NAAN MUDHALVAN REPORT

NM1054 – EXTENDED REALITY – XR BY ONE MILLION ONE BILLION

Submitted by

R. VENUVANESHWARI

(REG.NO:912421104053)

In partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

in

COMPUTER SCIENCE AND ENGINEERING

SHANMUGANATHAN ENGINEERING COLLEGE, ARASAMPATTI – 622 507

ANNA UNIVERSITY: CHENNAI - 600 025
NOV-DEC 2024

ANNA UNIVERSITY: CHENNAI - 600 025
NOV-DEC 2024

BONAFIDE CERTIFICATE

Certified that this Naan Mudhalvan report "**Extended Reality – XR by One Million One Billion**" is the Bonafide work of "**R. Venuvaneshwari**" who belongs to IV Year Computer Science and Engineering during Seventh Semester of Academic Year 2024-2025.

FACULTY INCHARGE   **HEAD OF THE DEPARTMENT**

Certified that the candidates were examined by us for **Naan Mudhalvan Practical** Viva held on＿＿＿＿＿＿＿＿at Shanmuganathan Engineering College, Arasampatti- 622 507.

INTERNAL EXAMINER   **EXTERNAL EXAMINER**

ACKNOWLEDGEMENT

It is a matter of pride and privilege for me to have done a **NAAN MUDHALVAN PROJECT REPORT** in **"SHANMUGANATHAN ENGINEERING COLLEGE"** and I am sincerely thankful to them for providing this opportunity to me.

I am thankful to **"Mr. HARSH KUMAR, Mr. PRATIK MANE, Mr. MEET KUMAR, Mr. YOGESH KUMAR"** for guiding me through this project and continuously encouraging me. It would not have been possible to complete this project without their support.

I am also thankful to all the faculty members of Department of Computer Science and Engineering, Shanmuganathan Engineering College, Arasampatti and particularly my mentor **Assistant Prof. S. SARAVANAKUMAR M.E.,** for helping me during the project.

I am thankful to the Head of the Department of Computer Science and Engineering, of of Shanmuganathan Engineering College, Arasampatti, **Dr .S. SARAVANAKUMAR M.E, Ph.D.,**

I am thankful to the Principal of Shanmuganathan Engineering College, Arasampatti, **Dr. KL. MUTHURAMU M.E(W.R)., M.E(S.E)., Ph.D., FIE., M.I.S.T.E.,**

I Wish to convey my sincere thanks to the beloved chairperson **Mrs. PICHAPPA VALLIAMMAL**, correspondent **Dr. P. MANIKANDAN B.E**, Director (Academic) **Shri M. SHANMUGANATHAN**, Director (Administration) **Mr. PICHAPPA** and Secretary **Mr. M. VISWANATHAN** for their extensive support.

Finally, I am grateful to my family and friends for their unending support.

<div align="right">

R. VENUVANESHWARI

</div>

TABLE OF CONTENTS:

INTRODUCTION:

Introduction to Extended Reality (XR) by One Million One Billion:
Extended Reality (XR) represents a revolutionary shift in how we interact with technology and the world around us. As an umbrella term for Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR), XR blends the physical and digital realms to create immersive experiences that reshape industries and enhance human capabilities.

One Million One Billion (OMOB) is at the forefront of utilizing XR to empower individuals and communities globally. OMOB's mission revolves around leveraging innovative technologies to address global challenges, drive social impact, and bridge the digital divide. XR serves as a cornerstone of this vision, enabling scalable solutions in education, healthcare, skill development, and storytelling.

Key Components of XR:
- **Virtual Reality (VR):** Fully immersive environments for training, education, and entertainment.
- **Augmented Reality (AR):** Real-world overlays of digital content, transforming fields like retail and navigation.
- **Mixed Reality (MR):** Seamless interaction between real and virtual elements for collaboration and design.

Fig1: Extended Reality

OMOB's XR initiatives focus on creating accessible tools and experiences, democratizing technology for marginalized communities, and fostering innovation to tackle critical issues like unemployment, digital illiteracy, and limited access to education. By integrating XR into transformative programs, OMOB inspires a future where technology is a bridge, not a barrier, empowering one million leaders and impacting one billion lives.

In a rapidly evolving technological landscape, XR by One Million One Billion represents the potential for immersive technologies to be more than just futuristic concepts—they are catalysts for meaningful change.

WEEK ASSESMENT:01

FOUNDATIONS OF METAVERSE, XR AND AR

FOUNDATIONS OF METAVERSE, XR AND AR:
Metaverse: The metaverse is a shared, immersive virtual space blending digital and physical worlds, where users interact through avatars and virtual objects. It integrates virtual reality (VR), augmented reality (AR), and the internet into a seamless experience.
Extended Reality (XR): XR is an umbrella term for immersive technologies, including AR, VR, and Mixed Reality (MR). These technologies enhance human interaction with digital and physical environments.
Augmented Reality (AR): AR overlays digital elements like images, sounds, or 3D objects onto the real world, accessible through devices such as smartphones, AR glasses, or heads-up displays.

TECHNOLOGICAL FOUNDATIONS:
- Hardware: AR glasses, VR headsets, motion controllers, and wearable sensors.
- Software: Tools like Unity, Unreal Engine, ARKit (Apple), ARCore (Google), and cloud computing for real-time content delivery.
- Connectivity: High-speed internet (5G) and IoT integration for enhanced interactions.
- AI: Powers dynamic content creation, natural language interaction, and adaptive user experiences.

DESIGN AND APPLICATIONS:
- **Immersion & Interactivity:** Core principles include engaging environments and real-time responsiveness.
- **Applications:**
  - Entertainment: Gaming and virtual concerts.
  - Education: Simulations and virtual training.
  - Healthcare: AR diagnostics and therapy.
  - Retail: AR-enhanced shopping.

ETHICAL CONSIDERATIONS:
Challenges include privacy, accessibility, and ensuring safe, inclusive digital spaces. The metaverse and XR technologies aim to revolutionize human interaction and creativity, reshaping industries and everyday life.

WEEK ASSESMENT:02

IDEATION, CONCEPTUALIZATION, STORYBOARDING IN AR

DESCRIPTION:

This 2D interactive effect is designed as an AR game where users can engage with a fun, branded character and collectible elements like coins or stars. The game starts when the user taps the screen, activating a simple yet engaging animation sequence.

IDEA:

Increasing Revenue - Retaining loyal customers with innovative new features.

CONCEPT:

Step1:   Open Meta Spark Studio >> Create New >> Sharing effect.

Step2:   Add object >> Face Tracker.

Step3:   Face Tracker >> add object >> Face Mesh.

Step4:   Face Mesh >> add "Materials".

Step5:   Material >> Shader Type – Flat.

Step6:   Choose file from the directory.

Step 7:   Add object>> Plane.

