International Journal of Engineering Research and Science & Technology

www.ijerst.org

ISSN : 2319-5991

Vol. 22 No. 2(1) (2026)

ijerst.editor@gmail.com

editor@ijerst.com

International Journal of Engineering Research and Science & Technology

ISSN 2319-5991 www.ijerst.com

Peer Reviewed, Referred & Indexed Journal

Research Paper

GENAI FOR AI-DRIVEN GAME DEVELOPMENT

[1]A Akhila, [2] P Vinay Kumar Reddy,[3] Y Vamshi Krishna, [4] R Rohan Reddy,[5] T Rahul
[1]AssistantProfessor, [2345]Students
Department of AIML
Siddhartha Institute of Technology & Sciences, Narapally
akhilaasaara@siddhartha.org.in, 24tq1a66j3@siddhartha.co.in, 24tq1a66j2@siddhartha.co.in, 24tq1a66h9@siddhartha.co.in, 24tq1a66g5@siddhartha.co.in

Abstract

The project titled "Echoes of the Forgotten Temple" presents an innovative application of Generative Artificial Intelligence in modern game development and interactive storytelling. The system combines the capabilities of Large Language Models (LLMs) with dynamic game environments to create personalized and adaptive narrative experiences for players. Unlike traditional video games that rely on predefined scripts, fixed dialogues, and linear story progression, this project introduces an AI-driven storytelling mechanism where narratives are generated dynamically based on player interactions and in-game decisions.

The game is developed using the Godot Engine and integrates a locally deployed Large Language Model through Ollama for real-time story generation. The gameplay is set within an ancient mythological temple environment containing interactive objects such as statues, relics, scrolls, and mysterious artifacts. Whenever players interact with these objects, the game sends prompts to the AI model, which analyzes the context and generates unique mythological stories, character dialogues, and narrative events dynamically.

The use of Generative AI significantly enhances player engagement and replayability because every interaction can produce different story outcomes, quests, and narrative paths. This creates a non-linear gameplay experience where no two sessions are exactly the same. The locally deployed AI model also eliminates dependency on cloud-based services and internet connectivity, thereby reducing latency, improving response speed, and enhancing user privacy and system reliability.

The project demonstrates how AI-driven procedural storytelling can transform traditional game design by enabling adaptive narratives, intelligent world-building, and context-aware interactions. It highlights the potential of integrating Large Language Models into interactive entertainment systems to create immersive and personalized gaming experiences.

I. Introduction

The gaming industry has experienced tremendous growth over the past few decades, evolving from simple 2D arcade games to highly immersive 3D virtual environments with realistic graphics, intelligent characters, and interactive gameplay mechanics. Modern games focus not only on visual quality but also on storytelling, player engagement, and immersive experiences. Despite these advancements, many

traditional games still rely heavily on static storytelling techniques where narratives, dialogues, and events are predefined by developers. As a result, players often encounter the same storyline and interactions during repeated gameplay sessions, which reduces replayability and long-term engagement.

Generative Artificial Intelligence offers a powerful solution to overcome the limitations of static storytelling in game development. Generative AI systems can dynamically create narratives, dialogues, quests, and game events in real time based on player interactions and contextual information. Unlike traditional scripted systems, AI-driven storytelling enables games to adapt continuously to player behavior, decisions, and exploration patterns, creating highly personalized and unique gameplay experiences.

This project focuses on integrating Generative AI into an interactive game environment titled “Echoes of the Forgotten Temple.” The system combines the capabilities of Large Language Models (LLMs) with modern game development technologies to create adaptive and intelligent storytelling experiences. The game is developed using the Godot Engine, while AI-based narrative generation is implemented using a locally deployed LLM through Ollama. The integration allows the game to generate mythological stories, dialogues, and contextual interactions dynamically whenever players interact with objects or characters within the game world.

The gameplay environment simulates an ancient temple filled with mysterious relics, statues, scrolls, and artifacts that players can explore and interact with. Each interaction triggers an API request to the AI model, which processes the contextual input and generates a unique narrative response. This dynamic storytelling mechanism ensures that every gameplay session becomes different, thereby significantly improving immersion, creativity, and replayability.

