PREDICTION MODEL USING FACIAL FEATURES

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JAYPEE INSTITUTE OF INFORMATION TECHNOLOGY, NOIDA

TABLE OF CONTENTS

DECLARATION

We hereby declare that this submission is our own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgment has been made in the text.

Place: Jaypee Institute of Information Technology Noida

Date: 24/05/2019

Signature:

Name: Harshit Paliwal, Raghav Mathur, Vedant Kukreti

Enrolment No: 15104042, 15103098, 15104061

CERTIFICATE

This is to certify that the work titled "**Prediction Model using Facial Features**" submitted by **"Harshit Paliwal, Raghav Mathur & Vedant Kukreti**" in partial fulfilment for the award of degree of Bachelor of Technology of Jaypee Institute of Information Technology, Noida has been carried out under my supervision. This work has not been submitted partially or wholly to any other University or Institute for the award of this or any other degree or diploma.

Signature of Supervisor

Name of Supervisor Dr. Shikha Jain

Designation Assistant Professor (Senior Grade)

Date 24/05/2019

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We would also like to thank the panel members, Ms. Shardha Porwal and Dr. Anuja Arora for reviewing and evaluating our work.

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SUMMARY

A human face gives a great deal of data that enables someone else to distinguish qualities, for example, age, gender, and so forth. Along these lines, the test is to build up an age gathering's forecast framework utilizing the strategy for programmed learning. The assignment of assessing the human age group from pictures of your frontal face, yet it is testing a result of the example of individual and non-straight maturing which is not quite the same as one individual to another. In view of giving face picture precision, analyses the issue of anticipating the age gathering of people. The reason for this examination is to set up a structure and later a calculation that helps in assessing age bunch with appropriate precision of face pictures. In this paper, we present a strategy for age prediction, in which the age group is anticipated by distinguishing face or face reference focuses utilizing the viola-jones calculation. Subsequent to recognizing the face, the highlights incorporate geometric attributes, wrinkle qualities and HOG qualities, and afterward these removed highlights are utilized to prepare a classifier utilizing neural systems. The framework utilized self-creation databases for age bunch grouping. At last, the distinguishing proof rate gotten by the HOG-neural system model improves results.

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Signature of Student(s)	Signature of Supervisor
Name: Harshit Paliwal, Raghav Mathur, Vedant Kukreti	Name: Dr. Shikha Jain
Date: 24/05/2019	Date: 24/05/2019

LIST OF FIGURES

LIST OF TABLES

LIST OF SYMBOLS/ACRONYMS

S.No	SYMBOL AND ACRONYM	FULL FORM
1	SVM	SUPPORT VECTOR MACHINE
2	KNN	K-NEAREST NEIGHBOUR
3	ANN	ARTIFICIAL NEURAL NETWORK
4	BPNN	BACK PROPAGATION NEURAL NETWORK
5	MAE	MEAN ABSOLUTE ERROR
6	RGB	RED,GREEN AND BLACK
7	HOG	HISTOGRAM OF ORIENTED GRADIENTS
8	GMM	GAUSSIAN BLEND MODELS

1. Introduction

1.1 General Introduction

Age estimation from faces is a challenging problem with applications in forensics, security, biometrics, entertainment and electronic customer relationship management. Automatic age estimation can increase many computer applications in these domains, but it can also be used as a stand-alone tool, since humans are not universally successful in estimating age. The main challenge of age estimation is the inconsistency in facial feature which changes due to aging in humans. To determine facial changes associated with age is a complex problem, because they are related not only to gender but also with genetic properties, and also to a number of external factors such as health, living conditions and weather. Gender can also play a role in the aging process as there are differences in aging pattern of males and females. Furthermore, facial cosmetics, surgical operations and the presence of spots, and even the presence of facial hair can be mitigating factors for age estimation. In this project successful age classification utilizing face elements like surface and shape from human face picture are proposed. For better execution, calculation of geometric components of facial picture like wrinkle topography , left to right eye partition, eye to nose distance, eye to jaw distance and eye to lip distance is mathematically calculated. With this perspective of the geometric structure and shape information, characterization is finished by utilizing Artificial Neural Network.

1.2 Problem Statement

The issue of Age characterization from the facial pictures is charming, yet additionally the requesting one since period of human shifts dependent on the different components which might be inside elements or outer elements. Inner variables change age incorporate sexual orientation, hereditary qualities and so on while the outer components that influence the age incorporate way of life, drugs, ethnicity, and so forth. Also, these two components could make it confounded to consummately plan the human development design. The facial maturing estimation process that has been created gotten a high exactness rate for the infant faces than the grown-up countenances, yet for the grown-ups this procedure has been a muddled errand because of the event of various examples of maturing, interior variables, skin surface, and outer elements for certain years. It is additionally worth referencing that age-bunch forecast has been helpful in the various frameworks, for example, statistic grouping, Age Specific Human Computer Interaction (ASHCI) and picture datasets ordering and so forth. In the

programmed age characterization, the principle objective is to build up a holy calculation that empowers to order the age-bunch dependent on highlight extricated facial pictures. One of the primary difficulties of the age arrangement is the exactness level, which is because of the multifaceted design of the human maturing design. Along these lines, it isn't just sufficient to arrange the human age, yet in addition basic to foresee it as accurately as could be expected under the circumstances. Another significant issue that is important to the age expectation issue is the age-bunches range and this parameter is a key viewpoint as various qualities of maturing design show up in various age-gatherings, subsequently the framework got prepared to adapt to explicit extents probably won't be applicable to an increasingly different scope of age-gathering. Accordingly, in this examination, we are experiencing the human age-bunch forecast task between the youthful, grown-up, and old to a worthy level of grouping precision dependent on facial pictures.

1.3 Novelty of the Problem

We have picked a task dependent on a critical use in everyday fields where age qualification is required and we are applying picture preparing systems alongside AI based calculations to distinguish the age gatherings of individuals. We have completed a mix of geometric and wrinkle features and with the assistance of BPNN classifier we can accurately foresee the age grouping. We are chipping away at three age bunches specifically young, adult and senior.

1.4 Brief Description of Solution Approach

In the past numerous recommendations for evaluation of various age groups have been proposed. The principle steps utilized in the significant gathering characterization are generally increasingly normal; for example, picture preprocessing, highlight extraction, preparing and testing. In this manner, a few techniques or calculations have been proposed by the creators.

The motivation behind this undertaking is to characterize the age into various age-gatherings, for example, kid, grown-up and old. Age-bunch expectation can be viewed as an example acknowledgment issue. Each age can be considered as a class; along these lines age expectation can be seen as a characterization. Following figure demonstrates the procedure of the age-bunch expectation framework The initial step of preprocessing is extraction. Separating the face district implies that the picture is removed from the information picture caught with the yield apparatus. The info shading picture is changed over to a dim picture and put away in the database for preparing. The area of the edited face and the dark picture changed over. The following stage is to expel the highlights of Age characterization. This framework utilizes the hoard descriptor (histogram-situated angle) to introduce the state of the age characterization. The hoard descriptor checks the number that

there is a slope direction in the limited picture of the picture. It utilizes histogram of force inclination to portray the state of the article. This method is adaptable under shadow and light change. Along these lines, this is a well known strategy for recognizing highlight extraction. The usage strategy for the Hog calculation descriptor is given as pursues. As a matter of first importance, the cells are isolated into littler potential zones of a picture. These territories are called cells, for every one of these phones, the slant towards the handle or histogram of edges is determined. Every cell is separated and discrete in its rakish compartment, as indicated by its angle direction. The weighted shield of every cell added to its related precise receptacle. The neighboring cell with a similar angle direction is gathered and these spatial districts are known as squares. These gatherings in the squares are the premise of the speculation of the histogram, the summed up gathering speaks to the square histogram, which thus speaks to the descriptor. Subsequent to removing the highlights, preparing dataset is made by utilizing them, which is then passed to the BPNN classifier to prepare it. From that point forward, test dataset is passed to the classifier which at that point arranges the pictures in one of the age-bunches for the test information.

1.5 Comparison of existing approaches to the problem framed

The current methodologies utilizes just Geometric features to order a human face which isn't precise for grown-up and senior faces however we have built up a cross breed model utilizing HOG which is an element extraction strategy. That implies HOG is a packed and encoded variant of your picture. What we need is a learning calculation, a calculation that can separate two arrangements of highlights. A calculation that can draw a line between two separate classes of highlights. One such sort of calculation is BPNN. What it as a rule do is, it takes highlights from individuals pictures (or any set of pictures of an article) and some arrangement of irregular pictures (where the item you wish to identify isn't there) and it will attempt to draw an isolating line between these two classes. So continuously when you give a picture of an individual, first we separate HOG includes out of it and then we will offer it to a prepared BPNN and we will check whether the component is near recently observed individual pictures or near arbitrary pictures.

2.Literature Survey

Paper 1

Title of the paper	Age Estimation on Head Movements:
Authors	Andreas Lanitis
Year of Publication	2010
Publishing Details	Procedures of the fourth International Symposium on Communications, Control and Signal Processing, ISCCSP 2010, Limassol, Cyprus

Objective	Results
The plausibility of the proposed system is assessed utilizing a devoted trial technique where we think about the exhibition of age estimation utilizing head developments against age estimation dependent on mouse developments and age estimation dependent on face pictures.	