Step 8:   Plane >> add "Materials" >> adjust position.
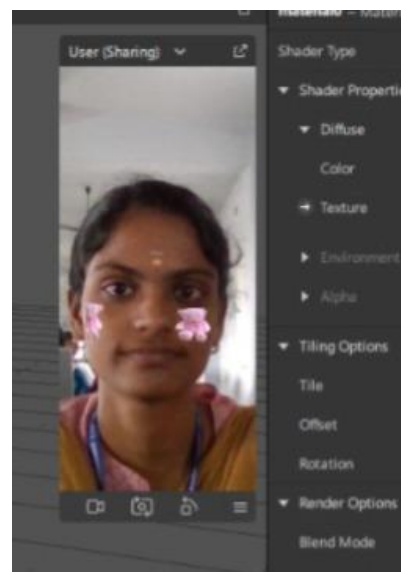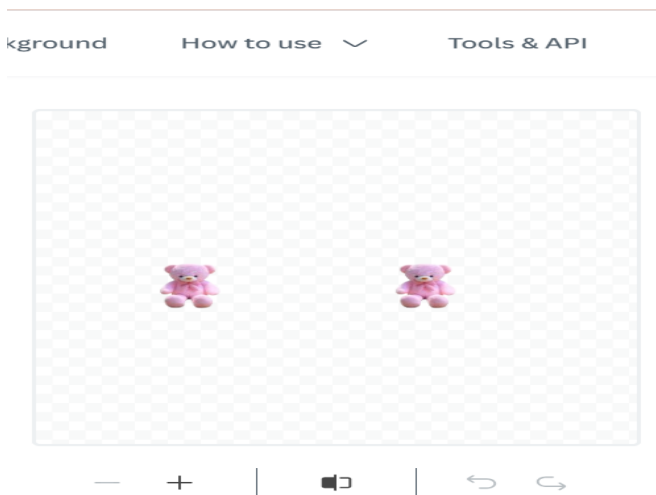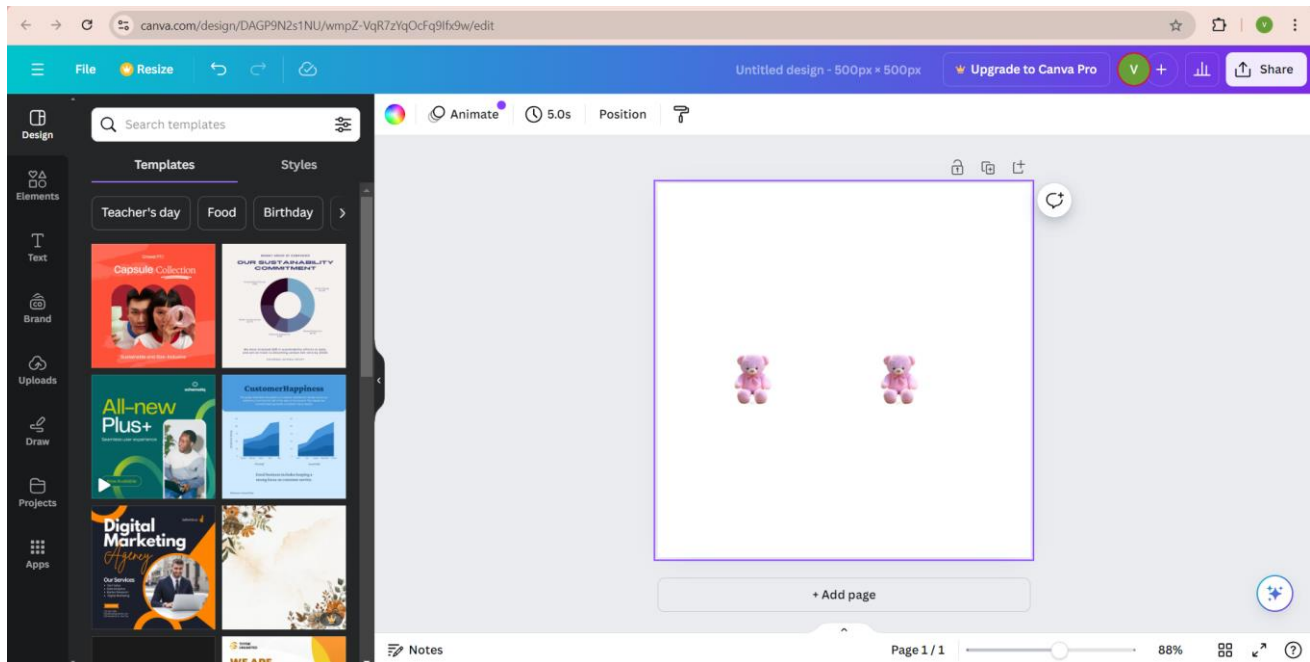
Step 9:   Material>> Shade Type - Flat.

Step 10:   Choose file from the directory.

Step 11:   Publish and took Screenshots

 PEAR FRAMEWORK CHECKLIST:

- P: Personalized

- E: Easy to Use

- A: Accessible

- R: Relatable

STORYBOARD:

PUBLISHED LINK:

WEEK ASSESSMENT: 03

CREATION OF 2D FACE MASK AR EFFECT

DESCRIPTION:

Generate a unique concept for your AR effect, considering the purpose, target audience, or personal interests. Use Meta Spark AR Studio to create a customized face mask effect with audio and visual enhancements.

PROCEDURE:

Step 1: Concept Generation

• **Theme:** Create a face mask effect based on your favourite theme (e.g., IPL team fan filter, tattoos, stickers).

• **Audience:** Target specific groups like sports fans, music lovers, or casual social media users.

Step 2: Development Instructions

• **Set Up Project:**

Learn the basics of Meta Spark AR Studio by starting a Blank Project.

• **Import Assets:**

Bring in 2D design elements like stickers, logos, or themed graphics.

Add an audio file to play in the background and set it to Loop.

• **Create Face Mask:**

Use face reference assets to apply textures and create a face mask.

Utilize the Face Tracker and Face Mesh tools for precise alignment.

• **Add Variants:**

Duplicate the 2D assets to create multiple theme-based variations.

Use the UI Picker to allow users to switch between options.
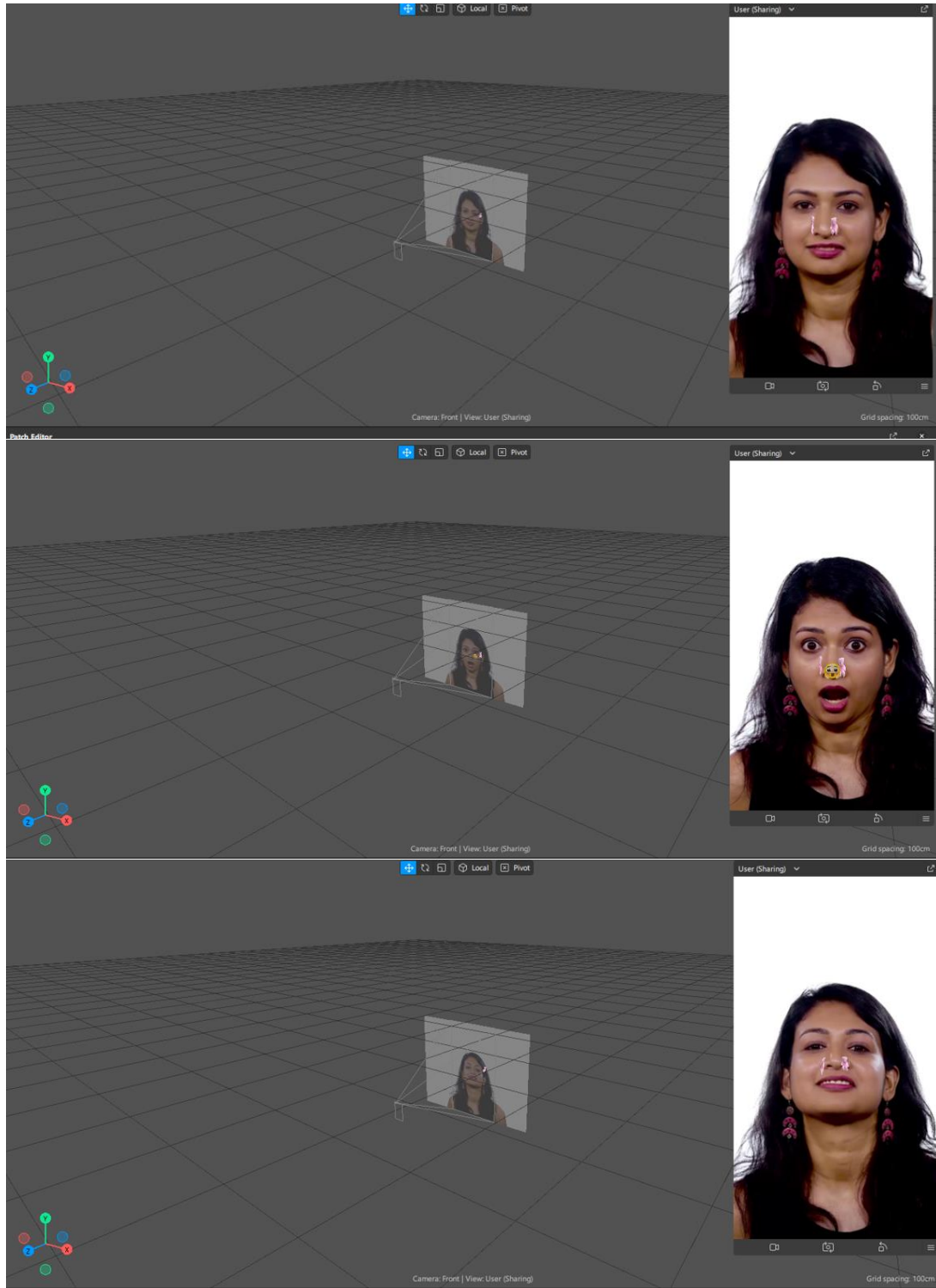
Step 3: Testing and Refinement

