Mini Project Report on

TITLE

Submitted in partial fulfilment of the requirement for the award of the degree of

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE & ENGINEERING

Submitted by:

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CANDIDATE' S DECLARATION

I hereby certify that the work which is being presented in the project report entitled " **Face Emotion Detection**" in partial fulfillment of the requirements for the award of the Degree of Bachelor of Technology in Computer Science and Engineering of the Graphic Era (Deemed to be University), Dehradun shall be carried out by the under the mentorship of **Mr Ashwini Kumar, Assistant Professor** , Department of Computer Science and Engineering, Graphic Era (Deemed to be University), Dehradun.

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Chapter 1

Introduction

Facial recognition, also known as facial recognition, is a technology designed to recognize and interpret human emotions from facial expressions using facial recognition and machine learning. The human face is a powerful source of emotion, and this technology bridges the gap between humans and computers by enabling machines to understand and respond to human emotions. The face detection process has several steps:

1. Face detection: The first step is to identify and recognize human faces in a photo or video. This is usually done using algorithms such as Haar incremental or deep learning based on facial recognition.

2. Face Analysis: After detecting the face, the next step is to identify important facial features such as the position of the eyes, nose and mouth. These important characters are points used for further analysis.

3. Feature Extraction: Extract features from facial markings such as facial expressions.

Commonly used features include the alignment of the facial muscles, the shape of the mouth, and the movement of the eyebrows.

4. Sensitivity Classification: Machine learning algorithms such as deep neural networks are used to classify extracted features based on specific sentiments. Observed emotions include happiness, sadness, anger, surprise, fear, and disgust.

5.

Real-time analysis: Face analysis can be used in applications in real time, allowing the device or system to respond appropriately from the point of view. For example, it can be used to create human-comp

uter interaction, virtual reality, or personalized experiences.

Face recognition applications are diverse and effective:

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Human-Computer Interaction: Virtual assistants can improve the user experience by changing the res ponse to the user's emotions in many applications such as video games and smart devices.

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Market Research: Companies can use market research techniques to measure customers' response t o products, promotions or services.

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Medical: Neuroimaging aids in mental health diagnosis and monitoring by helping doctors assess a p atient's mental state.

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Learning Skills: Learning tools can include self-discovery of learning needs and providing feedback ta ilored to student responses.

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Security: Can be used in security and surveillance to identify potential threats or misconduct in public places.

However, the ethical implications of such technology should be considered as it relates to the process ing of sensitive personal information. Privacy concerns and potential biases in the process must be c arefully addressed to ensure responsible and fair use of face masks.

"2018 is the year of machine learning to understand human behavior" - Andrew Moore, head of compu ter science at Carnegie Mellon University.

Today, with the spread of technology, our desires are increasing endlessly. Currently, many research p rojects are going into digital imaging and image processing. The way forward is exponential and calc ulative. Photography is a very big science in today's world and its applications are very wide. Image pr ocessing is the study of signals where both input and output are images.

One of the most important applications of image processing is face recognition. Our emotions are ex pressed through our face. Facial expressions play an important role in interpersonal communication. Facial expression is a nonverbal expression expressed in the face according to our emotions. Automa tic recognition of facial expressions plays an important role in artificial intelligence and robotics and i s therefore the need of this generation.

Some related applications include authentication and access control, video telephony and teleconfere ncing, forensics applications, human-computer interactions, automated surveillance, cosmetics, and more. The aim of this project is to develop an automatic face recognition system that can use and rec ognize images of human faces with a specific expression and divide them into seven different langua ge groups, such as: I. Neutral II. Anger III. Disgust IV.

Fear V. Joy VI. Fear VII. surprised. A lot of work has been done in this area and our goal is not only to c reate automatic face recognition, but also to improve the accuracy of this system compared to other existing systems.

Chapter 2

Literature Survey

Facial recognition has been an important area of

computer vision and machine learning. Here are some key research papers that contributed to the stu dy:

"Facial **Expression Recognition: A Survey"** by S. L. Happy and A. Routray (International Journal of Computer Applications, 2015)

This **article** provides **a comprehensive review** of **the various** techniques and **methods** used in

face learning, including **face recognition** and **methods.**

S. **Zafeiriou** et al. (International Journal of Computer Vision, 2017)

This **article** discusses the challenges and **strategies of face** recognition in **unrestricted** real-world **scenarios covering various** modalities such as audio and video.