Another important aspect of this project is the use of a locally deployed AI model instead of cloud-based AI services. Local deployment reduces latency, improves response speed, eliminates dependency on internet connectivity, and enhances user privacy. This makes the system more reliable and suitable for offline gameplay environments.

II. Literature Survey

Generative Artificial Intelligence has emerged as one of the most significant research areas in modern Artificial Intelligence due to its ability to generate human-like content such as text, images, audio, and interactive experiences. Generative AI systems are designed to learn patterns from large datasets and create meaningful outputs that resemble human creativity and reasoning. One of the most important advancements in this field is the development of Large Language Models (LLMs), which are trained on massive textual datasets to understand and generate natural language effectively. Models such as LLaMA 3 and Phi-3 have demonstrated impressive capabilities in generating coherent, context-aware, and semantically meaningful text responses. These models primarily use Transformer architectures with attention mechanisms that efficiently process sequential information and contextual relationships within data. In recent years, researchers and developers have

increasingly explored the integration of AI technologies into the gaming industry to improve player interaction, immersion, and engagement. Traditional games generally rely on static storytelling techniques, fixed dialogues, and predefined narrative structures. Although these approaches provide controlled gameplay experiences, they often reduce replayability because players encounter the same storyline during repeated sessions. To address this limitation, AI-driven systems have been introduced to create adaptive and dynamic gameplay experiences that respond intelligently to player behavior and decisions.

One major area of AI application in gaming is intelligent Non-Player Character (NPC) behavior. Research studies show that AI-based NPCs can respond realistically to player actions, making game environments feel more interactive and lifelike. Machine learning and behavior modeling techniques have been used to develop NPCs capable of decision-making, contextual dialogue generation, and adaptive responses. These intelligent systems significantly enhance player immersion by creating more believable virtual worlds.

Another important research area is procedural content generation (PCG), where AI systems automatically generate game content such as levels, maps, environments, quests, and narratives. Procedural generation reduces development effort and increases content variability, enabling developers to create expansive and dynamic game worlds efficiently. AI-based procedural storytelling systems extend this concept further by generating narratives dynamically based on player interactions rather than relying on fixed scripts.

Dynamic storytelling has become one of the most promising applications of AI in interactive entertainment. Unlike traditional linear narratives, AI-driven storytelling systems generate stories in real time according to player choices, exploration patterns, and contextual events. Research indicates that non-linear storytelling significantly improves player engagement and emotional immersion because each player experiences a unique narrative journey. Large Language Models are particularly effective in this domain because they can generate contextual dialogues, mythological stories, character interactions, and adaptive quests dynamically.

Recent studies also highlight the growing importance of local AI deployment frameworks for gaming applications. Platforms such as Ollama allow developers to run Large Language Models directly on local systems without depending on cloud-based AI services. Local AI deployment provides several advantages including reduced latency, faster response times, enhanced privacy, offline accessibility, and improved reliability. Unlike cloud-based systems, locally deployed AI models eliminate the need for continuous internet connectivity and reduce potential security risks associated with transmitting user data to external servers.

The integration of modern game engines with AI frameworks has further accelerated innovation in AI-driven game development. Game engines such as Godot Engine provide flexible and customizable environments for integrating AI models into interactive applications. Researchers have demonstrated that combining game engines with AI-powered narrative systems enables developers to build immersive worlds capable of real-time content generation, adaptive storytelling, and intelligent interactions. Despite these advancements, existing AI-driven game systems still face

several challenges such as maintaining narrative consistency, balancing computational efficiency, handling contextual memory over long gameplay sessions, and ensuring meaningful player interactions. Additionally, integrating Large Language Models into real-time gaming environments requires optimization techniques to reduce resource consumption and maintain smooth gameplay performance.

Overall, the literature survey demonstrates that Generative AI and Large Language Models have immense potential to transform the gaming industry. Technologies such as dynamic storytelling, procedural content generation, intelligent NPCs, and local AI deployment significantly improve player immersion, engagement, and replayability. The combination of AI frameworks with game engines creates opportunities for developing adaptive, personalized, and context-aware gaming experiences, making Generative AI an important foundation for the future of intelligent game development systems.