• **Device Testing:**

Test the effect on compatible devices to check for proper functionality.

• **Feedback and Improvement:**

Collect user feedback to identify issues and enhance the user experience

OUTPUT:

PUBLISHED LINK:

https://www.instagram.com/ar/952335910083806/?ch=Mzc2MTdiMDUwMDlkNjVhMGJ
hMmQ0YWEwNDkzNTIzYjE%3D

WEEK ASSESSMENT: 04

CREATION OF 3D PLANE TRACKING AR EFFECT

DESCRIPTION:
Design a 3D plane tracking AR effect to showcase animated characters or objects in a virtual environment. Integrate background audio and Native UI Picker to create an interactive and immersive experience.

PROCEDURE:
Step 1: Concept Generation
Theme: Create a 3D plane tracking effect featuring animated characters (e.g., favourite cartoon or anime characters, sportsperson, or furniture).
Audience: Target fans of cartoons, anime, or interior design enthusiasts.
Features: Use Native UI Picker to toggle between two characters or objects, each with its own corresponding audio.

Step 2: Development Instructions
Set Up Project:
Learn how to use Meta Spark AR Studio by starting a Blank Project.
Implement Plane Tracking:
Use Plane Tracker to detect and set up the plane surface for placing characters or objects.
Import 3D Assets:
Import 3D models of characters or objects from external sources.
Use tools like MIXAMO to animate the models.
Add Variants and Interactivity:
Create two different variants for the characters or objects.
Use the Native UI Picker to allow users to switch between them.
Audio Integration:
Add a background audio loop for the AR scene.
Include unique audio tracks for each character or object.
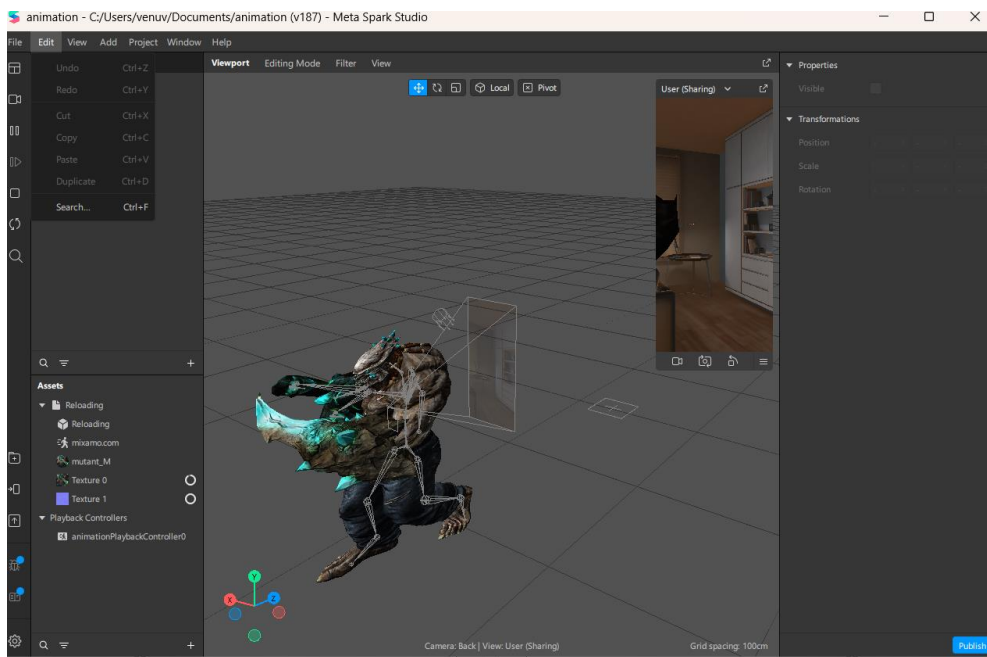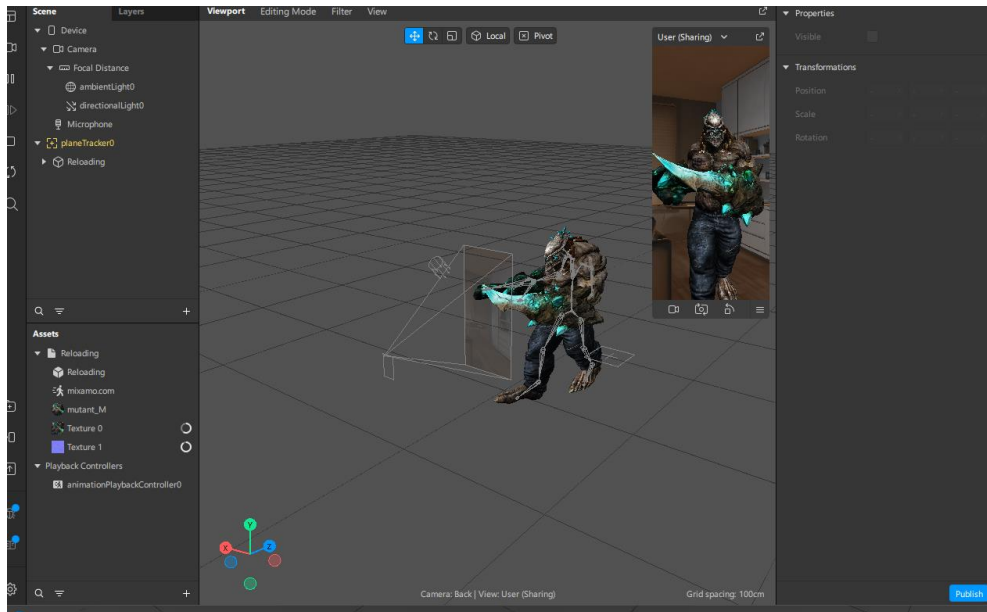
Step 3: Testing and Refinement
Device Testing:
Test the AR effect on compatible devices to ensure proper functionality.
Feedback and Optimization:
Refine animation, audio syncing, and asset positioning for the best user experience.

