A MATLAB based Face Recognition using PCA with Back Propagation Neural network

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ABSTRACT: Automatic recognition of people is a challenging problem which has received much attention during recent years due to its many applications in different fields. Face recognition is one of those challenging problems and up to date, there is no technique that provides a robust solution to all situations. There are many techniques used for this purpose. Face recognition is an effective means of authenticating a person. In this paper, a face recognition system for personal identification and verification using Principal Component Analysis (PCA) with Back Propagation Neural Networks (BPNN) is proposed. The dimensionality of face image is reduced by the PCA and the recognition is done by the BPNN for face recognition. The system consists of a database of a set of facial patterns for each individual. The characteristic features of pca called 'eigenfaces' are extracted from the stored images, which is combine with Back Propagation Neural Network for subsequent recognition of new images.

KEYWORDS: Neural Networks, Principal Component Analysis, Eigen Values, Eigen Vector, Back Propagation Neural Network

I. INTRODUCTION

Face recognition has a large number of applications, including security, person verification, Internet communication, and computer entertainment. Although research in automatic face recognition has been conducted since the 1960s, this problem is still largely unsolved. Recent years have seen significant progress in this area owing to advances in face modelling and analysis techniques. Systems have been developed for face detection and tracking, but reliable face recognition still offers a great challenge to computer vision and pattern recognition researchers. There are several reasons for recent increased interest in face recognition, including rising public concern for security, the need for identity verification in the digital world, and the need for face analysis and modelling techniques in multimedia data management and computer entertainment. Recent advances in automated face analysis, pattern recognition, and machine learning have made it possible to develop automatic face recognition systems to address these applications. In this paper we proposed a mathematical model and computational model of face recognition which is fast, reasonably simple, and accurate in constrained environment. Face recognition using eigenface has been shown to be accurate and fast. When BPNN technique is combine with PCA non-linear face images can be recognised easily. [1][5]

II. WORKING MODEL

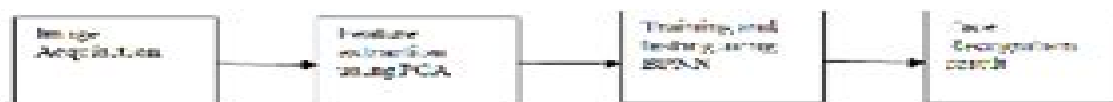The system involves three steps (Fig1):

Fig1: Generic representation of a face recognition system.

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Face Recognition Using Backpropagation Neural Network In Matlab Code:

Smart Infrastructures in the IoT Era Fadi Al-Turjman,2025-01-02 This book provides a comprehensive overview of advanced digital disruptive technologies that can be used or currently used in Construction and Smart Infrastructures It provides a holistic collection of such disruptive technologies to address issues or otherwise uplift the technological aspects of various aspects of human lives and projects impacting the overall culture and society sustainability These pertinent technologies explored in this book are Artificial Intelligence AI Internet of Things IoT Unmanned Aerial Vehicles UAVs Clouds and Big Data It is expected that the book will unify the fields of construction and project management through the integration AI frameworks provided in various chapters **Artificial Intelligence and Evolutionary Algorithms in Engineering Systems** L. Padma Suresh,Subhransu Sekhar Dash,Bijaya Ketan Panigrahi,2014-11-01 The book is a collection of high quality peer reviewed research papers presented in Proceedings of International Conference on Artificial Intelligence and Evolutionary Algorithms in Engineering Systems ICAEES 2014 held at Noorul Islam Centre for Higher Education Kumaracoil India These research papers provide the latest developments in the broad area of use of artificial intelligence and evolutionary algorithms in engineering systems The book discusses wide variety of industrial engineering and scientific applications of the emerging techniques It presents invited papers from the inventors originators of new applications and advanced technologies Signal and Image Processing for Biometrics Amine Nait-Ali,Regis Fournier,2012-12-17 The aim of this book is to deal with biometrics in terms of signal and image processing methods and algorithms This will help engineers and students working in digital signal and image processing deal with the implementation of such specific algorithms It discusses numerous signal and image processing techniques that are very often used in biometric applications In particular algorithms related to hand feature extraction speech recognition 2D 3D face biometrics video surveillance and other interesting approaches are presented Moreover in some chapters Matlab codes are provided so that readers can easily reproduce some basic simulation results This book is suitable for final year undergraduate students postgraduate students engineers and researchers in the field of computer engineering and applied digital signal and image processing 1 Introduction to Biometrics Bernadette Dorizzi 2 Introduction to 2D Face Recognition Amine Nait Ali and Dalila Cherifi 3 Facial Soft Biometrics for Person Recognition Antitza Dantcheva Christelle Yemdji Petros Elia and Jean Luc Dugelay 4 Modeling Reconstruction and Tracking for Face Recognition Catherine Herold Vincent Despiegel St phane Gentric S verine Dubuisson and Isabelle Bloch 5 3D Face Recognition Mohsen Ardabilian Przemyslaw Szeptycki Di Huang and Liming Chen 6 Introduction to Iris Biometrics Kamel Aloui Amine Nait Ali R gis Fournier and Saber Naceur 7 Voice Biometrics Speaker Verification and Identification Foezur Chowdhury Sid Ahmed Selouani and Douglas O Shaughnessy 8 Introduction to Hand Biometrics R gis Fournier and Amine Nait Ali 9 Multibiometrics Romain Giot Baptiste Hemery Estelle Cherrier and Christophe Rosenberger 10 Hidden Biometrics Amine Nait Ali R gis Fournier Kamel Aloui and Noureddine Belgacem 11

