has emerged as one of the most popular field to handle the ever-growing data. Data Science is a process of collecting, cleaning, analysing and visualizing the vast amount of data in a form that can be used for further processing such as decision making, etc. In order to extract useful
information, data science requires programming language that can handle complex mathematical and statistical functions. One of such programming languages that has gained attention in recent years for data science is Python. Python is a general purpose, open-source programming language that are widely used by data scientists today. In this paper we have discussed about the features and libraries of Python that makes it one of the best programming languages for Data Science. Moreover, we have also focused on some of the limitations of Python that makes it inappropriate for certain tasks with some solutions. This paper will be beneficial for researchers working in the area of Data Science to gain insights of Python.

**Smartphone based Human Activity Pattern Identification using Unsupervised Learning**

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Abstract. To avail smart healthcare facilities, it is essential to accumulate meaningful information on a patient. Study of human activity patterns is one of the magnificent areas to accumulate such meaningful information. Supervised learning methods are widely used to classify various human activity patterns. In supervised learning, generation of training dataset is laborious and repetitive work. In this paper, to avoid this labour-intensive work, we investigate a new approach using unsupervised learning method for smartphone sensor based Human Activity Pattern Identification (HAPI). In this work, hierarchical clustering method is used to cluster similar pattern activities using in-built accelerometer and gyroscope sensors of smartphones. Experimental results using our self-collected dataset show that hierarchical clustering achieves more than 90% accuracy to identify human activity patterns without generating the training dataset manually.

**Impact of Covid-19 on Solar Industry in India**

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Abstract. COVID-19 triggered worldwide unparalleled unrest. Covid-19 hit the world economy seriously, and global GDP fell from 3.5% to 2.4% by 2020. Broad interruption of economic operation, instability in the supply chain and health issues for workers have contributed to disruptions in supply and demand in the energy industry. This time of uncertainty and future preparation is the dilemma of governments, decision makers and players in the private sector. The world's solar industry has been forecast at 130-135 GW in 2020 to add a record capacity. The pandemic has, however, led to many financial and institutional disturbances, lowering the forecasts by 20% to about 105 GW. As at 31 March 2020, India had installed approximately 37 GW of installed solar electricity, with about 5,000 MW
installed in 2020, which was almost 32% less than in the previous year. In the quarter of September, India installed 438 MW of solar capability, down 80% of 2.177 MW added during the year. 205 MW of solar power is added in June quarter. The good news is that long-term factors for the transition to energy are today much more critical than ever. Conventional energy buyers are expected to ramp up the transition to renewables. The pandemic also has stressed the organizational robustness and appropriateness of solar power as a sustainable source of electricity.

Classification of Gastrointestinal Images based on Transfer Learning and Denoising convolution Neural Networks

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Abstract. Computer-aided diagnosis systems have become a common approach in helping doctors to diagnose and recognise various diseases more quickly. Medical image classification which represents a major part of the computer-aided diagnosis process is a challenging field of research. Recently, pre-trained convolution neural networks (CNNs) along with image noise filters as a pre-processing tool have been successfully and widely used in endoscopic image classification for gastrointestinal disease detection. Herein, one of most well-known pre-trained CNNs, AlexNet, with no data augmentation and fine-tuned settings preceded by the denoising convolutional neural networks (DnCNNs) method as a pre-processing tool is proposed for endoscopic image classification to help with gastrointestinal disease detection. The denoising pre-processing stage is then combined with classification methods to carry out the eight classes of Kvasir dataset for endoscopic images. The experiment was implemented using one of the most well-known endoscopic medical images; Kvasir medical images shows that the performance evaluation of the proposed method has 90.17% classification accuracy and outperformed some of the similar state-of-the-art methods.

Multiband Reconfigurable Antenna Design with Frequency, Polarization and Pattern diversities

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Abstract. A multiband reconfigurable antenna (39X36 mm2) with frequency, polarization and pattern diversities has been proposed for wireless and future wireless applications. FR4 substrate with 3.2 mm thickness has been used for the design. The antenna exhibits linear, elliptical as well as circular polarization at various frequencies with different radiation patterns. The antenna operates in 16 different modes in multiband fashion based on the switching conditions of four PIN
**Digital Economy Financial Applications**

**Galina Panova**

MGIMO-University, Russia

Abstract. The article presents discussion on innovative transformation of financial instruments, which definitions, classification and role in the economy has remained debatable. In the face of changes in the economy under the influence of the coronavirus pandemic, the technological transformation of the business and the introduction of more stringent international regulation’s banks seek to solve a three-pronged problem: to ensure high profitability of their business while maintaining liquidity and minimizing risks. The aim of the study is to identify the conceptual apparatus and financial tools of the digital economy, as well as to solve problems and determine development prospects. Various approaches to the interpretation and regulation of digital financial assets have been analysed. Discussion issues of theoretical understanding and practical application of crypto currencies are presented. The author's interpretation and classification of crypto currencies and digital currencies of central banks is proposed, and the place of the latter in the process of technological transformation of financial markets in Russia and the world is defined. Approaches to classification of crypto assets vary, but in general they can be identified mainly as private assets, which exist in the form of digital records; are not issued, guaranteed or controlled by the central bank, may perform separate functions of money and can be used for investment purposes and/or to provide access to a product or service. The modern tools of financial markets are diverse, so it is important to develop unified approaches, principles and regulations for digital financial instruments in global and national financial markets.

**Tool-supported Projects Evaluation for Decision-Making of Institutional Planning**

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Abstract. The objective of this work is to propose a tool to carry out the registration, control and monitoring of the Annual Operative Plan of the University, in order to support the management of Planning Department. The tool allows University officials to collect data on the projects to be implemented by each academic and administrative unit. It allows you to make an adequate record of the planning where resources to be included in each project are presented. An efficient system
administration and adequate control of the fulfillment of planned projects will allow the adequate execution of actions foreseen by the academic and administrative units, making an efficient use of institution resources. To support decision-making, the evaluation of projects is proposed through a set of indicators that apply fuzzy logic and artificial neural networks. Through the tool use, results of the budget execution can be made transparent in each period managed by the University. The obtained result provides a contribution to the improvement of tools to support the decision-making in organizations to projects-oriented production.

**Design and Analysis of Common Duty Ratio Controlled ISOP Connected Zeta Converter for Solar PV Water Pumping Application**

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Abstract. This work gives the design and implementation of an easy, cost effective and an advanced Zeta-Zeta converter for PV Induction Motor (IM) drive application. A Communal Duty Ratio Control (CDRC) Input Series Output Parallel (ISOP) connected Zeta-Zeta converter is used for the active input voltage and active output load current distribution. The Perturb and observe (P&O) Maximal Power Point Tracking (MPPT) algorithm is used to eliminate the potential and current sensors for switching of Zeta converters. Furthermore, it is used for the soft starting of IM’s. The Sine Pulse Width Modulation (SPWM) technique is applied here to produce the switching signals for Voltage Source Inverter (VSI). The constant head water pumps are designed to operate at constant speed without any dynamic distortions. The performance of the proposed CDRC ISOP connected Zeta-Zeta converter fed solar PV water pump system is analyzed by using MATLAB/Simulink software.

**Improved Contrast Enhancement Technique For Dark Images Using Color Channels**

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Abstract. Image enhancement is the key stage in many image processing applications. Particularly the techniques for enhancement of dark images require the in-depth decomposition of image channels. In this article an effective technique to enhance dark images captured in low light or degraded due to scattering and absorption is proposed. The proposed dark image enhancement technique relies on color correction, improved value channel and histogram equalization. The proposed method is based on five major principles. The first step is to precisely match the
colors in the visual source images (dark images). Next, in the second step, the color transformation from RGB to HSV is applied and its value (V) channel is extracted. In the third stage, adaptive enhancement is performed considering the quality of illumination and fusion is utilized to obtain enhanced channel V. In the fourth step, these channels are repeated as a single channel and histogram equalization is carried out for contrast adjustment. In the final steps, enhanced image is created by converting HSV color space into RGB color space. Experimental findings indicate that the proposed approach subjectively and objectively outperform other state-of-art methods.

Query-based Data-Valuation Strategy: An Exploratory View

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Abstract. In this era of big data, the operational & user-related data is generated in huge scales or dimensions, by user platforms, high-end algorithms and computing devices. This data is an essential 'asset' for the organization/individual for diverse analytics. The recent plethora of data raised immense challenges and opportunities to a data-driven organization. Data-valuation of potential data objects in a prodigious data/dataset is a one such co-occurring and multifaceted task, due to inherent characteristics/features of data objects and lack of a global measure or mechanism to evaluate. A data-valuation scheme assists the organizations to rank/outline or weighting the potential data objects for a computational objective. In this paper, we have explored the fundamentals aspects of the traditional data-valuation approaches to investigate the evolution of existing techniques and implicit aspects. In this process, an automated data-evaluation strategy is proposed. The strategy evaluates the values of data objects based on the assessment of user queries and ranked attributes of a target database. The key contribution of the work is its capability to evaluate the data value at the desired granularity-level, e.g., attribute-level, tuple-level, record-level, etc, on a just-in-time basis to the buyer/consumer. Each data objects will is assigned with rank values and could be adapted by several consumer/buyer. The paper also asserts the design challenges and issues for development of the similar approaches in the future.