OUTPUT:

PUBLISHED LINK:

https://www.instagram.com/ar/1262439611703826/?ch=ODdkOGE3YWQxNGM2NTRlYj
cwNWZlZmQzOWM3NTI3NWE%3D

WEEK ASSESSMENT: 05

USING THE PATCH EDITOR AND UI PICKER

DESCRIPTION:
Develop an interactive AR project using Spark AR Studio that allows users to switch between multiple options using a UI Picker. Integrate the Patch Editor to control logic and implement touch gestures for additional interactivity.

PROCEDURE:
Step 1: Concept Generation
• **Theme:** Create an AR filter with three distinct elements or effects (e.g., different 3D objects, colour themes, or face filters).
• **Audience:** Social media users looking for engaging and interactive AR filters.
Step 2: Development Instructions
• **Set Up Project:**
Start a Blank Project in Spark AR Studio and familiarize yourself with the Patch Editor and UI Picker.
• **UI Picker Integration:**
Use the Native UI Picker to allow users to switch between three or more options. Customize picker labels to represent each element or effect (e.g., Object 1, Object 2, Object 3).
• **Patch Editor Logic:**
Use the Patch Editor to connect the UI Picker output to the corresponding AR elements.
Set up logic to show or hide objects, change textures, or trigger effects based on user selection.
• **Import Assets:**
Import 3D models, textures, or effects to represent each UI Picker option.
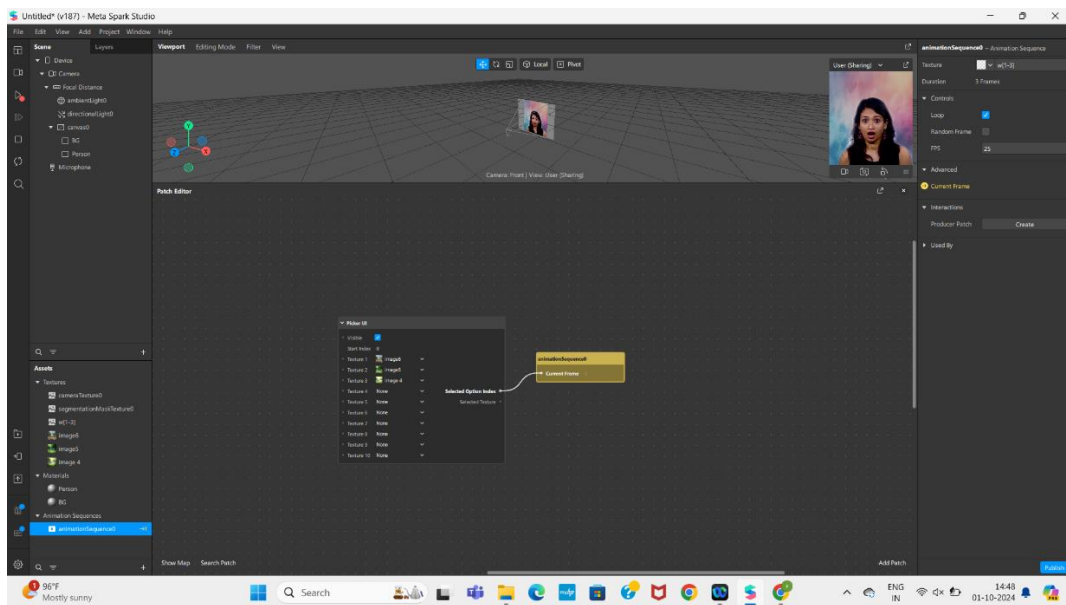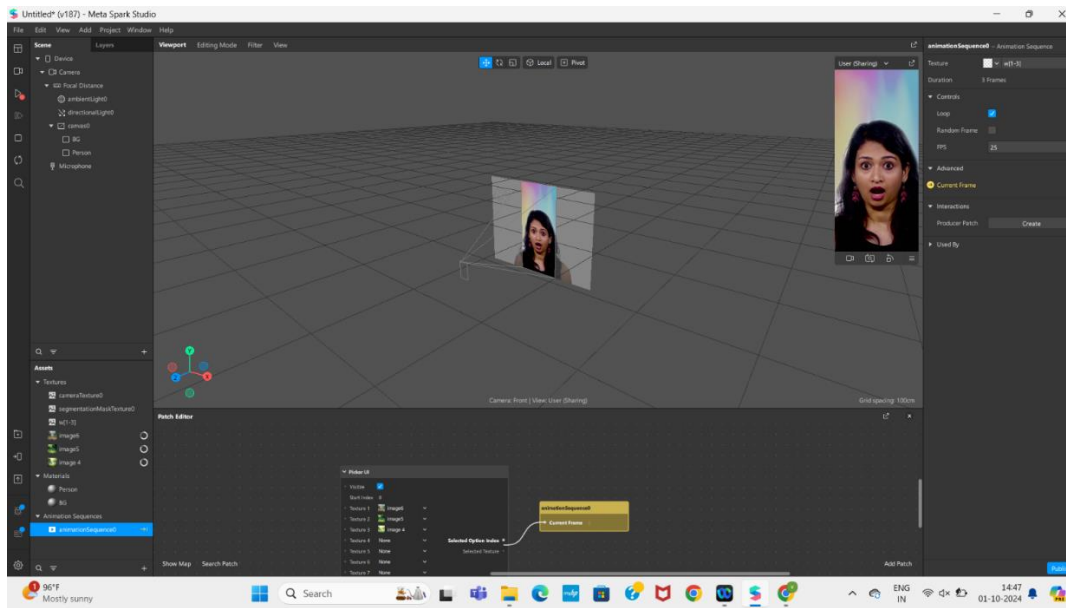Ensure that each option has a visibly unique appearance.
• **Add Touch Gestures:**
Include tap or swipe gestures to trigger animations or movements for selected elements. Use the Patch Editor to link touch gestures to object properties (e.g., position, scale, or rotation).
Step 3: Testing and Refinement
• **Device Testing:** Test the AR filter on compatible devices to ensure smooth transitions and interactions.
• **Feedback and Optimization:** Collect user feedback to improve usability and refine animations, Picker logic, and gesture responsiveness.

OUTPUT:

PUBLISHED LINK:

https://www.instagram.com/ar/910991274334357/?ch=MGVhODU0NmU4NGJhYjE2ND
dkY2U4MTE5NjkwMzFkNWI%3D

WEEK ASSESSMENT: 06

CREATION OF IMAGE/TARGET TRACKING AR EFFECT

DESCRIPTION:
Design an image/target tracking AR effect to bring static images like posters, product packaging, or promotional materials to life. Integrate animated visuals and background audio to create an engaging and interactive experience.