Performance Evaluation of Biometric Systems Mohamad El Abed Romain Giot Baptiste Hemery Julien Mahier and Christophe Rosenberger 12 Classification Techniques for Biometrics Amel Bouchemha Ch rif Nait Hamoud Amine Nait Ali and R gis Fournier 13 Data Cryptography Islam Naveed and William Puech 14 Visual Data Protection Islam Naveed and William Puech 15 Biometrics in Forensics Guillaume Galou and Christophe Lambert **Current Trends on Knowledge-Based Systems** Giner Alor-Hernández,Rafael Valencia-García,2017-03-13 This book presents innovative and high quality research on the implementation of conceptual frameworks strategies techniques methodologies informatics platforms and models for developing advanced knowledge based systems and their application in different fields including Agriculture Education Automotive Electrical Industry Business Services Food Manufacturing Energy Services Medicine and others Knowledge based technologies employ artificial intelligence methods to heuristically address problems that cannot be solved by means of formal techniques These technologies draw on standard and novel approaches from various disciplines within Computer Science including Knowledge Engineering Natural Language Processing Decision Support Systems Artificial Intelligence Databases Software Engineering etc As a combination of different fields of Artificial Intelligence the area of Knowledge Based Systems applies knowledge representation case based reasoning neural networks Semantic Web and TICs used in different domains The book offers a valuable resource for PhD students Master s and undergraduate students of Information Technology IT related degrees such as Computer Science Information Systems and Electronic Engineering Machine and Deep Learning Using MATLAB Kamal I. M. Al-Malah,2023-10-12 MACHINE AND DEEP LEARNING In depth resource covering machine and deep learning methods using MATLAB tools and algorithms providing insights and algorithmic decision making processes Machine and Deep Learning Using MATLAB introduces early career professionals to the power of MATLAB to explore machine and deep learning applications by explaining the relevant MATLAB tool or app and how it is used for a given method or a collection of methods Its properties in terms of input and output arguments are explained the limitations or applicability is indicated via an accompanied text or a table and a complete running example is shown with all needed MATLAB command prompt code The text also presents the results in the form of figures or tables in parallel with the given MATLAB code and the MATLAB written code can be later used as a template for trying to solve new cases or datasets Throughout the text features worked examples in each chapter for self study with an accompanying website providing solutions and coding samples Highlighted notes draw the attention of the user to critical points or issues Readers will also find information on Numeric data acquisition and analysis in the form of applying computational algorithms to predict the numeric data patterns clustering or unsupervised learning Relationships between predictors and response variable supervised categorically sub divided into classification discrete response and regression continuous response Image acquisition and analysis in the form of applying one of neural networks and estimating net accuracy net loss and or RMSE for the successive training validation and testing steps Retraining and creation for image labeling object identification