Using Word2Vec-LDA-Cosine Similarity for Discovering News Dissemination Pattern to Support Government-Citizen Engagement

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Abstract. Evidence of ineffective government-citizen engagement was observed when the Malaysian government decided to make face masks mandatory in public spaces. It is especially critical during a Covid-19 pandemic, where public compliance depends on the speed and clarity at which regulations are announced. Hundreds of arrested cases due to violation were met with confusion and demanded for greater clarification. This evidence signifies the need of identifying if government-disseminated information is communicated effectively to the citizens through news coverage. Despite this need, current literature has limitations in effectively analyzing huge numbers of articles as they mainly employ manual intervention for data news content analysis. Furthermore, there have been no us-age of systematic text analytics approaches in government-citizen engagement study through newspapers. As such, we researched and implemented a modelling framework for discovering how news coverage pattern aligns with government-disseminated information through a case study of Covid-19 in Malaysia during the pandemic. A Word2Vec-LDA-Cosine Similarity technique was employed in our framework to determine topic similarities as the indication of alignment be-tween news content and government disseminated information. Our results show that this framework succeeds in capturing the semantics of the corpus to describe news coverage at the same times identified the challenges in general topic comparison tasks.

### Applying Linguistics and Psycholinguistics Features in Machine Learning for Fake News Classification

Colin Jingwei Lee and Hui Na Chua

Sunway University, Malaysia

Abstract. The pinnacle of technology today has allowed for fake news to be spread widely and rapidly through social media channels. The huge volumes of fake news have led to the obsoletion of slow manual fact-checking websites where they are unable to keep up with the speed in classifying fake news. The solution to this lies in automated fact-checking applications which can be auto-mated and scaled to suit the large volume of data. There are still limitations to these as readily available datasets lack multi-dimension information that can be used to increase the accuracy of predictive model performances when detecting fake news. Since the objectives of fake news writers are to sway readers’ emotions in their favor, there is a possibility that fake news articles display distinct linguistic and psycholinguistic features that affects the human brain and emotions in a certain way. Hence compared to prior studies, this paper investigates and discovers potential features that can be derived from news texts such as their linguistic and psycholinguistic features that are influential in predicting fake news. This paper is also an expansion of our previous work that used attributes derived from Twitter data to classify fake news. Classification is a supervised machine learning technique used to categorize data into predetermined classes or out-comes. In this paper, a binary classification model is used classify news articles into either one of the two outcomes: real or fake news. The machine learning model derived from this research achieved an accuracy of 98.63% in detecting fake news.
Reducing error in localization of sensor nodes in precision agriculture: An AOA based approach

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Abstract. An angle of arrival (AOA) based localization technique for precision agriculture is proposed in this paper to reduce the error in the process of location finding for obtaining higher accuracy. In the proposed error extenuating solution, the dumb nodes are localized using the positions of the two nearest beacon nodes. The Average time from beacon (ATFB) is used to select the two beacon nodes that participate in the localization. It prevents errors in the dumb nodes from propagating and accumulating throughout the network. The simulation results show that the proposed approach obtains lower localization error over existing methods.

Creating a Decentralized Communication Protocol for SMART Manufacturing Units within Industry 4.0

Gareth Gericke, Rengith Kuriakose and Herman Vermaak

Central University of Technology, South Africa

Abstract. Communication protocols drive the flow of data between machines in the manufacturing setting. The speed of data flow is one of the factors that determines the efficiency of production. With the dawn of Industry 4.0, machines are set to become mobile, flexible and intelligent beyond what it was previously. These new traits, that are set to be part of the factory setting of Industry 4.0, puts a greater emphasis on the need for creating a decentralized communication protocol for SMART manufacturing units. Studies show that the research into developing a decentralized communication protocol have been slow and lacking in key aspects which promulgate the use of existing communication protocols. This article looks at creating a decentralized protocol for a real-time application and comparing its performance with existing communication protocols along factors such as latency, error checking, real-time and decentralized operation. The article is structured such that initially, it gives an introduction to Industry 4.0 and SMART manufacturing. Secondly, the article details the case study used this study and then it looks at the methodology used in creating the decentralized protocol. Finally, the results of the study are compared with existing communication protocols.
Continuous Model for States in CSMA/CA-based Wireless Local Networks Derived from State Transition Diagrams
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Abstract. The effectiveness of wireless local area networks significantly depends on the method of access to the common physical environment. The main access method that is used today in wireless local area networks is Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA), managing the efficient distribution of the common environment between active stations. In this paper as a topic of research we consider the state transition diagram of a CSMA/CA-based network, and we describe it by a system of differential equations. Analytical expressions for the probabilities of being in one of the possible states of a network station are derived.

Representation of situations and solutions for Case Based Reasoning when managing urban infrastructure complex technological objects
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Abstract. Modern urban infrastructure systems are complex technological objects. Their stable operation is important for facilitating a comfortable and safe urban environment. These systems are supported by monitoring and quickly addressing potentially dangerous situations. Due to the high complexity and high level of responsibility of decision-making in dangerous situations, the problems of intelligent decision-making support are relevant. The article explores the use of the case-based reasoning (CBR) method for solving these problems. In CBR, the knowledge base of a decision support system contains cases: situations and solutions that are applicable in such situations. When a dangerous situation arises, the system turns to the knowledge base to search for a case with a prepared solution. For realization of the CBR method, the paper proposes an ontological model of a complex technological object. The model contains its elements, the relationships between them, and the states of the elements. On this basis, models for representing
situations and decisions are proposed. The situation is represented through the states of the elements of a complex object and the relationships between them. The solution is presented through the multivector of states, which reflects the trajectory of movement towards a set of target elementary states. For the selection of cases in the knowledge base, an approach that takes into account the structural and parametric proximity of situations is proposed.

Re-admission rate Prediction of Diabetes Patient: Health-Analytics based Approach

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Abstract. Data science has many applications in 21st century. As a prominent field, healthcare is also not left behind in identifying the hidden potential from data. The study uses the Kaggle data set of diabetic patients discharged from hospital and run the model to identify the probability getting re-admitted to the emergency room. The study used logistic regression classifier, random forest classifier and decision tree classifier. The study concludes that random forest classifier is accurate enough to predict the re-admission. The research studied precision, accuracy, recall and AUC (Area Under Curve) to identify the best classifier and concludes that given all the conditions, random forest is the best classifier for the given data set. The research also gives implications for data science professionals and healthcare professionals to use the multiple data analytics methods and choose the best one for the prediction and healthcare professional should take the important variables into consideration while dis-charge process of patients and let them understand about their health status to take care of their physiological and psychological well-being.

Feature Selection using Multiple Ranks with Majority Vote Based Relative Aggregate Scoring Model for Parkinson Dataset

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Abstract. Parkinson's disease is a progressive neural disorder that affects the central
as well as the entire nervous system. The major symptoms of the disease are
difficulty in walking, slowness in movement, and difficulty in coordinating with
brain and body movements. Though it seems to be very tolerant at the beginning, it
becomes very worse over time due to the gradual increase in the effect of disease. It
also involves various other disorders including depression and sleeping disorder.
There are various causes of Parkinson’s disease such as environmental factors,
genetics, and more. With the technological growth, machine learning techniques
have been employed in various fields including health care in many aspects. Owing
to the advantage of machine learning techniques, this paper presents the model that
selects the significant features among various attributes in Parkinson’s dataset. The
proposed method employs multiple ranks with a majority vote based relative
aggregate scoring method for selecting key features among various features that
contribute towards the disease among patients. The proposed method ranks the
attributes using various methods having various weights which are computed based
on the accuracy of the method and the obtained ranks are then converted to scores
based on the obtained majority votes. The results from each method for each
attribute are computed using the relative aggregate score approach from which the
attributes having the highest average score are selected. The proposed model
provides better results in selecting the most imperative attribute from the underlying
Parkinson dataset. The experimental analysis has been made with three datasets
from which it is clear that the performance of the proposed model provides effective
results with 91.027% of accuracy.