III. System Analysis

The GenAI for AI-Driven Game Development system is designed to create dynamic and adaptive storytelling experiences within interactive game environments using Generative Artificial Intelligence and Large Language Models. The primary objective of the system is to overcome the limitations of traditional static storytelling by generating narratives, dialogues, and mythological events dynamically based on player interactions. The proposed game environment, titled "Echoes of the Forgotten Temple," simulates an ancient temple filled with interactive objects such as statues, relics, artifacts, and scrolls. Whenever players interact with these objects, the system sends contextual prompts to a locally deployed AI model for real-time narrative generation. The system integrates the Godot Engine with Ollama to enable seamless communication between the game environment and the Large Language Model. Unlike traditional games that rely on fixed scripts and predefined storylines, the proposed system generates unique narratives during every gameplay session, significantly improving replayability and player immersion. Local deployment of the AI model improves response speed, reduces latency, enhances data privacy, and eliminates dependency on internet connectivity. The system also supports adaptive gameplay mechanics and context-aware interactions. Performance evaluation focuses on response generation speed, narrative consistency, replayability, and user engagement levels. Overall, the project demonstrates the effectiveness of AI-driven procedural storytelling in creating intelligent and immersive gaming experiences.

Existing System

Traditional game development systems mainly rely on static storytelling techniques where dialogues, quests, and narrative events are predefined by developers during the game design process. Most conventional games follow linear story progression models in which players experience the same storyline repeatedly regardless of their decisions or interactions. Although these systems provide structured gameplay experiences, they often reduce long-term engagement and replayability. Existing games commonly use scripted Non-Player Characters (NPCs) with limited conversational capabilities and predefined responses. Earlier procedural content generation techniques focused mainly on generating maps, levels, or environments rather than adaptive narratives and contextual storytelling. Cloud-based AI-driven

gaming systems introduced dynamic content generation but faced issues such as internet dependency, higher latency, and privacy concerns. Many traditional AI systems also lacked contextual understanding and generated repetitive or inconsistent dialogues. Existing narrative systems often struggled to maintain story continuity and player immersion during long gameplay sessions. Integration of advanced Large Language Models into real-time game environments remained computationally expensive and difficult to optimize for local execution. Additionally, most current systems provide limited personalization and fail to adapt narratives meaningfully based on player behavior. These limitations highlight the need for intelligent, scalable, and context-aware AI-driven storytelling systems in modern game development.

Disadvantages of Existing System

- Relies on static and predefined storylines
- Limited replayability and player engagement
- NPC dialogues are repetitive and scripted
- Lack of adaptive and context-aware storytelling
- Limited personalization based on player actions
- Cloud-based AI systems require internet connectivity
- Higher latency in online AI processing
- Privacy and data security concerns in cloud systems
- Difficulty maintaining narrative consistency
- Limited real-time dynamic content generation

Proposed System

The proposed GenAI-driven game development system introduces an intelligent storytelling platform that dynamically generates narratives and interactions based on player behavior and in-game exploration. The system integrates Large Language Models through Ollama with the Godot Engine to create adaptive and context-aware mythological storytelling experiences. Players explore an ancient temple environment containing interactive objects such as relics, statues, scrolls, and mysterious artifacts. Whenever a player interacts with an object, contextual information is sent to the locally deployed AI model, which generates unique stories, dialogues, quests, and narrative events in real time. Unlike traditional games, the proposed system ensures that each gameplay session produces different outcomes and experiences, significantly improving replayability and immersion. The use of local AI deployment reduces latency, improves response generation speed, and enhances user privacy by eliminating dependency on external cloud-based services. The system also supports intelligent NPC interactions, procedural storytelling, and adaptive game mechanics that evolve according to player choices and actions. Real-time AI-generated narratives create highly personalized gaming experiences and improve emotional engagement with the virtual environment. The proposed architecture demonstrates how Generative AI can transform traditional game development into an intelligent, immersive, and dynamic entertainment experience. Overall, the project highlights the future potential of AI-driven storytelling systems in modern interactive gaming applications.