regression classification and text recognition Machine and Deep Learning Using MATLAB is a useful and highly comprehensive resource on the subject for professionals advanced students and researchers who have some familiarity with MATLAB and are situated in engineering and scientific fields who wish to gain mastery over the software and its numerous applications **Practical Robot Design** Jagannathan Kanniah,M. Fikret Ercan,Carlos A. Acosta Calderon,2013-10-17 Designed for beginners undergraduate students and robotics enthusiasts Practical Robot Design Game Playing Robots is a comprehensive guide to the theory design and construction of game playing robots Drawing on years of robot building and teaching experience the authors demonstrate the key steps of building a robot from beginning to end wi **Algorithms and Architectures for Parallel Processing** Jaideep Vaidya,Jin Li,2018-12-07 The four volume set LNCS 11334 11337 constitutes the proceedings of the 18th International Conference on Algorithms and Architectures for Parallel Processing ICA3PP 2018 held in Guangzhou China in November 2018 The 141 full and 50 short papers presented were carefully reviewed and selected from numerous submissions The papers are organized in topical sections on Distributed and Parallel Computing High Performance Computing Big Data and Information Processing Internet of Things and Cloud Computing and Security and Privacy in Computing **Neurodynamics of Cognition and Consciousness** Leonid I. Perlovsky,Robert Kozma,2007-08-26 Experimental evidence in humans and other mammalians indicates that complex neurodynamics is crucial for the emergence of higher level intelligence Dynamical neural systems with encoding in limit cycle and non convergent attractors have gained increasing popularity in the past decade The role of synchronization desynchronization and intermittent synchronization on cognition has been studied extensively by various authors in particular by authors contributing to the present volume This book addresses dynamical aspects of brain functions and cognition **Handbook Of Character Recognition And Document Image Analysis** Horst Bunke,Patrick S P Wang,1997-05-02 Optical character recognition and document image analysis have become very important areas with a fast growing number of researchers in the field This comprehensive handbook with contributions by eminent experts presents both the theoretical and practical aspects at an introductory level wherever possible *Advances in Electrical Engineering and Electrical Machines* Dehuai Zheng,2012-02-01 With success of ICEEE 2010 in Wuhan China and December 4 to 5 2010 the second International Conference of Electrical and Electronics Engineering ICEEE 2011 will be held in Macau China and December 1 to 2 2011 ICEEE is an annual conference to call together researchers engineers academicians as well as industrial professionals from all over the world to present their research results and development activities in Electrical and Electronics Engineering along with Computer Science and Technology Communication Technology Artificial Intelligence Information Technology etc This year ICEEE is sponsored by International Industrial Electronics Center Hong Kong And based on the deserved reputation more than 750 papers have been submitted to ICEEE 2011 from which about 98 high quality original papers have been selected for the conference presentation and inclusion in the Electrical and Electronics Engineering book based on the

