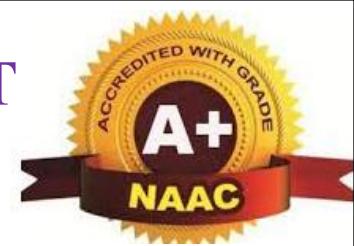


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DEPARTMENT OF ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

A Major Project Phase-II on “RGAC VIRTUAL UNIVERSITY”

Presented by

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Abstract

The rapid advancement of digital technologies has revolutionized education, leading to the emergence of Virtual Universities as a transformative alternative to traditional higher education. A Virtual University leverages online learning platforms, multimedia resources, and interactive tools to deliver flexible, accessible, and cost-effective education to students worldwide. This model eliminates geographical barriers, supports self-paced learning, and integrates innovative pedagogies such as MOOCs (Massive Open Online Courses), AI-driven tutoring, and virtual classrooms. This paper explores the evolution, benefits, challenges, and future trends of Virtual Universities, highlighting their potential to democratize education in the digital age.

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1. Introduction

The traditional education system faces critical challenges such as exorbitant fees, lack of practical training, and inefficient time utilization. Students often graduate without industry-ready skills, while financial and social barriers further limit accessibility. RGAC Virtual university reimagines education by leveraging metaverse technology to create an immersive, interactive, and affordable virtual university. By integrating 3D virtual campuses, VR-based labs, and real-time collaboration tools, RGAC Virtual university bridges the gap between theoretical knowledge and hands-on technical learning.

2. Objectives

- To provide affordable, high-quality education.
- To emphasize skill-based, job-oriented training.
- To reduce dependency on physical infrastructure and exams.
- To ensure equal access to education, regardless of financial or social background.
- To leverage technology (like Virtual Reality and online platforms) for practical learning.

3. Problem Statement

This project aims to address the critical inefficiencies and barriers to access that burden the traditional higher education system. By leveraging virtual technology, it seeks to dismantle the financial and geographic hurdles of physical campuses, offering an affordable and accessible alternative for all students, including those from rural and marginalized communities. Furthermore, this project aims to bridge the gap between academic knowledge and real-world employability by prioritizing practical, hands-on training with industry-standard tools, ultimately creating a more equitable and industry-aligned educational model.

4. Scope of the Project

- Educational Access & Affordability.
- Technology Integration.
- Skill-Based Learning.
- Inclusivity & Equality.

5. Literature Survey

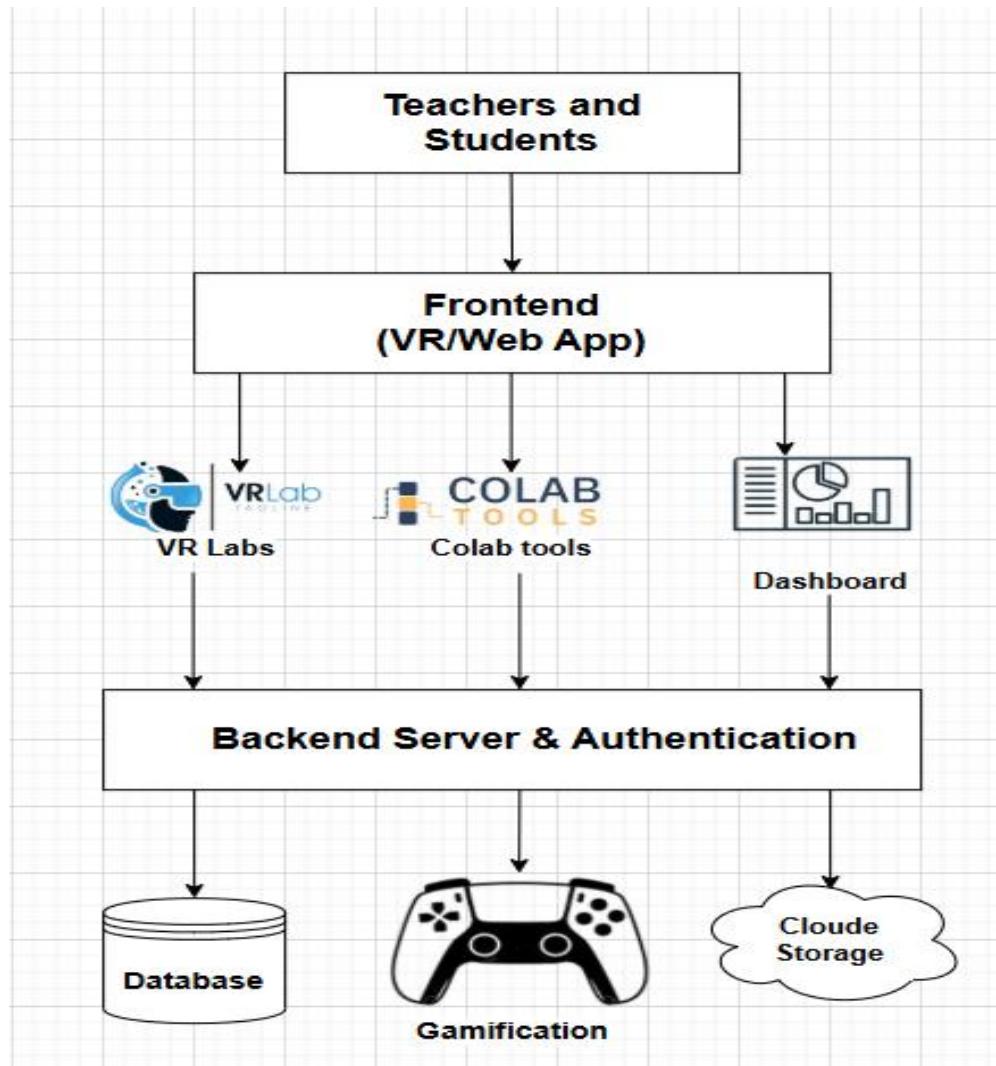
Title	Year	Summary	Gaps Addressed
“Metaverse in Education” By Leonard Zophan and Karin Northus	2018	Highlights the metaverse’s potential for immersive learning through avatars and 3D environments.	The app's reliance on internet and manual activation limits
“Virtual Labs” By Raghu Raman and Vinit Kumar Nair	2020	A study by IEEE (2023) shows VR labs increase retention rates by 40% compared to traditional methods.	The device raises privacy concerns, has uncertain emergency reliability and battery life, and needs better usability in high- stress situations.
“Gamification” By Fabricio Inocencio	2022	prove gamified elements boost student engagement.	The app needs manual data sync, lacks emergency service integration, and relies on user-triggered alerts, risking failure in critical moments.

