SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

(Established under section 3 of UGC Act 1956)

**MANUAL FOR PREPARATION OF B.TECH PROJECT REPORT**

##### MANUAL FOR PREPARATION OF B.Tech Project Report (Prescribed Format and Specification)

1. **GENERAL:**

The manual is intended to provide broad guidelines to the B.Tech Students in the preparation of the project report. In general, the document shall report, in an organized and scholarly fashion, an account of original research work of the student leading to the discovery of new facts or techniques or correlation of facts already known (analytical, experimental, hardware oriented etc) and demonstrating a quality as to make a definite contribution to the advancement of knowledge and the student’s ability to undertake sustained research and present the findings in an appropriate manner with actual accomplishments of the work plainly stated and honestly appraised.

##### NUMBER OF COPIES TO BE SUBMITTED:

3 or 4 hard copies according to size of project team (Per student one copy + guide copy + department copy) of the project report. In CD (2 No’s) a soft copy of project report in PDF format along with plagiarism report and whole project (Code, software used and instruction to execute the code) are to be submitted to the Internal Examiner during External Viva Voce Examination. The CD should be properly labelled with title of project, Batch ID, Registration No of students and guide name.

##### SIZE OF THE PROJECT REPORT:

The size of report should not exceed 100 pages of typed matter reckoned from the first page of Chapter 1 to the last page of the Appendix. Minimum 40 pages of technical chapter content (excluding front pages and appendix) should be available. Appendix may include screenshots of project, Main code (Max of 7 to 8 pages), supporting materials related to project.

##### ARRANGEMENT OF CONTENTS OF REPORT:

The sequence in which the project report material should be arranged and bound as follows:

1. Cover Page & Title page
2. Bonafide Certificate
3. Own work Declaration
4. Acknowledgement
5. Abstract
6. Table of Contents
7. List of Tables
8. List of Figures
9. List of Symbols and Abbreviations
10. Chapters
11. References
12. Appendices
13. Plagiarism Report –Format-I (Overall and Chapter wise report) along with final report from software
14. Paper Publication (proof)

The Tables and Figures shall be introduced in the appropriate places.

##### PAGE DIMENSIONS AND MARGIN:

The dimensions of the final bound copies of the Project report should be 297mm × 210mm (Standard A4 size).

The Report should have the following page margins

|  |  |  |
| --- | --- | --- |
| Top edge | : | 25 to 30 mm |
| Bottom edge | : | 25 to 30 mm |
| Left side | : | 35 to 40 mm |
| Right side | : | 20 to 25 mm |

The report should be prepared on good quality white paper preferably not lower than 80 gsm. Tables and figures should conform to the margin specifications. Large size figures should be photographically or otherwise reduced to the appropriate size before insertion.

##### REPORT PREPARATION:

The Student shall submit a typed copy of the manuscript to the supervisor for the purpose of approval. In the preparation of the manuscript, care should be taken to ensure that all textual matter is typewritten to the extent possible in the same format as may be required for the final thesis. Upon approval of the manuscript by the supervisor, the final report should be prepared according to the specification outlined in this section as well as in the following sections

##### General Typing Instructions:

* + - Corrections, interlineations and crossing out of letters or words will not be permitted in any of the copies of the thesis intended for submission. Erasures, if made, should be neatly carried out in all copies.

ƒ A sub-heading at the bottom of a page must have at least two full lines below it or else it should be carried over to the next page.

ƒ The last word of any page should not be split using a hyphen.

ƒ One and a half spacing should be used for typing the general text.

ƒ The general text shall be typed in Font Style “Times New Roman” and Font Size 12.

ƒ Single spacing should be used for typing:

1. Long Tables
2. Long quotations
3. Foot notes
4. Multiline captions
5. References
   * + All quotations exceeding one line should be typed in an indented space - the indentation being 15mm from either margin.
     + The headings of all items 2 to 14 listed in section 4 should be typed in capital letters without punctuation and centered 50mm below the top of the page.
     + The text should commence 4 spaces below this heading.
     + The page numbering for all items 1 to 9 should be done using lower case Roman numerals and the pages thereafter from Chapter – 1 onwards should be numbered using Arabic numerals.
     + All page numbers (whether it is in Roman or Arabic numbers) should be typed without punctuation on the upper right hand corner 15mm from top with the last digit in line with the right hand margin.
     + The title page will be numbered as (i) but this should not be typed. The page immediately following the title page shall be numbered (ii) of consecutively thereon for the remaining pages till the main text of chapter 1. Pages of main text, starting with Chapter 1 should be consecutively numbered using Arabic numerals.
     + Any statement to be highlighted or emphasized must be done using regular bold letters. Italics or underlining is not permitted for this purpose.
   1. **Cover Page & Title Page:** A specimen copy of the Cover page & Title page for thesis is given in Annexure I.
   2. **Declaration:** The declaration shall be in double line spacing using Font Style Times New Roman, Font Size 13, as per the format shown in Annexure II.
   3. **Bonafide Certificate:** The Bonafide Certificate shall be in double line spacing using Font Style Times New Roman, Font Size 12, as per the format shown in Annexure III.