Advantages of Proposed System

- Generates dynamic and adaptive storylines

- Improves player immersion and engagement
- Provides unique gameplay experiences every session
- Enhances replayability significantly
- Supports intelligent and context-aware NPC interactions
- Reduces dependency on internet connectivity
- Lower latency through local AI deployment
- Improved privacy and data security
- Enables real-time procedural storytelling
- Supports personalized and non-linear gameplay experiences

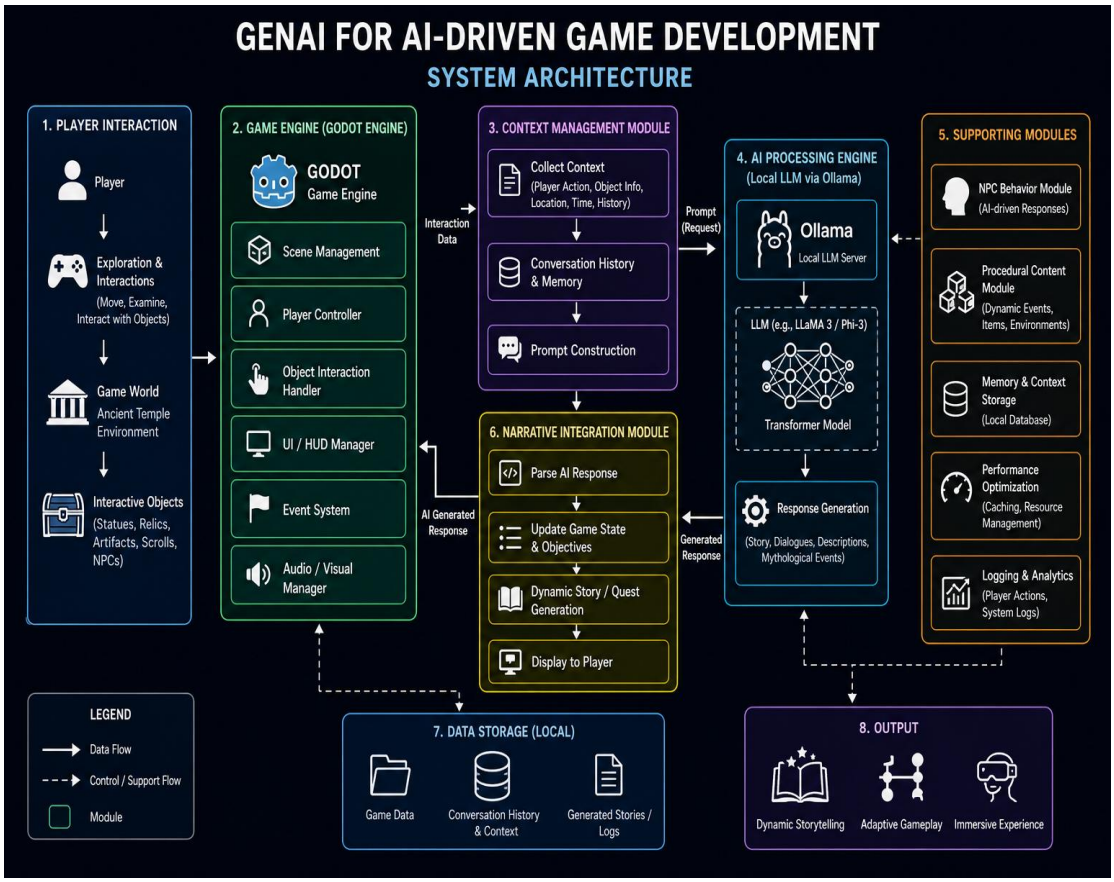
Methodology

The methodology of the proposed system begins with designing the interactive game environment using the Godot Engine. The game world is populated with objects such as statues, relics, artifacts, and scrolls that players can interact with during gameplay. When a player interacts with an object, the game engine captures contextual information related to the interaction and sends it as an API request to the locally deployed Large Language Model running through Ollama. The AI model processes the contextual prompt using Transformer-based language generation techniques and dynamically generates mythological stories, dialogues, or quest events. The generated narrative output is returned to the game engine and displayed to the player in real time. The system maintains contextual continuity by tracking player actions, interaction history, and narrative progression throughout gameplay. Additional modules handle procedural storytelling, adaptive NPC behavior, and event management within the game environment. The locally deployed AI model ensures low-latency response generation and offline accessibility without requiring cloud connectivity. The system also performs optimization to balance computational efficiency and gameplay performance. User interaction data and gameplay feedback are analyzed to evaluate immersion, replayability, and narrative quality. Python scripts and API integration techniques are used to establish communication between the Godot Engine and the AI framework. This methodology enables intelligent, adaptive, and immersive storytelling for AI-driven game development applications.