6.Domain

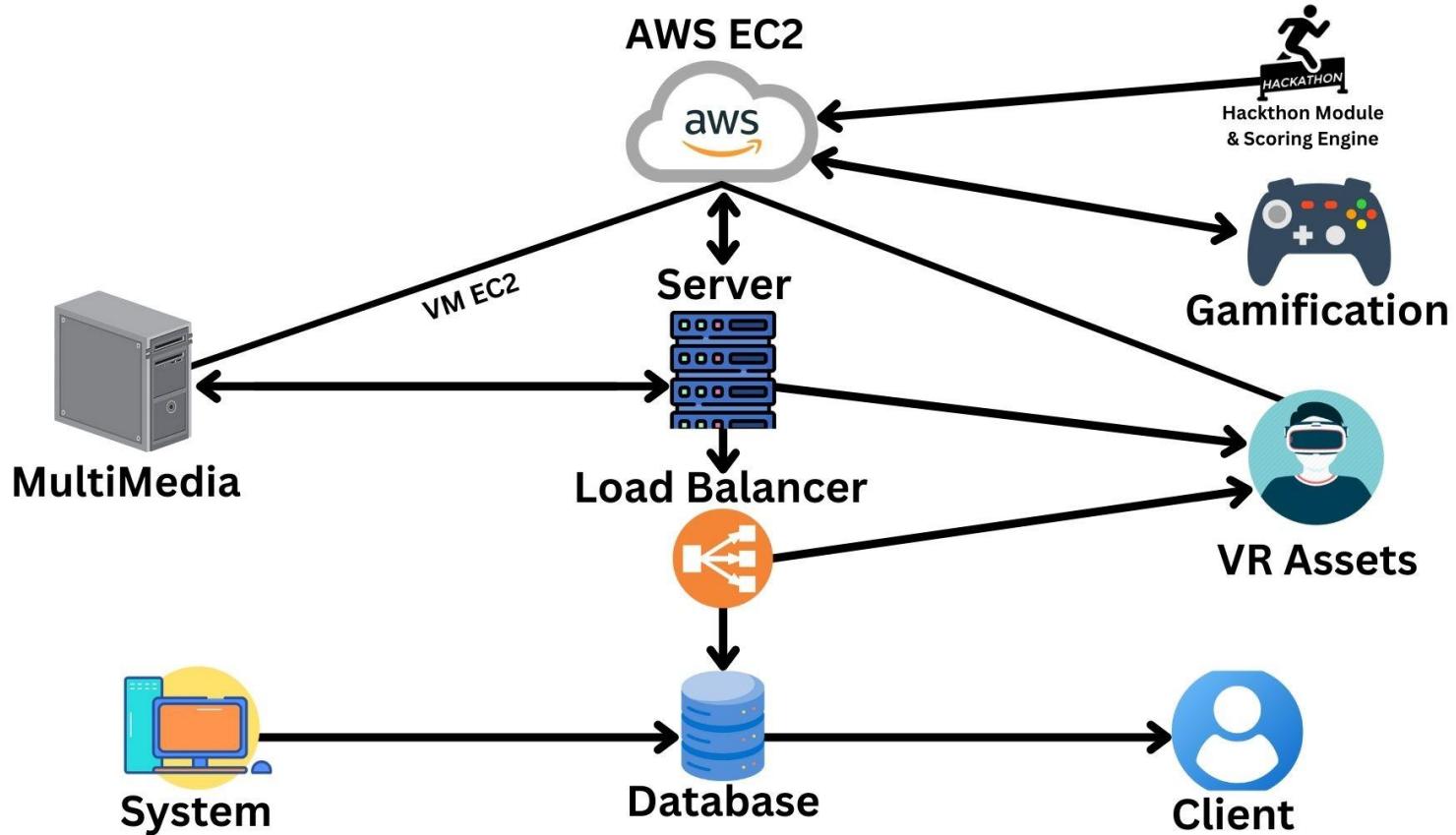
- **Core Domain (Technical focus):** Learning Management Systems (LMS), Artificial Intelligence (AI), Mobile Learning (m-Learning), Extended Reality (AR/VR).
- **Application Domain (Real-world Area):** Education (Focusing on educational content delivery and learn new skills through VR).

7. Proposed System

7.1 Block Diagram



7.2 Architectural Diagram



7.3 Modules And Their Functionality

- **Login & Register :** Secure accounts for students and teachers.
- **Teacher Upload Module:** Teachers upload videos, notes, and AR/VR content.
- **Student Learning Module:** Students learn through videos and interactive VR labs.
- **Virtual Reality (VR) Labs:** Real-like experiments in chemistry, robotics, circuits, and simulations.
- **Evaluation & Skill Testing:** Hackathons, projects, and problem-solving instead of traditional exams.