The certificate shall carry the supervisor’s signature and shall be followed by the supervisor’s name, academic designation (not any other responsibilities of administrative nature), department and full address of the institution where the supervisor has guided the research scholar. The term ‘SUPERVISOR’ must be typed in capital letters between the supervisor’s name and academic designation.

* 1. **Acknowledgement:** The acknowledgement shall be brief and should not exceed two pages when typed in double spacing. The scholar’s signature shall be made at the bottom end above his / her name typed in capitals.
  2. **Abstract:** An abstract is not an introduction. It summarizes the main highlights of your thesis, including the results. The abstract should not exceed 4 pages typed with double line spacing,

Font Style Times New Roman and Font Size 12 and not include any citations or figures. The abstract should **briefly**

* + - Describe the problem and why it is being investigated.
    - Summarize the primary methods used in your thesis.
    - Describe the major results of the thesis.
    - Summarize the conclusion of the results and the implications of your thesis.
  1. **Table of contents:** The table of contents should list all material following it as well as any material which precedes it. The title page, Declaration, Bonafide Certificate and Acknowledgment will not find a place among the items listed in the Table of contents but the page numbers in lower case Roman letters are to be accounted for them. One and a half spacing should be adopted for typing the matter under this head. A specimen copy of the Table of contents for thesis is given in Annexure IV.
  2. **List of Tables:** The list of tables should have the same captions as they appear above the tables in the text. One and a half spacing should be adopted for typing the matter under this head.
  3. **List of Figures:** The list of figures should have the same captions as they appear below the figures in the text. One and a half spacing should be adopted for typing the matter under this head.
  4. **List of Symbols and Abbreviations:** One and a half spacing should be used for typing the matter under this head. Standard symbo1s, abbreviations etc. should be used.
  5. **Chapters:** Divide your overall work into logical portions, and then develop each portion as a chapter. The logical order is likely to be different from the chronological order you completed the work. Each

chapter may be further divided into several divisions and sub-divisions.

* + - Each chapter should be given an appropriate title.
    - Tables and figures in a chapter should be placed in the immediate vicinity of the reference where they are cited.
    - Footnotes should be used sparingly. They should be typed single space and placed
    - Directly underneath in the very same page, which refers to the material they annotate.

The format for typing Chapter headings, Divisions headings and Sub-division headings are explained through the following illustrative examples. (Refer Annexure IV)

|  |  |  |
| --- | --- | --- |
| Chapter heading | : | CHAPTER 1 INTRODUCTION |
| Division heading | : | 1.1 OUTLINE OF THEISIS |
| Sub-division heading | : | 1.1.1…………………..  1.1.2………………….. |

The word CHAPTER without punctuation should be centered 45mm down from the top of the page. Two spaces below, the title of the chapter should be typed centrally in capital letters. The text should commence 4 spaces below this title, the first letter of’ the text starting 20mm, inside from the left hand margin.

The division and sub-division captions along with their numberings should be left justified. The typed material directly below division or sub-division heading should commence 2 spaces below it and should be offset 20mm from the left hand margin. Within a division or sub-division, paragraphs are permitted. Even paragraph should commence 3 spaces below the last line of the preceding paragraph, the first letter in the paragraph being offset from the left hand margin by 20 mm.

##### Numbering of Chapters, Divisions and Sub-Divisions:

The numbering of chapters, divisions and sub-divisions should be done using Arabic numerals only and further decimal notation should be used for numbering the divisions and sub-divisions within a chapter. For example, sub-division 4 under division 3 belonging to chapter 2 should be numbered as 2.3.4. The caption for the sub-division should immediately follow the number assigned to it.

Every chapter, beginning with the first chapter, should be serially numbered using Arabic numerals. Appendices included should also be numbered in an identical manner starting with Appendix 1.