Shape	Metric	Mouse	Head
Line	d	25%	58%
	Xgrad	33%	54%
	Ygrad	33%	45%
	Combined d, Xgrad, Ygrad	33%	57%
Rectangle	d	67%	**83%**
	Xgrad	58%	67%
	Ygrad	67%	63%
	Combined d, Xgrad, Ygrad	67%	74%
Ellipse	d	50%	**83%**
	Xgrad	75%	**83%**
	Ygrad	50%	75%
	Combined d, Xgrad, Ygrad	58%	70%
Age Estimation using face images from the FG-NET Aging Database		65%	

Fig 1: Gradient Percentage Mapping

Paper 2

Title of the paper	A Method for Estimating and Modeling Age and Gender utilizing Facial Image Processing

Authors	J. Hayashi, S M. Yosumoto
Year of Publication	2013
Publishing Details	Procedures of the Seventh International Conference on Virtual Systems and Multimedia, IEEE
Objective	Results
A technique for concentrate wrinkles utilizing facial picture preparing, and an arrangement of age and sex estimation.	During the time spent skin extraction, stable outcomes by methods of histogram adjustment preparing. Furthermore, during the time spent wrinkle recognition, they got steady outcomes by utilizing Hough change. Since this examination was led by utilizing facial picture of Japanese, we should implement me explores by utilizing the appearances from everywhere throughout the world.

Paper 3

Title of the paper	Three distinct classifiers for facial age estimation dependent on K-closest neighbour
Authors	Alaa Tharwat, Ahmed M. Ghane
Year of Publication	2013

Publishing Details	IS&T AVM-023

Objective	Techniques Used	Results
An effective precise age estimation framework dependent on three proposed classifiers. The proposed framework will viably appraise the accurate age from 2D face pictures.	1) Local Binary Pattern 2) Landmarks 3) Feature combination	In our exploration, there are two examinations. In each test, we extricate the neighbourhood and worldwide highlights from preparing and testing pictures and standardize these highlights and join it into one vector. At that point gauge the age of the test picture by coordinating the test picture with preparing pictures utilizing the proposed classifiers.

Paper 4

Title of the paper	Face Verification Across Age Progression Using Facial Feature Extraction
Authors	Shreyank N Gowda, Project Associate, IIT-M

Year of Publication	2016
Publishing Details	Ninth International Symposium on Computational Intelligence and Design (ISCID)

Objective	Results
Face identification and acknowledgment is a theme that has been contemplated for a long time now. Work has been done to guarantee various conditions like posture, lighting, articulation, and so on are taken care of.	As an initial step every one of the pictures are assembled dependent on the age contrasts of a specific individual. At that point each picture in a gathering is taken and the facial highlights are removed utilizing the ViolaJones calculation.

Paper 5

Title of the paper	Far reaching Review on Facial based Human Age Estimation
Authors	Anjali A. Shejul, Kishor S. Kinage, B. Eswara Reddy
Year of Publication	2017
Publishing Details	arXiv:1807.00412

Objective	Results
Age assumes a significant job for human PC connection. In the event that PCs could anticipate the age of the client secure web access can be given. For instance denying underage people to get to grown-up sites with unacceptable material or confined motion pictures , keeping minors from buying tobacco items from candy machines	Numerous techniques, for example, k Nearest Neighborhood, multilayer recognitions, Artificial Neural Network (ANN), Support Vector Machines (SVM) and a quadratic capacity can be utilized as a classifier for age expectation. Lanitis et al. investigated the exhibition of various classifiers for age estimation

Paper 6

Title of the paper	Geometric Feature Based Age Classification Using Facial Images
Authors	Shima Izadpanahi , Onsen Toygar
Year of Publication	2013
Publishing Details	IEEE

Objective	Results
This paper displays the utilization of geometric element based models for age bunch assurance of facial shading pictures. This procedure comprises of two principle stages: geometric element extraction, examination and age bunch grouping. The component extraction was performed with the right comprehension of the impact of age on facial anthropometry. The age separation capacity of the highlights is assessed utilizing three unique classifiers, in particular, neural	In this work, a novel age order and estimation model is displayed that characterizes input facial pictures into five age gatherings, to be specific, AG1(0-2), AG2(3-7), AG3(8-19), AG4(20-39), AG5(40-60) utilizing 6 geometric component put together proportions with respect to facial pictures. They have tried various classifiers that sort the pictures dependent on their facial highlights. The order precision of the proposed strategy beats different techniques

system classifier, bolster vector classifier, ordinary densities-based straight classifier	by utilizing any of the three classifiers. So as to accomplish high exactness rate on age bunch order, choosing proper highlights and highlight extraction technique is fundamental. Exploratory outcomes check the viability of the proposed highlight extraction technique. It is shown that the proposed technique with 6 proportions is better over different strategies utilizing 5 and 7 proportions.

Paper 7

Title of the paper	Picture Based Age-Group Classification Design Using Facial Features
Authors	Yi-Wen Chen, Meng-Ju Han and Kai-Tai Song
Year of Publication	2010
Publishing Details	International Conference on System Science and Engineering

Objective	Results
In this paper, a picture based age-bunch order strategy is proposed to assess three dimensions of age gatherings, specifically kid, grown-up and the old. After face identification from the procured picture outline, human facial region is separated and 52 highlight focuses are situated by utilizing	They utilize diverse picture preparing abilities to express facial highlights, to be specific dark dimension picture, edge picture, dim picture with edge picture and even edge picture. These highlights are sent into SVM classifier to perceive the age gathering. The normal acknowledgment rate is 87.8%. Later on, a full-programmed age bunch estimation framework will be built.They have utilized both dynamic appearance model and Lucas-Kanade strategy to remove facial highlights naturally.

Lucas-Kanade picture arrangement technique. These element focuses and comparing found facial zone are utilized to manufacture a functioning appearance model (AAM). After facial picture distorting, the surface highlights are sent to a help vector machine (SVM) to assess the dimension of age gathering. In the trial results, the normal acknowledgment rate of the proposed technique is 87%.	

Paper 8

Title of the paper	Age and Gender Estimation by Using Hybrid Facial Features
Authors	Vahid Karimi and Ashkan Tashk
Year of Publication	2012
Publishing Details	TELFOR 2012, Serbia

Objective	Results
In this paper, a technique for age and sex estimation utilizing facial pictures are proposed by concentrating on the extraction of hearty highlights existing in facial photographs. The fundamental stage for age estimation	In this paper, a programmed framework is proposed in which real highlights from facial pictures are separated and after that by computing significant proportions, the age and sex are assessed. Also, a face pre-preparing plan that is vigorous and does not have to adjust faces, is utilized. The assessment

is done in two primary advances. At the initial step arrangement and extraction of the worldwide highlights is done, and in the second step proportions which help recognizing youngster (1 to multi year-old kids) from youth (13 to multi year-elderly people men) are depicted and in the following stage by utilizing a similar technique, seniors (from 41 to 80 years of age) are isolated from the two previous gatherings. For sexual orientation estimation reason, proportions processed in the past advance, are utilized lastly the right sex estimation is finished.	and trial results show that the proposed technique has a reasonable execution regardless of whether the used pictures are exposed to meddlesome commotions. Our plan for sex estimation supports the sexual orientation acknowledgment exactness to 95% which is superior to past works. The proposed age estimation strategy is assessed and the outcomes decide its high exactness and it accomplishes unwavering quality close 80.7% for all out age estimation.

Paper 9

Title of the paper	Age Estimation from Facial Images Using Biometric Ratios and Wrinkle Analysis
Authors	Syed Musa Ali, Zaid Ali Darbar , Khurum Nazir Junejo
Year of Publication	2015
Publishing Details	IEEE

Objective	Results
This paper shows a strategy to characterize facial pictures into 3 equally conveyed age gatherings. Biometric proportions and wrinkle examination are utilized to characterize highlights of appearances. Three distinctive grouping calculations have been utilized for expectation. Testing is finished utilizing hold-out methodology. An adequately huge database is utilized to approve the validity of results	Fuse of wrinkle for age arrangement brought about an improvement of about 20% in precision. One of the constraints of the framework is that it some of the time comes up short when the temple (or other wrinkle regions) is secured with hair. This outcomes in a higher edge thickness, which the framework sees as wrinkles. Besides, the framework accept that all countenances are frontal. If there should be an occurrence of turned countenances, the Haar-course classifier still distinguishes tourist spots however the separations are changed because of the point, and in this way, the proportions are changed also. This outcomes in misclassification too.

Paper 10

Title of the paper	Robotized Clustering and Estimation of Age Groups from Face Images utilizing the Local Binary Pattern Operator
Authors	Imed Bouchrika , Ammar Ladjailia,Nouzha Harrati and Sofiane Khedairia
Year of Publication	2015
Publishing Details	

Objective	Results
In this examination think about, we investigate a dream based methodology for the estimation of age bunches from face pictures. The neighborhood parallel example administrator is connected to determine a lot of crossover highlights created nearby and worldwide qualities from the face. A histogram of highlights is built dependent on the connection of privately created histogram vectors from network cells of face pictures. Progressive component determination is depicted for the characterization procedure where age ranges decided naturally in a tree-based style. Highlight determination depends on the vicinity of examples having a place with a similar range is connected to get the most discriminative attributes at each dimension of the characterized age run. Trial results did on an openly accessible dataset affirmed the proficiency for the strategy to more readily bunch and gauge diverse age bunches for various face pictures.	We investigate in this examination a dream based strategy for the bunching and estimation of age bunches from facial highlights. The neighborhood paired example is connected to remove a crossover set of highlights including nearby and worldwide qualities from the face. Various leveled highlight determination is depicted for the order procedure where age ranges are assembled in a tree-based design. Trial results completed on an openly accessible dataset affirmed the possibilities for the proposed technique to more readily appraise the age run for various face pictures.

