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Classification of Fine-Grained Emotions

at the International Conference on Multi-Strategy Learning Environment (ICMSLE-2024) held on 12th and 13th January 2024 at Graphic Era Hill University, Dehradun, India.

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IEEE Xplore Part Number: CFP22DN7-ART; ISBN: 979-8-3503-0085-7

Performance Comparison of Conventional and Deep Learning Classifiers for Punjabi Dialect Identification

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***Abstract*—Dialect identification is the process of identifying the dialect from spoken form and this paper focuses on identifying the four dialects of Punjabi language. For any speech processing activity, the need of database arises at first stage and for Punjabi language, a database primarily for four dialectal variations is constructed. To extract the information from the dataset, Mel Frequency Cepstral Coefficients (MFCC) feature extraction technique is employed along with various pre-processing activities like pre-emphasis, framing and windowing. Then for classification of dialects, conventional classifiers like Support Vector Machine (SVM) and Logistic Regression (LR) are used. Also, Recurrent Neural Network (RNN) and Convolutional Neural Network (CNN) are implemented under the category of deep learning classifiers. Performance comparison is done to conclude that deep learning classifiers are giving better outcomes in terms of both accuracy and F1 scores as compared to conventional ones.**

Keywords*—Dialect, Punjabi, Mel Frequency Cepstral Coefficients (MFCC), Support Vector Machine (SVM), Convolutional Neural Network (CNN), Recurrent Neural Network (RNN)

I. Introduction

In today's digital era, the role of speech processing and its applications has a great significance. Role of dialect identification is crucial in speech recognition systems as they can impact the overall accuracy of these systems [1]. Recognizing the dialect of a speaker can improve the accuracy of transcription and voice commands in various languages and dialects. Dialects are linguistic variations that emerge within a language due to geographical, historical, social, or cultural factors. These variations can include differences in pronunciation, vocabulary, grammar, and even discourse patterns [2].

This work is focused on dialect identification for Punjabi language. Punjabi is the mother tongue of people residing in the state of Punjab in both India and Pakistan, as before partition it was a single state [3]. Punjabi language is spoken in variety of dialects which is due to vocabulary, grammar and pronunciation in different geographical locations. Punjabi dialects can be classified into two categories: Tonal dialects and Toneless dialects. Tonal dialects are mostly spoken in eastern Punjab or more specifically Indian Punjab. Major dialects under this category are Majhi, Doabi, Malwai and Powadhi. Toneless dialects are spoken in western Punjab or Punjab state of Pakistan and major dialects are Lahndi (Multani), Potohari, Shahpuri, Jangli. In this work, the dialects of Indian Punjab are under consideration for the implementation of dialect identification system from spoken form of dialects of Punjabi language. There are four main dialectal regions of Punjab and that are Majha, Malwa, Doaba and Powadh. Out of these four regions, Malwa region has districts with almost half of the area of Punjab. Major challenges to Punjabi dialect processing are: mergence with other major languages, one to many word mapping, lack of linguistic resources, and presence of sub dialects. As some of the dialect specific words are confined to a limited region, which sometimes leads to non-understanding of those words in other Punjabi dialects. This problem arises mainly due to different meanings of a particular Punjabi word in different dialects. These multiple meanings can act as a communication barrier during interaction of two or more persons belonging to different dialectal regions of Punjab. Thus, dialect acts as an identification characteristic for a particular community belonging to distinct geographical location [4].

The primary objective of the work presented is to create a spoken dialect identification system for Punjabi language that can recognize Punjabi dialects. For the implementation of same, firstly the speech database of Punjabi dialects is prepared and then preprocessing of speech samples are done to remove various artifacts like noise and disturbances. Also techniques like framing, pre-emphasis and windowing are applied to make data efficient for extraction of speech features. In order to extract the features from the speech, it is necessary to incorporate a variety of transformation-based spectral feature analysis techniques, such as Fast Fourier Transform based enhanced Mel Frequency Cepstral Coefficients (MFCC) so that these features can help in classification. For classifying the dialects, a wide range of classifiers are available under conventional and deep learning types. From these, Support Vector Machine (SVM), Logistic Regression (LR), Recurrent Neural Network (RNN) and Convolutional Neural Network (CNN) are applied due to the reason that these methods have proven their identity in the literature studied and their performances have shown good results in dialect identification process.