##### Numbering of Equations:

Equations appearing in each Chapter or Appendix should be numbered serially, the numbering commencing afresh for each Chapter or Appendix. Thus for example, an equation appearing in Chapter 2, if it happens to be the eighth equation in that Chapter should be numbered (2.8) thus:

|  |  |  |
| --- | --- | --- |
|  | *Vc* | 2 |
| *fc* = *k* | *V* +*V* + *V*  *c w a* | (2.8) |

While referring to this equation in the body of the thesis it should be referred to as “Equation (2.8)”. (Without quotes).

* + 1. **Tables and Figures:** A Table, is meant to tabulate numerical data in the body of the thesis as well as in the appendices. All other non-verbal material used in the body of the thesis and appendices such as charts, graphs, maps, photographs and diagrams may be designated as figures.

ƒ A table or figure including caption should be accommodated within the prescribed

margin limits and appear on the page following the page where their first reference is made.

ƒ Tables and figures on half page or less in length may appear on the same page along

with the text, However, they should be separated from the text both above and below by triple spacing.

ƒ All tables and figures should be prepared on the same paper or material used for the preparation of the rest of the thesis.

ƒ Two or more small tables or figures may be grouped if necessary in a single page.

ƒ Wherever possible, the entire photograph(s) may be reproduced on a full sheet of photographic paper.

ƒ Photographs if any, should be included in color photocopy form only. More than one photograph can be included in a page.

ƒ Samples of Fabric, Leather etc., if absolutely necessary may be attached evenly in a page and fixed/pasted suitably and should be treated as figures

* + 1. **Numbering of Tables and Figures:** Tables and Figures appearing anywhere in the thesis should bear appropriate numbers. The number of the Table should be given at the top of the table with a caption. The number of the figures should be given at the bottom of the figure with caption. The rule for assigning such numbers is illustrated through an example. The fourth figure in chapter 3 will be designated as Figure 3.4. Similar rules apply for tables except that the word Figure is replaced by the word Table. If figures (or tables) appear in appendices, then figure 3 in Appendix 2 will be designated as Figure A 2.3. If a table to be continued into the next page this may be done, but no line should be drawn underneath an unfinished table. The top line of the table continued into the next page should, for example read Table 2.1 (continued) placed centrally and underlined.
    2. **References**: Within the text, references should be cited in **numerical order** according to their order of appearance. The numbered reference citation within text should be enclosed in square brackets. Example: It was shown by Prusa [1] that the width of the plume decreases under these conditions. In the case of two citations, the numbers should be separated by a comma [1,2]. In the case of more than two references, the numbers should be separated by a dash [5-7].
    3. **Conclusion Chapter:** The conclusion chapter in some sense comprises the “introduction written backwards.” The conclusion should include the following:
       - Review: “Tell the reader what you just told them.” Refresh the reader’s memory about the contents of each preceding chapter at a level of approximately one to two sentences per chapter. The review can be very effective at enabling the reader to understand the overall scope of your work.
       - Conclusions: Summarize the salient contributions of your work. Justify that your work constitutes a contribution to the literature worthy of awarding a degree.
       - Recommendations for Future Work: Suggest how it would make sense to extend your work in the future. This may include opportunities for confirming or relaxing assumptions required within the scope of your work or applying your work to related research.
  1. **List of References:** The listing should be typed 4 spaces below the heading “REFERENCES” in single spacing left-justified. The References should be arranged in numerical order according to the sequence of citations within the text.

##### Reference to journal articles and papers in serial publications should include:

ƒ last name of each author followed by their initials

ƒ year of publication

ƒ full title of the cited article in quotes, title capitalization

ƒ full name of the publication in which it appears

ƒ volume number (if any) in boldface (Do not include the abbreviation, "Vol.")

ƒ issue number (if any) in parentheses (Do not include the abbreviation, “No.”)

ƒ inclusive page numbers of the cited article (include “pp.”)

##### Reference to textbooks and monographs should include:

ƒ last name of each author followed by their initials

ƒ year of publication

ƒ full title of the publication in italics, title capitalization

ƒ publisher

ƒ city of publication

ƒ inclusive page numbers of the work being cited (include “pp.”)

ƒ chapter number (if any) at the end of the citation following the abbreviation,

ƒ “Chap.”