PROCEDURE:
Step 1: Concept Generation
• **Theme:** Create an AR effect based on your favorite movie poster, band promotion, or product advertisement.
• **Audience:** Fans of the chosen movie, band, or target customers of the brand/product.
• **Features:** Make the static image dynamic by overlaying 3D/2D assets with animations and corresponding audio.
Step 2: Development Instructions
• **Set Up Project:**
Learn the basics of Meta Spark AR Studio and start a Blank Project.
• **Implement Image/Target Tracking:**
Use the Target Tracker to detect and align assets with the chosen image (e.g., poster or product label).
• **Import Assets:**
Import relevant 3D/2D models, animations, and textures.
Set up variants to create dynamic effects for different themes or messages.
• **Add Audio:**
Integrate a background audio loop to enhance the immersive experience.
Sync specific audio tracks to align with animations or promotional content.
• **Enhance Interactivity:**
Add interactive elements, such as tap gestures, to trigger additional effects or animations.
Step 3: Testing and Refinement
• **Device Testing:**
Test the AR effect on compatible devices to ensure accurate tracking and smooth functionality.
• **Feedback and Optimization:**
Collect user feedback to identify areas of improvement.Refine tracking, animations, and audio synchronization for a polished user experience.
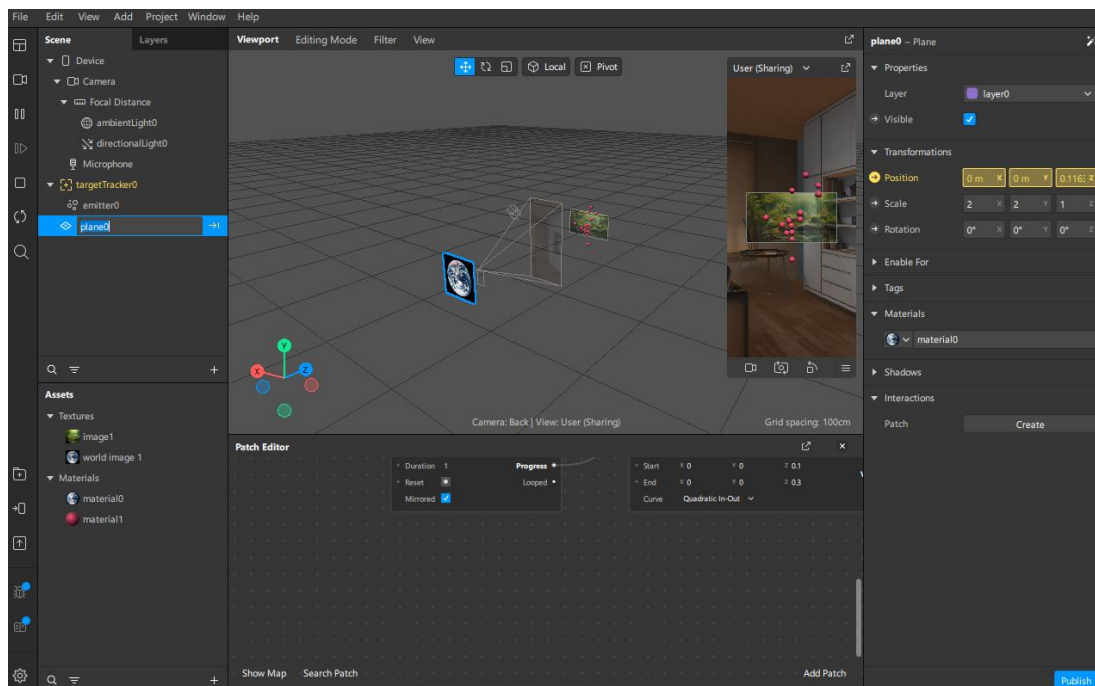
OUTPUT:

Image to be tracked

Output Images

PUBLISHED LINK:
https://www.instagram.com/ar/1094021135579106

WEEK ASSESSMENT: 07

CREATION OF AUDIO-RESPONSIVE AR EFFECT

DESCRIPTION:
Design an interactive AR filter where dynamic visual changes or animations are triggered by real-time audio input. Use audio-reactive patches in Spark AR Studio's Patch Editor to connect sound signals to visual elements for an immersive user experience.

PROCEDURE:
Step 1: Concept Generation
• **Theme:** Create an AR effect tailored to a specific theme (e.g., party vibes, nature-inspired visuals, or futuristic aesthetics).
• **Audience:** Social media users looking for engaging, music-reactive filters.
• **Features:** Integrate audio detection to control visual elements dynamically, based on sound signals.
Step 2: Development Instructions
• **Set Up Project:**
Start a Blank Project in Spark AR Studio and enable microphone input for audio detection.
• **Audio Input Integration:**
Use the Patch Editor to incorporate the Microphone Input node.
Extract key parameters like Volume and Frequency using an Audio Analyzer.
• **Design Visual Elements:**
Import or create 2D/3D assets (e.g., objects, particles, background visuals).
Customize these assets to fit the chosen theme.
• **Audio-Reactive Visuals:**
Set up audio-reactive behaviours using the Patch Editor:
Volume-Based Reactions: Link audio volume to scale, opacity.
Frequency-Based Reactions: Use frequency bands to trigger color changes.
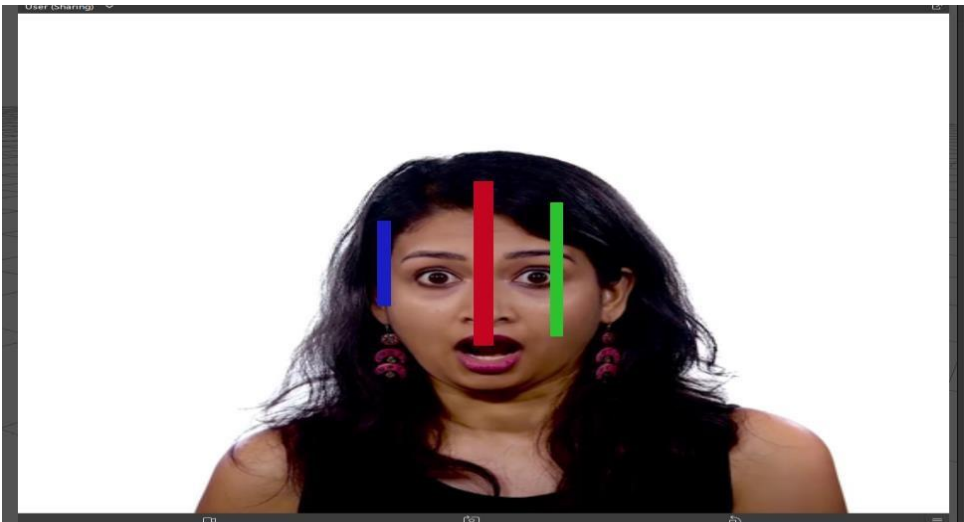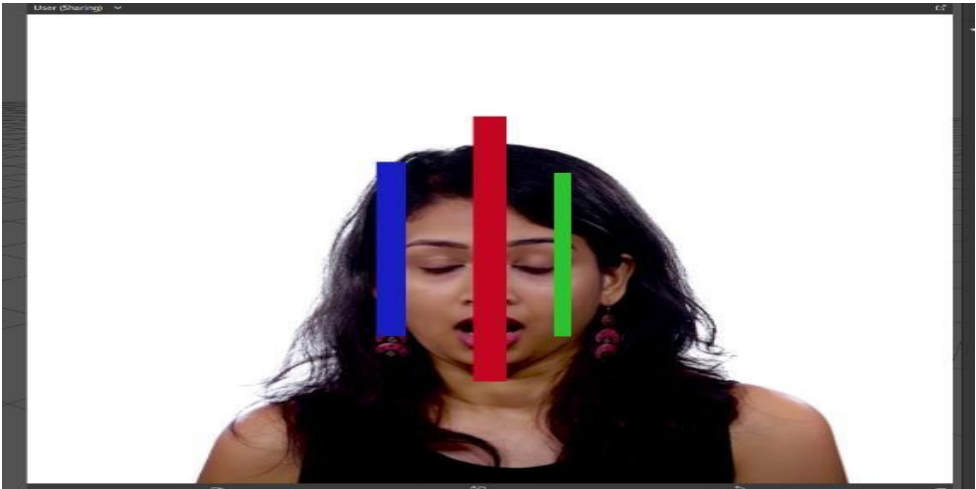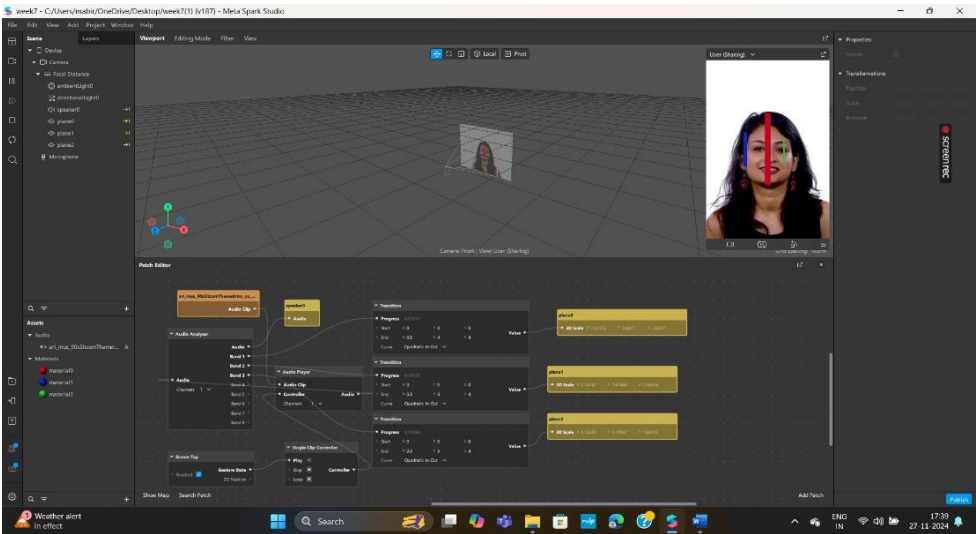**Rhythm-Based Animations:** Sync object animations with audio beats.
Step 3: Testing and Refinement
• **Device Testing:** Test the AR filter on different devices to ensure responsive and seamless audio-visual interactions.
• **Feedback and Optimization:**
Collect user feedback to refine visual elements, optimize performance, and enhance the overall experience.