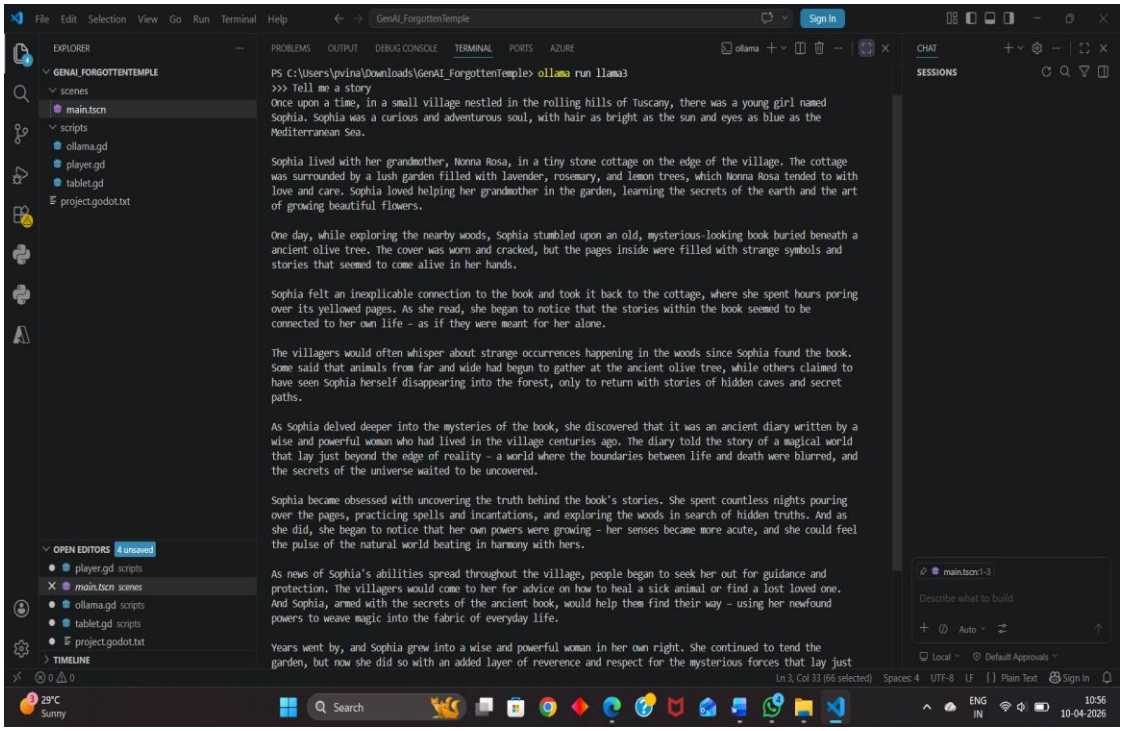
System Architecture

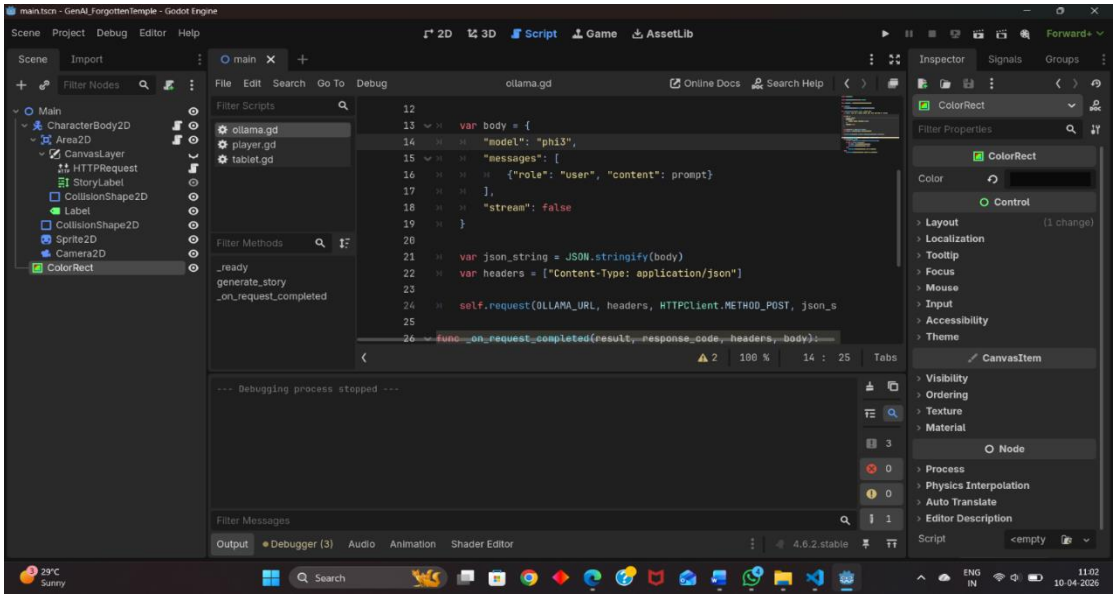
The system architecture of the GenAI-driven game development system consists of multiple interconnected modules that work together to provide dynamic storytelling and intelligent gameplay experiences. The process begins with the player interaction module within the Godot Engine, where users interact with game objects such as statues, relics, scrolls, and NPCs. Interaction events are captured and forwarded to the context management module, which collects player actions, environmental information, and narrative history. The contextual data is then sent to the AI communication module that establishes API connections with the locally deployed Large Language Model through Ollama. The AI processing engine uses Transformer-based language generation models to analyze contextual