Project Documentation

SAMPLE PROJECT DOCUMENTATION

PROJECT NAME: Pong!

SCHOOL NAME: Venkateshwar International School

YEAR/CLASS: 2025

TEACHER NAME: Ms. Meenu Kumar

TEACHER EMAIL: XXXXXXXX@XXXXX.COM

TEAM MEMBER NAMES AND GRADES

1. Anshika XII
2. Pratyaksha XII
3. Pratishtha XII

1. Prepare for the Project

Identify a local issue affecting your school or community and that could be solved using artificial intelligence (AI).

Students with disabilities often lack access to games designed specifically for them. They are unable to play with their peers or use computers in the same way others do. Accessibility is a major challenge they face in daily life.

The aim of this capstone project will be to develop a game which follows only hand gestures so that students having motor disabilities can also play.

2. Team Roles

2.1 Who is in your team and what are their roles?

Role	Role description	Team Member Name
Project leader	• Schedules and allocates tasks among the team • Ensures tasks are completed on time • Acts as the point of contact between the team and the teacher, users and stakeholders • Resolves team issues	Anshika
Data expert	• Decides on type of data needed to train an AI model • Collects data • Ensures data is in a format that the team can work with • Ensures data is ethically sourced and unfair bias is eliminated • Works with prototype builder to train the AI model	Anshika Pratyaksha
Information researcher	• Collects questions from the team that need answers • Identifies where answers can be located (source) • Searches for answers, writes up a report and passes information to the project reporter	Anshika Pratyaksha Pratishtha
Designer	• Works with the team and the user to create a process flow for the new user experience • Plans the user interface for the prototype	Anshika
Prototype builder/coder	• Works with data expert to train/teach computer • Creates the prototype and codes if necessary	Anshika
Tester	• Works with users to tests the prototype • Gets feedback from users and user sign-off when the prototype has met user requirements • Creates an action plan on what needs to be fixed and prioritizes requests for future improvements	All Team Members
Marketing/ Communications leader	• Collates the team Project Logbook submission and creates the content for the video pitch • Selects spokespeople within the team for various matters relating to the project	Pratishtha
Video producer	• Films the activities of the team and edits these into a presentation for submission	Pratishtha

2.2 Project plan

Phase	Task	Planned start date	Planned end date	Planned duration (hours, minutes)	Actual start date	Actual end date	Actual duration (hours, minutes)	Who is Responsible	Notes/Remarks
Preparing for the project	Coursework, readings	10/07	10/07	1 hour	12/07	12/07	1 hour	All Team Members	
Forming the Team	Getting to know the people in the team	12/07	12/07	1 hour	12/07	12/07	1 hour	All Team Members	
Defining the problem (SDG Aligned)	Background reading	13/07	13/07	2 hours	13/07	13/07	2 hours	All Team Members	Anshika to take help of school counsellor
	Research issues in our community	14/07	14/07	2 hours	14/07	14/07	2 hours	All team Members	
Understanding the users	Identify users	15/07	15/07	0.5 hour	15/07	15/07	1 hour	All team Members	
	Meeting with users to observe them	16/07	16/07	1 hour	16/07	16/07	1 hour	All team Members	
	Interview with user (1)	16/07	16/07	1 hour	16/07	16/07	1 hour	Anshika	Will conduct interview during meeting to save time
	Interview with user (2)	17/07	17/07	1 hour	17/07	17/07	1 hour	Pratyaksha	Online meeting
Brainstorm the solution	Generate ideas	18/07	18/07	2 hours	18/07	18/07	3 hours	All team Members	
	Vote on best idea	19/07	19/07	0.5 hour	19/07	19/07	1 hour	All team Members	Listen to all team members' reasoning
Design Solution	Document the steps that the users will do	20/07	20/07	1 hour	20/07	20/07	1 hour	All team Members	To be Documented
Collecting and preparing data	Analysing data requirements	21/07	21/07	3 hours	22/07	22/07	3 hours	Pratyaksha Anshika	
Building Prototype	Developing the AI model	23/07	23/07	4 hours	23/07	23/07	4 hours	Anshika	
Prototype Testing	Team meeting to discuss testing plan	24/07	24/07	20 mins	24/07	24/07	30 mins	All Team Members	
	Test your model and keep training with more data until you think your model is accurate	24/07	24/07	1 hour	24/07	24/07	1 hour	Anshika	
	Conduct testing with users	24/07	24/07	30 mins	24/07	24/07	30 mins	All Team members	
Reflection on Project	Reflect on the project with your team	25/07	25/07	1 hour	25/07	25/07	1 hour	All Team members	Will include self and team reflection
Creating the video	Team meeting to discuss video creation	26/07	26/07	1 hour	26/07	26/07	1 hour	Pratishtha	
	Write your script	27/07	27/07	1 hour	27/07	27/07	1 hour	Pratyaksha Pratishtha	
	Film your video	28/7	28/7	2 hours	29/07	29/07	2 hours	Pratishtha	
	Edit your video	30/07	30/07	2 hours	30/07	30/07	2 hours	Pratishtha	

2.3 Communications Plan

1. Will you meet face-to-face, online or a mixture of each to communicate?
   Mixture of face-to-face and online communication
2. How often will you come together to share your progress?
   We will try to meet at least once everyday
3. Who will set up online documents and ensure that everyone is contributing?
   Anshika as team leader will take care of this task.
4. What tools will you use for communication?
   WhatsApp, Microsoft Teams

2.4 Team meeting minutes (create one for each meeting held)

Date of meeting: 10/07/2024
Who attended: Anshika, Pratyaksha, Pratishtha, Mentor
Who wasn't able to attend: Nil
Purpose of meeting: To discuss ideas about the project
Items discussed:
1. Challenges faced by physically handicapped students
2. What is motor handicap?
3. Gaming options for students having motor disability

Things to do (what, by whom, by when):
1. Need to research challenges faced by students having motor handicap
2. Each member has to think along the same line
3. Come up with the solutions very quickly

Date of meeting: 16/07/2024
Who attended: Anshika, Pratyaksha, Pratishtha, Mentor
Who wasn't able to attend: Nil
Purpose of meeting: Online interaction with end users (students)
Items discussed:
1. What kind of games do they like to play?
2. Important points/ factors end users would like to consider while playing games

Things to do (what, by whom, by when)
1. Setup call, collect information which will be helpful while designing the solution.
2. Each team member will go over information provided by end-users
3. Same day

Date of meeting: 18/07/2024
Who attended: Anshika, Pratyaksha, Pratishtha, Mentor
Who wasn't able to attend: Nil
Purpose of meeting: Brainstorming
Items discussed:
1. Discussed what all is the requirement of the end user
2. Discussed and then decided upon the solution of making a game which uses simple hand gestures

Things to do (what, by whom, by when)
1. Python will be used to design the desired solution of making a bot
2. Each team member will contribute in data collection, coding and testing.
3. Within the next day

Date of meeting: 21/07/2024
Who attended: Anshika, Pratyaksha, Pratishtha, Mentor
Who wasn't able to attend: Nil
Purpose of meeting: Designing your solution
Items discussed:
1. Discuss about the solution
2. Using Python to design the game

Things to do (what, by whom, by when)
1. Using CV library to sense hand gestures
2. Anshika will code the solution
3. Within the next day

Date of meeting: 23/07/2024
Who attended: Anshika, Pratyaksha, Pratishtha, Mentor
Who wasn't able to attend: Nil
Purpose of meeting: Team meeting to discuss the testing plan
Items discussed:
1. Decided how to go about testing the accuracy and efficiency of our game 'Pong'
2. Came up with different ideas to test it yourself first and then by the end users.