referees comments from peer refereed We expect that the Electrical and Electronics Engineering book will be a trigger for further related research and technology improvements in the importance subject including Power Engineering Telecommunication Integrated Circuit Electronic amplifier Nano technologies Circuits and networks Microelectronics Analog circuits Digital circuits Circuits design Silicon devices Thin film technologies VLSI Sensors CAD tools Molecular computing Superconductivity circuits Antennas technology System architectures etc *Sensing and Artificial Intelligence Solutions for Food Manufacturing* Daniel Hefft,Charles Oluwaseun Adetunji,2023-03-31 This book gives readers a practical introduction into machine learning and sensing techniques their design and ultimately specific applications that could improve food production It shows how these sensing and computing systems are suitable for process implementation in food factories This book starts by giving the reader an overview of the historic structures of food manufacturing standards and how they defined today s manufacturing It is followed by a topical introduction for professionals in the food industries in topics such as AI machine learning and neural networks It also includes an explanation of the different sensor systems and their basic principles It shows how these sensing and computing systems are suitable for process implementation in food factories and what types of sensing systems have already been proven to deliver benefit to the food manufacturing industries The authors also discuss issues around food safety labelling and traceability and how sensing and AI can help to resolve issues They also use case studies and specific examples that can show the benefit of such technologies compared to current approaches This book is a practical introduction and handbook for students food engineers technologists and process engineers on the benefits and challenges around modern manufacturing systems following Industry 4 0 approaches Computational Neural Networks for Geophysical Data Processing M.M. Poulton,2001-06-13 This book was primarily written for an audience that has heard about neural networks or has had some experience with the algorithms but would like to gain a deeper understanding of the fundamental material For those that already have a solid grasp of how to create a neural network application this work can provide a wide range of examples of nuances in network design data set design testing strategy and error analysis Computational rather than artificial modifiers are used for neural networks in this book to make a distinction between networks that are implemented in hardware and those that are implemented in software The term artificial neural network covers any implementation that is inorganic and is the most general term Computational neural networks are only implemented in software but represent the vast majority of applications While this book cannot provide a blue print for every conceivable geophysics application it does outline a basic approach that has been used successfully **Robotic Vision: Technologies for Machine Learning and Vision Applications** Garcia-Rodriguez, Jose,2012-12-31 Robotic systems consist of object or scene recognition vision based motion control vision based mapping and dense range sensing and are used for identification and navigation As these computer vision and robotic connections continue to develop the benefits of vision technology including savings improved quality reliability safety and productivity are revealed Robotic Vision Technologies for

Machine Learning and Vision Applications is a comprehensive collection which highlights a solid framework for understanding existing work and planning future research This book includes current research on the fields of robotics machine vision image processing and pattern recognition that is important to applying machine vision methods in the real world **Advanced Biometrics with Deep Learning** Andrew Teoh Beng Jin ,Lu Leng,2020-12-28 Biometrics such as fingerprint iris face hand print hand vein speech and gait recognition etc as a means of identity management have become commonplace nowadays for various applications Biometric systems follow a typical pipeline that is composed of separate preprocessing feature extraction and classification Deep learning as a data driven representation learning approach has been shown to be a promising alternative to conventional data agnostic and handcrafted pre processing and feature extraction for biometric systems Furthermore deep learning offers an end to end learning paradigm to unify preprocessing feature extraction and recognition based solely on biometric data This Special Issue has collected 12 high quality state of the art research papers that deal with challenging issues in advanced biometric systems based on deep learning The 12 papers can be divided into 4 categories according to biometric modality namely face biometrics medical electronic signals EEG and ECG voice print and others *Advances in Imaging and Electron Physics* Peter W. Hawkes,Benjamin Kazan,Tom Mulvey,2003-05-20 Image processing and a major contribution on microscopy dominate the latest volume of these advances This volume looks at theory and it s application in a practical sense with a full account of the methods used and realistic detailed application The authors do this by examining the latest developments historic illustrations and mathematical fundamentals of the exciting developments in imaging and applying them to realistic practical situations Addressing and solving daily issues faced by researchers consultants and engineers working in this field makes this book essential reading Emphasizes broad and in depth article collaborations between world renowned scientists in the field of image and electron physics Emphasises theory and it s application in a practical sense Provides the FIRST full statement of a radical new approach to phase calibration and the solution of this important and difficult problem pioneered by A Lannes *COMSIG* ,1998 **Emerging Trends in Image Processing, Computer Vision and Pattern Recognition** Leonidas Deligiannidis,Hamid R Arabnia,2014-12-09 Emerging Trends in Image Processing Computer Vision and Pattern Recognition discusses the latest in trends in imaging science which at its core consists of three intertwined computer science fields namely Image Processing Computer Vision and Pattern Recognition There is significant renewed interest in each of these three fields fueled by Big Data and Data Analytic initiatives including but not limited to applications as diverse as computational biology biometrics biomedical imaging robotics security and knowledge engineering These three core topics discussed here provide a solid introduction to image processing along with low level processing techniques computer vision fundamentals along with examples of applied applications and pattern recognition algorithms and methodologies that will be of value to the image processing and computer vision research communities Drawing upon the knowledge of recognized