"Deep **Convolutional Neural Networks** in **Emotion Recognition** of Facial **Expressions: A Comprehensive Review",** S. Sharma **et al.**

S. Bhatia **(Neural Computing,** 2019)

This review **article presents** the **application** of deep convolutional neural networks (CNNs) **for face** recognition and provides **insight** into various **neural networks, absorption** and **information** used for **work.**

"Facial Expression Recognition Research for **Human-Computer Interactions",** P. **Sagonas** et al. (Image and **Visual** Computing, 2016)

This research focuses on the **use** of **visual aids** in **human-computer interaction and** discusses **problems** and potential applications in this **field.**

"Local binary **models** and **their** application to facial image analysis: **a review",** T. **Ojala** et al. (IEEE Transactions on Pattern Analysis and Machine Intelligence, 2002)

Although this article does not **focus** on emotion recognition, **it** introduces Local Binary Patterns (LBP), a widely used **descriptive model** in facial analysis.

"Representational Learning for **Face Recognition:** A **Practical Review",** Y. **Zhang** et al. **(Neural Computing,** 2018)

This review covers various representation **techniques for face analysis,** including **artificial intelligence** and deep **learning.**

"Affectiva-MIT Facial Expression Dataset (AM-FED): **Natural** and Spontaneous Facial Expressions Collected **in the 'Wild",** M. **Koelstra** et al. (IEEE Transactions on Affective Computing, 2020)

This **article** presents the Affectiva-MIT Facial Expression Dataset (AM-FED), a large dataset containing facial expressions in **a real environment.**

These are just a few examples, the field of **facial recognition** is **constantly changing** with new research and **development.**

If you **want** to **do new** research, I **suggest you** search **using keywords** in academic databases **such as** Google Scholar, IEEE Xplore, **PubMed.**

Chapter 3

Methodology

Image: Facial Emotion Detection System

An image or video containing one or more human faces.

Face Detection: The

uses face detection techniques such as Haar Cascades, Single Shot Multibox Detector - SSD or You O

nly See One - YOLO to detect and identify faces in input images or snapshots.

- Face Bookmark Detection:

  For each detected face, use face landmark detection (eg.

  For example, dlib, MTCNN or deep learning model to detect important facial features such as e

  yes, nose and mouth).

- Feature Extraction:

  Extracts features from facial landmarks to represent the face. Features include:

  The distance between the corners of the eyes and the corners of the mouth.

  Lashes.

  Mouth width and height.

  Eyes (eg, open, closed).

  Strength of facial muscles (eg.

  For example. raise your eyebrows, smile).

- Emotion Classification:

  uses Machine learning models such as Support Vector Machines - SVM, Convolutional Neural Networks - CNN or Recurrent Neural Networks - RNN to classify certain features according to certain emotions.

  Normal emotions include happiness, sadness, anger, surprise, fear, and disgust.

- Output:

  For each facial appearance, the system assigns an emotional tag and a confidence score indicating the accuracy of the prediction.

- Live Analysis:

  The system can be designed to perform real-time facial analysis in a video stream or live camera.

  The desired result can be displayed on the screen or used to trigger a custom function in the dialog.

3.1 Algorithm:

- Step 1: Collect an image dataset. (In this example, we use the FER2013 database, which Contains 35887 precropped 48 ×

  48 pixel grayscale images, each labeled with one of 7 emotional categories: angry, disgusted, scared, happy, sad, surprised, and neutral. 44

Step 2: Convert faces to grayscale images.

Step 5: The pipeline ensures that each image can be fed to the input process (1, 48, 48) as a numpy array.

Step 3: The numpy array is passed to the Convolution2D layer.

Step 6: Convolution to create the map. Chapter

Step 4 of

: The pooling method named MaxPooling2D uses windows in the map specification (2, 2) an d stores only the highest pixel values.

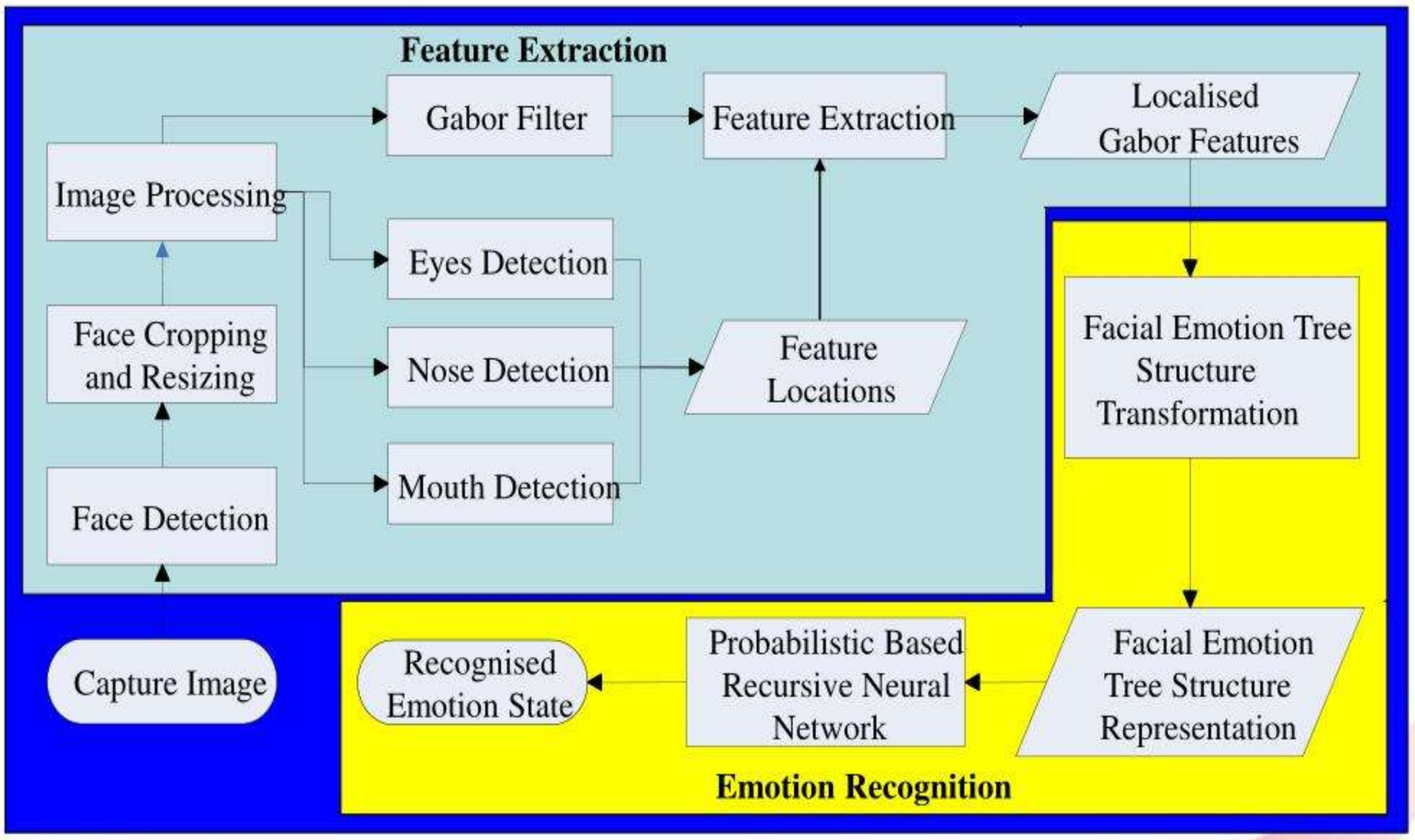
Step 5: During training, the neural network performs forward and backward propagation of pi xel values

.

Step 6: The Softmax function represents itself as the result of each class hypothesis.

The Model can show detailed probabilistic composition of facial expressions.

Facial Emotion Recognition System



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Chapter 4

Result and Discussion

Measuring accuracy and performance:

Researchers often use indicators such as accuracy, precision, recall, F1 score, and confusion matrix to evaluate face recognition performance.

Accuracy measures the overall accuracy of the hypothesis.

Precision represents the ratio of the correctly predicted hypothesis to each positive prediction.

Recall (or sensitivity) is the proportion of good predictors of each trait. The

F1 score is a compromise between precision and recall and provides a balanced measure when dealin g with conflicting hypotheses.

Reference data:

The selection of the

dataset plays an important role in the evaluation of facial features. Most researchers use publicly avail able data such as CK+, JAFFE, Affectiva-MIT Facial Expression Dataset (AM-FED) or RAF-DB. The size, diversity, and well-defined nature of the

dataset are important to the overall maintenance and operation of the system.

Comparison with State-of-the-Art Methods:

Researchers often compare the performance of face recognition methods with state-of-the-art method s or previously published studies on the same data.

These comparisons help measure competition and progress in the business.

Real World and Limitless:

Many studies have evaluated the performance of machines in the real world and unlimited space, wher e faces can have different lighting, occlusions, and poses. It is important for practical use that the system can perform well in these conditions.

Effects of Data Preprocessing:

Data processing procedures such as face merging, normalization, and data augmentation can affect s ystem performance.

Researchers can investigate the effects of different pretreatment modalities on improving outcomes.

Challenges and Limitations:

Researchers often cite problems encountered when seeing the face, such as seeing unclear thoughts or dealing with partial facial obstructions.

Ethical considerations, privacy concerns, and bias were also important topics of discussion in the esti mation.

Application-Specific Evaluation:

Sometimes researchers evaluate systems to evaluate their performance, effectiveness, and efficiency i n certain applications, such as human-computer interaction or healthcare.

Robustness and Generalizability:

The robustness of

, which tests for differences between age, gender, race, and culture, is important to provide unbiased a nd generalizable findings. The

Face Recognition Research discussion aims to understand the strengths and weaknesses and improv ements of the proposed techniques, ultimately advancing the field and making the technology effectiv e and useful in real situations.

Chapter 5

Conclusion and Future Work

As a result, face recognition has emerged as a promising potential in many applications such as human-computer interaction, robot interaction, emotion-based marketing and mental health services. Advances in computer vision, machine learning, and deep learning have allowed machines to better understand human emotions, leading to significant advances in facial recognition and interpretation. Many face recognition algorithms achieve a high level of accuracy in measuring data, proving their effectiveness and reliability.

Future Work:

Despite progress in face detection, there are many opportunities for research and development in the future:

Real World Robustness: Although there are many algorithms that perform well on environmental management and data, the real challenge lies in their use in real world scenarios. Further research should focus on improving the power of face detection to detect faces in difficult situations such as changing lighting, obstructions and different faces.

Multimodal approach: Emotional intelligence can benefit from combining information from multiple Modalities such as voice, body language, and body language to better understand a thought. Future studies should explore more ways to improve accuracy and reliability.

Deep Learning Architectures: Further progress in deep learning architectures such as Transformer-based architectures will lead to further improvements in cognitive theory. Researchers should explore the

use of cutting-edge models and transfer them to the field of facial recognition.

Transfer Learning and Data Augmentation: Data is often a limitation for training cognitive models. Transfer learning methods, pre-training on big data, and data augmentation techniques can help meet this challenge and increase exposure to invisible data.

Differences between cultures and individual differences: Different cultures can show different views and people can have unique faces. Future work should explore how to adapt the model to include cultural differences and differences in facial expressions.

Ethical Considerations: Emotion detection techniques raise ethical issues regarding privacy, consent, and bias. Future research should focus on addressing these issues to ensure responsible and fair use of this technology.

Emotion Synthesis: Advances in emotion research can be used in emotion synthesis, enabling machines to produce meaningful content and improving emotional intelligence and human-computer relationship.

Health Practice (Mental Health): Facial recognition can be used in mental health care and intervention. Future research should explore how these technologies can be integrated into mental health support to aid in the early diagnosis and self-treatment of mental illness.

In conclusion, facial recognition is a dynamic and evolving field with many opportunities for further research and development. By solving problems and exploring potential applications, these technologies can be adapted and integrated into all aspects of our daily lives, thereby enhancing the human experience, arrival and interaction with technology.

However, it is important to develop it responsibly with moral and immoral considerations in order to have a positive impact on people.

References

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