Things to do (what, by whom, by when)
1. Testing
2. Testing first by the team members followed by the end users

Date of meeting: 24/07/2024
Who attended: Anshika, Pratyaksha, Pratishtha, Mentor
Who wasn't able to attend: Nil
Purpose of meeting: Team meeting to test the game 'Pong' varied input by the team members and later by the end users on the same day
Items discussed:
1. Identify how well the game's motion-sensing features support accessibility.
2. Gather user feedback on usability, engagement, and areas for improvement.
3. Observe the interaction patterns of school students to gauge accessibility and ease of use.

Things to do (what, by whom, by when)
1. Testing
2. Testing by the team members followed by the end users
3. Same day

Date of meeting: 25/07/2024
Who attended: Anshika, Pratyaksha, Pratishtha, Mentor
Who wasn't able to attend: Nil
Purpose of meeting: Reflection on the game 'Pong'
Items discussed:
1. Shared observations from school students who tested the prototype.
2. Discussed initial user responses, identifying aspects of the game that were well-received and areas needing refinement.

Things to do (what, by whom, by when)
1. Any changes
2. By each team member
3. Same day

Date of meeting: 25/07/2024
Who attended: Anshika, Pratyaksha, Pratishtha, Mentor
Who wasn't able to attend: Nil
Purpose of meeting: Video Filming
Items discussed:
1. Script to be written
2. Which screen recording software to be used?
3. Any voice over required?

Things to do (what, by whom, by when)
1. Any changes
2. Pratishtha
3. Same day

3. Problem Definition

3.1 List important local issues faced by your school or community

- Children with disabilities don't have any games designed with them in mind. They aren't able to play with their peers or use computers in the same way others can.
- Students with disabilities face lots of difficulties in their day-to-day life, with accessibility as a major issue.

3.2 Which issues matter to you and why?

- Children with special needs being unable to access computers and interact with them on the same level as their peers can. A child is a child, and should be able to interact in the same way as everyone else irrespective of his/her special needs.

3.3 Which issue will you focus on?

- We're going to focus on the issue of games being inaccessible to those with special needs.
- We will design a game with their ability to play not being hampered, by designing a set of alternate controls.

3.4 Team's Problem statement

How can we help **children with special needs** [a specific user or group of users] find a way to **play games with their peers** [do what] so that they can [do] have an equally good experience and compete with the regular players [something not done before that can be measured].

4. Understand Your Users

4.1 Who are the users and how are they affected by the problem?

Children with special needs are the users; they are unable to play games or use computers as others would because the input methods (controller or keyboard & mouse) are not designed with their accessibility in mind.

4.2 What have you actually observed about the users and how the problem affects them?

Users are unable to compete and play with their peers while playing games with them. Their experience is inferior & they aren't able to convey their inputs effectively as the control systems are not designed with their accessibility in mind. They are disabled in the virtual world too, not just in the real world.

4.3 Record your interview questions here as well as responses from users.

Can you tell us about the difficulties you face when playing games or using a computer?

- **Response:** "Most games require fast keyboard or controller use, and it's hard to keep up. I feel left out when my friends play together because the controls are not something I can use comfortably."

What are some specific controls or parts of the gaming experience that make it difficult for you to enjoy playing with your peers?

- Response: "The buttons on controllers are too small, and moving the joystick is hard for me. On the computer, using the mouse or pressing many keys quickly is challenging."

Have you tried using any assistive technology or adapted controls for games? If yes, how was the experience?

- **Response:** "I've tried using voice control software, but it wasn't responsive enough for fast-paced games. It worked for simple tasks but not when I wanted to enjoy the same games as my friends."

How do you feel when you can't participate fully in games with your friends?

- **Response:** "It feels like I'm missing out. It's frustrating because I want to be part of the fun, but I'm always watching from the sidelines."

How do you think gaming or computer use can be made more accessible for you?

- **Response:** "It would help if there were larger, customizable buttons or maybe motion controls that don't require quick movements. Voice commands that work better could also be useful."

Do you enjoy watching others play games? How would you describe that experience?

- Response: "Yes, but watching isn't the same as playing. I enjoy seeing my friends have fun, but I wish I could be more involved.

4.4 Empathy Map

Map what the users say, think, do and feel about the problem in this table.

What our users are saying?	**What our users thinking?**
1. "I feel left out when my friends play together." 2. "The controls are not something I can use comfortably." 3. "It's frustrating to watch my friends have fun while I can't participate." 4. "I wish there were controls that adapted to my needs."	1. "I want to be included in the fun, just like my friends." 2. "I feel like I'm missing out on something important." 3. "Why is it so hard to create a game that I can play?" 4. "I want to feel normal, not different because of my special needs." 5. "If only there were games or controls designed with me in mind."
What our users are doing?	**How our users feel?**
1. Engage in non-gaming activities when games become too frustrating. 2. Sometimes avoid games altogether because the experience feels demotivating	1. Frustration: "It's unfair that I can't play the same games as others." 2. Loneliness: "I feel isolated when my friends play without me." 3. Helplessness: "No matter how much I want to play, I can't control the game the way it's designed." 4. Hope: "Maybe one day there will be a game or control system that works for me." 5. Desire for inclusion: "I want to be able to play and compete just like my friends."

4.5 What are the usual steps that users currently take related to the problem and where are the difficulties?

Choosing a Game

- **Step:** Kids try to play the same games their friends are playing.
- **Difficulty:** Most games aren't designed for children with special needs, so they don't know if they can play them comfortably.

Using Standard Controls

- **Step:** They try to use regular controllers, keyboards, or mice.
- **Difficulty:** These controls are often too small or complicated, making it hard or impossible for them to play.

Trying Accessibility Features

- **Step:** They look for options in the game that might help (e.g., remapping controls).
- **Difficulty:** These options are usually limited and don't fully solve the problem.

4.6 Refine your problem statement.

Children with special needs are experiencing issues with **playing games with their peers** today because of **inaccessible control systems that do not cater to their abilities**.

5. Brainstorming

5.1 Ideas

How might you use the power of AI/machine learning to solve the users' problem by increasing their knowledge or improving their skills?

AI Idea #1	Design new game
AI Idea #2	Create a software
AI Idea #3	Create a Voice assistant
AI Idea #4	Create a Motion sensing environment
AI Idea #5	Create a Motion sensor game

5.2 Priority Grid

Evaluate your five AI ideas based on value to users and ease of creation and implementation.

VALUE TO USERS	Easy	Hard
High	**High value to users, easy to create** A built-in voice assistant can help guide users through the game, offer instructions, and even perform simple commands (e.g., "Jump," "Run"). This would be relatively simple to integrate into the game, while greatly improving the accessibility for users with limited motor skills.	**High value to users, hard to create** Designing the entire game around motion sensors, where players can use body movements to play. This creates a more immersive experience, allowing children with special needs to interact in a way that works best for their abilities.
Low	**Low value to users, easy to create** The development of basic game software that could be customized over time. While important, this is something that can be fine-tuned as more specific accessibility features are added.	**Low value to users, hard to create** Building fully customizable software from scratch that allows for different game modes, difficulty levels, or controls. This can be left for later updates, as the core game needs to function smoothly first.

EASE OF DEVELOPMENT

5.3 Based on the priority grid, which AI solution is the best fit for your users and for your team to create and implement?

Briefly summarise the idea for your solution in a few sentences and be sure to identify the tool that you will use.

We will create a **motion sensor game** that allows children with special needs to play using their body movements instead of traditional controllers or keyboards. The game will detect gestures, hand movements, or even eye tracking, enabling users to interact in an intuitive and accessible way. This eliminates the need for complex inputs and makes gaming more inclusive and engaging.

We will use computer vision to achieve this.

6. Design your solution

6.1 What are the steps that users will now do using your AI solution to address the problem?

1. Starting the Game
   - **Step:** Users will launch the game and stand or sit in front of the motion sensor (like a camera or motion-detecting device).
   - **Improvement:** No need for physical controllers; the game will automatically detect their presence and adjust to their position.
2. Calibrating the Motion Sensor
   - **Step:** The game will ask the users to perform simple movements (e.g., raise a hand, move left or right) to calibrate the sensor and understand their range of motion.

7. Identify and collect data

7.1 What type of data do you need for your AI solution?

- Hand Tracking detection
- Distance from sensor
- Key body point tracking (hands, arms)
- Directional movement data (left/right, up/down)
- Joint angles and range of motion
- Speed and smoothness of movement
- Accuracy of gesture matching
- Reaction time to game events
- Fatigue indicators (e.g., slowed movements)

8. Prototype

8.1 Document your Prototype concept

- **Hand Tracking Outputs:** Detecting left- and right-hand positions to move the paddles accordingly.
- **Collision Detection:** Detect when the ball collides with the paddles or screen edges.
- **Game Over Decision:** If the ball crosses the boundary (misses the paddles), the game ends.
- **Reset Decision:** When the game ends, the system waits for the user to press "R" to reset the game.

8.2 Which AI tool(s) will you use to build your solution?

- **OpenCV** for camera-based motion sensing and real-time video capture.
- **cvzone** for simplifying tasks like hand tracking and overlaying images (bats, ball).
- **HandDetector** (from cvzone) for hand detection and tracking to control the in-game paddles.
- **Numpy** to handle mathematical operations like collision detection and boundary limits for the ball and paddles.

8.3 What decisions or outputs will your tool generate and what further action needs to be taken after a decision is made?

- **Hand Tracking Outputs:** Detecting left and right hand positions to move the paddles accordingly.
- **Action:** The game's paddles are moved based on detected hand positions.
- **Collision Detection:** Detect when the ball collides with the paddles or screen edges.
- **Action:** Reverse the ball's direction and adjust the score when the ball hits a paddle.
- **Game Over Decision:** If the ball crosses the boundary (misses the paddles), the game ends.
- **Action:** Display the "Game Over" screen and show the final score.
- **Reset Decision:** When the game ends, the system waits for the user to press "R" to reset the game.
- **Action:** Reset the ball position, score, and game state for a new round.

9. Testing

9.1 Who are the users who tested the prototype?

School students

9.2 List your observations of your users as they tested your solution.

- **Engagement:** The school students showed high levels of engagement and excitement while interacting with the prototype. They were eager to understand how the motion sensor controls worked.
- **Learning Curve:** Most users took some time to adjust to the new controls and gameplay mechanics. Initial attempts were clumsy, but as they practiced, their coordination improved significantly.
- **Feedback on Controls:** Users provided feedback that the motion detection was generally responsive, but some suggested that the sensitivity could be adjusted to accommodate different playing styles and physical abilities.
- **Game Dynamics:** Students enjoyed the competitive aspect of the game, particularly the scoring system. They expressed that the motion-based controls made the game feel more interactive and fun.
- **Inclusivity Awareness:** Many students became more aware of the challenges faced by their peers with disabilities. Testing the prototype sparked conversations about inclusivity and the importance of accessible games.
- **Physical Space:** Some users noted that the playing area needed to be spacious enough for comfortable movement. Crowded spaces made it difficult for them to engage fully with the game.
- **Desire for Customization:** Users expressed interest in having options to customize their characters or gameplay settings, suggesting that personalization could enhance their overall experience.
- **Game Duration:** The students found the game duration to be appropriate, with several expressing a desire for longer sessions once they became more skilled at playing.
- **Social Interaction:** Users enjoyed the multiplayer aspect, indicating that playing with friends enhanced the experience and made it more enjoyable.
- **Technical Issues:** A few users encountered occasional technical glitches, such as lag or disconnection of the motion sensors, which interrupted gameplay and affected their enjoyment.

9.3 Complete the user feedback grid

What works?	What needs to change?
Motion sensor controls are engaging and intuitive.	Some users found the playing area too cramped There was limited availability of children with disabilities for testing.
Questions?	**Ideas**
What size space is optimal for gameplay?	Develop guidelines for ideal playing environments.

9.4 Refining the prototype: Based on user testing, what needs to be acted on now so that the prototype can be used?

- Seek partnerships with local schools or special education institutions to involve children with disabilities in testing. Their direct feedback will provide insights into specific accessibility needs and refine controls or features further.
- Address any technical performance issues, such as glitches or lag, by optimizing the software. This will improve the smoothness and reliability of gameplay, especially during fast-paced actions.
- Add options to adjust game duration based on skill level and preference.

9.5 What improvements can be made later?

Add alternative input methods, such as eye-tracking or voice commands, to accommodate a wider range of physical abilities. This would allow users with limited hand or body mobility to interact with the game more effectively.

Add a selection of game modes to appeal to different player interests, such as timed challenges, cooperative modes, or creative play. This variety could improve user engagement and offer more tailored experiences.

10. Team collaboration

10.1 How did you actively work with others in your team and with stakeholders?

Working with Ms. Meenu Kumar, we planned and executed the user testing process effectively. We collaborated closely, dividing tasks to leverage our strengths.

1. **Planning and Preparation:** Together, we set clear objectives and prepared the testing materials. Ms. Meenu reviewed and refined my materials, adding clarity and relevance.
2. **Conducting the Testing:** During testing, I managed user interactions while Ms. Meenu offered guidance and insights, ensuring we captured key usability issues. We both led post-testing interviews, which revealed valuable user feedback.
3. **Feedback Analysis:** We analysed results together, prioritizing improvements. Ms. Meenu's experience helped frame practical next steps, while I documented our findings.

   Our collaboration ensured a user-centered, practical approach to the project.

11. Individual Learning Reflection

11.1 Team Reflections

A good way to identify what you have learned is to ask yourself what surprised you during the project. List the things that surprised you and any other thoughts you might have on issues in your local community.

Team member name: ANSHIKA

Reflecting on this project, I was surprised by several insights that emerged along the way. Designing an accessible game proved more challenging than expected, with the feedback highlighting specific needs, like additional sensory cues, that I hadn't initially considered. Even minor interface and control adjustments made a big difference in usability, reinforcing the importance of thoughtful design for inclusivity. I was also struck by the strong interest from both the target users and others, showing that inclusive tech benefits everyone by fostering empathy and shared experiences. This project underscored a clear need for more accessible recreational spaces and resources in my community, emphasizing that inclusive design is essential for creating tools that serve all users meaningfully.

Team member name: PRATYAKSHA

Working on the game project using Python and OpenCV has been an exciting experience. I focused on calibrating the hand gestures and ensuring smooth detection. It was challenging at first to reduce lag, but we managed to improve accuracy over time. I also contributed to designing how the ball responds to hand movements. This project taught me how computer vision can be used in real-time applications and improved my understanding of gesture-based interaction.

Team member name: PRATISHTHA

My main task was to integrate the OpenCV camera feed with the game logic and make sure the ball's motion synced with the hand gestures. I learned how to use contours and track hand position accurately. Debugging the motion was tricky, especially when the lighting conditions changed, but it helped me develop better problem-solving skills. Overall, the experience strengthened my confidence in using Python for real-time AI projects.

12. Links

Enter the URL of your project:

https://drive.google.com/drive/folders/1z4-sosBUyD6_P0h8iL7vwVMO2OM_bb0S?usp=sharing

or scan the QR code.

Youtube Video Link: https://www.youtube.com/watch?v=VR5FIlcMPQk

or scan the QR code.

Note: This is only a sample project documentation. Students can make changes as per their requirements.