Significant Association Rule Mining with MMS and
Efficient Correlation Framework

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Abstract. Correlation based significant association rule mining is highly required for
proper knowledge discovery. Selection of proper correlation measure is a critical
task. A significant association rule may become insignificant if the correlation
measure is changed. Traditional approaches only concentrate on mining correlated
association rules from frequent item sets and ignore rare item sets. The fact promotes
the generation of insignificant association rules with low correlation and high
dissociation. An association rule with high dissociation is meaningless. To
overcome the issues, this paper introduces an efficient correlation framework (ECF)
for significant association rule mining. Subsequently, an efficient algorithm called
SARM (Significant Association Rule Mining) is proposed based on the concept of
multiple minimum supports (MMS) and efficient correlation framework (ECF). The
proposed SARM follows downward closure property that reduces the itemset search
space. Experimental studies on real life datasets show the effectiveness of the
proposed approach in terms of itemset and rule generation, runtime, memory usage,
correlation and dissociation.
An Approach towards Numerical Data Augmentation and Regression Modeling using Polynomial-Kernel-based SVR

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Abstract. The paper is devoted to solving the current problem of processing short data sets. The authors developed a new numerical data augmentation procedure based on the use of polynomial-kernel-based SVR. Its use provides an increasing the generalization properties of the SVR method during regression analysis of short data sets. In addition, the paper presents the author's prediction procedure based on an extended data set, which provides a significant increasing of the accuracy of the SVR with a polynomial kernel. The simulation of the method was based on the use of a real short set of medical data. The optimal parameters of the method are selected, the efficiency of its work is compared with the existing methods of this class. The lowest errors of the developed method in comparison with the existing ones are established. Prospects for further research are presented both in terms of improving the proposed approach and the new areas of its practical application.

A New Approach to Collision-Free Path Planning for Robot Navigation using Safety Envelopes

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Abstract. Finding a short and safe path for a mobile robot is a primary requirement for success in any mobile robot navigation applications in homes, factories, and offices. Although A star pathfinding algorithm is usually used to search for the shortest path from source to target in a known environment, however, in the case of cluttered environments, the condition of finding a safe path by avoiding obstacles is vital. The paper presents a modified version of a classic A star algorithm for finding an optimum path in a cluttered scenario for a mobile robot with a focus on finding a safe path. In addition, this paper introduces collision-free path planning by placing the safety envelopes around the static obstacles in the environment. The obstacles
are encompassed with safety envelopes so that during searching for shortest paths if
the robot passes very near to the obstacle especially during the turning of robot near
the edges of an obstacle, the robot follows a safe path without colliding with the
obstacles. The same has been depicted using simulation in a static environment in
the form of a grid and different size obstacles. The modified algorithm using safety
envelopes presents an approach to implement the shortest path obtained using
classical A* algorithm in the physical world taking into consideration the finite
dimensions of the robot and the radius of curvature while turning around the corners
of an obstacle. The simulation results of the modified A star Algorithm for Collision-
free path planning using Safety Envelopes provide an improvement in finding a safe
and shorter path as compared to the classic A star algorithm.

A Decentralised Model for IoT Networks
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Aryan Bansal
Delhi Technological University, India

Abstract. In light of our study on Load Balancing in Internet of Things (IoT)
Networks, we propose: “The future of computing is distributed.” This paper
highlights the need to bring a distributed architecture to IoT networks. Thus,
realizing an IoT network where end nodes can process and analyze the data it
gathers. This makes a significant contribution to load reduction in terms of network
traffic and avoiding data coagulation at a edge server. The resultant architecture, we
envision shall have lower rates of traffic congestion by virtue of lower traffic and
shall only need to address load balancing chiefly in terms of consistency
requirements. With a distributed architecture, consistency is required to be
maintained on all data that can be remotely modified. But we point out that the
nature of IoT is different i.e., there are simply less remote write operations. Thus,
the nature of IoT networks is such that the consistency overhead associated with
adopting distributed architecture would be minimal. Based on this, we put forth a
Deployment Template for ‘A Decentralised IoT Network.’

Performance Analysis of Multi-scale Transforms for
Saliency based Infrared and Visible Image fusion
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Sohi²

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Abstract. Infrared and visible image fusion brings complementary information from
the source images to a single image, providing an improved representation of the
scene. Multi-scale transform (MST) based methods forms the basis of most of image
fusion techniques. In this paper, a general framework is proposed for performance
evaluation of different multi-scale transforms for infrared and visible image fusion. Firstly, the source images are decomposed using a MST to produce low-frequency and high-frequency coefficients. Low-frequency coefficients are fused using a saliency-based technique; and high-frequency coefficients are fused using a max-abs technique with consistency verification check. The computational time requirement of the different transforms is also presented. The subjective and objective results for multi-scale transforms show that shift-invariant transforms provide superior image fusion performance.

Control de un Robot Manipulador SCARA

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Abstract. This document describes the implementation of a 3D virtual simulator to evaluate the performance of control algorithms, applied to the SCARA robot manipulator for the execution of autonomous tasks. The virtual simulation environment allows immersion and interaction of users in order to manipulate and control robot manipulator tasks within laboratory and virtualized environments for industrial processes. In order to get the robot-environment interaction, it is necessary to establish the Unity 3D graphic engine because it exchanges information with Matlab software to analyse the control strategies. The information transfer is bidirectional and in real time for feedback within the control loop. Finally, the simulation is evaluated by incorporating a control scheme to observe the response of the operator to different trajectories created according to the virtual environment.

Boost Converter Control for Maximum Power Tracking of PV System Using Brain Emotional Learning Based Intelligent Controller

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Abstract. This paper introduces a maximum power point tracker using the concept of artificial intelligence control called brain emotional learning based intelligent control (BELBIC) for maximum power tracking. The intelligent control is based on the limbic system of the human brain. The input to the BELBIC is error of reference PV voltage and actual PV voltage and output of BELBIC is the gate pulse to boost converter switch. The BELBIC is used to track the maximum power point by changing the duty ratio. The performance of the proposed BELBIC-based MPPT operation of boost converter is compared to that of P&O and Fuzzy logic based
An Adaptive Horizontal Vertical Gradient Feature Extraction Algorithm for Face Recognition

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Abstract. This paper proposes a novel adaptive horizontal vertical gradient (AHVG) feature extraction algorithm for face recognition that is robust against pose and age changes. This method initially segments the face region and then extracts the feature by an adaptive approach. The adaptive feature extraction process extracts the adaptive features in both row-wise and column-wise directions and the gradient is estimated. The vertical and horizontal gradients are mixed and then the feature reduction process reduces the number of features extracted from the image in two stages row-wise and column-wise feature reduction which reduces the complexity in the classification process. The feature thus extracted from train and test image is classified using K-nearest neighbour algorithms. Experimental results have been evaluated with different number test image using three different datasets such as MORPH, YALE and FGNET dataset and the result reveals that the proposed system has achieved its superiority to the traditional face recognition algorithms with the average recognition rate of 92.7%, average time for feature extraction is 0.15s and average time for face recognition is 249s.

Highly Efficient Stochastic Techniques for Evaluation of Multiple Integrals Related to Neural Networks

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²Ruse University Angel Kanchev, Bulgaria

Abstract. In this work we investigate advanced stochastic methods for solving a specific multidimensional problem related to neural networks. Monte Carlo and quasi-Monte Carlo techniques have been developed over many years in a range of different fields, but have only recently been applied to the problems in neural networks. As well as providing a consistent framework for statistical pattern recognition, the stochastic approach offers a number of practical advantages including a solution to the problem for higher dimensions. For the first time multidimensional integrals up to 100 dimensions related to this area will be discussed in our numerical study.
Performance Enhancement of Fractional PID Controllers using Modified Grey Wolf Optimization
Santosh Verma and Amit Choudhary
BIT Sindri, Dhanbad, India

Abstract. In this paper, a modified version of Grey Wolf Optimizer (GWO) is presented to upgrade the parameters of the fractional order PID (FOPID) controllers. The Modified Grey Wolf Optimization (MGWO) investigates for the most favourable solution in the predefined search space. The MGWO is incorporated with a novel fitness function which helps the algorithm for fastest computation. The proposed technique is certified by minimizing the defined fitness. Additionally, the proposed technique is exercised for different benchmark problems and results are validated with well-established techniques.

Evaluation of Spam Email Classification Models using Feature Selection
Akshaya Ramachandran K and Siddhaling Urolagin
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Abstract. There is a quite a lot of need for email communication in the present world. We can observe the growth of email users is increasing day by day. However, unsolicited e-mail also known as spam quickly became a major problem on the Internet and preventing them from hampering devices becomes one of the most important research areas. These emails consume a lot of space and bandwidth. To detect spam, we are using various classification algorithms. This paper discusses the performance evaluation of four different classification models which are Decision Trees, Gaussian Naïve Bayes, Logistic Regression and Random Forest. Feature selection is applied on the dataset for the training set and cross validation. For the cross validation, the training data is segmented into folds. Most of these algorithms produce results almost closer to 100%. The performance of the algorithms was measured in terms of Accuracy, Precision, Recall, F-Measure. Based on these results the best classifier for email spam is chosen.

Cross-Domain Self-Attentive Sequential Recommendations
Nawaf Alharbi and Doina Caragea
Kansas State University, United States

Abstract. Self-attentive Sequential Recommendation (SR) systems have attracted significant interest, as they can model temporal information capturing users’
preferences over time to produce accurate recommendations. However, data sparsity can hinder the performance of SR in single-domain tasks. Cross-Domain Recommendations (CDR) have been proposed to alleviate the sparsity issue by transferring knowledge across domains. A key challenge in CDR for sequential tasks is how to extract user’s preferences based on previous sequential behaviors from multiple source domains, and transfer knowledge into target domain(s). In this paper, we propose a Cross-Domain Self-Attentive Sequential Recommendation model (CD-SASRec). We apply self-attention layers over a sequence of source items to aggregate a user’s representational source vector. Then, we fuse the aggregated vector into the item embedding in the target domain, while applying another self-attention layer. Extensive experiments on three large datasets extracted from Amazon dataset illustrate that CD-SASRec outperforms other state-of-the-art sequential recommendation models.

A Novel Image Encryption using the Chaos Theory and Compressed Sensing
Saumya Patel and Ankita Vaish
Banaras Hindu University, India

Abstract. This paper presents an image encryption scheme that is based on Compressive Sensing (CS) and chaos theory. Firstly, the plain image is transformed with the help of Discrete Wavelet Transform (DWT) to obtain the sparse representation of the signal. The measurement matrix (MM) is generated with the help of the Logistic-tent system which provides better reconstruction quality and also reduces the bandwidth utilization since it requires only initial parameter to generate MM at the receiver end. To provide more security, row and column wise confusion and diffusion is also applied with the help of the logistic map. Experimental results verify the effectiveness of the proposed scheme over the existing algorithm.

Multiband Reconfigurable Antenna Design with Frequency, Polarization and Pattern diversities
Farha Usman and Ram Suchit Yadav
University of Allahabad, India

Abstract. A multiband reconfigurable antenna (39X36 mm2) with frequency, polarization and pattern diversities has been proposed for wireless and future wireless applications. FR4 substrate with 3.2 mm thickness has been used for the design. The antenna exhibits linear, elliptical as well as circular polarization at various frequencies with different radiation patterns. The antenna operates in 16 different modes in multiband fashion based on the switching conditions of four PIN diodes.
Open Challenges and new horizons for IoT based cloud applications and AI based cloud applications

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Abstract. The demand for greater speed of processing data has sky-rocketed due to the recent trends of technological advancement such as IoT and AI. Thus, now the cloud applications strive towards only perfection such as “hyper-automation”, and not just automation due to AI and ML advancements, democratization of software development capabilities, edge computing for IoT and expansion of AI via cloud. These advancements in cloud computing are made possible by the growth of independent technologies such as IoT and AI. With the storage issues resolved, IoT and AI based cloud applications focus solely on the performance and feasibility of the applications. As much progress as these technologies provide, the challenges that the cloud applications pose are still substantial enough for the companies to not opt for it, despite the favourable outcomes. Security challenges aside, a major cause of concern in the domain of cloud computing is the lack of expertise, which pushes businesses to seek cloud vendors and risk security to only focus on the execution of the operations and not on cloud complexities even though this makes the owner lose ownership of his data, giving rise to yet another challenge, i.e., data ownership. But obvious as it is, the benefits of cloud assisted applications are too much to resist. Data analysis is accelerated dramatically in an AI and the data in the cloud environment helps in easy identification of patterns and trends thus troubleshooting potential adversities even before they occur. IoT devices and cloud computing, being complementary in terms of technology produce revolutionary results when combined together. One such example would be the implementation of device shadowing in which a backup of the IoT applications and devices is created in the cloud which can also be accessed offline to prepare the system even for failing situations. This study provides a detailed insight into the challenges of the cloud applications in the IoT and AI environment as well as discuss their solutions and new horizons for the implementation of these technologies.

A Review on Pattern Recognition based Retinal Blood Vessels Extraction Technique to Detect Diabetic Retinopathy (DR)

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Abstract. The Diabetic Retinopathy (DR) detection is an emerging biometric modality which deserves a discussion and systematic review of the connected
methods and findings. In this paper, most of the Pattern Recognition based retinal blood vessels extraction techniques will be reviewed which have been applied to detect Diabetic Retinopathy (DR). In particular, we categorize the methodologies based on the extraction and segmentation techniques. Finally, a comparative analysis of a few of the pattern recognition-based DR detection technique is presented on the basis of their characteristics and other parameters like Sensitivity, Specificity and Accuracy. The comparative study includes the cases where data collected from publicly available dataset. The analysis shows that most of the techniques that have been proposed for DR detection perform well to extract wide and normal vessels from retinal images. However, few techniques can’t extract the tiny, thin and the abnormal vessels. As a result, performance degradation occurs. That notwithstanding, only a few of the proposed DR detection methods appear to be able to support performance improvement.

Issues and Framework of Rules for Resolving Anaphora in Marathi Text

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Abstract. Understanding the natural language is difficult for the computers because natural language is coherently ambiguous. This paper presents the different types of issues occurred during the resolution of the anaphora in Marathi text. The work on anaphora resolution is performed on many Indian languages like, Hindi, Tamil, Telugu, Bengali, and Urdu etc. but very less work done in the Marathi language. Anaphora resolution is a complex problem for the researcher. Difficult issues like unavailability of the Marathi corpus as well as same gender antecedent is the main issue in the anaphora resolution. To overcome those type of issues we have framed some rule to resolving the anaphora.

Investigation on Customer Churn Prediction using Machine Learning Techniques

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Abstract. Churn prediction is one of the major use cases in banking business. We assumed customers of a large bank decided to leave from the services offered by the bank. The bank decided to investigate a very high rate of customer leaving the bank. The dataset used for experimentation contains 10000 records, and we use it to investigate and predict which of the customers are more likely to leave the services provided by the bank in near future. The approach used in this paper is supervised classification model using the various state of the art machine learning techniques;
the classification model has been built on historical banking data and then used to predict the classes for the current customers to identify the potential churn. The dataset contains 13 features, and a label column. Comparatively, the best accuracy has been obtained using Naïve Bayes model with 86.29%. The churn prediction models could be very useful for applications in telecommunication sector in order to identify the customers who will be changing port to other network soon, and also in human resource department to find out the employees who will be leaving the organization in near future, which would enable the organization to plan for hiring of new employees well in advance.

Accessibility of Health Care Sites: Evaluation by Automated Tools

Kumari Sarita, Parminder Kaur and Satinder Kaur
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Abstract. Websites have played a significant role in the evolution of the digital world. These are the primary sources of communication and dissemination of information all over the world. The utilization of e-health platforms is getting a universal reputation in medical field. The most challenging job for the site engineers or developers is to provide the universal access to all kinds of users having impairments like vision, hearing, cognitive, physical, literacy with no barrier. So, the prime requirement is to gauge the accessibility of these websites and same can be ensured by using automated accessibility evaluation tools. This paper aims to evaluate the accessibility of top six health care websites in India. These sites are selected based on Alexa ranking. The accessibility of these sites is inspected using three automated tools: AChecker, WAVE and TAW against the conformance of WCAG 2.0 level AA. Overall results show that mohfw is the most accessible site while medindia is the least accessible site among the six. It is recommended to include the expert testing with automated testing so that more accurate and consistent results can be obtained. Furthermore, this work can be extended by evaluating more healthcare sites under the conformance of WCAG 2.1 level AA with addition of some commercial tools.

Review On Object Detection with Audio Feedback using Trigger word

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Abstract. People who are handicapped with impaired vision or blindness cannot perceive elements in their surroundings as normal people. Performing daily tasks and avoiding obstacles in their way are a few of the challenges that they have to face. This application aims to create an assistive device for the visually impaired that would help them cope with all the hurdles in their way. This application aims
to aid visually impaired people with a system that can let them know what object is present in front of them without the need to touch or smell but just call out the system with a trigger word that in turn activates an object detection module, which gives audio feedback of any object identified with their position.

**Key object classification for Activity Recognition in tennis using cognitive approach in Mask RCNN**

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Abstract. Previous research studies in sports content analysis have focused based on the spatio-temporal instead of a content-based viewpoint. Currently the view for classification of sports is done using object and activities present in videos meaningfully. As it can have achieved through various means one among them is through knowledge-based approach, which choose the path of continuous training along with some intelligence induced to the system. Hence in the proposed work, our major focus is towards meaningfully masking the key functional object that act as base for sports scene detection. In order to achieve that improvised Mask RCNN technique is used which have knowledge base at classification level of label prediction. As our approach results with 91% of accuracy, shows the improvised stage in the concept of meaningful segmentation of functional sports objects.

**Efficient Data Aggregation in WSN for Air Pollution monitoring: A PCA based approach**

Ranadeep Dey and Parag Kumar Guha Thakurta

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Abstract. In this paper, an efficient principal component analysis (PCA) based data aggregation method is proposed in a hierarchical wireless sensor network (WSN) for air pollution monitoring. The collected data readings of three major and specific air pollutants, such as SO2, CO and NO2, by the sensor nodes from the environment have been considered here. The PCA is used to reduce the original correlated data set at the data aggregator node (DAN). This proposed approach is performed, for the data compression by means of dimensionally decrease of raw collected readings of air pollutants. The extracted useful information is obtained using principal components. The simulation results evidently show the efficiency of the proposed work in terms of considerably reduced errors from the other existing methods. The accuracy of this proposed work is assessed over those existing methods as well.
BioGamal Privacy Preserving Public Auditing for Cloud Computing

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Abstract. The advent of internet technologies has created a wonder that results into several streams using computing technologies termed as cloud computing such as in factories, medical stream, manufacturing industries, fields of science and researches, schools, colleges, universities, public sector units, etc. for the sake of depot of data. As per the requirement of information the data can be easily obtained from such cloud depot. Also, the hindrances like insecurity of data like loss of data, unexpected issues are in front during storing data in cloud. As always along with barriers there are various ways to avoid or minimize the issues relating to such cloud computing. One of the well-known technologies that takes care of security of data getting stored in cloud is Cryptography. Conventional method of securing data involved cryptography algorithms was not that much fruitful and suffice for the top-level preservation of data, processed information in cloud. The invent of new approach of applying DNA succession results in the discovering latest preserving technology. Hybrid encryption or decryption methods are also prevailing technologies now a days that enable security of processed information. AES algorithm is meant for preserving secrecy of processed information whereas Hybrid algorithm uses DNA cryptography. Fact, figures righteousness can be verified applying the approach of TPA along with SHA. Applying the concept of digital signature that enable user to validate the proposed document, information involves usage of latest approaches EDSA. Advanced concept manages the trine involves Integrity, Authenticity and Confidentiality. Modernized & advanced preservation technology with low time consumption in between the process of data file encryption & decryption become possible only due to proposed algorithm.

Relationship Between Capital Market and Sectoral Indices: An Indian Perspective

Anwesha Nath and Soumya Banerjee

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Abstract. This paper aims to prove theoretical and empirical relationship between various sectoral indices on the National Stock Exchange (NSE) and to the extent, they are related to each other. NIFTY is the index used by NSE to track the top 50 stocks. Various other sectoral indices were also introduced to have sector specific trends. These indices are important as they help to balance the market and help predicting trends. Investors can easily assess their risk and return according to the historical data provided by the indices. In this research, eleven sectoral indices are considered and their price movements for five years i.e., from April 2014 to January 2019 monthly was analysed. Correlation study and Multiple Linear Regression
model has been implemented to determine the relationship between the indices. Further the presence of multicollinearity in the model is observed and hence diagnosed. The results then used to forecast the Capital Market Indices for April 2019 to March 2020.

Analysis of independence and Clustering pattern of students in adopting MOOCs

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Abstract. Massive Open Online Courses (MOOCs) are getting popularised day by day. A number of students are benefitted from them whether these are related to enhancing subject knowledge or related to hobby. Though MOOCs are not a part of the curriculum in universities still some of the universities have adopted MOOC as a supplementing course. Adoption of MOOC as a supplementary course is still a challenging task. The present paper analyses dependency of selection of MOOCs on students’ study year of the course and the clustering pattern of students for selecting and getting certificate of MOOC examination. Data from the existing students of Graphic Era Hill University (GEHU) has been taken for the present work. We find that decision of choosing MOOCs depends on the study year of students when first-year students are involved but it is independent of study year when we consider senior students showing that the decision of first-year students has some association with the decision of their seniors. We find four clusters for various reasons for choosing MOOCs and not getting certificate. These clusters are very useful in making strategies for implementing MOOCs as supplementary courses.

Analysis of Intelligent Fuzzy Logic MPPT for Hybrid PV-Wind Energy System

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Abstract. In this paper, study of maximum power point Techniques for Hybrid solar PV and Wind power generation explained. This system proposes mainly doubly fed induction generator (DFIG) based wind power and solar photovoltaic power generation. The controlling of the DFIG is make through two converters rotor side converters (RSC) and the grid side converter (GSC) to generate active and reactive power and to maintain the DC bus voltage constant. Both wind power and solar power systems have control algorithms to track maximum powers. MPPT control is used to maximize the Photovoltaic (PV) power and a boost converter increases the voltage which used by the inverter to feed the grid. The main work in this paper is to track the maximum power at grid by using fuzzy logic MPPT for Hybrid energy
system, to increase the efficiency and to obtain continuous power. Simulation made by using Matlab/Simulink environment and the results are provided to show the performance of the hybrid energy system.

Fusion Based Feature Extraction Approach for Recognition of Handwritten Devnagari Numerals
Danveer Rajpal and Akhil Ranjan Garg
MBM Engineering College, Jai Narain Vyas University, Jodhpur, India

Abstract. Exploring fresh methods for handwritten digit recognition receiving close attention from respective research communities due to its wide application fields ranging from bank and postal services automation to archaeological surveys. Handwritten digit recognition is challenging task due to unconditional variation in shapes and sizes of hand written digits written by different individuals. The task becomes more demanding for the scripts like Devnagari due to richness of curvatures in digit structure. The proposed scheme implemented transfer learning approach for feature extraction from handwritten digits. For the purpose, pre-trained deep convolutional models VGG-16 and VGG-19 were deployed due to their splendid capability of minute features extraction from the given pattern. The features collected from both the models were fused into single feature map by reducing their dimensionality with the help of effective Principal Component Analysis (PCA) method. The model managed to attain recognition accuracy of 97% with fusion based approach.

Traffic Sign Detection using Computer Vision and Machine Learning
Parvez Aziz Boruah, Kishore Kashyap and Manash P. Bhuyan
Gauhati University, India

Abstract. Object detection is a computer technology that deals with detecting specific instance of an object of a particular class (such as cars, table, road signs etc) in a digital image or video. Computer vision is a sub-field of computer science and technology that seeks on enabling computers to identify and process images using Artificial Intelligence and then provide appropriate output. Here, the computer interprets what it visualizes, and performs appropriate analysis and give desire outputs. Detecting object in images and video is key for several important application domains in computer vision.
Panoptical View of Machine Learning Techniques
Geetika Vashisht¹, Smriti Bansal¹ and Manisha Jailia²

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Abstract. Modern computing world has been progressively working to make machines mimic the human brain surfacing the enormous field of Machine Learning. It is making a phenomenal impact in predictive forecasting, healthcare services, modern businesses and the list goes long. It uses algorithms and models like neural network assisting computer systems to progressively improve their performance. Machine learning algorithms automatically, using sample data builds a mathematical model – known as “training data” – so that decisions can be made by the system without being specifically programmed, exactly how humans learn! When an algorithm learns what to do with data, it can do its work automatically, being the main advantage of using machine learning. This paper reviews several machine learning algorithms delving into the mathematics involved in training the models. This paper also brings forward the metrics that are used to evaluate the machine learning classifiers together with an analysis of the usage of these algorithms in different scenario. The development trend in the field in the last decade is also pointed out.

Enhancing Monitoring in Online Exams using Artificial Intelligence
Santosh Gopane and Radhika Kotecha

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Abstract. Online teaching accommodates learners from distant locations and also saves time to commute, reduces traffic, etc. Exams are an important component of online educational programs and students’ cheating during the exam is a widespread phenomenon around the world. Also, applicants tend to cheat more under no monitoring in the online exam. So, a proctoring method to detect cheating and reduce its possibility is the need of an hour. Various methods had been proposed to ensure smooth and efficient online exam proctoring. But such methodologies are costly and require much human intervention. Also, proctoring in online exams requires precision and accuracy. The proposed methodology involves continuous user validation and verification to ensure his / her integrity. Proposed approach of monitoring during the test includes subtle micro expression detection such as laughter detection, eye gaze tracking to predict applicant’s viewing direction, eyes blinking / close duration, and head activity/head movement detection. Any suspicious activity or moment by the applicant will be tracked and associated penalty are imposed. The work uses Artificial Intelligence for classifying the
applicant’s activity. Having remotely proctored exams can significantly reduce logistic efforts, reduce evaluation time, and make it easier to reach distant test takers. The preliminary results demonstrate efficiency of the proposed approach for the same.

**Can Artificial Intelligence predict breast cancer?**

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Abstract. Nowadays, many areas of research use new technologies to improve performance and customer satisfaction. Healthcare is one of the areas most affected by the innovations of Artificial Intelligence and its sub-domains. One of the health domains most affected by technology transformations is cancer which also has a high mortality rate requiring a socio-technical solution. In this paper, we will focus on the most common type of female cancer: breast cancer. We test four different machine-learning algorithms that offer classification and prediction capabilities in order to improve diagnosis of breast cancer using openly available secondary data set. The study also offers some best practices to improve the health technology assessments when using AI technologies for better stakeholder and public value perceptions.

**Stratification of Breast Cancer Dataset with Suitable Fuzzy-Possibilistic Clustering Algorithm**

Esha Kashyap¹, Kannan S.R.¹ and Mark Last²

¹Pondicherry University, India

²Ben-Gurion University of The Negev, Israel

Abstract. Nowadays, many areas of research use new technologies to improve performance and customer satisfaction. Healthcare is one of the areas most affected by the innovations of Artificial Intelligence and its sub-domains. One of the health domains most affected by technology transformations is cancer which also has a high mortality rate requiring a socio-technical solution. In this paper, we will focus on the most common type of female cancer: breast cancer. We test four different machine-learning algorithms that offer classification and prediction capabilities in order to improve diagnosis of breast cancer using openly available secondary data set. The study also offers some best practices to improve the health technology assessments when using AI technologies for better stakeholder and public value perceptions.
Emergent use of AI and Social Media for Disaster Management

Saima Saleem and Monica Mehrotra
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Abstract. Timely access to up-to-date and relevant disaster information is crucial for disaster response organizations to make effective decisions and proper management strategies to lessen the impact of disasters. In recent years, Social Media (SM) has evolved into a proactive communication channel during disasters. It has facilitated disaster response organizations to receive vast amounts of real-time information about disasters directly from the affected communities. Advances in Artificial Intelligence (AI) are enabling researchers and practitioners to harness the potential of this user-generated content for supporting effective decision-making in disaster management. This study presents an overview of the current application of AI techniques to process disaster-related SM content for supporting disaster management at different phases. Few case studies are presented which highlight that the growing use of SM and Information and Communication Technology (ICT) has provided new approaches towards the dissemination and acquisition of time-sensitive information (text, images, and videos) during disasters. It presents an outline of some AI-based systems that exploit SM data for managing disasters. Furthermore, this study points out various research challenges and opportunities for SM information processing in response to disasters.

Analysis of fuzzy DEMATEL approach for financial ratio performance evaluation of NASDAQ Exchange

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Abstract. The relative performance analysis and ranking of the financial ratios are highly important for optimal portfolio selection in the stock market. However, the financial relative performance evaluation of financial ratios is a highly complex and nonlinear system. Thus, the main goal of this study is to measure the relative importance of the financial ratios of two groups such as Accounting based financial measures (AFM) and Economic value-based financial measures (EFM) by using fuzzy Decision-Making Trial and Evaluation Laboratory (DEMATEL) method. In this regard, the data for one-year performance (June 2018-May 2019) of 8 industries in the IT sector has been collected by distributing a questionnaire among two experts: investors in the NASDAQ exchange, and a professor in Finance. Based on the collected information AFM and EFM are ranked by using the fuzzy DEMATEL approach. Finally, the fuzzy DEMATEL approach is compared with the classical DEMATEL approach. The empirical results assist the investor and traders to select
Driver Behavior Analysis based on Numerical Data using Deep Neural Networks

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Abstract. Driver behavior has become an essential consideration throughout the current Smart Transportation system. Most drivers are unfamiliar with this new technology and very ignorant of their driving style, which leads to problems like a violation of pedestrian safety. Driver Behavior Analysis (DBA) is intended to improve passengers' safety from harsh driving by analyzing the behavior of selected drivers while driving. Therefore, we aim to develop a model to detect aggressive driving to minimize traffic safety violations. This paper presents a method using SimpleRNN, LSTM & GRU individually to detect drivers' actions from statistical numeric data where LSTM performs better. A public dataset that uses numeric sequential data to predict driver's behavioral conditions. We compared our DBA algorithm with previously used deep learning and machine learning models to detect driver actions by accuracy and precision. After many epochs, we concluded that the LSTM model yielded greater success than most other models and achieved 0.961 accuracies.
Time series forecasting of optimal ELSS mutual funds - An Indian perspective

Ria Dey, Deblina Chakraborty and Soumya Banerjee

Amity University Kolkata, India

Abstract. One of the safest ways to invest money in the stock market or for purchasing securities is Mutual Fund. To get some idea about the future, past and present analysis of the mutual fund investing scenario is necessary. This paper aims to forecast the NAV values of the optimum ELSS mutual fund. All the ELSS funds with inception before January 2015 are taken and their monthly returns are calculated. The funds with negative average monthly return and negative skewness of monthly returns are then eliminated. Then we select those funds with low standard deviation and high beta value using investor’s perception map. Four funds have been obtained and with these selected funds, we apply Generalized Reduced Gradient approach to find the weightage of each funds constituting the portfolio. This will help the investors to select a fund to invest in. Finally, we have developed appropriate Time-Series models for each of the four mutual funds to forecast the future NAV values for the year 2020 and used chi-square analysis to check the goodness of fit.

A Survey on Dimensionality Reduction Techniques and Clustering Methods

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Abstract. In machine learning and data mining applications, high-dimensional data become the most common and popular. It requires huge computational time and resources to compute such data sets and requires data reduction. In the present situation, Feature Selection (FS) and Feature Extraction (FE) are popular approaches for data dimensionality reduction. Most of the feature extraction methods rely on the graph matrix approach for reducing the data. Feature extraction has been divided into two categories, i.e., supervised learning and unsupervised learning approaches. Various methods of supervised and unsupervised learning are discussed in this paper. A large number of research papers and reports have already been published on this topic. This paper provides an overview of a few methods and approaches of feature extraction andselection. This paper presents, the work done by various authors in feature extraction and selection approach as well as clustering algorithms in order to obtain the current trend.
Similarity Distance based Kernel Canonical Correlation Analysis for Multiview Data Representation

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Abstract. Data from different views of a problem can help us a better inside of the problem enabling to find better solution. Different views may contain either similar or complementary data. Integrating multi-view data in one common featured space may improve the performance of the decision system. Data from multiple views are often not directly comparable to one another, therefore In this paper, similarity distance based kernel canonical correlation analysis (KSDCCA) has been proposed. The proposed approach nonlinear transform multiple views data into a common subspace such that nonlinear complementary information between views contribute more into the common subspace and the local manifold structure of the single view is also closer into common subspace. It is evident from experimental results based on real-world data sets that the KSDCCA approach performs around 0-13% better than existing canonical correlation analysis-based methods. Thus, is a more effective and promising approach for solving real-life problems where consideration of nonlinear complementary information in multiple views is essential.

Robust Land Record System using Blockchain in Bangladesh

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Abstract. Land registration is a method by which ownership, possession or other rights in land can be recorded to provide evidence deed, facilitate transactions and prevent illegal settlement. In Bangladesh, the verification process is slow, cumbersome and fully manual. Hence, it is time-consuming, exhausting, error-prone and easy to manipulate. Nowadays there are numerous deceitful activities in land registration. The main problem is the use of paper documents in the land recording system. These paper documents can be easily forged, dispersed or destroyed. In this research, we have proposed a land registration and verification system using Blockchain. The intrinsic security feature of Blockchain makes the data secure, tamper-proof and difficult to hack. Blockchain reduces the use of forged documents and increases the credibility of each transaction. Each registered land becomes unique when they use Blockchain technology. Blockchain offers the end user all the records unchanged as well as updates along with a specific record.
Facial Expression Recognition with FlatcamLensless Imaging

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Abstract. With the recent advancements in the field of Artificial intelligence, Internet of things and Machine vision research, there is a great demand for low cost and miniature size cameras to be integrated in any device that can detect faces and recognize face and facial expressions. Current lens-based cameras have a major limitation of large weight, size and expensive thus making them difficult to be integrated into small devices. Unlike to lens-based cameras, mask-based lens less imaging cameras are compact and in-expensive due to reduction in the form factor and use of simple semi-conductor sensors. However, they come at the expense of low-quality images compared to lens-based imaging. In this work, we propose a first of its kind evaluation of Facial Expression Recognition (FER) in case of a specific lens less imaging camera called Flatcam which consists of a binary coded mask placed next to a sensor. We propose a deep learning-based FER framework to recognize ten different facial expressions on lens less face images captured in different variations of lightening, angle and scale. Our framework has a component for enhancing poor quality lens less face images thereby improving the recognition performance comparable to that of lens-based cameras. Extensive experiments on FCFD dataset captured using Flatcam camera demonstrate utility of proposed framework.

Prediction of Indian Hotel Ratings on Clear Trip Website

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Abstract. Hotels are primarily viewed as a service industry with intangible areas of guest experience and service levels expected to attract major focus however, there are also significant property developments and therefore, have many tangible aspects (location, amenities, fittings, etc). The reason for focusing on service quality is because it has been demonstrated that the more satisfied the guests are, the more likely they will return or prolong their hotel stay. Hotel ratings are often used to classify hotels according to their quality. From the initial purpose of informing travellers on basic facilities that can be expected, the objectives of hotel rating have expanded into a focus on the hotel experience as a whole. Hotels are independently assessed in traditional systems and rest heavily on the facilities provided. A key to profitability in the hospitality industry is a clear understanding of what leads to satisfied loyal customers. This main objective of this study is to predict the hotel ratings based on the data collected from the clear trip website. The project is done on the secondary data of Indian hotels collected from the website clear trip. Recommendation systems are currently being applied to many different domains. These tools produce personalized recommendations for a large variety of choices.
In the tourism domain, recommendation systems have been extensively applied to reduce the information overload. Recommenders are seamless components that work on behalf of tourists to provide personalized recommendations. Rating prediction is the core of any recommendation engine.

**Dimensionality Reduction Using Hybrid Brain Storm Optimization Algorithm**

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Singidunum University, Serbia

Abstract. In this work, a swarm-intelligence-based algorithm, brain storm optimization, is proposed for reducing dimensionality (feature selection) in data sets that are used for classification. Dimensionality reduction is a well-known and widely used technique in analysing big data. Its role is to reduce the number of features in high-dimensional data sets and to keep only those that contain useful and rich information. This results in better understanding and interpretation of data, higher accuracy, and boosting the training process of machine learning method used for classification. After extracting features from the data set, it should be decided which subset of features will be used in the training process. Since, in high dimensional data sets many features exist, this problem is categorized as NP hard and it is necessary to employ metaheuristics for its solving. For tackling this issue, a binary hybrid brain storm optimization metaheuristic, that overcomes drawbacks of original algorithm, is proposed. For performance evaluation, 21 datasets are used. The comparative analysis is made between proposed approach and the original brain storm optimization algorithm, as well as with nine other metaheuristics adopted for feature selection. Experimental results prove the robustness of proposed method, since it is capable to reduce the number of features by simultaneously achieving better classification accuracy than other methods taken for comparative analysis.

**Prudential Life Insurance Customer Evaluator**

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Abstract. Life Insurance is one the most important part in today’s world. And with many varieties of insurance policies, the objective is to provide the most suitable policy which is beneficial to both the customer and the insurance company. This is generally done by the insurance agents based on their domain knowledge. But our goal here is to do it using a statistical solution. One method is to use Customer Scoring based on information provided by them when filling their insurance application form. Based on this score they are provided a set of insurance policies to select from. For this we tried building regression models (Linear and Multinomial Logistic) based on the customer information and scores we already have. These scores were provided based on the policy they already have. Different models based
on different variable combinations were compared using Stepwise AIC Method for both regression models. The final model has an accuracy of 44% which can of course further be improved. This kind of statistical modelling will be useful in filtering the large number of policies to select from. After which the customer or agent may select from the smaller number of choices suitable for them. This will make the job of the agents as well as the customer much easier.

A Real Coded Genetic Algorithm for identification of Defects with Ultrasound Time-of-Flight Data
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Abstract. Tomographic reconstruction enables to look through engineering objects for material defects without hindering the objects functionality. Tomographic reconstruction procedures available in literature are developed in the lines of binary genetic algorithm principles. The binary genetic algorithm procedure reported earlier required the user to input the actual values of characteristic properties of materials present in an objects cross-section. The previous algorithm was designed to estimate the size and location of the defects, given the characteristic properties of object and defect material. In this work a tomographic reconstruction procedure is modelled and implemented using the principles of real genetic algorithms. The algorithm is shown to achieve the task of reconstructing the cross-section of a test specimen starting with initial guesses that are within a given range of characteristic property to be estimated. The present algorithm does not necessitate the user to input exact characteristic property of material defects assumed to be present in the material cross-section being examined. The efficacy of proposed reconstruction algorithm is demonstrated with several numerical simulation studies.

Epoch Based Channel Selection Algorithm for Device-to-Device Communication using Multi-Armed Bandit with Random Rewards and Adaptive Randomization
Himanshu Agrawal and Krishna Asawa
Jaypee Institute of Information Technology, Noida, India

Abstract. In wireless networks, device-to-device communication continues to rise significantly. Due to the high performance and bandwidth requirements of an increasing number of users, network capacity would be substantially limited by spectrum availability soon. Besides, due to the fixed assignment policy, the present network scenario is experiencing a vast spectrum shortage problem, so a substantial spectrum remains unused. Opportunistic Spectrum Access (OSA) is a method used to increase the efficiency of the spectrum. Thus, to facilitate the device-to-device
communication by OSA, a truly distributed channel selection algorithm is proposed. Besides, the mean-availability of different channels is unknown. Thus, identification and selection of the best channel become more difficult. Moreover, it is considered that no information exchange takes place between different users in order to access the shared spectrum opportunistically. Users must transmit on those channels most likely to be vacant to achieve the optimum network throughput. Hence, it is essential to estimate the mean-availability of different channels at the individual node. An algorithm based on the Multi-Armed Bandit (MAB) is proposed, termed Epoch based channel selection (EBCS). The results indicate that the regret of the proposed algorithm is logarithmic. The collisions are less than 2% of total time-slots.

Detection of Potential Citation Clubs in Bibliographic Networks

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Abstract. Citation networks are directed acyclic graphs that are formed by taking research papers as nodes and two papers are linked if one cites the other giving rise to a directed link. It is well-known that there exist groups of authors who collaborate among themselves as well as cite one another's work. We term such clusters of authors as 'Potential citation clubs. The aim of the paper is to extract the potential citation clubs present in the citation networks and contrast the nature of the clubs that exist in open access journal vs closed access journal. First, a network called the author-author citation network is constructed from the citation as well as the co-authorship networks. The aim is to retrieve groups of authors who have large number of collaboration as well as citation links among themselves. The proposed approach utilizes community discovery algorithms from social network analysis to detect dense clusters within co-authorship network and the citation network. The communities of papers of citation network are converted to the constituent groups of authors. Intersections of these communities are computed to obtain groups of authors who are related via collaboration links and citation links, yielding, to what we term as potential citation clubs. The strongly connected components (SCC) contained in the potential citation clubs are used to define a measure called the 'strength' of the potential citation club indicating the citation reach of the authors. The entire experimentation is carried out on citation and collaboration networks of papers from an Open access journal (OJ) and a Closed access journal (CJ) from the DBLP database. The citations are limited to papers from the respective journals in order to obtain contrasting trends. The results show that indeed citation clubs exist. Further, OJ has clubs with high membership and more closely knit clubs in comparison to those of CJ. More interesting effects may be seen when the experiments are expanded to consider citations to all the journals which is part of our future work.
Epoch Based Channel Selection Algorithm for Device-to-Device Communication using Multi-Armed Bandit with Random Rewards and Adaptive Randomization

Himanshu Agrawal and Krishna Asawa
Jaypee Institute of Information Technology, Noida, India

Abstract. In wireless networks, device-to-device communication continues to rise significantly. Due to the high performance and bandwidth requirements of an increasing number of users, network capacity would be substantially limited by spectrum availability soon. Besides, due to the fixed assignment policy, the present network scenario is experiencing a vast spectrum shortage problem, so a substantial spectrum remains unused. Opportunistic Spectrum Access (OSA) is a method used to increase the efficiency of the spectrum. Thus, to facilitate the device-to-device communication by OSA, a truly distributed channel selection algorithm is proposed. Besides, the mean-availability of different channels is unknown. Thus, identification and selection of the best channel become more difficult. Moreover, it is considered that no information exchange takes place between different users in order to access the shared spectrum opportunistically. Users must transmit on those channels most likely to be vacant to achieve the optimum network throughput. Hence, it is essential to estimate the mean-availability of different channels at the individual node. An algorithm based on the Multi-Armed Bandit (MAB) is proposed, termed Epoch based channel selection (EBCS). The results indicate that the regret of the proposed algorithm is logarithmic. The collisions are less than 2% of total time-slots.

Impact of Internet of Things in Agriculture

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Abstract. The advent of Internet of Things (IoT) has changed ordinary things into smart, hyperconnected objects that can make intelligent decisions. IoT technology has invaded every area of life including energy sector, health care, agriculture, vehicular networks etc. In this paper, the impact created by IoT in the agricultural sector has been carefully reviewed. Expanding population, decrease in available land area due to large scale urbanization, climate change etc. are few of the driving factors that has led to the widespread digitization of agriculture. Smart farming, precision agriculture, 5G enabled IoT for agriculture and various other technologies have been presented here. The various IoT-based applications in agriculture in terms of automation, monitoring, prediction and control have been meticulously documented. The prominent research challenges and the future scope of IoT in agriculture has also been analysed.
Towards Personalization in Intelligent Learning Systems

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Abstract. The advantages of new technologies enable creating a smart learning environment where teachers make pedagogical practice more flexible and attractive, appropriate and personalized, and most of all - effective. Improving the quality of education is related to teaching and learning in Intelligent Education System (IES). Based on intelligent approaches, IES provides intelligent management of the learning process, smart workspaces or laboratories, adaptive learning, virtual pedagogical agents, smart data collection, immediate feedback to the user, and control of learning environment parameters. The paper presents an overview of IES from five different perspectives end-user (teacher, student), technology (applications, devices, networks), data (collection, analysis, storage), smartness (personalization, decision making), and management (security, quality). It proposes an open model of the knowledge needed for personalization, based on a network of mapped ontologies. The essential aspects of IES, such as modelling sensor networks and systems, knowledge presentation and methods for adaptive training, as well as ensuring reliability and service quality, are also considered. Of particular importance for an effective teaching and learning process in an IES is the possibility for offering personalized education, so this aspect is discussed in detail.

Optimal Allocation of Capacitor using Ant Lion Optimization Algorithm

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Abstract. Right now, the quantity of customers in the distribution side is developing, the power interest and the quantity of capacitor setting is additionally in-wrinkling. Ill-advised sitting of capacitor bank prompts declines the advantages of the framework. In this article Ant Lion Optimization Algorithm (ALO) is proposed to locate the ideal size of the capacitor and Loss Sensitivity Factor (LSF) is utilized to decide the area of the capacitor. The goal of this work is to limit the force misfortunes alongside transport voltage improvement. The current methodology is actualized on IEEE 34 transport outspread dispersion framework (RDS) and the out-comes are contrasted and DE-PS and PGS based methodologies. The re-enactments results show the viability of the current methodology.
Intelligent Military Combat Potential & Configuration
Decision Support System
Arun Kumar and Dr Dasari Srikanth
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Abstract. Combat Potential evaluation and the relative power matrices of forces against the adversaries have been the foci of studies by various analysts and combat planners for making decisions and reaching conclusions. As the variables and factors involved in the decision-making process combine tangible and intangible measures with due weightage to environmental factors, it is always a challenge to gauge the true levels of combat potential. Existing methods of evaluations are classified as static or dynamic depending upon the approach taken by the analyst; however, a lot of grey areas remain sparsely touched because of the intangibles. This paper proposes a hybrid decision support system by incorporating Artificial Intelligence (AI) for analysis of combat potential, analysing different configurations from military’s land battle perspective. Mathematical modelling inherits primarily from Quantified Judgment Method of Analysis (QJMA) and Combat Potential comparison carried out with superimposition of Artificial Intelligence algorithms.

Classification of Masses in Mammogram Images into Benign and Malignant using GLCM on LBP Using Non-Overlapping Blocks of Varying Sizes
Heba Kurdi, Atheer Alkubeyyer, Reema Alabdullatif and Alhanoof Althnian
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Abstract. Classification of benign and malignant masses in mammograms is a challenging task in the development of computer-aided diagnosis (CAD) system. Feature extraction particularly is the most important step while designing those systems as it contributes positively to the overall performance when features are discriminative. This paper presents texture-based features extraction technique that divide images into non-overlapping blocks prior to extraction. The images are first converted to LBP format using LBP opera-tors and then second-order statistics are derived from these blocks with GLCM. SVM with RBF kernel was utilized in the classification process. The proposed algorithm was test on whole and divided images to evaluate the performance and using known metrics such as accuracy, it was found that this method increases the accuracy by 17%.
Analysis of Colon Cancer Metagenomic Data Using Machine Learning

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Abstract. The human gastrointestinal tract is the part of the body that holds a large variety and complex population of microbiota called the gut microbiome which is very crucial for human health. Colon cancer is the most common cause of death in many countries. In this work, we compared the accuracy of different machine learning algorithms with the combination of two features Operational Taxonomic Unit and K-mers on 16S rRNA amplicon sequenced gut metagenomic data for the classification of healthy samples and samples with colon cancer. The raw rRNA gene sequence data is first pre-processed for denoising, then the sequences are fed to the feature extraction phase, where the taxonomic features are extracted. The raw sequence data is directly used by the Jellyfish software to extract the k-mer features. Then both features are fed to the classification phase for predicting colon cancer. We show that when both the features combined together and used for classification the accuracy improved.

Blind Image Restoration with CNN Denoiser Prior

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Abstract. Recently, convolutional neural networks (CNN) are used as a well-structured image prior for solving inverse problems. To enhance a single noisy image, Deep image prior (DIP) is a popular blind image denoising approach having a CNN model with no prior heavy data-driven training. In this paper, we aim to further enhance the effectiveness of the image denoising capability of DIP by introducing the Kullback-Leibler (KL) Divergence regularization to the loss function. The noisy input image is assumed to be the Gaussian distributed. For validation, we compared the performance of different versions of DIP method qualitatively and quantitatively using measures like PSNR, mean SSIM and MS-SSIM. Our results indicate that the proposed method outperforms the conventional deep image prior approach.
Automated Classification Of Hepatocellular Carcinoma (HCC) Images For Detection of Malignant Tumor Using HOG Technique

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Abstract. Patients with liver cancer have a high mortality rate before the final diagnosis. Computerized medical diagnosis by medical imaging methods may assist significantly in disease diagnosis during the onset of cancer. This research provides a means of identifying liver cancer in humans using CT scans and classifying them with the histogram of the oriented gradient with different paradigms of Support vector machine. The model includes several steps where the image normalization and pre-processing are carried out using homomorphic, and median filters to remove artifacts in the image. The segmentation and area extraction is done in the second step by thresholding and fitting the contour model. We used ROI based gradient histogram to extract features to train the classifier with faster rate in Fine Gaussian SVM relative to other SVM models. The experimental results demonstrate that the device showed an accuracy of 98.4% detecting liver cancer in the real evidence.

An Efficient Blind Fragile Watermarking Scheme for Tamper Localization

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Abstract. Nowadays many cases of image tampering on social medias are reported. Attackers collect the images from social media and share those images by altering the original one to harm their goodwill and reputation. Thus, there is need of an efficient technique to verify the originality of an image and localize the tampering if any occurs in the image. This paper presents an efficient blind fragile watermarking scheme to identify and localize the tamper using self-embedding techniques. For this, authentication bits are embedded in two LSBs of every pixel in the image. Experimental results show the efficacy of the proposed approach.
Student Performance Monitor: A Big Data Analytical Application

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Abstract. The use of AI and Big Data Analytics is limited in developing countries, and even more so is use of it in education sectors. As students and instructors everywhere become more and more reliant on online learning, developing countries like Bangladesh must also follow suit. While we may not be able to transfer a student’s entire educational experience from classroom to the Internet, we can certainly take steps to use the data we already store to create effective monitoring systems such as Student Performance Monitor (SPM) that can inform students about their strengths and weaknesses, and guide them in the right direction. The Big Data Analytic software can be based on the OBE system which gives sets of outcomes an engineering student must successfully achieve to complete their program.

A Novel Portfolio Selection Strategy Using Gradient Based Optimizer

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Abstract. Investment in the different securities of capital markets has always been the center of attraction. The selection of the right combination of securities from the available securities has also been the challenging task for most of the investors and professionals of the field. Researchers, investors and experts of the field have always tried to find the different techniques, methods, and models to optimize investment in different securities by maximizing return and minimizing risk. In this paper, a novel portfolio selection strategy using Gradient Based Optimization (GBO) is proposed to maximize sharp ratio. GBO algorithm is motivated by Newton's gradient procedure with gradient search rule process and local escaping operator. An experimental study has been done to evaluate the proposed strategy by comparing its performance with Particle Swarm Optimization (PSO) based solution approach on dataset of the S&P BSE Sensex of Indian stock exchange (30 stocks). Study reveals the superior performance of the proposed strategy.
Feasibility Study on the Intelligent Control of General Nonlinear Discrete-Time Dynamical Systems: An Analysis on the Scalar Case

Udhaya Ravishankar

Abstract. Intelligent control of nonlinear discrete-time dynamical systems is an interesting and an open research problem in the field of intelligent systems control, and has been around for quite a few decades. So far, only specific classes of nonlinear systems varying from affine systems to time-delayed systems, i.e. structure-specific systems, have been tackled. Despite this, in most of these works, other additional knowledge about the systems, such as control directions and/or lower bounds in internal dynamics, are required to ensure stability in tracking. As such, there exists no control scheme till now for the general case of nonlinear discrete-time systems. Hence, in this work, an attempt is being made to study the feasibility of an intelligent control scheme design for the general case of nonlinear discrete-time systems without knowing any other information about the system as mentioned before. The scalar case is investigated. Results and Lyapunov analysis on uniform and ultimately boundedness of the tracking errors and parameters show that such generalized control schemes are indeed feasible.

A New CNN for pixel classification in Hyperspectral Images

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Abstract. Hyperspectral Image (HSI) contains the large volume of information about the reflectance energy, recorded in hundreds of narrow bands. Classification of pixels in HSI has become challenging due to a greater number of bands (features or dimensions). Lot of research has been done in dimensionality reduction to improve the classification accuracy of HSIs. Convolutional Neural Networks (CNN) models are popularly used for pixel classification in recent years and producing the state-of-the-art results. This paper presents a new CNN architecture for classification of pixels in Hyperspectral Images. The interesting part of this work is that the even by considering the spectral information alone the proposed CNN achieves better classification accuracy than the ones which consider spectral and special information. Experimentally, it is shown that the proposed CNN Model produces better results than the existing best CNN Models on the benchmark data sets in the literature.
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