OUTPUT:

PUBLISHED LINK:

https://www.instagram.com/ar/889249416695501/?ch=ZDM0ODg4MDRjNmRkNGI0MD
Y4YTNiM2UzMDhlYTk4Zjg%3D

WEEK ASSESSMENT: 08

CREATION OF 2D HAND/BODY TRACKING AR EFFECT

DESCRIPTION:
Design a 2D AR effect that uses hand or body tracking to create interactive and dynamic visuals. Tailor the effect to a specific purpose, theme, or audience, offering a fun or creative experience.

PROCEDURE:
Step 1: Concept Generation
Theme: Develop an effect based on your interests (e.g., wearable 2D stickers)
Audience: Social media users looking for creative hand/body interaction effects.
Features: Use 2D elements like animations, stickers, or effects that respond to hand or body movements.

Step 2: Development Instructions
Set Up Project: Start a Blank Project in Meta Spark AR Studio. Enable hand or body tracking by using the Hand Tracker or Body Tracker objects in the Scene Panel.
Design Visual Elements: Import or create 2D assets such as stickers, animations, or textures that align with your chosen theme.
Tracking Implementation:
For Hand Tracking: Use the Hand Tracker to attach elements to hand gestures like open palm, point, or fist.
For Body Tracking: Use the Body Tracker to apply effects or animations to body parts like arms, legs, or torso.
Customization and Animation:
Add dynamic animations to the tracked elements (e.g., sparkling trails for hand movements, or animated stickers for the torso).
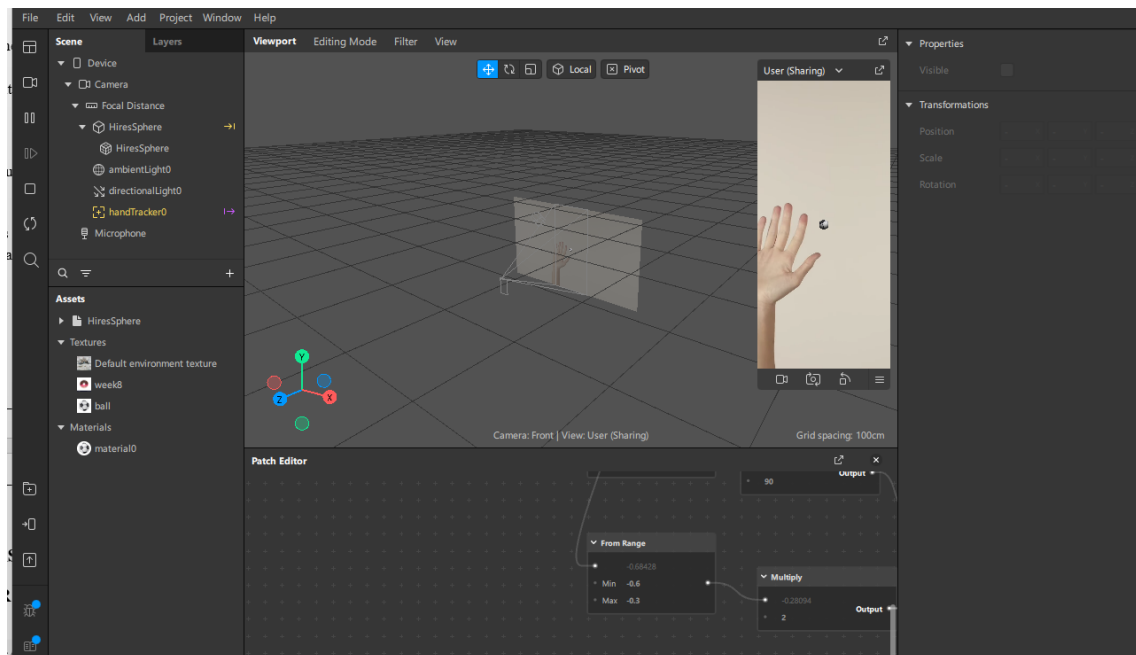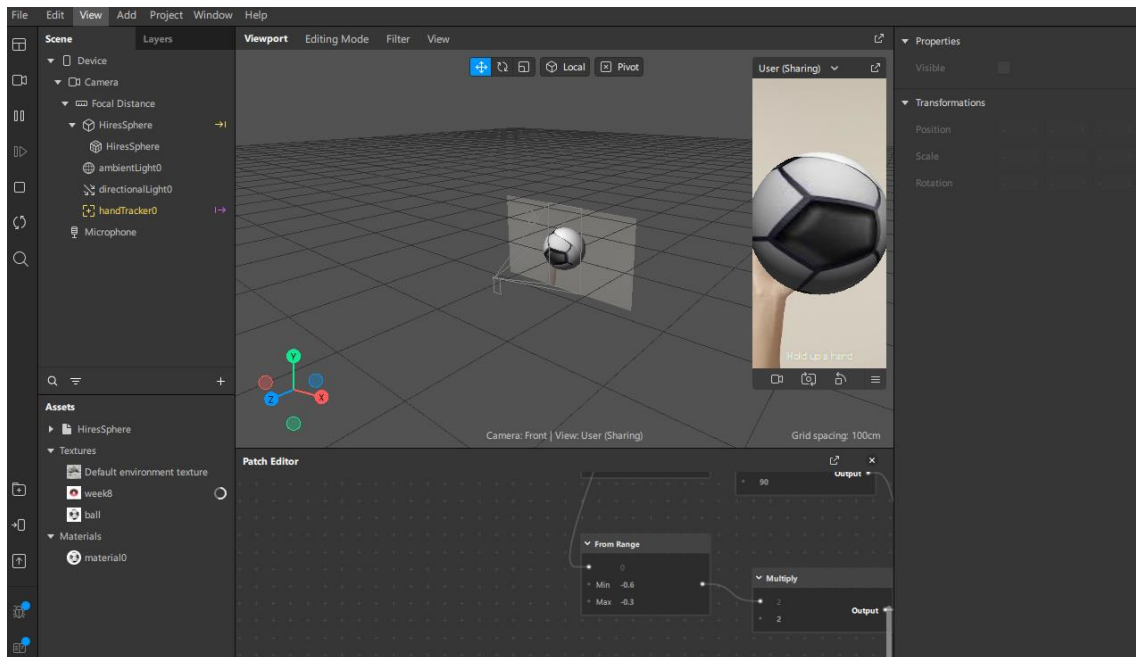Use the Patch Editor to link tracking data with asset.