1. **Reference to individual conference papers, papers in compiled conference proceedings, or any other collection of works by numerous authors should include:**

ƒ last name of each author followed by their initials

ƒ full title of the cited paper in quotes, title capitalization

ƒ individual paper number (if any)

ƒ full title of the publication in italics, title capitalization

ƒ initials followed by last name of editors (if any), followed by the abbreviation (in the case of books /reports),

ƒ “eds.” (in the case of books),

ƒ Publisher (in the case of books),

ƒ city of publication (in the case of books),

ƒ volume number (if any) in boldface if a single number, include, “Vol.” if part of larger identifier (e.g., “PVP-Vol. 254”)

ƒ inclusive page numbers of the work being cited (include “pp.”)

ƒ month and / or year of publication

##### Reference to theses and technical reports or books should include:

last name of each author followed by their initials, year of publication (in bracket),

full title in quotes, title capitalization report number (if any) publisher or institution name, city A typical illustrative list is given below.

* 1. Ning, X., and Lovell, M. R., “On the Sliding Friction Characteristics of Unidirectional Continuous FRP Composites,” ASME J. Tribol., 124(1), pp. 5-13, 2002.
  2. Barnes, M., “Stresses in Solenoids,” J. Appl. Phys., 48(5), pp. 2000–2008, 2001.
  3. Jones, J., (2000), Contact Mechanics, Cambridge University Press, Cambridge, UK, Chap. 6.
  4. Lee, Y., Korpela, S. A., and Horne, R. N., “Structure of Multi-Cellular Natural Convection in a Tall Vertical Annulus,” Proc. 7th International Heat Transfer Conference, U. Grigul et al., eds., Hemisphere, Washington, DC, 2, pp. 221–226, 1982.
  5. Hashish, M., “600 MPa Waterjet Technology Development,” High Pressure Technology, PVP-Vol. 406, pp. 135-140, 2000.
  6. Watson, D. W., “Thermodynamic Analysis,” ASME Paper No. 97-GT-288, 1997.
  7. Tung, C. Y., (1982), “Evaporative Heat Transfer in the Contact Line of a Mixture,” Ph.D. thesis, Rensselaer Polytechnic Institute, Troy, NY.
  8. Kwon, O. K., and Pletcher, R. H., (1981), “Prediction of the Incompressible Flow Over A Rearward-Facing Step,” Technical Report No. HTL-26, CFD-4, Iowa State Univ., Ames, IA.
  9. Smith, R., (2002), “Conformal Lubricated Contact of Cylindrical Surfaces Involved in a Non-Steady Motion,” Ph.D. thesis, <http://www.cas.phys.unm.edu/rsmith/homepage.html>
  10. **Appendices:** Appendices are provided to give supplementary information, which if included in the main text may serve as a distraction and cloud the central theme under discussion. Common examples of information included in appendices are listing of computer programs used to obtain your results, documentation of experimental setups, standards required for your work, tables of raw data, and part drawings.

ƒ Appendices should be numbered using Arabic numerals, e.g. Appendix 1, Appendix 2, etc.

ƒ Each appendix must be given a descriptive title. Most appendices require at least an introductory paragraph explaining what the appendix contains and why.

##### List of Publications:

The list of papers published by research scholar during the period of research shall be given under the heading “List of Publications”. The listing as per the format specified in section 6.12 should be typed 4 spaces below the heading “LIST OF PUBLICATIONS” in single spacing left-justified.

##### Binding Specifications

* Each of the 4 copies of the report (if batch size is 2) submitted for evaluation should be sewn and soft bound using flexible cover of thick white art paper. The cover should be printed in black letters and the text for printing should be identical to what has been prescribed for the title page**.**

1. **Plagiarism:** Plagiarism is the representation of any work or idea of another author as one's own. Remember at all times that plagiarism is a serious offence that could jeopardize an academic career. Scholars are reminded that they are required to respect standards of academic honesty and intellectual property in the case of all material used in the thesis.
2. **Concluding Remarks:**

ƒ Your thesis must meet all formatting guidelines

ƒ Define unfamiliar terms before using them.

ƒ Every chapter must begin with an overview of the contents of that chapter. Similarly, every section and sub-section must begin with a brief overview of that section.

ƒ One paragraph is usually appropriate for each chapter or major section. One sentence may suffice for a short section.

ƒ Use short, simple sentences. Each sentence should express a single idea.

ƒ Use short, simple paragraphs. Each paragraph should express a single thought.

Most paragraphs will be three to six sentences in length.

ƒ All units of measure should be in the SI system

ƒ If your research involves some form of modeling or analysis, develop the equations in the

body of your text. Use “Microsoft Equation” or something similar to typeset your equations. Place each equation on a separate line and number your equations sequentially.