8.Methodology

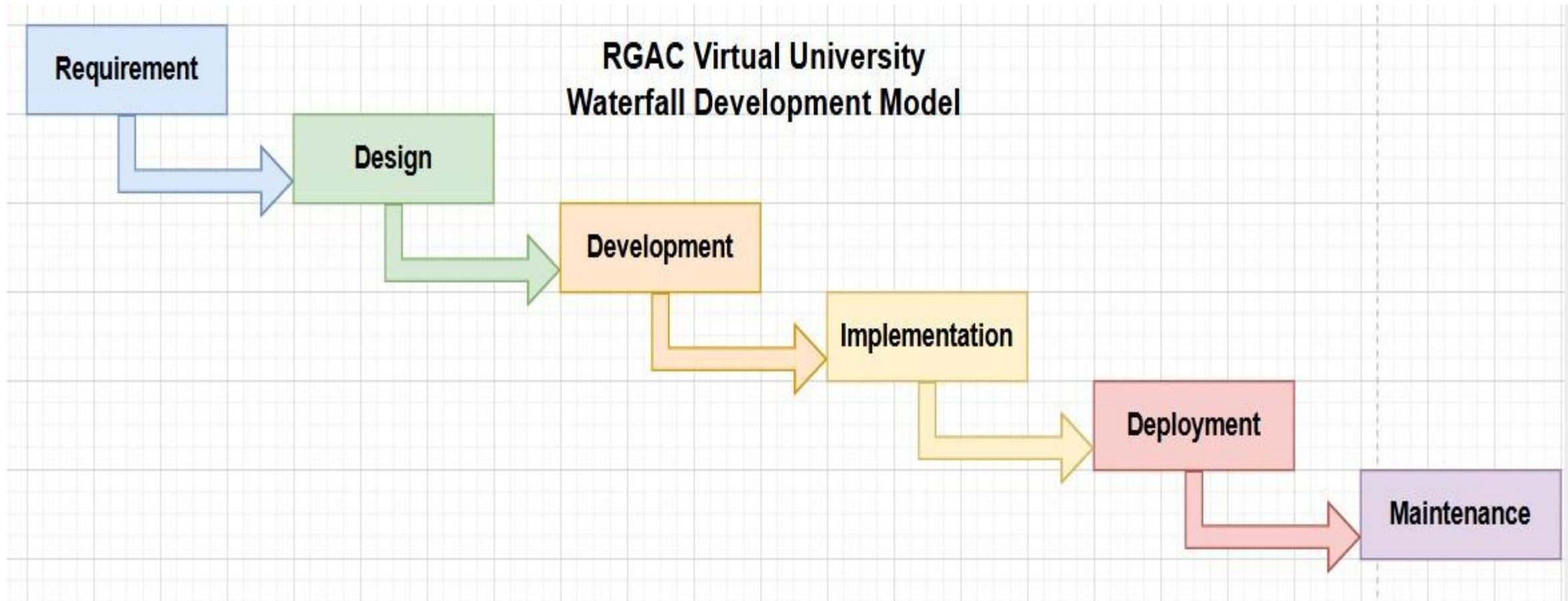
8.1 Techniques & Algorithms :

- **AI-Based Algorithms:** Evaluates student abilities in hackathons.
- **Real-Time Sync:** WebSockets for instant client-server updates.
- **Virtual Reality Rendering:** WebXR + Unity 3D for immersive labs.
- **User Authentication:** OAuth 2.0 + JWT for secure login.

8.2 Development Model

- **Public Cloud Deployment Model :** This means the entire "RGAC Virtual University" application is hosted on infrastructure owned and operated by a third-party provider like Amazon Web Services (AWS).
- **Waterfall Development Model :** The project's structure and timeline strongly suggest it follows a traditional Waterfall development model. This is evident from the project timeline, which breaks the work into distinct, sequential phases.

8.2 Waterfall Development Model :



8.3 Tools & Technologies

- 1. AI Tools** : Power AI tutors and skill evaluation.
- 2. Cloud Services** – For hosting, scalability, and VR rendering.
- 3. GitHub Storage** – Used to reduce cloud costs by storing lightweight VR configs.
- 4. React.js** – For the Learning Management System (LMS) and 3D graphics in browser.
- 5. WebXR** – Lets students access VR/AR labs directly from a browser.

9. Requirements Specifications

9.1 Functional Requirements

- **User Registration:** OAuth 2.0 for secure sign-up.
- **Virtual Lab Interactions:** Drag-and-drop sensors, code compilation, real-time output visualization.
- **Collaboration Tools:** Voice/chat features, screen sharing.
- **Performance Dashboard:** Track completed experiments, coding scores, and achievements.

9.2 Non Functional Requirements :

- **Scalability:** AWS EC2 for cloud rendering; support 10,000+ concurrent users.
- **Latency:** 100ms for VR interactions using WebSockets.
- **Security:** GDPR-compliant data policies; JWT token authentication.
- **Reliability & Uptime :** Ensure 99.9% system availability for learning.
- **Usability & Accessibility :** Intuitive design with support for desktop, and low-cost VR devices to include rural students.