prompts and generate mythological stories, dialogues, and adaptive quests dynamically. The generated narrative output is returned to the Godot Engine and displayed to players through the user interface module. A procedural storytelling module manages narrative continuity, event progression, and adaptive gameplay logic based on player choices. The system also includes an NPC behavior module that enables intelligent character interactions

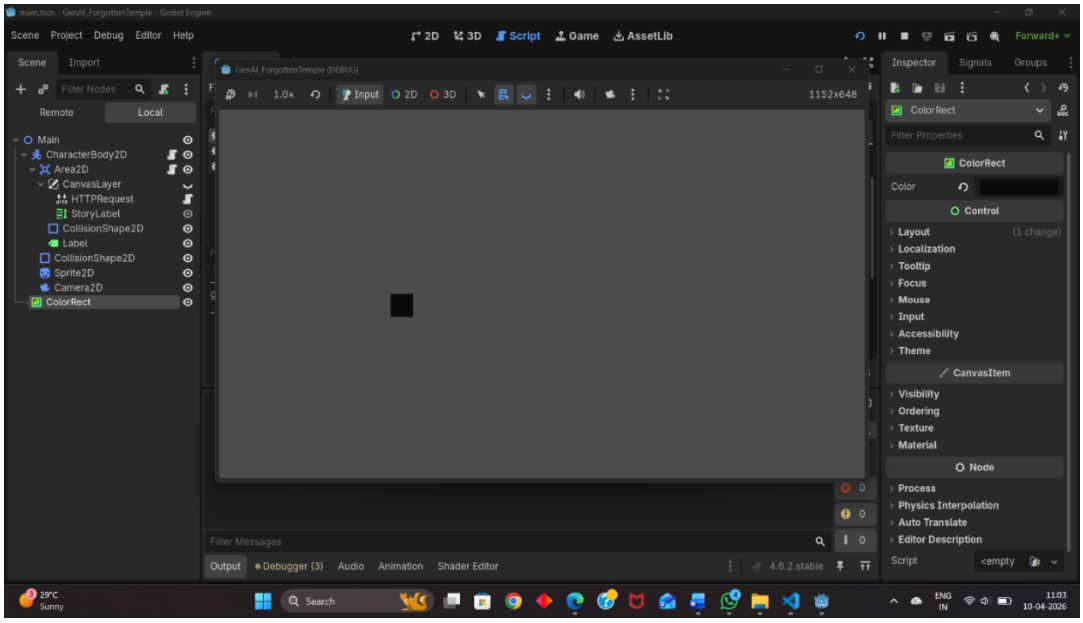
and context-aware responses. Local AI deployment ensures reduced latency, offline functionality, and enhanced privacy. Performance optimization modules maintain smooth gameplay and efficient resource utilization during real-time AI processing. Overall, the architecture provides an intelligent, scalable, and immersive AI-powered storytelling system for next-generation game development applications.



