



# **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):

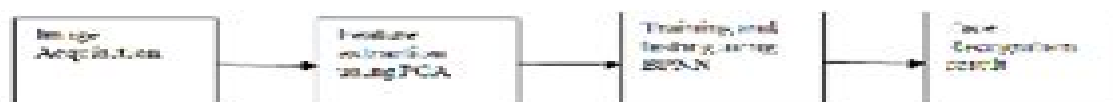


Fig1: Generic representation of a face recognition system

# Face Recognition Using Backpropagation Neural Network In Matlab Code

**Leonid I. Perlovsky, Robert Kozma**



## **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 of AI frameworks provided in various chapters.

**Artificial Intelligence and Evolutionary Algorithms in Engineering Systems** L. Padma Suresh, Subhansu 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 a 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, Régis 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.

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- 10 Hidden Biometrics Amine Nait Ali, Régis Fournier, Kamel Aloui, and Nouredine Belgacem
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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

**Deep Learning for Image Recognition** Peng Long, Yu Song, 2025-11-03 Deep Learning for Image Recognition provides a detailed explanation of the fundamental theories underpinning image recognition and code for recognition tasks in specific application scenarios Readers can manipulate the existing code thereby deepening their understanding Chapters include project work enabling readers to apply the skills and knowledge gained from that section of the book Projects are based on the accessible Pytorch framework which is straightforward to learn and can be replicated and modified Readers are presented with current research findings and up to date techniques in image recognition and deep learning A comprehensive introduction to the technology and applications of image recognition based on deep learning Delves into the core concepts of image recognition from pre processing to modelling and algorithm implementation This is supported by clear descriptions of neural networks including convolutional neural network principles model visualization model compression and model deployment Highlights current research outcomes of multiple new technologies in the field of computer vision Examples and case studies are included

Machine and Deep Learning Using MATLAB Kamal I. M. Al-Malah, 2023-10-24 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 with

*Neurodynamics of Cognition and Consciousness* Leonid I. Perlovsky, Robert Kozma, 2007-08-26 Experimental evidence in humans and other mammals 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

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

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**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

*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

**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      *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

**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

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

**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

**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 **Information Technology - New Generations** Shahram Latifi,2018-04-12 This volume presents a collection of peer reviewed scientific articles from the 15th International Conference on Information Technology New Generations held at Las Vegas The collection addresses critical areas of Machine Learning Networking and Wireless Communications Cybersecurity Data Mining Software Engineering High Performance Computing Architectures Computer Vision Health Bioinformatics and Education **COMSIG** ,1998



The Enigmatic Realm of **Face Recognition Using Backpropagation Neural Network In Matlab Code**: Unleashing the Language is Inner Magic

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