9.3 Hardware Requirements:

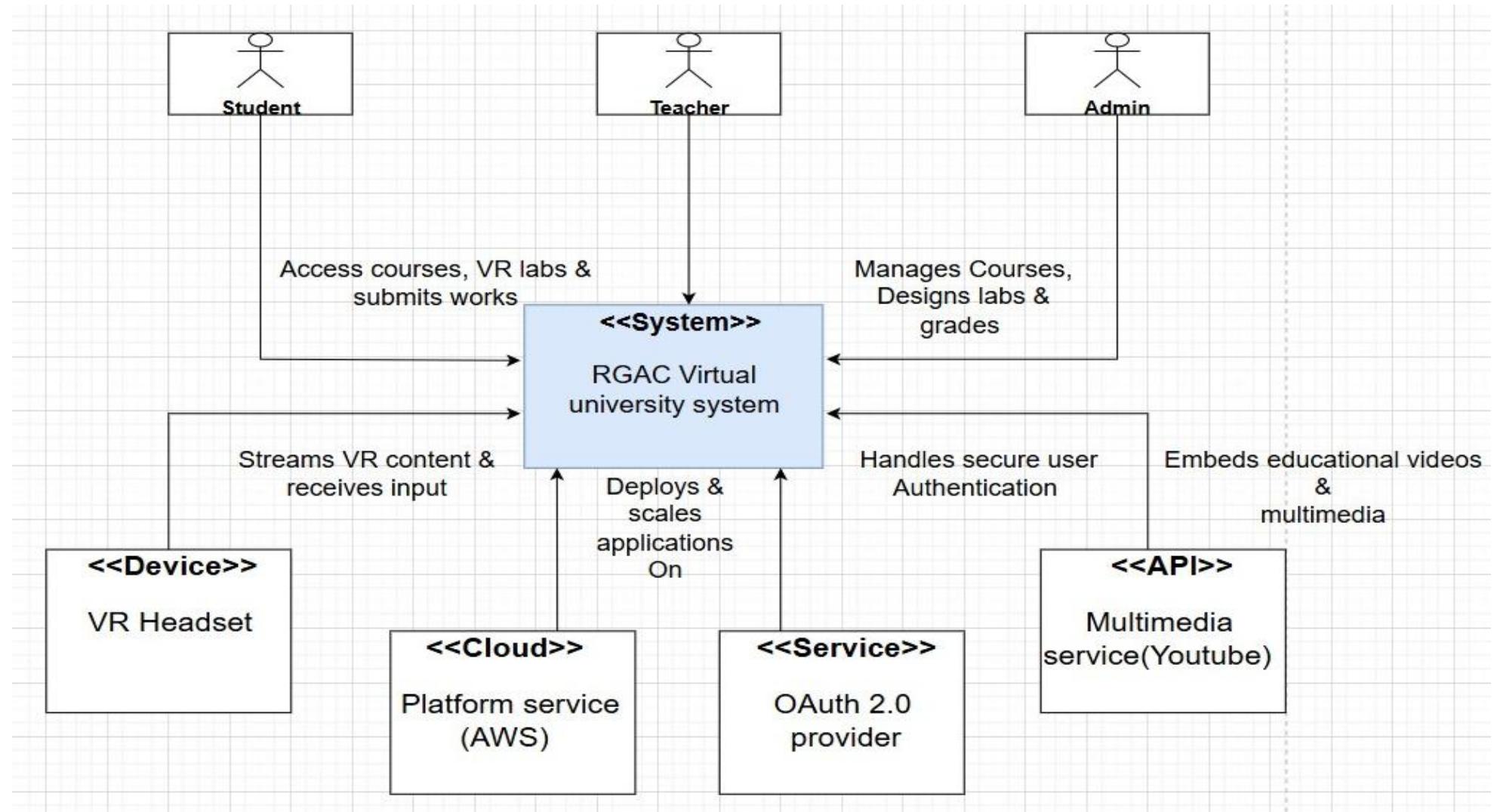
- **VR Headset** : Oculus Quest, Meta Quest.
- **Laptop** : Unity development, testing, coding.
- **Microphone**: Clear voice recording during lectures.
- **Webcam**: Record instructor face for overlays.
- **Green Screen Cloth**: Remove video background in OBS.

9.4 Software Requirements:

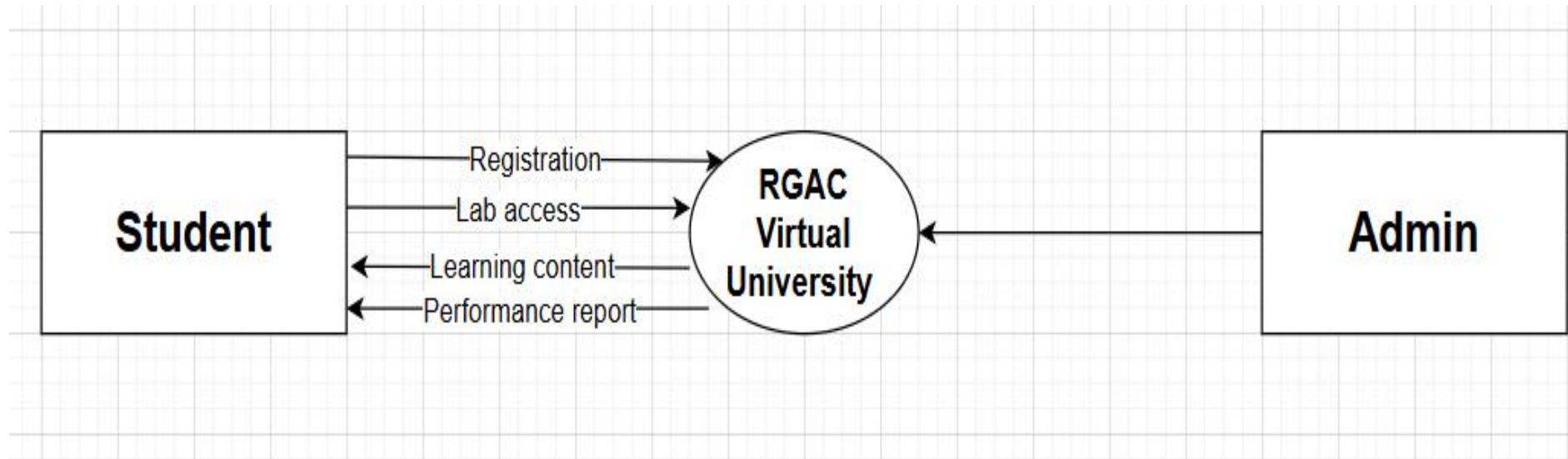
- **VR Development:** Unity 3D, Blender, Sketchfab.
- **Frontend:** React.js, Three.js.
- **Gamification:** Unity UI + Scoreboards.
- **Backend & Database :** Node.js ,Express.js , Reset API , MongoDB.
- **Content & Delivery :** YouTube API , WebXR .
- **Authentication & Security :** OAuth2 + JWT .

10.Design

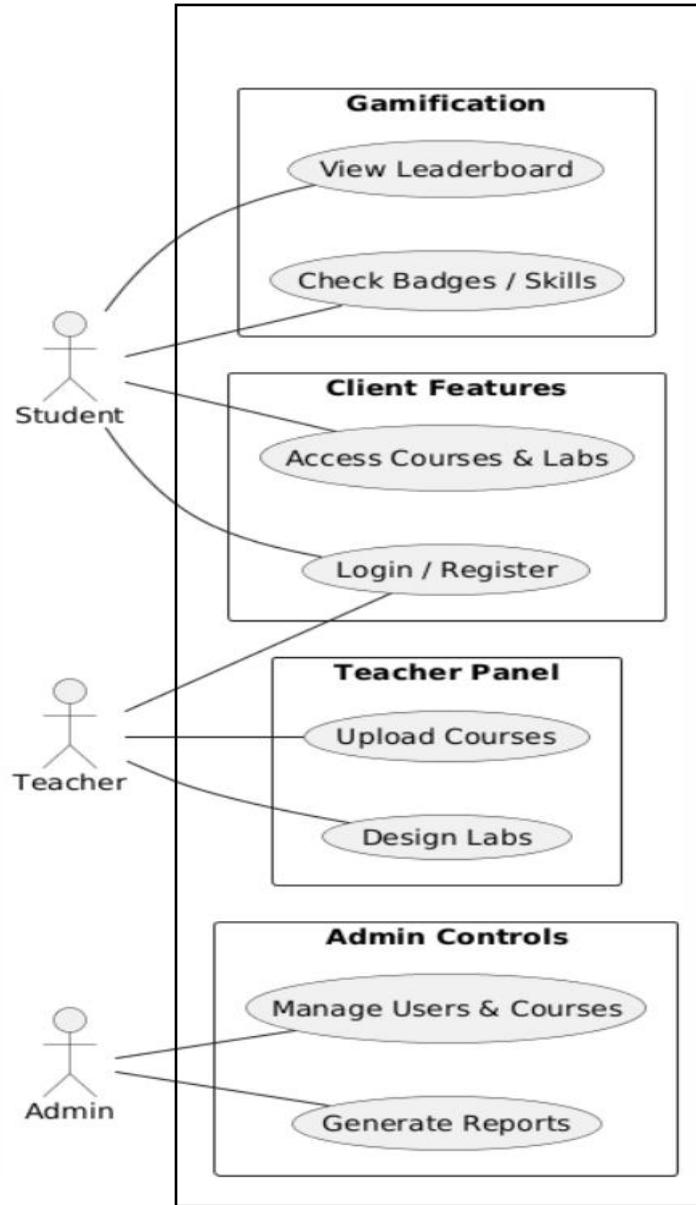
10.1 Context Diagram



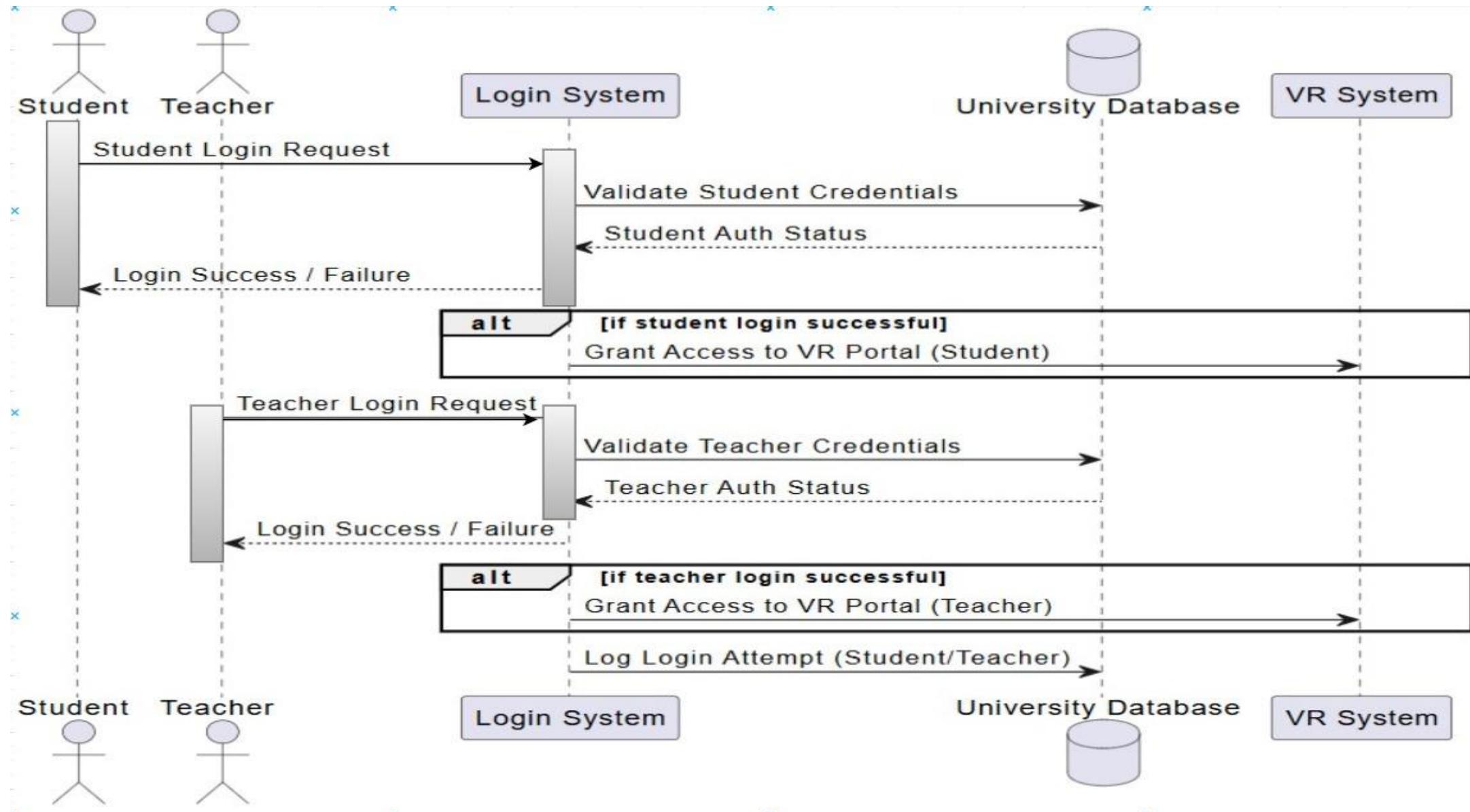
10.2 Data Flow (Level 0) Diagram



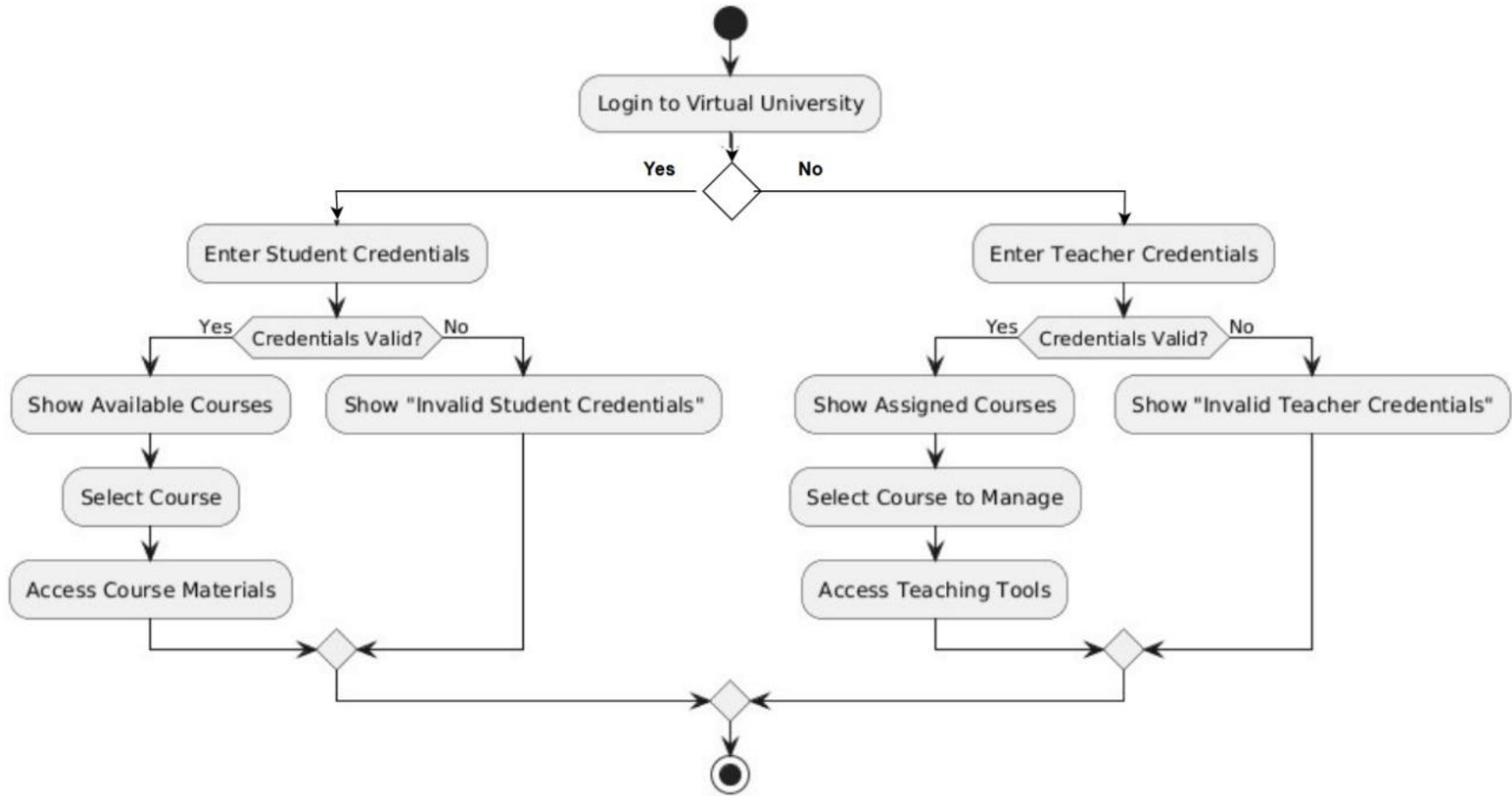
10.3 Use Case Diagram



10.4 Sequence Diagram



10.5 Activity Diagram



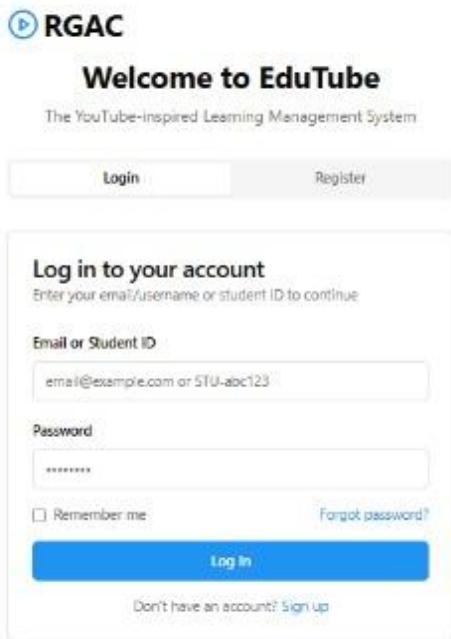
11.Implementation

- User Register

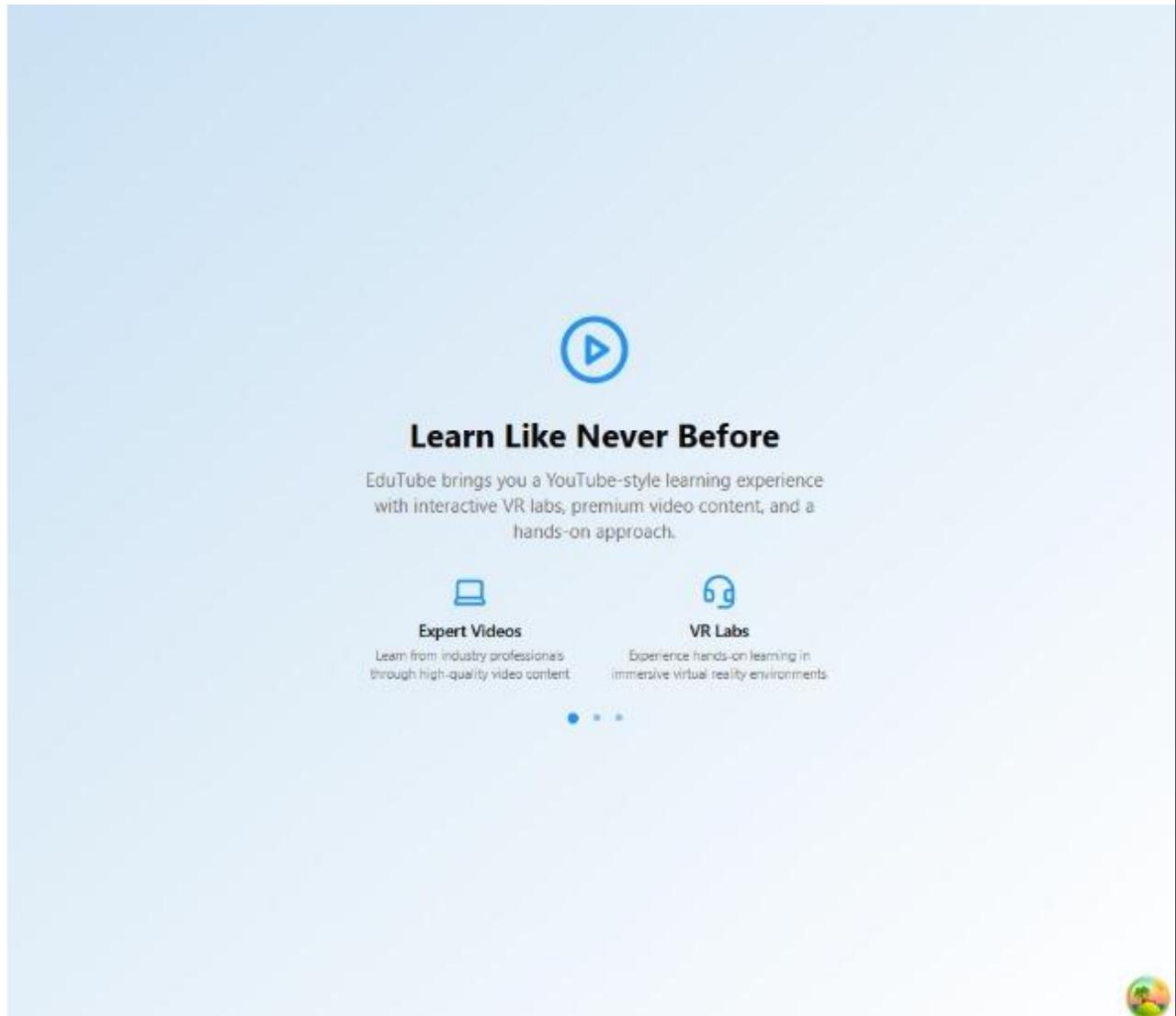
The screenshot shows the 'Create an account' form on the EduTube registration page. It includes fields for Full Name (John Doe), Email (email@example.com), Phone Number (+91 9876543210), Address (Your full address), Role (Student or Teacher), Username (johndoe), Password, Confirm Password, and a checkbox for agreeing to the Terms of Service and Privacy Policy. A 'Create Account' button is at the bottom.



- User Login



The screenshot shows the RGAC EduTube login page. At the top, there's a logo with a play button icon and the text "RGAC". Below it, a large heading says "Welcome to EduTube" and "The YouTube-inspired Learning Management System". There are two buttons: "Login" and "Register". The main area is titled "Log in to your account" with a sub-instruction "Enter your email/username or student ID to continue". It has two input fields: "Email or Student ID" containing "email@example.com or STU-abc123" and "Password" with a masked input. Below these are two checkboxes: "Remember me" and "Forgot password?". A blue "Log In" button is at the bottom. At the very bottom, there's a link "Don't have an account? Sign up".



• User as Teacher

RGAC

Home My Videos Students Leaderboard Hackathon New

TEACHER TOOLS Student Marks Assignments

BRANCH ROAD MAP Computer Science

Settings Help Send Feedback

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santhose Santhose@gmail.com ID: STU-1B7A4UA0

My Profile My Courses Settings Help Sign out

Search courses, branches, or videos

Welcome to RGAC Virtual University

Revolutionizing education through immersive VR technology and hands-on learning.
Get started by uploading your documents to begin your journey.

[Start Enrollment Now](#) [Learn More](#)

 Immersive Learning
Experience virtual labs with realistic simulations and hands-on practice.

 Expert Mentors
1-on-1 guidance from industry professionals and academic leaders.

 Career Ready
Gain job-ready skills with our industry-aligned curriculum.

Virtual Lab Experience

Explore our cutting-edge virtual laboratories powered by latest technologies

 Lab Modules

- Electronics: Virtual circuits with Arduino & sensors
- Robotics: Program bots with motors & sensors
- CSE: Virtual IDEs for Python/ML, programming
- IoT: Simulated device networks & protocols

 Key Features

- Real equipment interaction in 3D space
- Instant visual feedback (LEDs, sensors)
- Multplayer collaboration rooms
- AI-powered lab assistant

 Learning Tools

- Drag & drop component interface
- In-VR code editors & compilers
- Multimedia whiteboards & annotations
- Voice chat & avatar system

 Technologies

- Unity3D & WebXR for VR rendering
- Node.js + MongoDB backend
- AWS EC2 & S3 cloud hosting

 Benefits

- 70% cost savings vs physical labs
- 24/7 access from any device
- Unlimited lab retries & assessments

 Evaluation System

- No traditional exams
- Hackathon performance tracking
- Project-based assessments

• Teacher Uploading Video Contents

The screenshot shows a user interface for managing course content. On the left, there's a sidebar with various navigation links: My Videos, Students, Leaderboard, Education, Teacher Tools, Student Marks, Assignments, Branch Map, Computer Science, Settings, Help, Send Feedback, and Log Out. The main area is titled "My Videos" and displays a video thumbnail for "Single Variable". Below it, there's a snippet of a machine learning tutorial. A modal dialog box is open in the center, titled "Add Course Video". It has fields for "YouTube URL" (with a placeholder "https://youtube.com/watch?v=..."), "Title" ("Intro to Data Structures"), "Description" (a large text area with placeholder "Brief description..."), "Select a branch" (a dropdown menu), "Tags" (a button "Add tag..."), and a checkbox "Restrict access to enrolled students" which is checked. At the bottom right of the dialog are "Cancel" and "Add Video" buttons.

• Uploaded Video

RGAC

Home My Videos Students Leaderboard Hackathon New TEACHER TOOLS Student Marks Assignments BRANCH ROAD MAP Computer Science Settings Help Send Feedback © 2025 UMS Terms · Privacy · Policy & Safety

Search courses, branches, or videos

My Videos

Single Variable

Machine Learning Tutorial Python - 2
In this tutorial we will predict home prices using linear regression. We use training...
301 + 0

Upload Video

The screenshot shows the RGAC Virtual University interface. On the left is a sidebar with various navigation links: Home, My Videos (which is selected and highlighted in grey), Students, Leaderboard, Hackathon (with a 'New' badge), Teacher Tools, Student Marks, Assignments, Branch Road Map, Computer Science (with a dropdown arrow), Settings, Help, and Send Feedback. At the bottom of the sidebar are copyright information and links to Terms, Privacy, Policy & Safety. The main content area is titled 'My Videos' and features a video thumbnail for 'Single Variable'. The thumbnail has a blue background with a white 'y' axis and a scatter plot. A person wearing glasses and a hoodie is pointing at the graph. A yellow button in the top right corner of the thumbnail says 'Python'. Below the thumbnail is the title 'Machine Learning Tutorial Python - 2' and a brief description: 'In this tutorial we will predict home prices using linear regression. We use training...'. There are two small circular icons below the description: one with '301' and another with '0'. In the top right corner of the main content area, there is a blue button labeled 'Upload Video' with a camera icon. At the very top right of the page, there are three small circular icons with icons inside them.

- User as an Student

The screenshot shows the RGAC Virtual University student dashboard. The top navigation bar includes a logo, a search bar, and a user profile menu for 'sunday'.

Welcome to RGAC Virtual University
Revolutionizing education through immersive VR technology and hands-on learning.
Get started by uploading your documents to begin your journey.

[Start Enrollment Now](#) [Learn More](#)

Immersive Learning
Experience virtual labs with realistic simulations and hands-on practice.

Expert Mentors
1-on-1 guidance from industry professionals and academic leaders.

Career Ready
Gain job-ready skills with our industry-aligned curriculum.

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Lab Modules

- Electronics: Virtual circuits with Arduino & sensors
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- Real equipment interaction in 3D space
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- AI-powered lab assistant

Learning Tools

- Drag & drop component interface
- In-VR code editors & compilers
- Multimedia whiteboards & annotations
- Voice chat & avatar system

Technologies

- Unity3D & WebXR for VR rendering
- Node.js + MongoDB backend
- AWS, EC2, S3 cloud hosting

Benefits

- 70% cost savings vs physical labs
- 24/7 access from any device
- Unlimited lab retries & experiments

Evaluation System

- No traditional exams
- Hackathon performance tracking
- Project-based assessments

Left Sidebar:
Home, My Courses, VR Lab (New), Leaderboard, Hackathon (New), MY PROGRESS, Assignments, Skill Assessment, BRANCH ROAD MAP, Computer Science (selected), Settings, Help, Send Feedback.

Bottom Footer:
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• Videos Contents Uploaded by Teachers on a Specific Branch

The screenshot shows the RGAC Virtual University interface. On the left, a sidebar lists navigation options: Home, My Courses (selected), VR Lab, Leaderboard, Hackathon, MY PROGRESS, Assignments, Skill Assessment, BRANCH ROAD MAP, and Computer Science (with a dropdown menu). The main area is titled "Branch Videos" and displays "7 videos available". A search bar at the top right allows searching for courses, branches, or videos. Below the search bar is a "Filter" button. The video thumbnails are arranged in two rows. The first row contains three thumbnails: "LEARN VR IN 3 HOURS" (Learn VR Development in 3 Hours - Unity VR Tutorial Complete Course), "COMPLETE JAVASCRIPT COURSE" (Introduction to JavaScript | Complete JavaScript Crash Course | Tap...), and "COMPLETE JAVASCRIPT COURSE" (#2 Programming Basics | HLL, MLL, ALL | Complete JavaScript Crash Course | ...). The second row contains three thumbnails: "this morning prayer changed" (god song), "What is Machine learning" (Machine Learning Tutorial Python - 1: What is Machine Learning?), and "Linear Regression Single Variable" (Machine Learning Tutorial Python - 2). A partial thumbnail for "Linear Regression Multiple Variables" is visible at the bottom.

RGAC

Home
My Courses
VR Lab
Leaderboard
Hackathon
MY PROGRESS
Assignments
Skill Assessment
BRANCH ROAD MAP
Computer Science

Search courses, branches, or videos

Branch Videos

7 videos available

Search videos... Filter

1 Learn VR Development in 3 Hours - Unity VR Tutorial Complete Course

2 Introduction to JavaScript | Complete JavaScript Crash Course | Tap...

3 Programming Basics | HLL, MLL, ALL | Complete JavaScript Crash Course | ...

4 god

5 Machine Learning Tutorial Python - 1: What is Machine Learning?

6 Machine Learning Tutorial Python - 2

Linear Regression Single Variable

Linear Regression Multiple Variables

12. Expected Outcome

- A scalable Virtual University model.
- Students with enhanced employability skills.
- A decline in the urban-rural education gap.
- Financially inclusive access to quality education.
- Stronger industry-academia collaboration.

13.Applications

- Global Higher Education.
- AI-Powered Personalized Tutoring.
- Virtual Science and Engineering Labs.
- Global Expansion.

14.Timeline

Phase	Description	Duration
1	Synopsis + Literature Survey + Problem Statement	5 weeks
2	Requirements + Design	4 weeks
3	Module Development	4 weeks
4	Integration + Testing + Final Report	4 weeks

15. Conclusion

To conclude, the Virtual University is a groundbreaking solution to the limitations of traditional education systems. By combining affordability, flexibility, and industry-aligned learning, it empowers students with practical skills needed for real-world success.

References

- [1] X. Zhang, Y. Chen, L. Hu, and Y. Wang, “The metaverse in education: Definition, framework, features, potential applications, challenges, and future research topics,” *Frontiers in Psychology*, vol. 13, 2022.
- [2] G.-A. Bodea and V. I. Bacu, “VRduino Learning: Introduction in Arduino with Virtual Reality,” in Proc. International Conference on Ubiquitous and Smart Technologies for Health and Education (ICUSI), Chisinau, 2023.
- [3] F. Shadbad, G. Bahr, A. Luse, and B. Hammer, “Best of Both Worlds: The Inclusion of Gamification in Virtual Lab Environments to Increase Educational Value,” in Proc. 56th Hawaii Int. Conf. Syst. Sci. (HICSS), 2024.

Thank you all