SOMAIYA VIDYAVIHAR UNIVERSITY
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Dept. of INFORMATION TECHNOLOGY
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Mini Project Poster

Somaiya TRUST

GENERATING AR & VR VISUALIZATION FROM TEXTUAL DESCRIPTION OF NUMERICAL DATA

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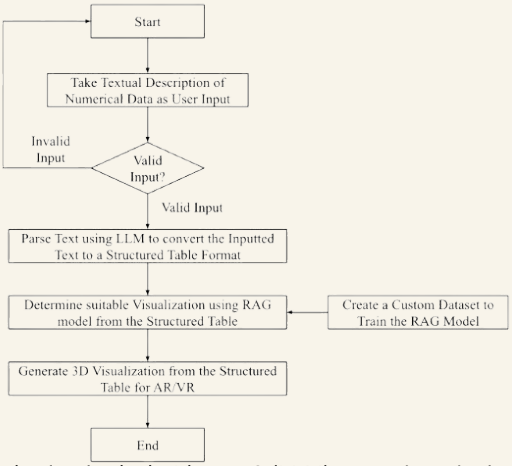
1 INTRODUCTION & MOTIVATION

Traditional data visualization methods, primarily 2D charts and graphs, often struggle to convey complex, multidimensional datasets effectively. These static visuals limit spatial understanding and user interaction, making it challenging to extract deeper insights.

Our project aims to overcome these limitations by transforming natural language descriptions of numerical data into immersive 3D visualizations rendered in Augmented Reality (AR) and Virtual Reality (VR) environments. This approach offers users a spatial, interactive experience that enhances pattern recognition and data comprehension, fostering intuitive and engaging data exploration.

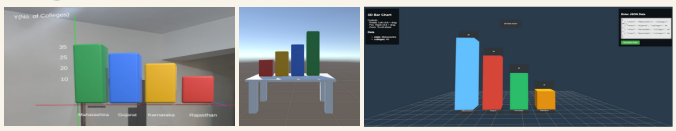
2 SYSTEM ARCHITECTURE & WORKFLOW



Key technologies include Llama-2 (LLM), a custom-trained RAG model, Unity game engine, Three.js for 3D graphics, and AR Foundation for mobile AR deployment.

3 IMPLEMENTATION HIGHLIGHTS

- User Interface: Provides options to input text and select visualization modes — VR, AR, or chart preview.
- Data Parsing: The system validates and processes the input text to ensure presence of numerical data before passing it to the LLM.
- Model Pipeline: The LLM extracts entities and numerical values into JSON tables. The RAG model then predicts the most suitable visualization.
- VR Visualization: Uses Unity and Three.js to render 3D charts with user controls for zooming, rotating, and panning, allowing immersive data exploration.
- AR Visualization: Implements static, color-coded 3D charts with labeled axes overlaid on real-world scenes via mobile devices, enhancing contextual understanding.



4 RESULTS & PERFORMANCE

Feature	Description	Performance
Text-to-Table Conversion	Data-field extraction accuracy	**94 %**
	Numerical-value mapping accuracy	**91 %**
Visualization Prediction	RAG model accuracy in choosing chart type	**88.9 %**
VR Rendering	Interaction latency (Meta Quest 2)	**< 100 ms**
	Average scene load time	**≈ 1.5 s**
AR Visualization	Quality of spatial 3D charts	Clear, contextual, passively observable

These results confirm the system's ability to convert unstructured text into immersive, interactive visual formats that improve user engagement and understanding.

5 CONCLUSION & FUTURE SCOPE

This project successfully integrates natural language processing and immersive technologies to generate meaningful AR and VR visualizations from textual numerical data. By leveraging LLMs, RAG models, and modern 3D rendering frameworks, the system offers an innovative, intuitive method of data exploration beyond traditional 2D charts. Future enhancements include: Multimodal input support (voice, handwriting), Expanding datasets for broader domain coverage, Real-time data integration via APIs, Advanced interaction techniques in AR/VR (gestures, voice commands), Cross-platform support including desktop and iOS, Multilingual processing to enhance accessibility, User customization for colors, scales, and filters. These improvements will broaden the system's applicability and user experience, paving the way for next-generation immersive data visualization tools.

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