Paper 11

Title of the paper	A proposition of an answer for age band expectation from human appearances
Authors	Yannick Lufimpu-Luviya, Djamel Merad Sebastien Paris and Bernard Fertil
Year of Publication	2013
Publishing Details	Tenth IEEE International Conference on Advanced Video and Signal Based Surveillance

Objective	Results
The motivation behind this work is to propose a prescient model of a subject's age band. First they propose a relapse approach, with Partial Least Squares Regression and Support Vector Regression. At that point propose a grouping approach by joining Support Vector Machines and Classification and Regression Tree. The arrangement approach defeats the relapse approach. In the end, an examination between our last model and the human administrator demonstrates the pertinence of the order approach.	The order approach prompts better outcomes, with a worldwide exactness of 77% for ladies and 82% for men. A blend of parallel classifiers and a relapse tree is proposed to take care of the issue. A correlation with human evaluators demonstrates that their methodology beats human's forecast.

Paper 12

Title of the paper	Facial Features Monitoring for Real Time Drowsiness Detection

Authors	Manu B.N
Year of Publication	2016
Publishing Details	Twelfth International Conference on Innovations in Information Technology (IIT)

Objective	Results
This paper portrays an effective strategy for laziness recognition by three all around characterized stages. These three stages are facial highlights identification utilizing Viola Jones, the eye following and yawning recognition. The following of eyes and yawning recognition are finished by Correlation coefficient format coordinating. The element vectors from every one of the above stages are connected and a twofold direct help vector machine classifier is utilized to arrange the back to back casings into weariness and non exhaustion states and sound an alert for the previous, on the off chance that it is over the limit time.	Relationship coefficient layout coordinating gives a super-quick approach to follow the eyes and mouth. The proposed framework accomplishes a general exactness of 94.58% in four experiments, which is most noteworthy in contrast with the ongoing techniques. A high identification rate and diminished false alerts ensures that this framework can productively decrease the quantity of fatalities consistently.

Paper 13

Title of the paper	Age Estimation utilizing Local Matched Channel Binary Pattern
Authors	Imad Mohamed Ouloul , Karim Afdel , Abdellah Amghar
Year of Publication	2008

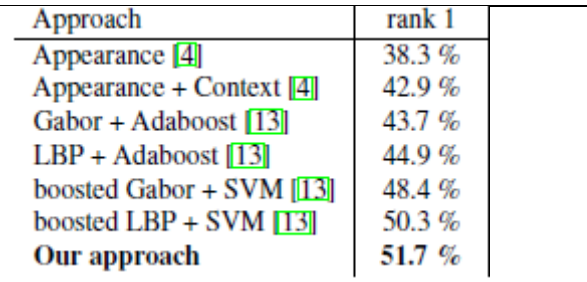
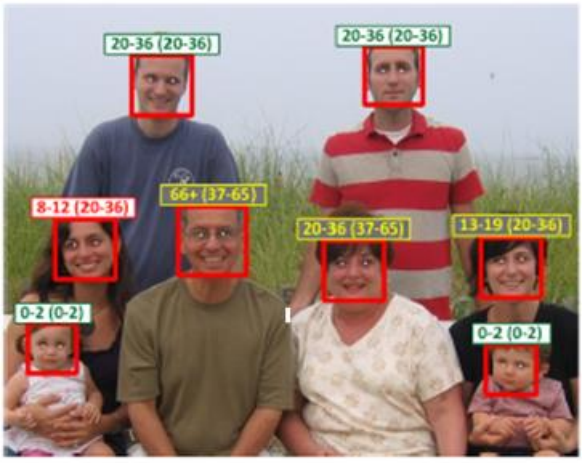
Publishing Details	ISCIS'08. 23rd International Symposium on, pp. 1–4, IEEE

Objective	Results
This paper proposes an age estimation framework dependent on the shape and dim dimension surface force, separated from facial pictures. The fundamental commitment of this work is the plan of another descriptor named Local Matched Filter Binary Pattern, which distinguishes and encodes face territories containing wrinkles. This descriptor, joined with parameters extricated by the dynamic appearance model, empowers the plan of a high discriminative age.	TABLE I RESULTS BEFORE AAM AND LMFBP COMBINATION Acc. Classification (%) MAE AAM 70.49 5.54 LMFBP 56.96 8.50 TABLE II COMPARISON OF OUR METHOD'S RESULTS TO OTHER PREVIOUS WORKS Methods of Age estimation MAE MIR [24] 9.49 AGES [14] 6.77 SBAE [8] 6.20 RUL[24] 5.78 LD [24] 5.77 **LMFBP** **5.09** FO (LOPO) [3] 4.78 Fig 2: MAE-Mean Absolute Error(lower is better)

Paper 14

Title of the paper	Age Classification in Unconstrained Conditions Using LBP Variants
Authors	Juha Ylioinas, Abdenour Hadid, and Matti Pietik¨ainen
Year of Publication	2016

Publishing Details	Community for Machine Vision Research, University of Oulu, Finland

Objective	Results
The greater part of the proposed methodologies in this field have anyway been for the most part managing controlled settings. In this paper, they propose a novel strategy for age characterization in unconstrained conditions(live following) and give broad execution assessment on benchmark datasets with standard conventions, subsequently permitting a reasonable examination and a simple multiplication of the outcomes. Proposed strategy depends on nearby double example (LBP). The test examination brings up the intricacy of the age grouping issue under uncontrolled settings.	 Approach | rank 1 Appearance [4] | 38.3 % Appearance + Context [4] | 42.9 % Gabor + Adaboost [13] | 43.7 % LBP + Adaboost [13] | 44.9 % boosted Gabor + SVM [13] | 48.4 % boosted LBP + SVM [13] | 50.3 % **Our approach** | **51.7 %**  Figure 3: Examples of estimated age categories

Paper 15

Title of the paper	Continuous Gender Classification by Face
Authors	Eman Fares Al Mashagba

Year of Publication	2016
Publishing Details	(IJACSA) International Journal of Advanced Computer Science and Applications

Objective	Results
In this paper, we present a hearty strategy that utilizes worldwide geometry-based highlights to group sex and recognize age and people from video successions. The highlights are separated dependent on face recognition utilizing skin shading division and the figured geometric highlights of the face circle area. These geometric highlights are then used to shape the face vector directions, which are inputted to a period defer neural system and are prepared utilizing the Broyden–Fletcher–Goldfarb–Shanno (BFGS) work.	Results demonstrate that utilizing the recommended strategy with our own dataset under an unconstrained condition accomplishes a 100% arrangement rate in the preparation set for all application, just as 91.2% for sexual orientation grouping, 88% for age recognizable proof, and 83% for human distinguishing proof in the testing set. This depends on 10 video tests.

Paper 16

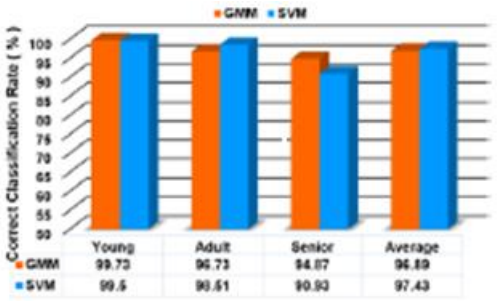
Title of the paper	Programmed Age Estimation Based on Facial Aging Patterns
Authors	Xin Geng, Zhi-Hua Zhou, Senior Member, IEEE, and

	Kate Smith-Miles, Senior Member, IEEE
Year of Publication	2007
Publishing Details	IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE

Objective	Results
This paper proposes a programmed age estimation technique named AGES (AGing example Subspace). The essential thought is to display the maturing design, which is characterized as the grouping of a specific person's face pictures arranged in time request, by developing a delegate subspace.	Face estimate changes crosswise over ages, particularly amid developmental years. Consequently, as future work, taking the size and state of the face shape into thought may fundamentally improve the exactness of AGES, particularly for age estimation on kids' countenances. Other than age estimation, AGES can be used in other PC vision undertakings. For instance, with the capacity to mimic facial maturing impacts, AGES can be utilized for face acknowledgment crosswise over ages, which has been tried in the examination. All the more for the most part, posture and brightening varieties are constantly inconvenient in PC vision frameworks. Like AGES managing pictures at various ages, pictures under diverse posture and enlightenment conditions can be treated all in all (undifferentiated from a maturing design). This thought has been investigated in face acknowledgment, known as the "Eigen Light-field"

Paper 17

Title of the paper	Age Group Classification and Gender Detection Based on Forced Expiratory
Authors	Sema Coşğun and I. Yucel Ozbek, *Member, IEEE*
Year of Publication	2015
Publishing Details	Spirometry Sema Coşğun and I. Yucel Ozbek are with the Electrical and Electronics Eng. Dept., Ataturk University, 25240, Erzurum, Turkey

Objective	Results
This paper researches the utility of constrained expiratory spirometry (FES) test with productive AI calculations with the end goal of sex identification and age gathering arrangement. The proposed strategy has three fundamental stages: highlight extraction, preparing of the models and recognition. In the first stage, a few highlights are separated from volume-time bendwhat's more, expiratory stream volume circle acquired from FES test. In the second stage, the probabilistic models for every sex and age bunch are built via preparing Gaussian blend models (GMMs) and Support vector machine (SVM) calculation. In the last stage, the sex (or age gathering) of guinea pig is assessed	The trial results demonstrate that normal right grouping rate execution of both GMM and SVM techniques dependent on the FES test is more than 99.3 % and 96.8 % for sexual orientation and age bunch characterization, individually.  Fig 4: CCR performance results of age classification for male and female

by utilizing the prepared GMM (or SVM) model. Examinations have been assessed on a huge database from 4571 subjects.	

Paper 18

Title of the paper	Characterization of Older Adults with/without a Fall History utilizing AI Methods
Authors	Lin Zhang, Ou Ma, *Member, IEEE*, Jennifer M. Fabre, Robert H. Wood, Stephanie U. Garcia, Kayla M. Ivey, and Evan D. McCann
Year of Publication	2016
Publishing Details	*IEEE*

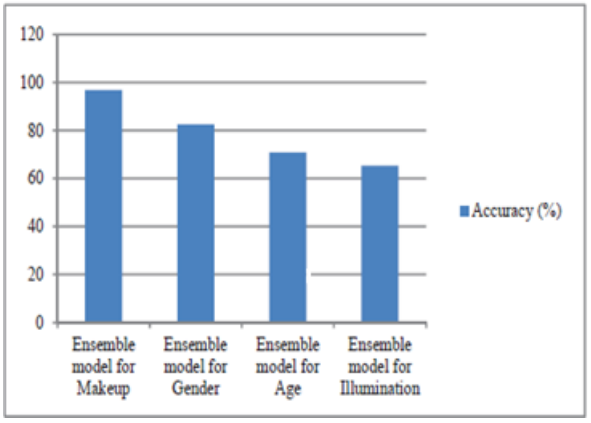
Objective	Results
This paper presents an utilization of a few machine learning techniques for preparing a classifier which is able to do characterizing individual more seasoned grown-ups into a high hazard gathering and a generally safe gathering (recognized by whether the individuals of the gathering have an ongoing history of falls). Utilizing a 3D movement catch framework, noteworthy stride highlights identified with falls hazard are removed. Via preparing these highlights, grouping speculations are acquired dependent on AI methods (K Nearest neighbour,	In this examination, we connected five distinctive AI (ML) procedures to order 35 more established grown-ups into a fallers gathering (marked with an ongoing history of falls paying little mind to the reasons for fall) and a non-fallers gathering (without an ongoing history of falls), to create innovation of foreseeing the danger of falls of individual old grown-ups. The ML calculations utilized 32 stride highlights to manufacture the models and our objective of arranging the members is satisfied through these models with great arrangement precision. Every

Gullible Bayes, Logistic Regression, Neural Network, what's more, Support Vector Machine). Preparing and test correctnesses with affectability and explicitness of every one of these systems are evaluated. The element change and tuning of the machine learning calculations are talked about. The result of the examination will profit the forecast and aversion of falls.	person member's danger of fall was surveyed by the subsequent models quantitatively.

Paper 19

Title of the paper	Gender, Makeup, Age and Illumination Prediction
Authors	Kundan Nigam, Sahil Sharma and Prashant Singh Rana
Year of Publication	*2018*
Publishing Details	2018 third International Conference for Convergence in Technology (I2CT)

Objective	Results
We attempt to created group methods for solid age arrangement ranges and these extents are characterized into four classes that are youngster, youthful, center and old. Essentially Gender orderranges are partitioned into male and female and Makeup grouping ranges are isolated into fractional cosmetics and over cosmetics and furthermore light characterization ranges are partitioned into terrible, medium and high	In this exploration paper, Ensemble strategy have been proposed for human sex, cosmetics, brightening and age arrangement so as to improve the precision. The outcomes demonstrate that the outfit models have demonstrated increasingly reliable than different models and what we accomplished in this examination appear that it is conceivable that human sex, age, cosmetics and light forecast can be connected on

classes.	continuous application furthermore, can be envisioning future individuals necessities.  Fig 5: Ensemble graph for age, gender, makeup and illumination

Paper 20

Title of the paper	Programmed age characterization with LBP
Authors	Günay, Asuman, and Vasif V. Nabiyev
Year of Publication	2008
Publishing Details	PC and Information Sciences, 2008. ISCIS'08. 23rd International Symposium on. IEEE, 2008.

Objective	Results
Evaluating the age precisely and after that creating the more youthful and more seasoned pictures of the individual is significant in security frameworks plan. In this paper nearby parallel examples are utilized to characterize the age from facial pictures. The nearby parallel examples (LBP)	In this investigation age estimation from facial pictures with neighborhood double examples is referenced. Worldwide and spatial LBP histograms are delivered for each picture from preparing set. Loads doled out to picture locales as significance of data they contain. Framework is prepared with FERET picture database and tried with FERET and

are key properties of neighborhood picture surface and the event histogram of these examples is a powerful surface component for face depiction. In the investigation we order the FERET pictures as indicated by their ages with 10 years interims. The countenances are partitioned into little locales from which the LBP histograms are extricated and linked into a component vector to be utilized as a proficient face descriptor. For each new face introduced to the framework, spatial LBP histograms are created and used to arrange the picture into one of the age classes. In the grouping stage, least separation, closest neighbor and k-closest neighbor classifiers are utilized. The trial results have demonstrated that framework execution is 80% for age estimation.	our own database which contains 350 face pictures. The pictures of database arranged to 6 age classes from 10±5 to 60±5 with multi year interims. After the preparation stage framework's presentation is tried with various pictures of same age classes

Paper 21

Title of the paper	Order of Age Groups from Facial Image Using Histograms of Oriented Gradients
Authors	Hajizadeh, Mohammad Ali, and Hossein Ebrahimnezhad
Year of Publication	2011
Publishing Details	Machine Vision and Image Processing (MVIP), 2011 seventh Iranian. IEEE, 2011

Objective	Results
In this paper, we propose an age-bunch order calculation utilizing Histograms of Oriented Gradients (HOG) as the face portrayal. The proposed technique orders subjects into four distinctive age gatherings. The procedure of the framework is separated into three principle stages: pre-handling, include extraction and age-bunch characterization. In this work, we utilize Iranian Face Database (IFDB) [1] since the real age of the subjects are resolved in this database. IFDB contains the pictures of the subjects with age range from 1 to 85 years. After pre-preparing, HOG highlights of the appearances are extricated and afterward, the pictures are arranged into age-bunches utilizing a PNN classifier. Test results demonstrate that acknowledgment rate of the proposed strategy is 87.025% for age-bunch grouping.	In this paper, we proposed an age-bunch characterization technique in which the Histograms of Oriented Gradients (HOG) were utilized as facial highlights out of the blue. Exploratory outcomes showed that the accomplished presentation of framework considering unclear ages between age bunches is 87.025%. Future work will concentrate on consolidating other facial highlights like anthropometric and Gabor highlights to get progressively precise outcomes.

Paper 22

Title of the paper	Geometric element based age arrangement utilizing facial pictures
Authors	Izadpanahi, Shima, and Onsen Toygar
Year of Publication	2012
Publishing Details	Picture Processing (IPR 2012), IET Conference on. IET, 2012

Objective	Results
This paper introduces the utilization of	We have tried various classifiers that classify

geometric element based models for age bunch assurance of facial shading pictures. This procedure comprises of two fundamental stages: geometric element extraction, investigation and age bunch order. The component extraction was performed with the right comprehension of the impact of age on facial anthropometry. The age separation capacity of the highlights is assessed utilizing three distinct classifiers, to be specific, neural system classifier, bolster vector classifier, ordinary densities-based straight classifier. The facial face pictures are arranged to five noteworthy age gatherings. To demonstrate the viability and exactness of the proposed highlight extraction, tests are directed on two publically accessible databases to be specific FGNET and IFDB. The outcomes demonstrate that the achievement rate of characterization is around 90%.	the pictures dependent on their facial highlights. These classifiers are LDC, NNC and SVC. The grouping precision of the proposed strategy beats different techniques by utilizing any of the three classifiers. So as to accomplish high precision rate on age bunch characterization, choosing suitable highlights and highlight extraction strategy is basic. Exploratory outcomes confirm the adequacy of the proposed highlight extraction strategy.

Paper 23

Title of the paper	Human age order utilizing appearance pictures for human-robot cooperation
Authors	Luo, Ren C., Li Wen Chang, and Shih Che Chou
Year of Publication	2013
Publishing Details	Industrial Electronics Society, IECON 2013-39th Annual Conference of the IEEE. IEEE, 2013

Objective	Results

Paper 24

Title of the paper	A various leveled structure for picture based human age estimation by weighted and OHRanked Sparse Representation-based arrangement
Authors	Li, Weixin, Yunhong Wang, and Zhaoxiang Zhang
Year of Publication	2012
Publishing Details	Biometrics (ICB), 2012 fifth IAPR International Conference on. IEEE, 2012

Objective	Results
Human age estimation dependent on face pictures can figure in a wide assortment of true applications. In this paper, we propose a novel and effective facial age estimation calculation which chooses human age in a progressive structure. Naturally, human lives can be generally isolated into two phases, the period from birth to adulthood and the period from adulthood to maturity, which are very not quite the same as one another in face development and maturing shapes. Taking into account that craniofacial development happens primarily in the primary stage while keeps fundamentally stable in the second, in	In this paper, we propose a various leveled structure for picture based human age estimation utilizing weighted and OHRanked Sparse Representation-based Classification. The normal maturing highlights shared by individuals in a similar age bunch make it conceivable to tackle the age estimation issue by methods for SRC. Use of the loads of preparing tests' numbers to SRC improves the exhibition of the calculation. Furthermore, the presentation of the possibility of OHRank to SRC adds to the adequate preparing tests in every characterization, making the age estimation calculation accomplish

view of the shape includes, the coarse advance of the structure figures out which age organize the test has a place with utilizing a quadratic capacity. Then again, since the face appearance of people in a similar age gathering or even of a similar age has a few similitudes in like manner, exact age estimation inside the age organize is comprehended by Sparse Representation-based characterization (SRC) in the fine advance. Nonetheless, SRC requires adequate preparing tests in each class and by and by this presumption regularly does not hold, making the presentation of age estimation constrained. Likewise, we take utilization of the possibility of Ordinal Hyperplanes Ranker (OHRank) and loads of tests' numbers in each class to take care of the previously mentioned issue, improving the age estimation results. Consequences of analyses directed on the FG-NET Database exhibit the adequacy of our technique.	increasingly acceptable outcomes. The progressive system understands the decrease of the calculation's computational intricacy and improve the precision of the evaluated age also. Contrasted with other best in class age estimation calculations, our system beats them from the part of MAE on the FG-NET Database. For the CS bend, our outcome is likewise practically identical to the best one so far announced.