V. Result and Output


PS C:\Users\pvina\Downloads\GenAI_ForgottenTemple> ollama run llama3
>>> Tell me a story
Once upon a time, in a small village nestled in the rolling hills of Tuscany, there was a young girl named Sophia. Sophia was a curious and adventurous soul, with hair as bright as the sun and eyes as blue as the Mediterranean Sea.
Sophia lived with her grandmother, Nonna Rosa, in a tiny stone cottage on the edge of the village. The cottage was surrounded by a lush garden filled with lavender, rosemary, and lemon trees, which Nonna Rosa tended to with love and care. Sophia loved helping her grandmother in the garden, learning the secrets of the earth and the art of growing beautiful flowers.
One day, while exploring the nearby woods, Sophia stumbled upon an old, mysterious-looking book buried beneath a ancient olive tree. The cover was worn and cracked, but the pages inside were filled with strange symbols and stories that seemed to come alive in her hands.
Sophia felt an inexplicable connection to the book and took it back to the cottage, where she spent hours poring over its yellowed pages. As she read, she began to notice that the stories within the book seemed to be connected to her own life – as if they were meant for her alone.
The villagers would often whisper about strange occurrences happening in the woods since Sophia found the book. Some said that animals from far and wide had begun to gather at the ancient olive tree, while others claimed to have seen Sophia herself disappearing into the forest, only to return with stories of hidden caves and secret paths.
As Sophia delved deeper into the mysteries of the book, she discovered that it was an ancient diary written by a wise and powerful woman who had lived in the village centuries ago. The diary told the story of a magical world that lay just beyond the edge of reality – a world where the boundaries between life and death were blurred, and the secrets of the universe waited to be uncovered.
Sophia became obsessed with uncovering the truth behind the book's stories. She spent countless nights pouring over the pages, practicing spells and incantations, and exploring the woods in search of hidden truths. And as she did, she began to notice that her own powers were growing – her senses became more acute, and she could feel the pulse of the natural world beating in harmony with hers.
As news of Sophia's abilities spread throughout the village, people began to seek her out for guidance and protection. The villagers would come to her for advice on how to heal a sick animal or find a lost loved one. And Sophia, armed with the secrets of the ancient book, would help them find their way – using her newfound powers to weave magic into the fabric of everyday life.
Years went by, and Sophia grew into a wise and powerful woman in her own right. She continued to tend the garden, but now she did so with an added layer of reverence and respect for the mysterious forces that lay just


var body = {
"model": "phi3",
"messages": [
{"role": "user", "content": prompt}
],
"stream": false
}
var json_string = JSON.stringify(body)
var headers = ["Content-Type: application/json"]
self.request(OLLAMA_URL, headers, HTTPClient.METHOD_POST, json_s
func _on_request_completed(result, response_code, headers, body):
--- Debugging process stopped ---



VI. Conclusion

This project successfully demonstrates how Generative Artificial Intelligence (GenAI) can significantly enhance modern game development by enabling dynamic and adaptive storytelling. The development of "Echoes of the Forgotten Temple" showcases the integration of AI-driven narrative generation within an interactive gaming environment, moving beyond traditional static storytelling methods.In conventional games, narratives are fixed and predefined, offering limited variation in gameplay. This project overcomes that limitation by incorporating a Large Language Model through Ollama, which generates unique and context-aware stories in real time based on player interactions. By combining this AI capability with the Godot Engine, the system delivers a seamless and immersive user experience.One of the key achievements of this project is the improvement in replayability. Since the AI generates a different story for every interaction, players can experience new narratives each time they play the game. This not only increases user engagement but also adds an element of unpredictability and creativity to the gameplay. The system effectively transforms the game into a dynamic storytelling platform rather than a fixed entertainment product.