ƒ Use tables when absolute numbers are important and graphs when trends are important.

Always discuss a table or figure before presenting it

# SCREEN CONTROL USING GESTURES

A PROJECT REPORT

#### Submitted by

AMAN GOEL RA2211003011296

AYUSHI MISHRA RA2211003011344

#### Under the Guidance of

## Dr. TYJ NAGA MALLESWARI

(Associate Professor, NWC)

### *in partial fulfillment of the requirements* *for the degree of*

## BACHELOR OF TECHNOLOGY

## in

## COMPUTER SCIENCE ENGINEERING

## with specialization in (CSE Core)

## 

## DEPARTMENT OF COMPUTING TECHNOLOGIES

## COLLEGE OF ENGINEERING AND TECHNOLOGY

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

## KATTANKULATHUR- 603 203

### MARCH 2024

### Annexure II

Department of Computing Technologies

##### SRM Institute of Science & Technology

##### Own Work Declaration Form

This sheet must be filled in (each box ticked to show that the condition has been met). It must be signed and dated along with your student registration number and included with all assignments you submit – work will not be marked unless this is done.

To be completed by the student for all assessments

##### Degree/ Course : B. Tech CSE Core

**Student Name : Aman Goel, Ayushi Mishra**

##### Registration Number : RA2211003011296, RA2211003011344

**Title of Work : Screen Control Using Gestures**

We hereby certify that this assessment compiles with the University’s Rules and Regulations relating to Academic misconduct and plagiarism, as listed in the University Website, Regulations, and the Education Committee guidelines.

We confirm that all the work contained in this assessment is our own except where indicated, and that We have met the following conditions:

* Clearly referenced / listed all sources as appropriate
* Referenced and put in inverted commas all quoted text (from books, web, etc)
* Given the sources of all pictures, data etc. that are not my own
* Not made any use of the report(s) or essay(s) of any other student(s) either past or present
* Acknowledged in appropriate places any help that I have received from others (e.g. fellow students, technicians, statisticians, external sources)
* Compiled with any other plagiarism criteria specified in the Course handbook / University website

I understand that any false claim for this work will be penalized in accordance with the University policies and regulations.

|  |
| --- |
| **DECLARATION:** |
| I am aware of and understand the University’s policy on Academic misconduct and plagiarism and I certify that this assessment is our own work, except where indicated by referring, and that I have followed the good academic practices noted above. |
| Aman Goel Ayushi Mishra |



# SRM INSTITUTE OF SCIENCE AND TECHNOLOGY KATTANKULATHUR – 603 203

## BONAFIDE CERTIFICATE

Certified that 21CSE292P project report titled “**SCREEN CONTROL USING GESTURE RECOGNITION**” is the bonafide work of “**AMAN GOEL RA2211003011296, AYUSHI MISHRA RA2211003011344”** who carried out the project work under my supervision. Certified further, that to the best of my knowledge the work reported herein does not form any other project report or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

**SIGNATURE SIGNATURE**

##### DR. TYJ NAGA MALLESWARI DR. M. PUSHPALATA

|  |  |  |
| --- | --- | --- |
| **SUPERVISOR**  Associate Professor  NWC |  | **HEAD OF THE DEPARTMENT**  COMPUTING TECHNOLOGIES |

**ABSTRACT**

In this project, we aim to develop an innovative gesture recognition system that enables users to control their computer screens and simulate mouse and keyboard inputs using hand gestures. Leveraging the power of computer vision and machine learning, our system utilizes PyAutoGUI, MediaPipe, and OpenCV to detect and interpret hand movements in real-time. We have designed and trained a neural network on a custom dataset to achieve high accuracy in gesture recognition, ensuring a seamless and intuitive user experience.

The system is capable of recognizing a variety of gestures, each mapped to specific keyboard or mouse functions. For instance, users can navigate their screens, click, scroll, and even type using predefined hand movements. This approach not only enhances accessibility for individuals with physical limitations but also offers a novel and efficient way for users to interact with their computers.

Our project stands out due to its emphasis on accuracy and user-friendliness. By creating a custom neural network and dataset, we have tailored the system to accurately recognize a wide range of gestures. Additionally, we have focused on developing a user-friendly interface that allows for easy customization and adaptation to individual needs.