experts with years of practical experience and discussing new and novel applications Editors Leonidas Deligiannidis and Hamid Arabnia cover Many perspectives of image processing spanning from fundamental mathematical theory and sampling to image representation and reconstruction filtering in spatial and frequency domain geometrical transformations and image restoration and segmentation Key application techniques in computer vision some of which are camera networks and vision image feature extraction face and gesture recognition and biometric authentication Pattern recognition algorithms including but not limited to Supervised and unsupervised classification algorithms Ensemble learning algorithms and parsing algorithms How to use image processing and visualization to analyze big data Discusses novel applications that can benefit from image processing computer vision and pattern recognition such as computational biology biometrics biomedical imaging robotics security and knowledge engineering Covers key application techniques in computer vision from fundamentals to mid to high level processing some of which are camera networks and vision image feature extraction face and gesture recognition and biometric authentication Presents a number of pattern recognition algorithms and methodologies including but not limited to supervised and unsupervised classification algorithms Ensemble learning algorithms and parsing algorithms Explains how to use image processing and visualization to analyze big data

Proceedings of ELM-2014 Volume 2 Jiuwen Cao,Kezhi Mao,Erik Cambria,Zhihong Man,Kar-Ann Toh,2014-12-09 This book contains some selected papers from the International Conference on Extreme Learning Machine 2014 which was held in Singapore December 8 10 2014 This conference brought together the researchers and practitioners of Extreme Learning Machine ELM from a variety of fields to promote research and development of learning without iterative tuning The book covers theories algorithms and applications of ELM It gives the readers a glance of the most recent advances of ELM

MatConvNet Deep Learning and iOS Mobile App Design for Pattern Recognition: Emerging Research and Opportunities Wu, Jiann-Ming,Tien, Chao-Yuan,2020-04-17 Deep learning has become a trending area of research due to its adaptive characteristics and high levels of applicability In recent years researchers have begun applying deep learning strategies to image analysis and pattern recognition for solving technical issues within image classification As these technologies continue to advance professionals have begun translating this intelligent programming language into mobile applications for devices Programmers and web developers are in need of significant research on how to successfully develop pattern recognition applications using intelligent programming MatConvNet Deep Learning and iOS Mobile App Design for Pattern Recognition Emerging Research and Opportunities is an essential reference source that presents a solution to developing intelligent pattern recognition Apps on iOS devices based on MatConvNet deep learning Featuring research on topics such as medical image diagnosis convolutional neural networks and character classification this book is ideally designed for programmers developers researchers practitioners engineers academicians students scientists and educators seeking coverage on the specific development of iOS mobile applications using pattern recognition strategies **Medical**

Image Computing and Computer-Assisted Intervention – MICCAI 2016 Sebastien Ourselin,Leo Joskowicz,Mert R. Sabuncu,Gozde Unal,William Wells,2016-10-17 The three volume set LNCS 9900 9901 and 9902 constitutes the refereed proceedings of the 19th International Conference on Medical Image Computing and Computer Assisted Intervention MICCAI 2016 held in Athens Greece in October 2016 Based on rigorous peer reviews the program committee carefully selected 228 revised regular papers from 756 submissions for presentation in three volumes The papers have been organized in the following topical sections Part I brain analysis brain analysis connectivity brain analysis cortical morphology Alzheimer disease surgical guidance and tracking computer aided interventions ultrasound image analysis cancer image analysis Part II machine learning and feature selection deep learning in medical imaging applications of machine learning segmentation cell image analysis Part III registration and deformation estimation shape modeling cardiac and vascular image analysis image reconstruction and MR image analysis

Face Recognition Using Backpropagation Neural Network In Matlab Code Book Review: Unveiling the Magic of Language

In an electronic era where connections and knowledge reign supreme, the enchanting power of language has be apparent than ever. Its power to stir emotions, provoke thought, and instigate transformation is actually remarkable. This extraordinary book, aptly titled "**Face Recognition Using Backpropagation Neural Network In Matlab Code**," compiled by a highly acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound effect on our existence. Throughout this critique, we will delve in to the book is central themes, evaluate its unique writing style, and assess its overall influence on its readership.

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