Step 3: Testing and Refinement
Device Testing: Test the effect on compatible devices to ensure accurate hand/body tracking and smooth animations.
Feedback and Optimization: Gather feedback from users to identify areas for improvement.

OUTPUT:

PUBLISHED LINK:
https://www.instagram.com/ar/1076576537573542

WEEK ASSESSMENT: 09

AR CREATOR INSIGHTS, AI IN AR

AR CREATOR INSIGHTS, AI IN AR:
AR CREATOR INSIGHTS:
Creating compelling AR experiences requires a blend of technical skills, creativity, and user-centric design principles:

- **Design for Context**: AR creators must consider the physical environment where their experiences will be used.
- **User Interaction**: Intuitive controls like gesture recognition, voice commands, and gaze tracking enhance engagement.
- **Tools and Platforms**: AR creators leverage platforms like **ARKit**, **ARCore**, and **Vuforia**, as well as game engines like Unity and Unreal.
- **Iterative Development**: Prototyping and user testing are vital to ensure experiences are engaging and accessible across diverse devices.
- **Storytelling in AR**: Immersive storytelling enhances user involvement, making the AR experience more memorable and impactful.

AI IN AR:
Artificial Intelligence (AI) plays a transformative role in AR by enhancing interactivity, personalization, and functionality:

- **Object Recognition**: AI enables AR systems to identify and interact with real-world objects, crucial for applications like retail or navigation.
- **Natural Language Processing (NLP)**: Supports voice-controlled AR applications, allowing users to interact naturally.
- **Personalization**: AI analyses user behaviour to customize AR experiences, tailoring content based on preferences and patterns.
- **Scene Understanding**: AI improves spatial mapping and depth perception, ensuring virtual objects are placed accurately within the environment.
- **Real-Time Enhancements**: AI-driven algorithms enable dynamic updates, such as adjusting lighting for realistic object rendering or translating text in real time.

FUTURE SYNERGY:
The fusion of AR and AI opens new possibilities, from smart assistants that visualize tasks to advanced training simulations. Together, they redefine how we interact with digital and physical worlds.

WEEK ASSESSMENT: 11

AI+ SUSTAINABILITY JOB READINESS PROGRAM

COURSE TITLE:
Getting Started with Artificial Intelligence.

DESCRIPTION:
This course is designed for beginners eager to explore the world of Artificial Intelligence (AI). It provides foundational knowledge about AI systems, including Machine Learning, Data Types, the growing field of Generative AI, and Large Language Models (LLMs) with concepts like transformers. Participants will learn how AI analyses data, craft precise prompts for generative AI, and understand real-world applications of AI. Upon completion, learners earn an IBM SkillsBuild Digital Credential, showcasing their expertise in AI.

PROCEDURE FOR COURSE COMPLETION:

1. Complete the Modules
- Module 1: Introduction to Artificial Intelligence
   Learn the fundamentals of AI, including its history, development, common applications, and its role in transforming industries.
- Module 2: Introduction to Large Language Models (LLMs)
   Explore the power of LLMs, their capabilities, and the transformative concepts of transformers and deep learning.
- Module 3: Crafting Precision Prompts with Generative AI
   Master techniques for writing effective prompts to generate precise and accurate results from AI models like GPT.

2. Engage with Practical Exercises
Complete hands-on exercises to reinforce understanding, including:
- Analysing structured and unstructured data.
- Applying AI to solve real-world problems.

3. Final Assessment
Take the final assessment to test your knowledge and understanding of the AI concepts covered.

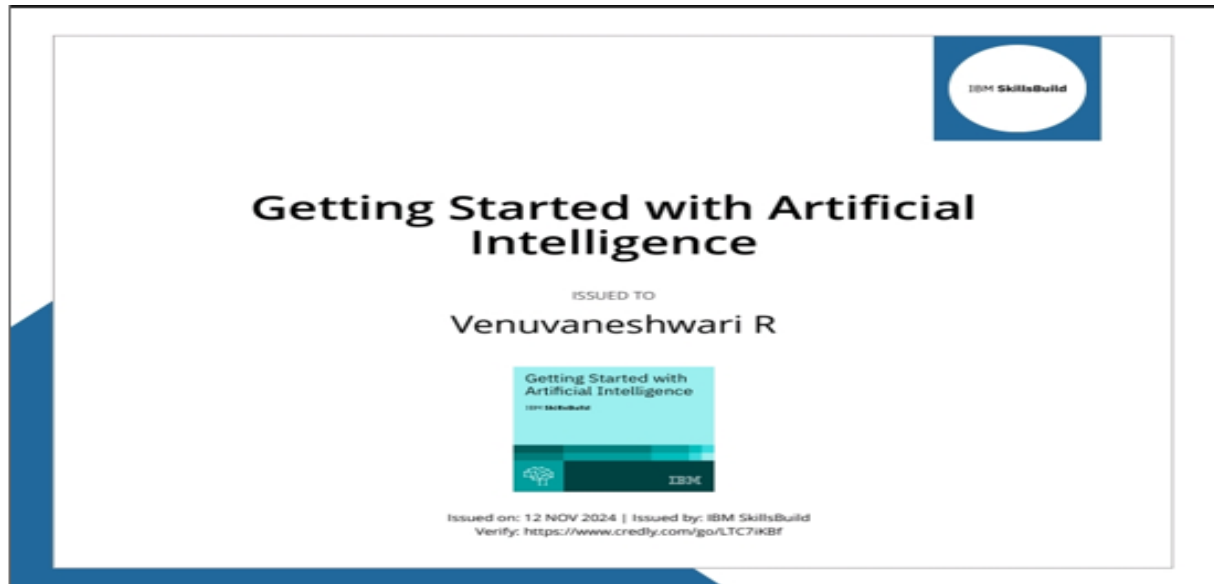**4. Earn the Digital Credential**
Upon successful completion, receive the IBM SkillsBuild Digital Credential as recognition of your skills and knowledge in AI.
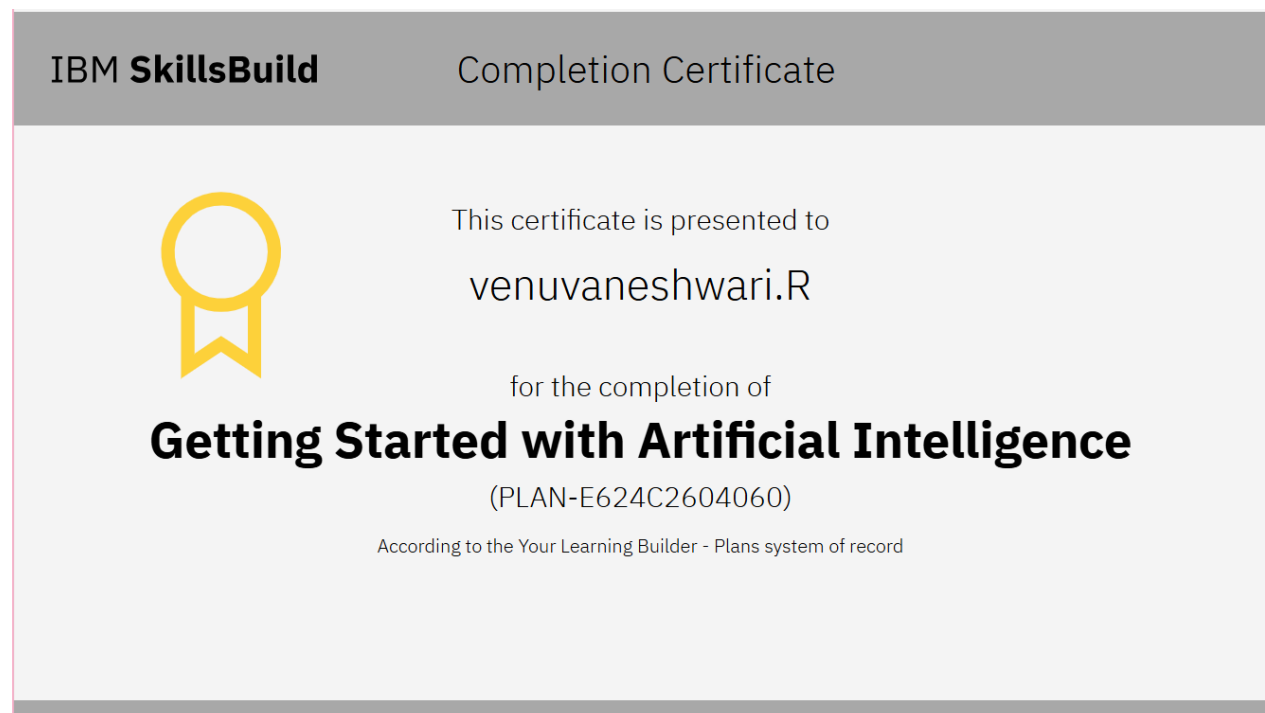
5. Apply Knowledge