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**ABBREVIATIONS**

**AI** Artificial Intelligence

**API** Application Programming Interface

**AUC** Area Under the Curve

**CNN** Convolutional Neural Network

**CV** Computer Vision

**DL** Deep Learning

**FPS** Frames Per Second

**GPU** Graphics Processing Unit

**GUI** Graphical User Interface

**IoT** Internet of Things

**ML** Machine Learning

**NN** Neural Network

**RGB** Red, Green, Blue (color model)

**ROC** Receiver Operating Characteristic

**RNN** Recurrent Neural Network

**SVM** Support Vector Machine

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**CHAPTER 1**

**INTRODUCTION**

In recent years, gesture recognition has emerged as a transformative technology in the field of human-computer interaction, offering a more natural and intuitive way for users to interact with digital devices. This project aims to develop an advanced gesture recognition system that allows users to control their computer screens and simulate mouse and keyboard inputs using hand gestures. By leveraging the power of computer vision and machine learning, our system provides a seamless and efficient interface for various applications, from accessibility enhancements to gaming and virtual reality.

* 1. **About Gesture Recognition**

Gesture recognition is a technology that interprets human gestures, such as hand movements, to perform specific tasks or commands. Its importance lies in its ability to bridge the gap between humans and machines, making interactions more natural and intuitive. This is particularly beneficial for individuals with physical disabilities, as it provides an alternative method of controlling devices without the need for traditional input devices like keyboards and mice.

Additionally, gesture recognition can enhance user experiences in gaming, virtual reality, and augmented reality, where natural and fluid interactions are crucial for immersion and engagement.

* 1. **About Gesture Recognition**

For our gesture recognition system, we have developed a custom dataset that is tailored to our specific needs. This dataset includes a diverse range of hand gestures, each mapped to corresponding control commands. By personalizing the dataset, we ensure that our system can accurately recognize and interpret the intended gestures.

We employ a neural network to classify these gestures, which has been meticulously designed and trained to achieve high accuracy. The neural network architecture is optimized to extract relevant features from the input images, enabling precise and efficient gesture recognition.

* 1. **About Gesture Recognition**

Our system is developed using Python 3.10, chosen for its speed and extensive library support. We utilize PyAutoGUI for simulating mouse and keyboard actions, MediaPipe for robust hand tracking, and OpenCV for real-time image processing. TensorFlow and Keras are used for implementing the neural network. The software is designed to be compatible with various operating systems, ensuring that it can be widely used across different platforms.

The choice of Python 3.10 and these libraries ensures that our system is both fast and reliable, providing a smooth user experience.

**CHAPTER 2**

**LITERATURE SURVEY**

In the initial phase of our project, we undertook a comprehensive review of around ten academic papers related to gesture recognition. This review was essential to understand the current landscape of the field, including the methods and technologies commonly employed. By studying these papers, we aimed to identify the various approaches to gesture recognition, their strengths, and their limitations.

For each paper, we focused on understanding the specific methodologies used for detecting and interpreting gestures. This involved examining the algorithms, techniques, and tools employed by researchers to achieve accurate gesture recognition. Through this analysis, we gained valuable insights into the different ways in which gesture recognition can be implemented and the challenges associated with each approach.

The information gleaned from this literature survey was instrumental in shaping our project. It provided us with ideas for our own system and helped us determine the best practices to follow. We learned about the significance of accurate hand tracking, the various neural network architectures that could be employed, and the importance of a high-quality dataset for achieving reliable recognition. These insights guided our decisions regarding the selection of technologies and the development of our methodology, ensuring that our approach to gesture recognition was informed and effective.

* 1. **Survey**

Gesture recognition is a technology that interprets human gestures, such as hand movements, to perform specific tasks or commands. Its importance lies in its ability to bridge the gap between humans and machines, making interactions more natural and intuitive. This is particularly beneficial for individuals with physical disabilities, as it provides an alternative method of controlling devices without the need for traditional input devices like keyboards and mice.

Additionally, gesture recognition can enhance user experiences in gaming, virtual reality, and augmented reality, where natural and fluid interactions are crucial for immersion and engagement.

**CHAPTER 3**

**SYSTEM ARCHITECTURE AND DESIGN**

The architecture of our gesture recognition system is meticulously designed to provide a seamless and efficient user experience. It comprises several interconnected modules, each performing a specific function to ensure accurate gesture recognition and translation into computer commands.