Paper 25

Title of the paper	Geometric Feature Based Age Classification Using Facial Images
Authors	Shima Izadpanahi , Onsen Toygar
Year of Publication	2013
Publishing Details	IEEE

Objective	Results
This paper displays the utilization of	In this work, a novel age order and estimation

geometric element based models for age bunch assurance of facial shading pictures. This procedure comprises of two principle stages: geometric element extraction, examination and age bunch grouping. The component extraction was performed with the right comprehension of the impact of age on facial anthropometry. The age separation capacity of the highlights is assessed utilizing three unique classifiers, in particular, neural system classifier, bolster vector classifier, ordinary densities-based straight classifier	model is displayed that characterizes input facial pictures into five age gatherings, to be specific, AG1(0-2), AG2(3-7), AG3(8-19), AG4(20-39), AG5(40-60) utilizing 6 geometric component put together proportions with respect to facial pictures. They have tried various classifiers that sort the pictures dependent on their facial highlights. The order precision of the proposed strategy beats different techniques by utilizing any of the three classifiers. So as to accomplish high exactness rate on age bunch order, choosing proper highlights and highlight extraction technique is fundamental. Exploratory outcomes check the viability of the proposed highlight extraction technique. It is shown that the proposed technique with 6 proportions is better over different strategies utilizing 5 and 7 proportions.

Paper 26

Title of the paper	Picture Based Age-Group Classification Design Using Facial Features
Authors	Yi-Wen Chen, Meng-Ju Han and Kai-Tai Song
Year of Publication	2010
Publishing Details	International Conference on System Science and Engineering

Objective	Results
In this paper, a picture based age-bunch order strategy is proposed to assess three dimensions of age gatherings, specifically kid, grown-up and the old. After face identification from the procured picture outline, human facial region is separated and 52 highlight focuses are situated by utilizing Lucas-Kanade picture arrangement technique. These element focuses and comparing found facial zone are utilized to manufacture a functioning appearance model (AAM). After facial picture distorting, the surface highlights are sent to a help vector machine (SVM) to assess the dimension of age gathering. In the trial results, the normal acknowledgment rate of the proposed technique is 87%.	They utilize diverse picture preparing abilities to express facial highlights, to be specific dark dimension picture, edge picture, dim picture with edge picture and even edge picture. These highlights are sent into SVM classifier to perceive the age gathering. The normal acknowledgment rate is 87.8%. Later on, a full-programmed age bunch estimation framework will be built.They have utilized both dynamic appearance model and Lucas-Kanade strategy to remove facial highlights naturally.

Paper 27

Title of the paper	Age and Gender Estimation by Using Hybrid Facial Features
Authors	Vahid Karimi and Ashkan Tashk
Year of Publication	2012

Publishing Details	TELFOR 2012, Serbia

Objective	Results
In this paper, a technique for age and sex estimation utilizing facial pictures are proposed by concentrating on the extraction of hearty highlights existing in facial photographs. The fundamental stage for age estimation is done in two primary advances. At the initial step arrangement and extraction of the worldwide highlights is done, and in the second step proportions which help recognizing youngster (1 to multi year-old kids) from youth (13 to multi year-elderly people men) are depicted and in the following stage by utilizing a similar technique, seniors (from 41 to 80 years of age) are isolated from the two previous gatherings. For sexual orientation estimation reason, proportions processed in the past advance, are utilized lastly the right sex estimation is finished.	In this paper, a programmed framework is proposed in which real highlights from facial pictures are separated and after that by computing significant proportions, the age and sex are assessed. Also, a face pre-preparing plan that is vigorous and does not have to adjust faces, is utilized. The assessment and trial results show that the proposed technique has a reasonable execution regardless of whether the used pictures are exposed to meddlesome commotions. Our plan for sex estimation supports the sexual orientation acknowledgment exactness to 95% which is superior to past works. The proposed age estimation strategy is assessed and the outcomes decide its high exactness and it accomplishes unwavering quality close 80.7% for all out age estimation.

Paper 28

Title of the paper	Age Estimation from Facial Images Using Biometric Ratios and Wrinkle Analysis
Authors	Syed Musa Ali, Zaid Ali Darbar , Khurum Nazir Junejo
Year of Publication	2015
Publishing Details	IEEE

Objective	Results
This paper shows a strategy to characterize facial pictures into 3 equally conveyed age gatherings. Biometric proportions and wrinkle examination are utilized to characterize highlights of appearances. Three distinctive grouping calculations have been utilized for expectation. Testing is finished utilizing hold-out methodology. An adequately huge database is utilized to approve the validity of results	Fuse of wrinkle for age arrangement brought about an improvement of about 20% in precision. One of the constraints of the framework is that it some of the time comes up short when the temple (or other wrinkle regions) is secured with hair. This outcomes in a higher edge thickness, which the framework sees as wrinkles. Besides, the framework accept that all countenances are frontal. If there should be an occurrence of turned countenances, the Haar-course classifier still distinguishes tourist spots however the separations are changed because of the point, and in this way, the proportions are changed also. This outcomes in misclassification too.

Paper 29

Title of the paper	Robotized Clustering and Estimation of Age Groups from Face Images utilizing the Local Binary Pattern Operator
Authors	Imed Bouchrika , Ammar Ladjailia,Nouzha Harrati and Sofiane Khedairia
Year of Publication	2015
Publishing Details	

Objective	Results
In this examination think about, we investigate a dream based methodology for the estimation of age bunches from face pictures. The neighborhood parallel example administrator is connected to determine a lot of crossover highlights created nearby and worldwide qualities from the face. A histogram of highlights is built dependent on the connection of privately created histogram vectors from network cells of face pictures. Progressive component determination is depicted for the characterization procedure where age ranges decided naturally in a tree-based style. Highlight determination depends on the vicinity of examples having a place with a similar range is connected to get the most discriminative attributes at each	We investigate in this examination a dream based strategy for the bunching and estimation of age bunches from facial highlights. The neighborhood paired example is connected to remove a crossover set of highlights including nearby and worldwide qualities from the face. Various leveled highlight determination is depicted for the order procedure where age ranges are assembled in a tree-based design. Trial results completed on an openly accessible dataset affirmed the possibilities for the proposed technique to more readily appraise the age run for various face pictures.

dimension of the characterized age run. Trial results did on an openly accessible dataset affirmed the proficiency for the strategy to more readily bunch and gauge diverse age bunches for various face pictures.	

Paper 30

Title of the paper	A proposal of a solution for age band prediction from human faces
Authors	Yannick Lufimpu-Luviya, Djamel Merad Sebastien Paris and Bernard Fertil
Year of Publication	2013
Publishing Details	10th IEEE International Conference on Advanced Video and Signal Based Surveillance

Objective	Results
The purpose of this work is to propose a predictive model of a subject's age band. First they propose a regression approach, with Partial Least Squares Regression and Support Vector Regression. Then propose a classification approach by combining Support Vector Machines and Classification and Regression Tree. The classification approach overcomes the regression approach. Eventually, a comparison between our final model and the human operator shows the relevancy of the classification	The classification approach leads to better results, with a global accuracy of 77% for women and 82% for men. A combination of binary classifiers and a regression tree is proposed to solve the problem. A comparison with human evaluators shows that their approach overcomes human's prediction.

approach.	

3.Requirement Analysis and Solution Approach

3.1.Overall Description of the project

The process of the system is mainly composed of three phases- location, feature extraction, and age classification. In the location phase, the symmetry of human faces helps find vertical central lines of faces. Since eyes, noses, and mouths have significant brightness changes, the Sobel edge operator and region labeling are applied to locate them.

Both geometric and wrinkle features are employed in the system for classification. In the feature extraction phase, two geometric features are evaluated as the ratios of the distances between eyes, noses, and mouths. Three different wrinkle features are defined to quantify the degrees of facial wrinkles.

In the age classification phase, two methods are constructed. The first one employs the geometric features to distinguish whether a facial image is a baby. If it is not, then the second network uses the wrinkle features to classify the image into adult or senior groups.

Notice that the dynamic range of each facial image is different. Thus, the preprocessing of histogram stretch operation is performed on all experimental images so that the ranges of gray-level of all images are mapped to the range [0, 255].

3.2 Requirement Analysis

Functional Requirements

1. The dataset on which the calculation is connected ought to have enough number of sections for legitimate approval.
2. The dataset ought to be adjusted, for example The quantity of the classes ought to be practically equivalent.
3. The MATLAB programming ought to be of most recent rendition. We have done our work in MATLAB 2016.

Non-Functional Requirements

- The images should be of good quality and without any non-required meta-data on the image.
- The validation phase and estimation phase should not take much time for ease of use and convenience of the practitioner using the application.

3.3 SOLUTION APPROACH

Age Dataset Description

The dataset for this framework has been downloaded from the accompanying website: http://www.cslab.openu.ac.il/download/. The database comprises of 2040 pictures containing 3 age gathering (Adult, Child and Senior) demonstrated by 100 of individuals crosswise over world. In this examination we have made our very own database for testing by clicking pictures of different individuals with various age bunches with a telephone camera of 13 megapixels. The photos had a unique goal of 2000x1500 and were taken with a dark foundation. At that point, the extent of every one of these pictures was institutionalized to 512x512 to guarantee better effectiveness.

IMAGE PREPROCESSING

Image preprocessing is a very essential process in the image processing and it may have a significant impact on the image analysis result because in general, most of the images used in the database include some superfluous information, unsteady lightening in an image and sometimes the contrast of an image is also very poor which make it very intricate to process that image. The basic sequence of steps that have been involved in the image pre-processing is shown.

FACE DETECTION

The second step in the age expectation framework is to recognize the frontal face in an info picture or video succession. Distinguish the face inside a picture is named as face confinement or dace discovery and finding the face over the different video grouping outlines is named as face following. The work has utilized face limitation or face identification process in our technique dependent on the idea of Viola-Jones calculation as depicted. This face recognition strategy adjusted the utilization of Haar-like highlights. These highlights foreordain the presence of inclining contrasts between the districts in the picture.

Fig 6: Detected Faces

THE PRIMARY FACE FEATURES

These proportions just require the programmed restriction of essential highlights, to be specific the eyes, nose, mouth, jawline, and virtual top of the head

Proportion 1 is the T-proportion framed by two portions: the section T1 joining the two eyes and the fragment T2 between the midpoint of T1and the nose.

Proportion 2 is the T-proportion framed by two portions: the section T1 as above, and the fragment T3 between the midpoint of T1 and the mouth.

Proportion 3 is the T-proportion framed by two portions: the section T1 as above, and the fragment T4 between the midpoint of T1 and the jawline.

Proportion 4 is the proportion of the section speaking to the distinction in tallness among nose and eye midpoint, and the portion speaking to the distinction in stature among mouth and eye-midpoint.

Proportion 5 is the proportion of the section speaking to the distinction in tallness among mouth and eye-midpoint, and the portion speaking to the distinction in stature among jawline and eye-midpoint. **Proportion 6** is the tallness of the eyes inside the top and base head-edges see fig. After measurable investigation of these proportions on various age bunches input pictures the qualities depict that changes brought about by craniofacial development are: Forehead slants back, psychologists and discharges spaces on the outside of the noggin, Facial highlights grow their territories and spread the interstitial spaces.

STEPS OF HOG

- Color image is converted to grayscale
- Luminance gradient is calculated on each pixel

• To create histogram of shield orientation for each cell

• Feature quantity becomes stronger for changes in the form

• Generalization and Description Block

• Feature quantity gets stronger for change in light

The luminance gradient is calculated in each pixel. The luminance gradient is a vector with magnitude m and orientation θ represented by the change in luminance.

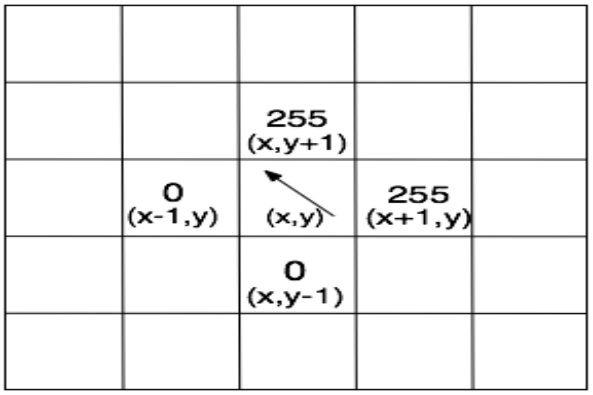


Fig 7: Luminance Slope of each pixel

Here, the luminance gradient is a vector that shows the changes in luminance by M magnitude and orientation. Then, the luminance of the coordinate system of the coordinate system (x, y) is given by the equation of magnitude m. In this equation, the orientation of the brain is given by the expression, in addition to the intensely intensively intense vertical and horizontal objective pixels, in addition to this. L is the luminance value of the pixels contained in these expressions. Applying this process to all pixels, this figure looks like this.

Using the magnitude of the calculation and orientation gradient, the histogram of the orientation of the gradient for each cell (5 × 5 pixels) does. The orientation inclination is equal to 0 degrees -180 degrees and is provided by 9 degrees of 20 degrees. For each orientation, create a histogram by adding the magnitude of the luminance gradient.

After this, We describe how to create a gradient histogram in the area of the cell. Here, the area of the cell is an area that has 5 times 5 pixels. This image shows how to divide cells. In this way, divide into a single image, create a luminance gradient histogram for each cell area, using the magnitude and orientation of a region called a cell called a

gradient. At that time, the Orientation Bands are uniformly 0 degrees -180 degrees and are available from 20 degrees to 9 degrees. In other words, a characteristic of a cell is limited to the dimensions of vector 9. By combining the amount of shield in the container corresponding to the direction of the shield, you can create a histogram, as shown below.

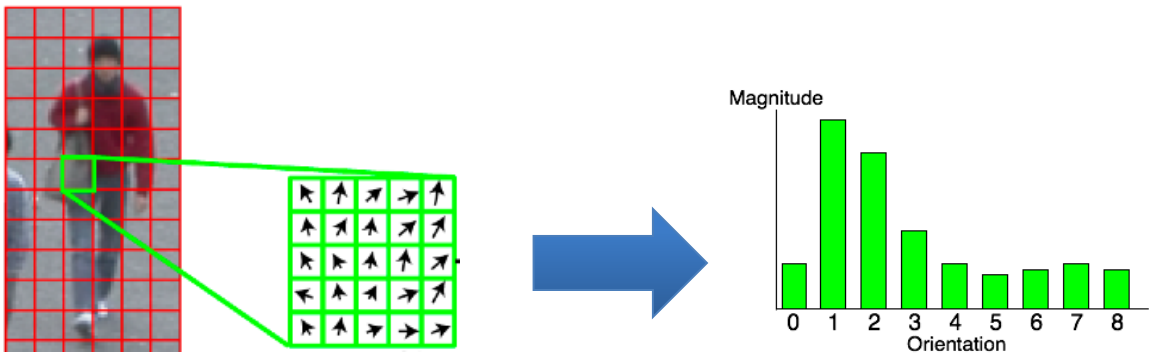


Fig 8: Histogram depicting directions

Back Propagation Neural Network (BPNN)

It can be thought that the area of the neural network is related to artificial intelligence, machine learning, parallel processing, statistics and other areas. The attraction of neural networks is that they are the most adequate to solve traditional problems, which are the most difficult to solve with traditional computational methods. Consider an image processing task, such as identifying the estimated daily object with the background of other objects. It is such a task that a small child can solve the brain in a few tenths of another. But building a traditional serial machine is equally complex and incredibly complex. However, that child cannot calculate 2 + 2 = 4, while the serial machine fixes it in a few nanoseconds. The fundamental difference between the problem of image recognition and the addition of the problem is that the first one is solved better in parallel, while the ordinary mathematics is better, respectively. Neurobiologists believe that the brain is a parallel, large-scale analog computer. It is similar, with approximately 10 ^ 10 simple processors, each of which requires a few milliseconds to answer the entry. With neural network technology, we can use parallel processing methods to solve some real-world problems where it is very difficult to define conventional algorithms.

WHY DID WE USE BPNN ONLY ?

A large amount of input / output data is available, but you are not sure how to connect to the output. There is great complexity in the problem, but clearly it is easy to give many examples of correct behaviour given the input and output parameters (ie, today, 2 + 2 = 4, but in the future, 2 + 2 = 3.8). the limits of the problem, the solution to the problem may change over time. The outputs can be "fuzzy" or non-numerical. One of the most common applications of NN is in image processing. Some examples will be: Identify handwritten characters; Match an image of a person's face with a different image in a database; The visualization of data compression in an image with minimal loss of content can be from other applications: speech recognition; Analysis of radar signatures; Predicting the stock market All these problems include large amounts of data, and there is a complex connection between different parameters.

It is important to remember that with an NN solution, you do not have to understand the solution at all! This is a great advantage of the NN approach. With more traditional techniques, you must understand the input, the algorithms and the output in great detail, what works, there is hope to implement something. With an NN, it only shows it: "This is input, this is the correct input". With adequate training, the network will mimic the function it is showing. Apart from this, it is good to implement some entries that are irrelevant to the solution during the training process, with an NN; the network learns to ignore the entries that do not contribute to the output. On the contrary, if you leave some important information, you will know why the network solution will not be linked.

4. MODELLING AND IMPLEMENTATION DETAILS

4.1 DESIGN DIAGRAMS

4.1.1 USE CASE DIAGRAM

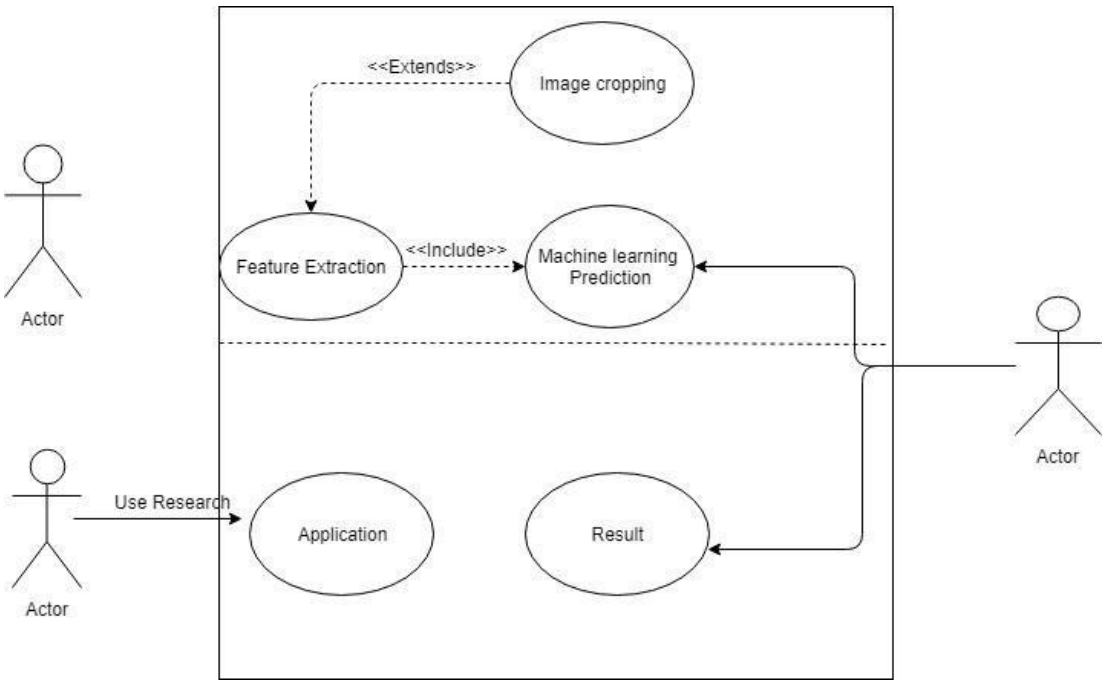


Fig 9: Use Case Diagram

4.1.2 CLASS DIAGRAM

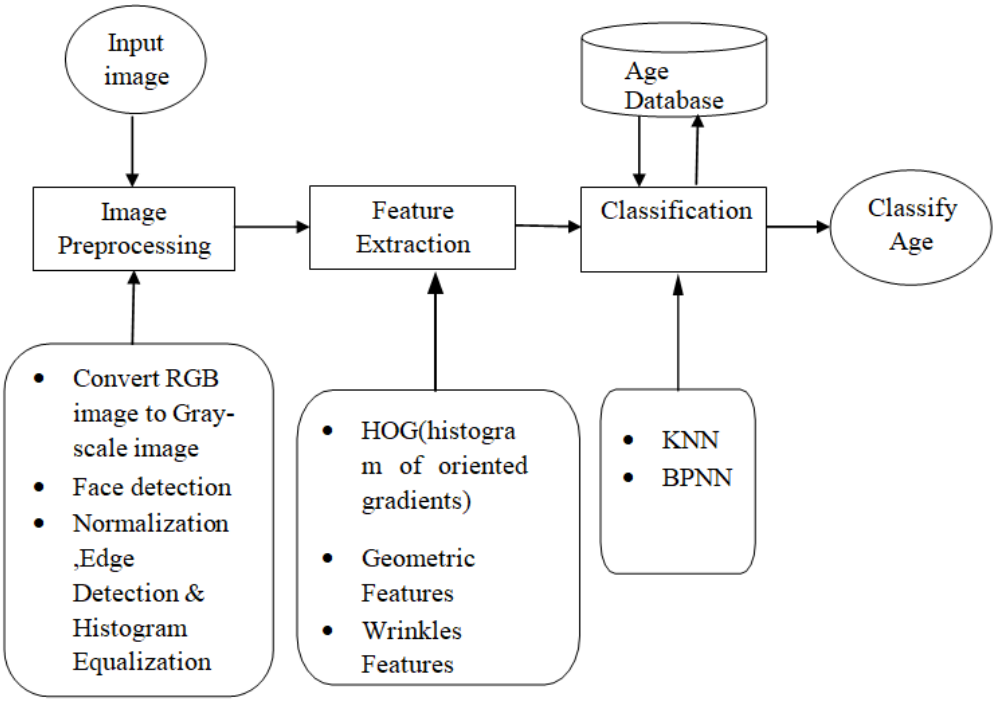


Fig 10: Class Diagram for Prediction Model

4.1.3 SEQUENCE DIAGRAM

IMAGE PREPROCESSING

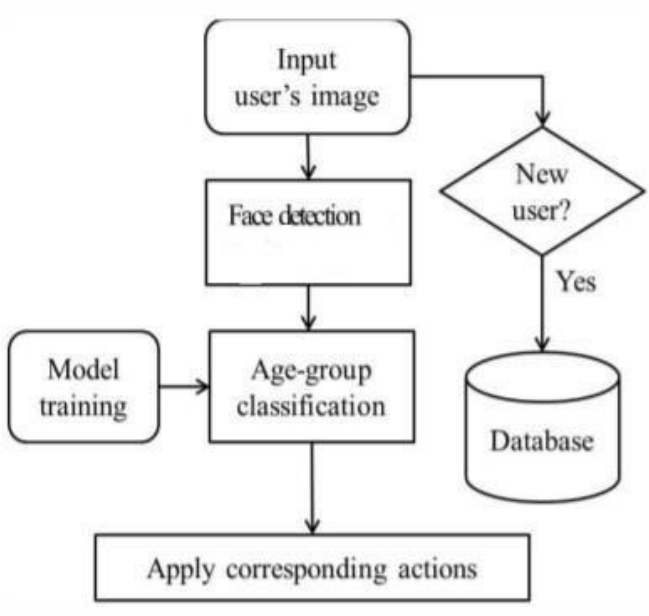


Fig 11: Image Pre-processing steps

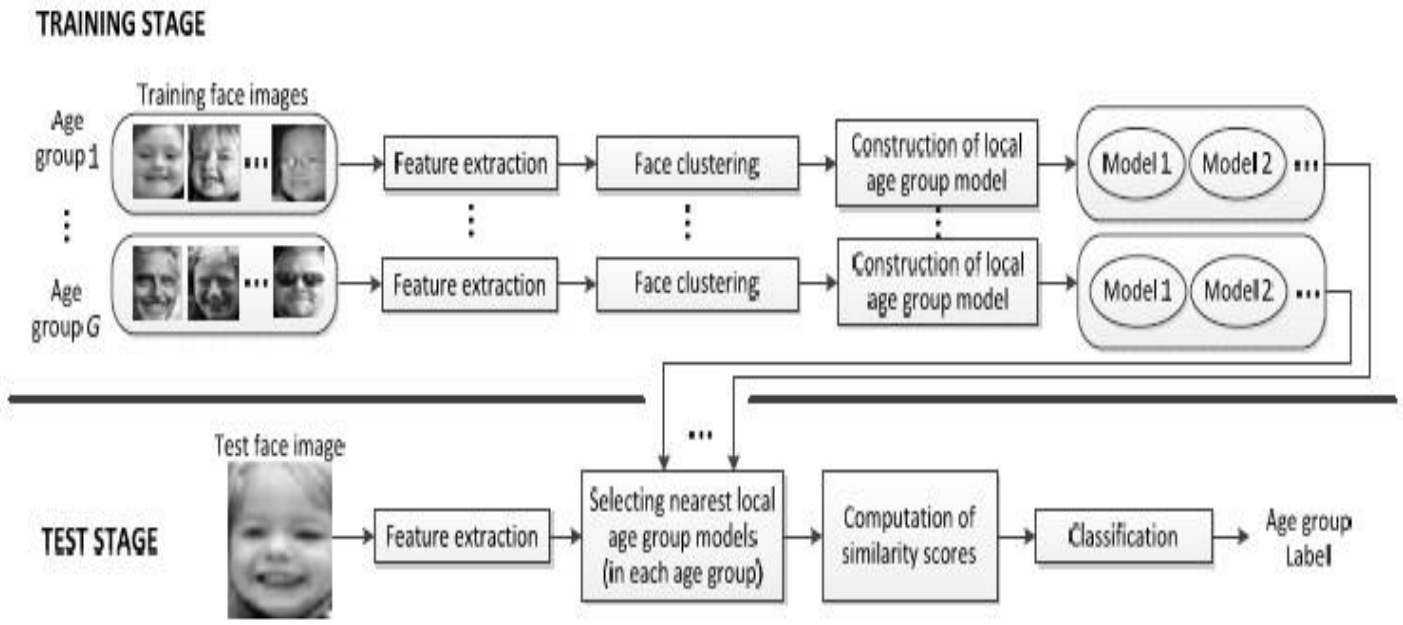


Figure 12: Age Classification on the basis of Local Age Group Modeling

4.2 RISK ANALYSIS AND MITIGATION

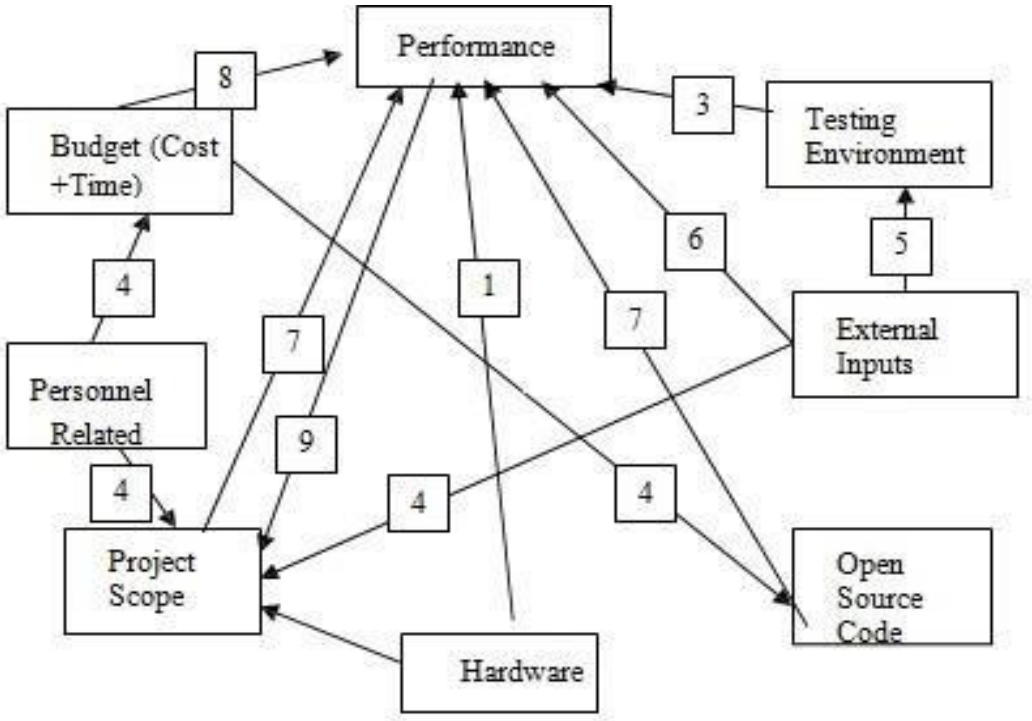


Fig 13: Risk Analysis Score

5. TESTING FUNCTIONALITY

5.1 TESTING PLAN

We started the testing phase by first carrying out unit testing in the entire project and then integrating testing was applied while integrating the modules so that there are no bugs while using functions of other modules while calling from some other module.

Type of Test	**Will Test Be Performed ?**	**Comments/Explanations**	**Software Component**
Unit	Yes	Every component has to be individually tested before being used as a complete module.	Feature Extraction
Integration	Yes	After all our individuals modules were working, an integration test plan	Image feature extraction and Back Propagation Neural

		was formulated.	Network Classification.
Performance	Yes	A very essential part of our testing.	A constant performance test has to be done.

Table 34: Testing Plan

TEST TEAM DETAILS		
ROLE	**NAME**	**Specific Responsibilites/Comments**
Developer	Vedant Kukreti	Worked in eXtreme Programming approach to debug and work on results.
Developer	Harshit Paliwal	Worked in eXtreme Programming approach to debug and work on results.
Developer	Raghav Mathur	Worked in eXtreme Programming approach to debug and work on results.

Table 35: Test Team Details

5.2 Component Decomposition & Type of Testing Required

S.No	**List of Various Components (modules) that require testing**	**Type of Testing Required**	**Technique for writing test cases**
1	Hog Features	UNIT	DATASET ITERATION
2	BPNN accuracy classifier	PERFORMANCE	WHITE BOX
3	MAIN GUI	WEB TESTING	BLACK BOX

Table 36: Component Decomposition Testing

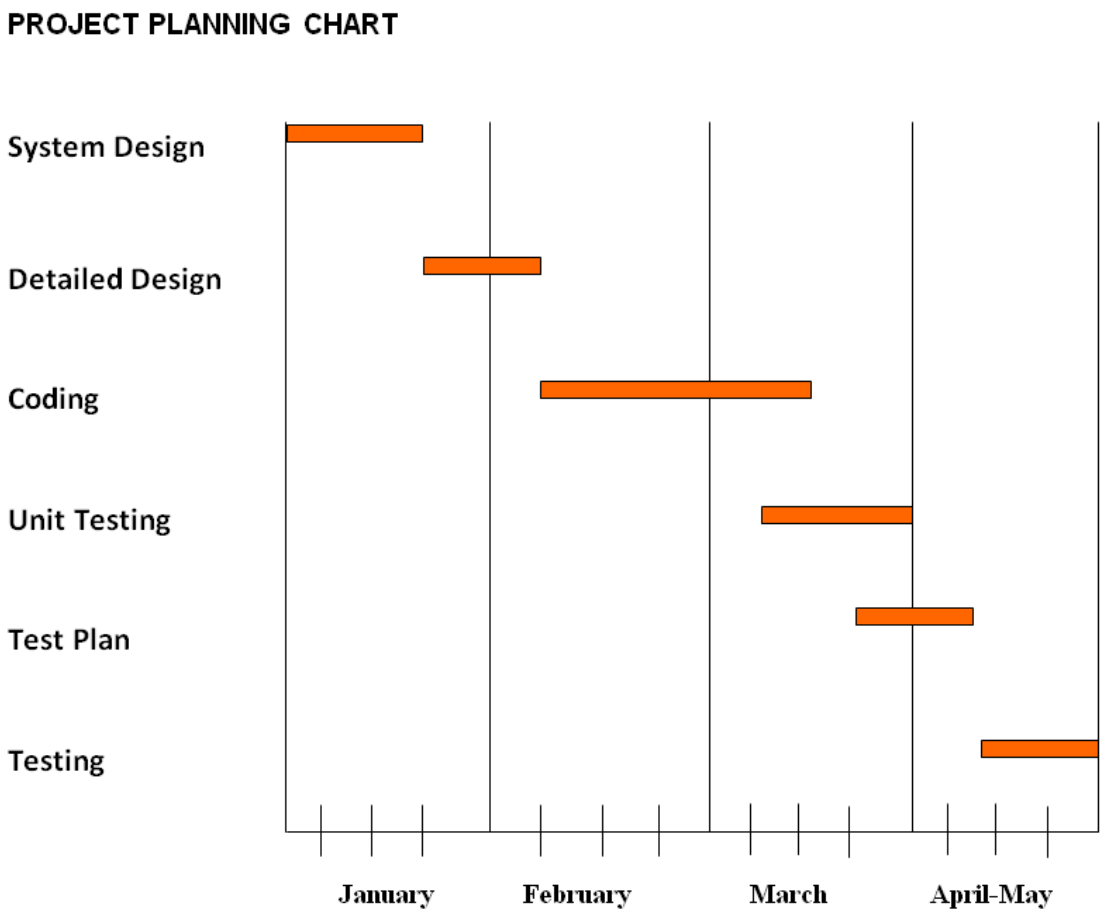


Fig 14: Gantt chart

5.3 LIMITATIONS OF TESTING

Unit testing

Unit testing refers to tests that verify the functionality of a specific section of code, usually at the function level. In an object-oriented environment, this is usually at the class level, and the minimal unit tests include the constructors and destructors.

These types of tests are usually written by developers as they work on code (white-box style), to ensure that the specific function is working as expected. One function might have multiple tests, to catch corner cases or other branches in the code. Unit testing alone cannot verify the functionality of a piece of software, but rather is used to assure that the building blocks the software uses work independently of each other. Unit testing is also known as Component Testing.

Integration testing

Integration testing is any type of software testing that seeks to verify the interfaces between components against a software design. Software components may be integrated in an iterative way

or all together ("big bang"). Normally the former is considered a better practice since it allows interface issues to be localized more quickly and fixed.

Integration testing works to expose defects in the interfaces and interaction between integrated components (modules). Progressively larger groups of tested software components corresponding to elements of the architectural design are integrated and tested until the software works as a system

System integration testing

System integration testing verifies that a system is integrated to any external or third party systems defined in the system requirements.

Alpha testing

Alpha testing is simulated or actual operational testing by potential users/customers or an independent test team at the developers' site. Alpha testing is often employed for off-the-shelf software as a form of internal acceptance testing, before the software goes to beta testing.

Beta testing

Beta testing comes after alpha testing. Versions of the software, known as beta versions, are released to a limited audience outside of the programming team. The software is released to groups of people so that further testing can ensure the product has few faults or bugs. Sometimes, beta versions are made available to the open public to increase the feedback field to a maximal number of future users.

6. Conclusion and Future Work

6.1 Conclusion

This project explains a novel method for the age group classification. Proposed technique based on hybrid wrinkle and geometrical features which provides a robust method that identifies the age group of individuals from a set of different images including various age groups. From these images, features are then extracted and then calculations are performed for finding out face age groups. Based on the observed results, images are then classified into 3 groups on the basis of BPNN algorithm. We can conclude that wrinkle analysis is one good approach to estimate human age for an individual. For better eye detection, images should be captured without spectacles. Viola

Jones algorithm focuses on the front face that is why the image needs to be a straight frontal face. Working on the individual faces, age group identification should contain single human face only. This research has shown results with 92.2% accuracy for three age groups.

6.2 FUTURE WORK

In future we will try to apply BPNN which is considered as the best classification algorithms. We expected that the accuracy of the project should definitely increase as the best algorithm is used here. One more thing we can improve on our own work by adding on complex classifiers which predict at better accuracy. A comparison study can also take place because of having sufficient stuff to compare.

This work can be further extended by extracting more feature points to improve the accuracy of classification. By introducing more features more age group ranges can also be introduced. We intend to increase the classification and handle boundary cases by increasing the number of age groups (at least 5 age groups), gender identification can also be added on to facial image recognition which will further enhance this project. The higher exactness it might accomplish, the more extensive use in real world applications. We can anticipate the age group better with Artificial Neural Network and Hog classifiers.

This project can further be used in Multimedia Content Analysis, an interactive and our goal to build our intelligent robots.

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