Leverage your AI expertise to: Start creating projects, or
- Explore more advanced topics in AI and machine learning.

BADGE:

COMPLETION CERTIFICATE

WEEK ASSESSMENT 12

AI+ SUSTAINABILITY JOB READINESS PROGRAM

COURSE TITLE:
Build Your First Chatbot

DESCRIPTION:
This beginner-friendly course teaches how to create conversational chatbots that understand and respond to natural language. The course covers the fundamentals of Natural Language Processing (NLP) and how to apply these techniques to build intelligent chatbots. Learn to use pre-built and custom conversations, offer users options and suggestions, and deploy chatbots to real-world platforms.

LEARNING OBJECTIVES:

After completing this course, learners will be able to:

1. Build a conversational chatbot that offers options and suggestions.

2. Use pre-built and custom conversations to generate chatbot dialogues.

3. Understand and apply NLP techniques for better user interactions.

4. Deploy chatbots and test performance on various platforms.

PROCEDURE FOR COURSE COMPLETION:

1. Complete the Modules:

- Module 1: Learn the basics of chatbot development and its applications.
- Module 2: Understand key NLP concepts like tokenization, intent detection and entity recognition.
- Module 3: Build a first chatbot and set up intents and responses.
- Module 4: Customize conversation flows and add user options.
- Module 5: Deploy and test chatbots on different platforms.

2. Practical Exercises:
Complete hands-on tasks to reinforce chatbot development and NLP-techniques.

3. Final Assessment:
Take a final assessment to test knowledge of chatbot building and NLP.
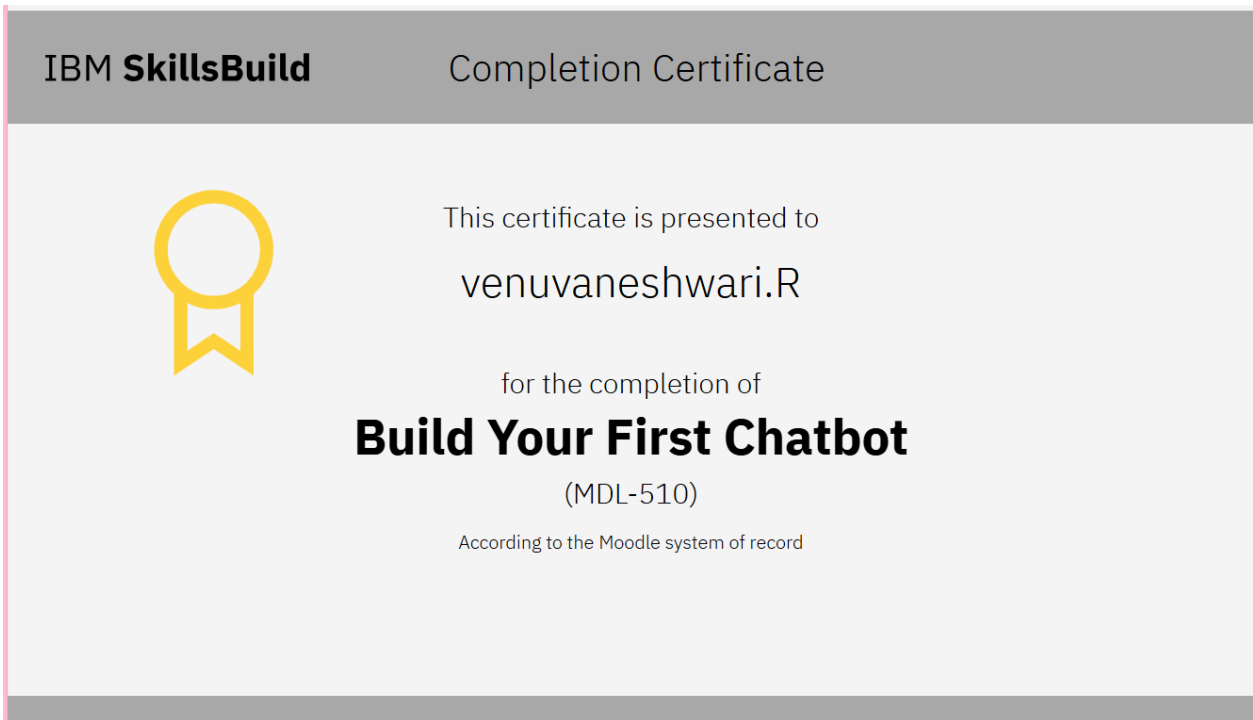
4. Earn the Digital Credential:
Earn an IBM digital credential upon completing the course and passing the
 Assessment

5. Apply Knowledge:

Use chatbot-building skills to create real-world applications or explore advanced topics in AI.

COMPLETION CERTIFICATE:

IBM **SkillsBuild**   Completion Certificate

This certificate is presented to

venuvaneshwari.R

for the completion of

Build Your First Chatbot

(MDL-510)

According to the Moodle system of record

CONCLUSION

Conclusion to Extended Reality (XR) by One Million One Billion

Extended Reality (XR) stands as a transformative force reshaping how we live, learn, and connect. Combining Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR), XR breaks traditional barriers by merging the physical and digital worlds.

Its potential spans industries, creating immersive experiences that revolutionize education, healthcare, skill development, and entertainment.

One Million One Billion (OMOB) harnesses this power of XR to drive global impact. By making XR accessible and meaningful, OMOB bridges the gap between cutting-edge technology and real-world challenges.

Their commitment to empowering individuals and communities reflects a vision where technology becomes a tool for inclusion, opportunity, and progress.

Through innovative XR-based programs, OMOB is fostering a generation of leaders equipped to navigate and transform an increasingly digital world.

As XR evolves, its role in shaping a better future becomes even more critical. OMOB's initiatives remind us that technology, when guided by purpose, can inspire hope, bridge divides, and create scalable solutions to global problems.

By integrating XR into their mission, OMOB is not just exploring the possibilities of immersive technologies—they are turning them into realities that improve lives and communities worldwide.

In the journey ahead, XR will continue to redefine human potential, and organizations like OMOB will be instrumental in ensuring its benefits reach all, making a lasting impact on one billion lives.