* 1. **System Overview**
     1. **Gesture Detection**

The core components of our system include:

* **Camera Input:** This module is responsible for capturing the real-time video feed from the user's webcam or an external camera. It ensures that the video stream is consistently available for processing by other modules.
* **Hand Tracking:** Utilizing the advanced capabilities of the MediaPipe library, this module detects the user's hand in the video feed and tracks its movements. It provides crucial information about hand landmarks, which are key points on the hand used for gesture recognition.
* **Gesture Recognition:** This is the heart of our system, where the magic happens. The gesture recognition module analyzes the hand landmarks provided by the hand tracking module using a neural network specifically trained for this purpose. The neural network classifies the hand's posture into one of the predefined gestures, such as a swipe or a click.
* **User Interface:** To ensure user-friendliness, we provide a graphical interface that allows users to interact with the system, customize gesture mappings, and view real-time recognition results. The interface is designed to be intuitive and easy to navigate.
* **Command Execution:** Once a gesture is recognized, this module translates it into a corresponding computer command. For example, a swipe gesture could be mapped to a scroll action, while a pinch gesture could simulate a mouse click. We use the PyAutoGUI library to execute these commands, allowing for seamless interaction with the computer.
  + 1. **Neural Network**

The core components of our neural network are:

* **Custom Dataset:** We have created a personalized dataset for sign language detection, which includes images of hand gestures representing alphabets, numbers, and four specific functions. This dataset is tailored to our project's requirements, ensuring that the neural network can accurately recognize the intended signs.
* **Data Processing:** The dataset images are processed using the MediaPipe library to extract hand landmarks, which are then used as input features for the neural network. Each image is converted into a set of coordinates representing the position of key points on the hand.
* **Neural Network** **Model:** A Random Forest Classifier is employed as the neural network model for this project. It is trained on the processed data to classify each gesture into its corresponding sign (alphabet, number, or function).
* **Model Training:** The model is trained using a split of the dataset, with 80% of the data used for training and 20% for testing. This ensures that the model is well-validated and can generalize well to new, unseen data.
* **Accuracy Measurement:** The accuracy of the model is measured using the test data, providing a quantitative assessment of the model's performance in recognizing sign language gestures.
* **Real-time Inference:** In the live application, the trained model is used to predict the sign language gestures in real-time, providing immediate feedback to the user.

* 1. **Design of Module**
* **Camera Input Module:**
  + Captures live video feed at a specified resolution and frame rate.
  + Converts the feed into individual frames for processing by subsequent modules.
* **Hand Tracking Module:**
  + Employs MediaPipe's hand tracking algorithm to identify key hand landmarks in each frame.
  + Outputs a set of coordinates representing the position of each landmark.
* **Gesture Recognition Module:**
  + Processes the landmark coordinates to extract features relevant for gesture recognition.
  + Utilizes a neural network model, trained on a custom dataset, to classify the hand posture into predefined gestures.
* **Command Execution Module:**
  + Maps each recognized gesture to a specific keyboard or mouse action based on predefined settings.
  + Executes the mapped actions using PyAutoGUI, allowing for direct control of the computer.
* **User Interface Module:**
  + Provides a graphical interface for system settings and real-time feedback.
  + Allows users to customize gesture-to-command mappings and view the system's status.

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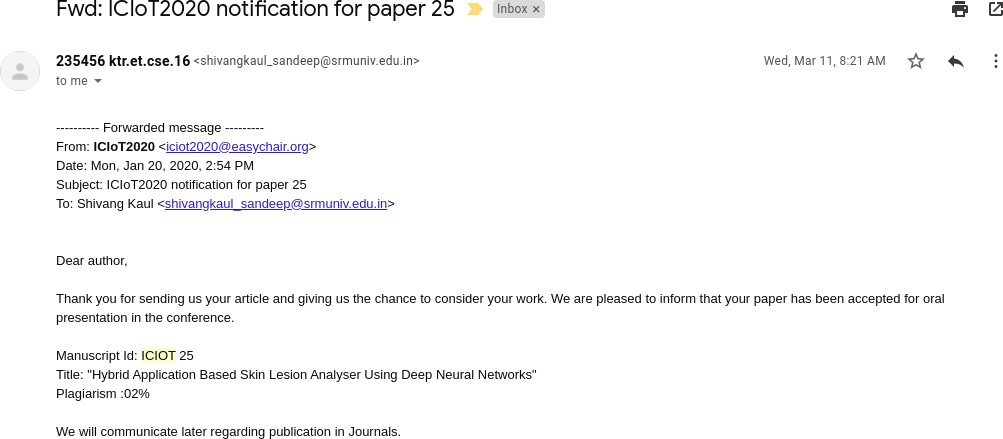
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**APPENDIX A**

**CONFERENCE PRESENTATION**

Our paper on **Hybrid application based skin lesion analyzer using deep neural networks** was presented at ICIOT 2020 conference held at SRM. 200+ shortlisted teams presented their papers on various fields in the conference. Our paper got accepted as paper id : 25 with a plagiarism of just 2 %.



##### Figure A.1: ICIOT 2020 Acceptance

On presenting the paper in this international conference held at SRM KTR campus, we received positive remarks and suggestion from the judging panel. We were then awarded the best paper award at the same conference.



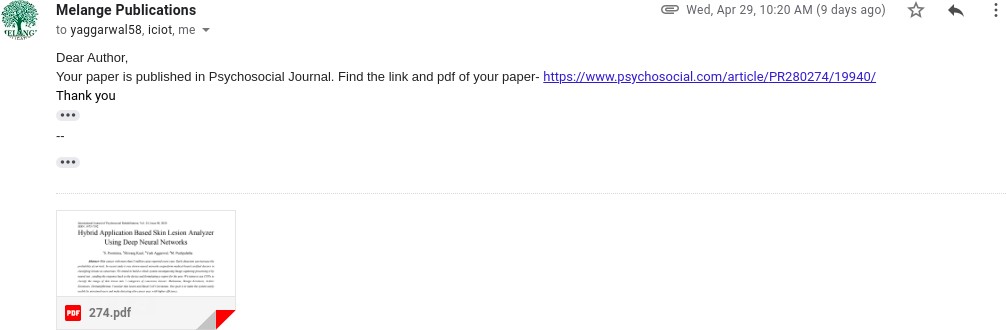
##### Figure A.2: ICIOT 2020 Best Paper award

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**APPENDIX B**

**PUBLICATION DETAILS**

We submitted our research paper for publication at IJPR publication house puducherry. We had selected the journal **International Journal of Psychosocial Rehabilitation (ISSN: 1475- 7192)**. We got the acceptance notification from the IJPR stating our paper has been published in the April Issue of the same journal. Proof of publication is attached in figure [B.1](#_bookmark123) The research



##### Figure B.1: Publication Notification

paper cover page has been attached below.

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Hybrid Application Based Skin Lesion Analyzer Using Deep Neural Networks

1S. Poornima, 2Shivang Kaul, 3Yash Aggarwal, 4M. Pushpalatha

***Abstract--****Skin cancer with more than 5 million cases reported every year. Early detection can increase the probability of survival. In recent study it was shown neural networks outperform medical board certified doctors in classifying lesions as cancerous. We intend to build a whole system encompassing Image capturing processing it by neural net , sending the response back to the device and formulating a report for the user. We intent to use CNNs to classify the image of skin lesion into 7 categories of cancerous lesions: Melanoma, Benign Keratosis, Actinic Keratoses, Dermatofibroma, Vascular skin lesion and Basal Cell Carcinoma. Our goal is to make the system easily usable by untrained users and make detecting skin cancer easy with higher efficiency.*

***Key words--****Neural Networks, Image Processing, Convolu-tional Neural Networks, Skin Cancer Detection, Skin Lesion Imaging, App Development, Localization Algorithms, Cloud Computing, GCP, Compute Engine, App Engine.*

1. **INTRODUCTION**

Skin Cancer is a major kind of cancer with around 5 million reported cases worldwide every year. The major cause of skin cancer is exposure to UV rays. Diagnosing skin cancer generally included the skin lesion being examined by a doctor. Recent studies have shown neural networks to be more efficient in classifying lesion as cancerous as compared to trained doctors. Misdiagnosing or late detection of cancer can lead to a higher mortality rate and less chance of cure. The goal of this project is making detection and classification of lesions on the skin easier. Not all the marks on skin are a matter of concern but early detection and treatment of cancer can save lives. So this gives the user a way to check if there’s a chance of the mark on your skin being cancerous. The aim of this project is to detect and analyse such a correlation using neural networks. It is expected that the outcome of this project will lead to automated classification of skin lesions.

1. **LITERATURE SURVEY**

The following papers were read and analysed for the refer-ence of this paper. A brief image has been presented here.

1) Andre Esteva et al. 2017,” Dermatologist-level classification of skin cancer with deep neural networks.” Contribution: Claimed to classify skin lesions at par with board trained dermatologists. Methodology used:

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**APPENDIX C**

**PLAGIARISM REPORT**