Another important contribution of this project is the use of a local AI framework. By running the AI model locally using Ollama, the system ensures faster response times, reduced dependency on internet connectivity, and improved data privacy. This makes the solution more efficient and suitable for real-time applications.The implementation also highlights the importance of prompt engineering in controlling AI-generated outputs. By designing structured prompts with specific constraints, the system ensures that the generated stories maintain a consistent mythological tone and relevance to the game environment.Overall, this project proves that the integration of Generative AI into gaming is not only feasible but also highly beneficial. It enhances user engagement, improves creativity, and introduces a new paradigm of interactive storytelling. The approach can be extended to various domains such as education, simulation, and entertainment, where dynamic content generation is essential.In conclusion, the integration of AI into games opens new possibilities for intelligent,

adaptive, and personalized user experiences. This project lays a strong foundation for future advancements in AI-driven game development and interactive storytelling systems.

References

[1] Kumar, R. D., Prudhviraj, G., Vijay, K., Kumar, P. S., & Plugmann, P. (2024). Exploring COVID-19 through intensive investigation with supervised machine learning algorithm. In Handbook of Artificial Intelligence and Wearables (pp. 145-158). CRC Press.

[2] Swathi, B., Vijay, K., Sushanth Babu, M., & Dinesh Kumar, R. (2024, November). Machine Learning Techniques in Cloud Based Intrusion Detection. In The International Conference on Artificial Intelligence and Smart Environment (pp. 557-564). Cham: Springer Nature Switzerland.

[3] Sv satyakrishna, shirisha rangu ,bhargavi nalacheruve.(2024) Prospective investigation on colorectal cancer with SMOTE on machine learning Algorithm

[4] Dr.G.Vishnu Murthy, BhargaviNalacheruve 1Professor, Department of computer Science & engineering, Anurag University, TS, India. 2Student, Department of computer Science & engineering, Anurag University, TS, India.

[5] V. N. S. Manaswini, K. K, C. Nigam, S. S. Ali, R. Niranjana, and Suman, "Real-Time Object Detection in Drone Surveillance Using YOLOv5," in Proc. 2025 3rd Int. Conf. IoT, Communication and Automation Technology (ICICAT), Gorakhpur, India, 2025, pp. 1–6, doi: 10.1109/ICICAT68430.2025.11414670.

[6] B. Soundarya, V. N. S. Manaswini, M. Ayyakrishnan, R. D. Kumar, "Contextual Analysis of Big Data Analytics in Intelligent Transportation Frameworks," in Intersection of Artificial Intelligence, Data Science, and Cutting-Edge Technologies: From Concepts to Applications in Smart Environment, Lecture Notes in Networks and Systems, vol. 1353, Cham: Springer, 2025, doi: 10.1007/978-3-031-88304-0_79.

[7] R. D. Kumar, V. N. S.Manaswini, "Applications of blockchain in smart cities: detecting fake documents from land records using blockchain technology," in Blockchain for Smart Cities, Elsevier, 2021, pp. 105–117, doi: 10.1016/B978-0-12-824446-3.00017-X.

[8] Tejavath Veeramma, Badarla Anil, Guguloth Ravinder, "An advanced movie recommender using collaborative filtering and sentiment analysis," International Research Journal of Modernization in Engineering Technology and Science, vol. 7, no. 7, July 2025, doi: 10.56726/IRJMETS81618.

[9] Ravi Kumar Banoth, Ramana Murthy B V, "Automatic crop recommendation system using LightGBM and decision tree machine learning models," Journal of Machine and Computing, vol. 5, no. 1, pp. 343, Jan. 2025, doi: 10.53759/7669/jmc202505026.

[10] Ravi Kumar Banoth, Dr. B.V. Ramana Murthy, "Smart agriculture through IoT and machine learning for analyzing carbon footprints," in Proc. Int. Conf. Computer Science and Communication Engineering (ICCSCE), