

# **A PROJECT REPORT**

Submitted by

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**AND**

**COMPUTATIONAL SCIENCE**



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**DEPARTMENT OF APPLIED MATHEMATICS**

**AND**

**COMPUTATIONAL SCIENCE**

**BONAFIDE CERTIFICATE**

Certified that this project report is the bonafide work of JOSHIK RAJ S(20S014), Third Semester student of 5 Year Integrated MSc (Data Science) Degree Programme, who carried out the project under my supervision from 23.11.2021 to 14.12.2021 during the academic year 2021-2022.

The project report was submitted to the department on 14/12/2021 for evaluation/assessment.

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## **1.INTRODUCTION:**

A hand game called rock paper scissors, which originated in China, is often played by two players who simultaneously make one of three shapes with their outstretched hands. These are the "scissors," "paper," and "rock" shapes, respectively (a fist with the index finger and middle finger extended, forming a V). The two-finger V sign, which also means "victory" or "peace," is the same as the "scissors" sign, with the exception that it is held horizontally in the air rather than vertically. It is a simultaneous, zero-sum game with three outcomes: a victory, a loss, or a draw. In this project, the Rock Paper Scissors game is created using Computer Vision. Hand tracking is used to find the move of the player and generate a random move for the bot. It is going to be a user-friendly game that even children can understand the game. Rock Paper Scissors is fundamentally a simple game, which can be played anywhere using only hands. Rock Paper Scissors is a simple two-person hand game. The game can be played with one or multiple rounds. Both players begin by saying "Rock, Paper, Scissors" while moving their first in an up and down motion. The players then simultaneously play, or throw, one of the three hand gestures. It has some rules to identify a winner. The idea behind these rules is that rocks make scissors blunt, that scissors cut paper, and that paper covers the rock. Games like Rock, Paper, and Scissors are typically described as finger-throwing or finger-flashing games. Players 'throw' their chosen gesture simultaneously during gameplay. While the hand gestures can be represented in slightly different ways, the rock is represented by a fist. Paper is represented by a flat hand, and scissors are represented by a horizontal peace sign.

## **2. OBJECTIVE:**

The objective of Rock, Paper, Scissors is to defeat your opponent by making a move that defeats their choice under the following rules:

- Rock smashes (or blunts) Scissors, so Rock wins
- Scissors cut Paper, so Scissors win
- Paper covers Rock, so Paper wins
- If players choose the same image which is shown by Josi, neither win nor the game is played again
- The program will choose a weapon (Rock, Paper, Scissors), but its choice will not be displayed until later so the user doesn't see it.
- The program will announce the beginning of the round and ask the user for his/her weapon choice
- The two weapons will be compared to determine the winner (or a tie) and the results will be displayed by the program
- The next round will begin, and the game will continue until the user chooses to quit
- The computer will keep score and print the score when the game ends.
- An encounter consists of a number of rounds. In each round, each player commits to their move (either Rock, Paper, or Scissors), and reveals the commitment to the other player.
- The winner of each round is found according to standard Rock-Paper-Scissors rules (Rock beats Scissors beats Paper beats Rock).
- The player who scores 5 at first wins the encounter.
- After match ends it says who wins the match.
- In final it asks for a new game or exit to the user.
- User can choose according to his wish.

### 3. DESCRIPTION OF THE PROJECT:

In this project, the Rock Paper Scissor game is created using Computer Vision. Like all decision-making games, it is important to clearly define fixed rules before starting play. With Rock Paper Scissors, one of the most important aspects is deciding how many rounds need to be won to win the entire game. The main purpose of this project was to create an application utilizing computer vision to play Rock Paper Scissors against. A secondary goal was to explore concepts of computer vision, and human-computer interaction.

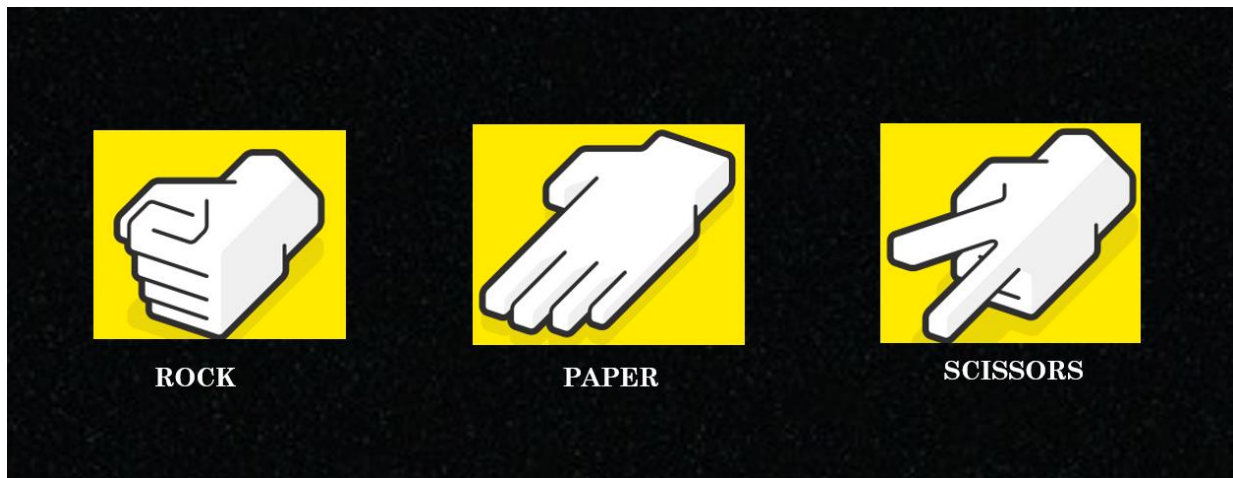


Fig. 3.1

Python programming language is used here for developing the game. 'PyCharm' is used to code python. PyCharm is a dedicated Python Integrated Development Environment (IDE) providing a wide range of essential tools for Python developers, tightly integrated to create a convenient environment for productive Python, web, and data science development.

This project was taken by us on discussion with our mentor. We chose this because the user will be more friendly and very interactive to the bot which we created. To make this, we have used certain libraries and functions.

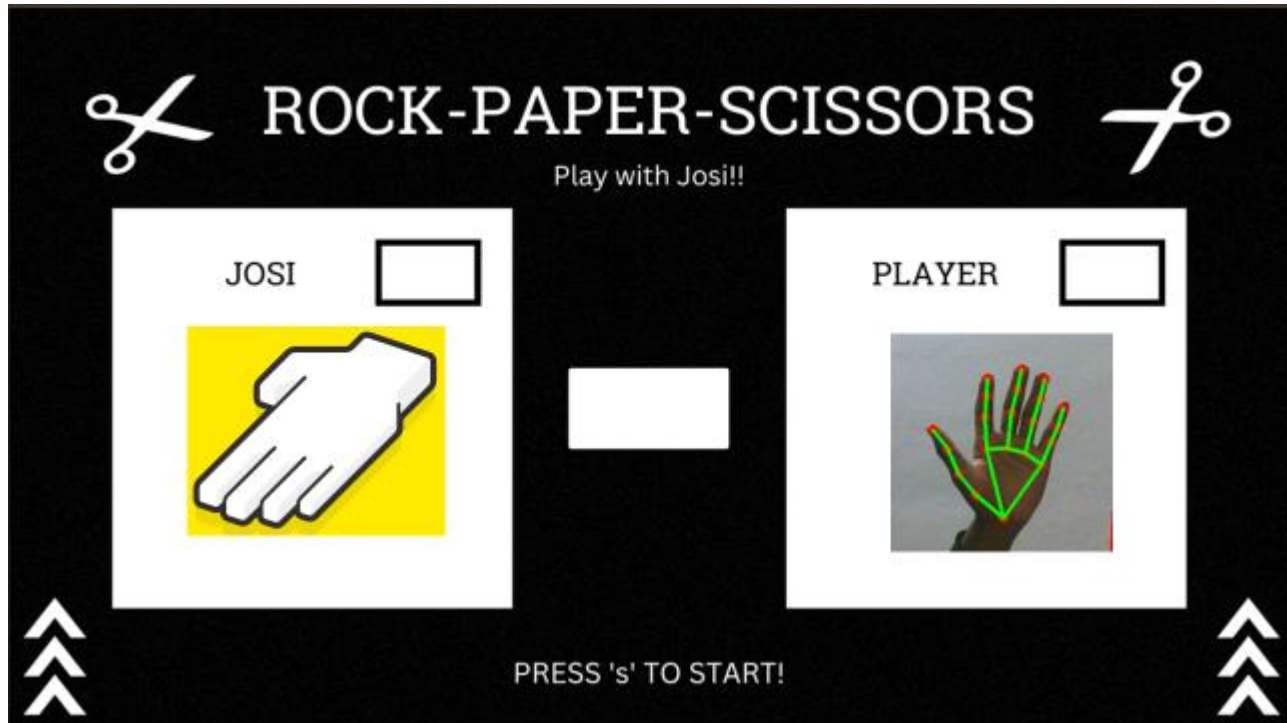


Fig. 3.2

Here, named our bot as 'JOSI'. In that 'JOSI' space random moves (rock, paper, Scissors) are generated after a move by the player is made within 3 minutes. There is a score panel in JOSI's space where the score of the JOSI is going to display. Right side there is a space for player to make moves (rock, paper, scissors) with their fist. At center there is a white space for the timer. On count of three the game will start. Also there is a score panel in player's space where the score of the player is going to display.



## 4. IMPLEMENTATION:

### Step 1: Installations

- There are some important libraries to do our operations, they are Cvzone, Czone, mediapipe, random, time, HandDetector, protobuf and pygame.

```
import random
import cv2
import cvzone
from cvzone.HandTrackingModule import HandDetector
import time
import pygame
from pygame import mixer
```

Fig. 4.1

### Step 2: Webcam

- To access the webcam VideoCapture(0)

```
cap = cv2.VideoCapture(0)
```

Fig. 4.2

### Step 3: Background Image

- Then to import a background image use cv2.imread()

```
imgBG = cv2.imread("resources/BG1.PNG")
```

Fig. 4.3

## Step 4: Webcam Embed

- To overlay the video of the user in the background image, scale the video according to the height and width of the background image also install a package called protobuf for tracking.

```
imgScaled=cv2.resize(img,(0,0),None,0.7125,0.7125)  
imgScaled=imgScaled[:12:446]  
imgBG[283:625, 787:1221] = imgScaled
```

Fig. 4.4

## Step 5: Find Hand

- To indicate that your hand is rock or paper or scissors hand tracking in the video of the player is done.
- There are three moves
- If you fingers are up it will be assumed as 1 else 0
- So for paper it will show as [1,1,1,1,1]
- For rock it will show as [0,0,0,0,0]
- For paper it will show as [0,1,1,0,0]

```
if hands:  
    playerMove=None  
    hand = hands[0]  
    fingers = detector.fingersUp(hand)
```

Fig. 4.5

## Step 6: Timer

- The user should press the 's' key to play the game. Once the 's' is pressed the timer will start. Within the timer the player should make a move. So, after that josi will make a move. We can also set the font size of the timer which is given below.

```

if startGame:
    if stateResult is False:
        timer = time.time() - initialTime
        cv2.putText(imgBG, str(int(timer)), (605, 435), cv2.FONT_HERSHEY_PLAIN, 6, (255, 0, 255), 4)

        if timer > 3:
            stateResult = True
            timer = 0
if key == ord('s'):
    startGame = True
    initialTime = time.time()
    stateResult = False

```

Fig. 4.6

## Step 7: Player Hand

- If all the fingers are up it is recognized as paper i.e. playerMove is 1
- If all the fingers are up it is recognized as rock i.e. playerMove is 2
- If only two fingers are up it is recognized a scissors ie.playerMove is 3

```

if hands:
    playerMove = None

    hand = hands[0]
    fingers = detector.fingersUp(hand)
    if fingers == [1, 1, 1, 1, 1]:
        playerMove = 1
    if fingers == [0, 0, 0, 0, 0]:
        playerMove = 2
    if fingers == [0, 1, 1, 0, 0]:
        playerMove = 3
    print(playerMove)

```

Fig. 4.7

## Step 8: AI Move

- By using the random number we will generate the random pictures of Rock, Paper and Scissors and it will display in the josi side.

```
randomNumber = random.randint(1, 3)
imgAI = cv2.imread(f'Resources/{randomNumber}.jpeg', cv2.IMREAD_UNCHANGED)
cv2.imshow("AI", imgAI)
```

Fig. 4.8

## Step 9: Scoring

- If the player makes a move of stone and the bot makes a move of scissors or if the player makes a move of paper and the bot makes a move of stone or if the player makes a move of scissors and the bot makes a move of paper then the score of the player will rise one by one
- Similarly, If the bot makes a move of stone and the player makes a move of scissors or if the bot makes a move of paper and the player makes a move of stone or if the bot makes a move of scissors and the player makes a move of paper then the score of the bot will rise one by one.

```
if (playerMove == 2 and randomNumber == 3) or \
    (playerMove == 1 and randomNumber == 2) or \
    (playerMove == 3 and randomNumber == 1):
    scores[1] += 1

# AI Wins
if (playerMove == 3 and randomNumber == 2) or \
    (playerMove == 2 and randomNumber == 1) or \
    (playerMove == 1 and randomNumber == 3):
    scores[0] += 1
```

Fig. 4.9

## Step 10: VOICE

- Here there will be a maximum score of 5
- If the player first scores 5 there will one voice and if josi wins and there will be another voice will play.

```
if scores[0] == 5:  
    play(r'C:\Users\JOSHIK RAJ\Downloads\lose.mp3', 2)  
    print("Josi wins!")  
    exit()  
if scores[1] == 5:  
    play(r'C:\Users\JOSHIK RAJ\Downloads\won.mp3', 2)  
    print("Player wins!")  
    exit()
```

Fig. 4.10

## **5. SIGNIFICANCE OF THE PROJECT:**

The significance of the project is even a small kid can play this game even the kid cannot know the rules. This is the strength of the project. The unique feature of the project is the user will be more interactive because their face will be shown in the game while playing and also there will be a quick response from "Josi" when the user makes a move. The project will be deployed as a web app because the project's goal is to make the user more friendly to the game. Through this web app the user will get all the information about the game like rules of the game and more. Typically, most of the students will be doing projects related to Machine Learning, Deep Learning and Predictive Analytics but we are developing a fun-based game because entertainment is very important. Here, the game is created based on the random generator but we can also challenge the user by predicting the move of the player and the player will be lost always. This is not done in this project because loyalty is important. The user will be interactive and feel themselves more engageable while playing this game and the player will definitely recommend to their friends. So, this must be the benefit for the user who is playing this game.

### **Challenges:**

- Fitting the user's image with respect to the background image is quite tough
- Randomizing the moves
- Fitting the Rock, Paper and Scissors image in the correct place is challenging
- Aligning the Score in the Background image is challengeable.

## **6. CONCLUSION:**

We have designed and implemented a Rock-Paper-Scissor game to provide a verifiable, decentralized, game platform. With a computer running macOS or Windows and a webcam, you can now play a more natural and unrestricted game of Rock Paper Scissors. While we accomplished our initial goals, there are many ways this project could be expanded upon. First of all, the application still requires the user to press 's' before starting a game. This was done to save computational resources and reduce complexity. While we accomplished our initial goals, there are many ways this project could be expanded upon. But having a way to start a game with a gesture would be more intuitive and would provide a better user experience. Finally, despite significant effort, we were unable to create a packaged version of the software for distribution. Hopefully, this will become possible in the future with changes to the OpenCV-Python package. In the future, this project can be developed into a web page or a mobile app. This makes user to understand and play easier.

## 7. PROJECT WORKSHEET/DIARY:

WEEK 1	Date	Topics learned / Activity carried out / Task completed / Online / E-resources accessed
	10.08.2022	The topic was chosen with the help of our guide.
	11.08.2022	
	12.08.2022	
	13.08.2022	Get to know about Rock, Paper, and Scissors game.
	14.08.2022	
	15.08.2022	Read some articles and papers about designing the game.
	16.08.2022	

WEEK 2	Date	Topics learned / Activity carried out / Task completed / Online / E-resources accessed
	17.08.2022	Get to know the basic requirements for this project by googling.
	18.08.2022	
	19.08.2022	
	20.08.2022	Learned how to develop a game using python
	21.08.2022	
	22.08.2022	
	23.08.2022	Internal exam



<b>WEEK 3</b>	<b>Date</b>	<b>Topics learned / Activity carried out / Task completed / Online / E-resources accessed</b>
	24.08.2022	Internal exam
	25.08.2022	
	26.08.2022	
	27.08.2022	Learned about the python libraries which are useful in developing a game.
	28.08.2022	
	29.08.2022	
	30.08.2022	Installed PyCharm for coding

<b>WEEK 4</b>	<b>Date</b>	<b>Topics learned / Activity carried out / Task completed / Online / E-resources accessed</b>
	31.08.2022	Installed libraries that are useful for developing the code.
	01.09.2022	Started developing the code and accessed the webcam for tracking our hand moves.
	02.09.2022	
	03.09.2022	
	04.09.2022	Attended 1 <sup>st</sup> review with our guide and got some feedback from the guide.
	05.09.2022	Altered our code according to the feedback.
	06.09.2022	

WEEK 5	Date	Topics learned / Activity carried out / Task completed / Online / E-resources accessed
	07.09.2022	Created a layout for the background and got pictures of rock, paper, and scissors hand gestures.
	08.09.2022	
	09.09.2022	
	10.09.2022	Code developing.(Randomly generating the moves and providing points for the winner)
	11.09.2022	
	12.09.2022	
	13.09.2022	

WEEK 6	Date	Topics learned / Activity carried out / Task completed / Online / E-resources accessed
	14.09.2022	Code developing
	15.09.2022	Attended 2 <sup>nd</sup> review with our guide and got some feedback from the guide.
	16.09.2022	With the help of the feedback given modified the project.
	17.09.2022	Created a front end for the game.
	18.09.2022	
	19.09.2022	Worked on the report.
	20.09.2022	

<b>WEEK 7</b>	<b>Date</b>	<b>Topics learned / Activity carried out / Task completed / Online / E-resources accessed</b>
	21.09.2022	Worked on the report.
	22.09.2022	Submitted the report.

**Signature of the Student**  
**(with date)**

**Signature of the faculty guide**  
**(with date)**