II. Related Works

Dialect identification field has a lot of research work done on non-Indian languages like English, Mandarin, Arabic, Malay etc. but Indian languages are still lagging and that may be due to non-availability of standard dialectal speech databases for local languages. Many Indian speech databases

DLT Based Smart Medical Ecosystem

Publisher: IEEE Cite This PDF

Vikram Puri ; Aman Kataria ; Sita Rani ; Piyush Kumar Pareek **All Authors**

Abstract:
The healthcare system has become more reliant on the data collection capabilities of fast evolving IoT devices. Patient healthcare records (PHR) now contain additional information as a result. However, securing identities and guaranteeing data security have emerged as critical challenges in the healthcare system. When it comes to regulating PHR, many of the centralized and decentralized methods now in use struggle difficulties such as single point of failure, high transaction fees, slow throughput, and excessive latency. To address these concerns, a distributed ledger technology (DLT)-based framework named IOTA rather than a blockchain-based platform such as Ethereum or Polygon is proposed. The proposed framework considered the example of a hospital with several patients on the same and various floors. Furthermore, the suggested approach employs a real-time experimental setup for calculating the time and power consumption of the devices.

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Amit Kamra

A Review on CLAHE Based Enhancement Techniques

Authors Richa Sharma, Amit Kamra

Publication date 2023/9/14

Source 2023 6th International Conference on Contemporary Computing and Informatics (IC3I)

Volume 6

Pages 321-325

Publisher IEEE

Description Machine intelligence concepts have revolutionized the way to solve/address the multifaceted problems in many domains such as network security, 3-D modelling, etc. One domain which profoundly benefits from these algorithms is Medical Science. To solve the noise and contrast issues in medical images, we have reviewed different implementation and variants on CLAHE based enhancement techniques. Implementation of CLAHE based techniques in medical images is reviewed extensively in this paper along with its usage in other fields is also highlighted. Different algorithms are measured on performance parameters like Entropy, SNR, PSNR etc.

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Edge Computing and IoT in Smart Cities - An Overview

Ms. Ramandeep Kaur
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Abstract

In an era of growing urbanization and rising sustainability expectations, the confluence of edge computing and IoT technologies has emerged as a critical enabler for creating smarter, more efficient, and resilient urban settings. IoT and edge computing work together as complementary technologies to build smart cities. This chapter delves into the various aspects of edge computing and IoT, highlighting their critical role in enhancing urban living. It looks at the underlying ideas, architectural models, and methods of implementation that facilitate the fusion of different technologies in the context of the smart city environment. The study also discusses a range of use cases and scenarios in which edge computing and IoT are transforming smart cities in profound ways. Applications that come under this category include energy management, public safety, healthcare, environmental monitoring, and intelligent transportation systems. The present research also explores the challenges and considerations that must be made when integrating edge computing and IoT in smart cities, including infrastructure needs, security, privacy, and scalability. By bringing computation and data storage closer to the edge, these technologies can improve the performance, reliability, and security of smart city applications.

Keyword: Edge Computing, Smart Cities, IoT, Fog Computing.

Introduction

The modern world is experiencing enormous urbanisation, with cities now hosting more than half of the global population. In furtherance, rapid urbanisation has brought with it, number of

Chapter

Digital Twin

Enabling Technologies, Applications, and Challenges

By Jaskiran Kaur, Pankaj Bhambri, Sita Rani

Book AI-Driven Digital Twin and Industry 4.0

Edition	1st Edition
First Published	2024
Imprint	CRC Press
Pages	15
eBook ISBN	9781003395416

ABSTRACT

Digital twin is one of the most rapidly developing technologies across various sectors to improve design, optimize resources and processes, and develop efficient systems. A digital twin is the digital representation of a physical thing or system that may be tracked, analyzed, and simulated to enhance the original's operation. The fundamental objective of this chapter is to discuss the framework and enabling technologies to design

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Chapter

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RESEARCH ARTICLE | MARCH 25 2024

Exploring the application domains of ML-based facial emotion recognition systems: Framework, techniques and challenges

Sita Rani ✉; Pankaj Bhambri; Jaskiran Kaur; Yashwant Singh Sangwan

AIP Conf. Proc. 2919, 090008 (2024)
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Exploring the Application Domains of ML-Based Facial Emotion Recognition Systems: Framework, Techniques and Challenges

Sita Rani[1, a)], Pankaj Bhambri[2, b)], Jaskiran Kaur[2, c)], Yashwant Singh Sangwan[3, d)]

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Abstract. Human facial expressions are one of the important techniques of non-verbal communication. Facial expressions are the most tender signs for larger communication and are complemented by other gestures like eye contact, hand movement, etc. This is the direct method of communication of human emotions and intent. In this paper, the authors present the Facial Emotion Recognition (FER) framework and a brief survey of various FER techniques. It also presents the various phases of the FER system i.e., face detection, pre-processing, feature extraction, and classification. Various FER databases like JAFFE, YALE, MUG, etc. are also summarized in terms of the number of emotions, number of images, and resolution. The importance of the domain in other related subject areas like medicine, neuroscience, psychology, decision science, gaming, mental research, etc., is also introduced. The authors explored the application areas of FER techniques. The authors also present the various challenges faced in the real-time implementation of FER models. Finally, the paper is concluded by discussing future research directions.

Keywords: Datasets, Convolution Neural Networks (CNN), Facial Expression Recognition (FER), Machine Learning, Support Vector Machine.

INTRODUCTION

Communication plays a very significant role in the social ecosystem. Usually, human communication comprises both, i.e., verbal and non-verbal methods. Non-verbal communication is done using several means like body language and gestures, eye contact, human facial expressions, paralanguage, etc. [1]. Among these, human facial expression recognition (FER) is the most common technique for non-verbal communication and plays a very essential role [2-4]. These are the most tender signs for larger communication and are complemented by eye contact. Eye contacts help to manage the discussion and establish a rhyme among the communicators. In general, facial expressions are used to recognize different states of human emotions which helps to analyze the psychology of an individual at a particular moment or over a while [5-7]. Broadly, human emotions are categorized as happy, sad, thoughtful, angry, and surprised. ML-based facial expressions are recognized in two stages, i.e., extraction of features and their classification. The process of feature extraction can be categorized as geometric and appearance based. The process of classification also plays a significant role to categorize happy, sad, thoughtful, angry, and surprising emotions. The geometric-based feature extraction uses various facial components like eyes, lips, eyebrows, etc., whereas appearance-based techniques use specific sections of the human face to recognize the true emotion[8].

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Plants recognition using leaf image pattern analysis with focus on advanced smart computing technologies

Pankaj Bhambri ✉; Sukhmeet Singh; Sidharth Jain; Inderjit Singh Dhanoa

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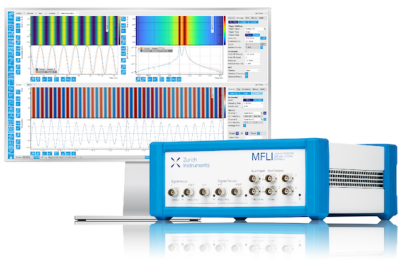

Plants Recognition using Leaf Image Pattern Analysis with Focus on Advanced Smart Computing Technologies

Pankaj Bhambri[1, a)], Sukhmeet Singh[2, b)], Sidharth Jain[1, c)] and Inderjit Singh Dhanoa[3, d)]

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Abstract. Pattern recognition is an important activity in image processing applications. Patterns may be from different class/category like mechanical assemblies, alphabets, numerals, traffic signs and plant's leaves. Each class of patterns bears some common Properties based on its appearance, shape, color profile and other features. The features including shape and color profile can be covered up in image processing while evaluating a pattern under test. In image processing, a pattern is transformed from its shape to feature vector. Feature vector may include its perimeter, color profile, radii, area, edge features, moments and key points on pattern etc. While working or extracting features of a pattern, it is very much required that the features are invariant with respect to its size, orientation and location. Size invariance can be achieved via centre of mass of the pattern. Orientation invariance is obtained by using orthogonal transformation of features. And size invariance is achieved using the mean radius of the pattern under test. In the existing techniques of pattern recognition, the features are dependent upon size, orientation and location. Therefore, a pattern recognition system lacks the faithfulness and repeatability for the same pattern if are resized or oriented at different angles. This issue of feature normalization has been taken care of by normalizing the features using different techniques. Size normalization is achieved by using mean radius. Orientation normalization is obtained using orthogonal transformation while location normalization is achieved using centre of mass using first order of moments.

Keywords: Image Segmentation, Support Vector Machine Classifier, Textural Features, Statistical Variances and Features

INTRODUCTION

Image Mining for extraction of all possible Patterns includes pattern extraction from the input image using image thresholding, segmentation and edge operations etc. Once the input image is binarized using the thresholding operations, patterns are segmented out for shape related features like symmetry around its centre of mass, figure aspect, area and perimeter.

The features are extracted in different domains like radial features. LBP based derivatives from binary version of the input image, texture and histogram features from gray version, color moments from color components of the input image and frequency domain features from enhanced version of the input image. If a transform could be worked out, that will justify the uniqueness of the feature vector to its respective pattern. This enables to retrieve a pattern from its feature vector using the inverse transform. The performance of the pattern realized using the inverse feature vector transform should be as close as possible to the real pattern.

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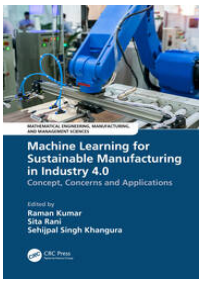

ML techniques for analyzing security threats and enhancing sustainability in medical field based on Industry 4.0

By Sukhpreet Kaur Khalsa (/search?contributorName=Sukhpreet Kaur Khalsa&contributorRole=author&redirectFromPDP=true&context=ubx), Ranjodh Kaur (/search?contributorName=Ranjodh Kaur&contributorRole=author&redirectFromPDP=true&context=ubx), Rajwinder Kaur (/search?contributorName=Rajwinder Kaur&contributorRole=author&redirectFromPDP=true&context=ubx)

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IMAGE DEMOSAICING USING NAÏVE BAYES CLASSIFIER FOR IMPROVED IMAGE METRICS

GURJOT KAUR WALIA, GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA, INDIA
NAVNEET KAUR, GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA, INDIA
CHAHAT JAIN, GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA, INDIA

Abstract: Capturing minute details and transforming them into a complete image is a tedious task, which is accomplished by demosaicing process. Image demosaicing has gained popularity in forensics, low-light imaging, biomedical applications etc. in the present scenario. The proposed work presents the usage of naïve bayes classifier for the demosaicing mechanism on the images from Kodak dataset for the kernel size of 7*7. The metrics Signal to Noise Ratio, Peak Signal to Noise Ratio have been used to decide the quality of the output images. The results after extensive simulations on Matlab have shown superiority over the existing KNN algorithm.

Keywords: *Naïve bayes, Demosaicing, Bayer pattern, SNR, PSNR.*

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PERFORMANCE ANALYSIS OF RADIO OVER FSO FOR ADVANCED MODULATION FORMATS

RAMNEET KAUR SAHOTA, GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA, INDIA
PREETI PANNU, GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA, INDIA
GURJOT KAUR WALIA, GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA, INDIA

Abstract: Since Radio Over Free Space Optical systems are being preferred over other systems these days, so this paper presents a RoFSO system that works at 40 Gbps data speed. In the presented system with radio frequency mixing, different modulation formats viz. NRZ, CSRZ and RZ are evaluated based on varied power range and aperture diameter. Also, despite the number of benefits, the system needs to be evaluated for various launch powers and distances in terms of the Q factor. After extensive simulations, a comparison of CSRZ, RZ, and NRZ has been presented in terms of BER to detect the optimal modulation format for the RoFSO system from which it is deduced that the modulation format CSRZ outperforms the other techniques.

Keywords: *BER, CSRZ, RZ, NRZ, RoFSO, Aperture diameter.*

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CONTENT

A LINEAR 16x1 and 42x1 ELEMENTS ANTENNA ARRAY FAILURE CORRECTION USING BRAIN STORM OPTIMIZATION ALGORITHM

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ABSTRACT
The malfunctioning of one or more antenna array elements causes degradation of radiation characteristics and thus may hamper the normal operation of antenna system. In the presented work, an advanced optimization technique has been used to rectify the problems of element failure of antenna array that contain 16x1 and 42x1 elements. The suggested strategy yields effective resultsand can be implemented in practical systems.

Keywords
Antenna Array system, Linear 16x1 and 42x1 elements Array, Element Failure correction, Optimization, brain storm optimization

1. INTRODUCTION
The backbone of wireless communication system is an antenna array. The array's high number of antenna elements increases the likelihood of certain elements fail during the operation. When an antenna element fails, the original characteristics of antenna system are distorted, leading to the malfunctioning of an antenna array. In critical applications such as space craft, war time communication system etc, it could be challenging to fix a malfunctioning antenna element.However,the respective issue can be resolved without repairing of faulty elements and rearrange the amplitude or phase or both excitations of remaining good antenna elements in order to recover the antenna system original pattern.

The researchers have worked on various methods to address the issue of antenna array failure correction including conjugate gradient algorithm using complex excitations of good elements [1]; a numerical technique based on one element failure case [2]; an orthogonal process [3] and applying a digital beamforming array method [4].

The randomness of the geometric layout of operational antenna array elements makes it difficult for numerical methods to regain the desired beam characteristics under failure conditions. In view of that, the optimization techniques have edge over conventional method in solving antenna array failure problems. These techniques have ability to provide identify multiple solutions simultaneously without any need of prior information. The prominent optimization techniques have been investigated for antenna array failure problems including simulated annealing (SA) [5-6], genetic algorithm (GA) [7,8], firefly algorithm [9-11], bat algorithm [12], Brain Storm Optimization BSO [13].

In the presented work, an extension of previous paper [13] based on brain storm optimization (BSO) [14] has been proposed to recover the original characteristics of linear 16x1 and 42x1 elements antenna array with failed condition. The proposed optimization method has also been used in various other engineering fields [15-16].

2. PROBLEM FORMULATION
The array factor of the linear array of $N\,x\,1$ identical elements with uniform half wavelength spacing d between adjacent elements is generally given as

$$AF_d = W^K S(\varphi,\varphi_p) \qquad (1)$$

where,

$$W^K = \{w_1, w_2, w_3 \ldots\ldots w_N\}^T, \quad w_z \in C^M, \quad z = 1,2,\ldots N \qquad (2)$$

The equations (1) and (2) using different variables including the weighting vector W^K, the steering vector S, the direction variable and main beam direction φ,φ_p. The real numbers C^M is used as weights of the N elements linear antenna array.

The steering vector S in (1) is follows as

$$S = exp\left\{\frac{j2\pi d}{\lambda}\left(z - \frac{N-1}{2}\right).(\cos\varphi - \cos\varphi_p)\right\} \qquad z = 1,2,\ldots N \qquad (3)$$

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UNLEASHING THE POWER OF DATA IN DATA SCIENCE

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Abstract: Certainly, Data Science stands out as a transformative technology of our time, aimed at extracting valuable insights from data to address complex real-world problems. The burgeoning demand for Data Science can be attributed to the relentless generation of data at an unprecedented pace. In the era of the Fourth Industrial Revolution (Industry 4.0), the digital landscape is inundated with a vast volume of data encompassing statistics, facts, knowledge, and information from sources such as the Internet of Things (IoT), business operations, healthcare systems, mobile devices, urban environments, and security networks, owing to technological advancements. Deriving knowledge and practical insights from this wealth of data facilitates informed decision-making across various application domains. Data Science employs advanced analytics techniques, including machine learning models, predictive models, and intricate statistical analysis, to delve deep into data sets, enabling a deeper understanding and extraction of actionable insights. These techniques play a pivotal role in enhancing decision-making processes, streamlining computations, and bolstering the intelligence and capabilities of applications in diverse contexts. This paper provides an extensive overview of Data Science, elucidating its multifaceted analytics techniques and their potential to drive perceptive decision-making across a wide array of scenarios.

Keywords: *Big data, Data science, Deep learning, Decision-making, Correlation analysis.*

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Chapter 35
Parameter Estimation in Design of 5.2 GHz Rectangular U Slot Microstrip Patch Antenna with ANFIS

Harleen Kaur and Balwinder Singh Dhaliwal

1 Introduction

To meet the growing need for more compact, low-profile antennas to meet personal and mobile communications needs, microstrip antennas (MSA) have grown in popularity. These antennas function incredibly well because of factors including size, weight, cost, utility, and simplicity of installation [1]. Due to their dual configuration of the radiating patch and the ground on opposite sides of the dielectric substrate, microstrip antennas are also known as patch antennas. Although these antennas offer many benefits, they also have several drawbacks, including low efficiency, limited power, and a relatively small frequency bandwidth [1]. Rectangular microstrip antennas are the simplest and most used kind. Several studies have been done on various bandwidth improvement solutions to address the narrow frequency bandwidth characteristics of microstrip antennas, such as stacked patches, parasitic patches, or forms like U or H [2]. Since etching a U slot into a patch is regarded to be a simple design, it eliminates the need for additional techniques that increase the antenna's lateral dimension or thickness. By altering the current distribution on the microstrip patch, it is possible to increase the impedance bandwidth and occasionally reach more than one resonance frequency [3].

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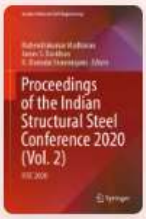

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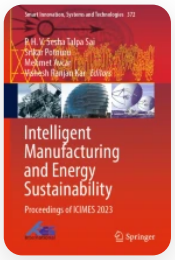

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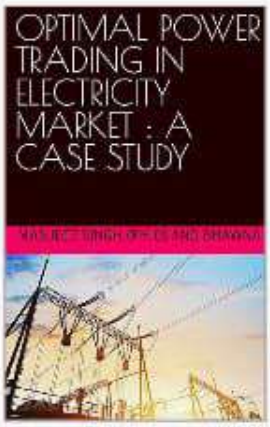

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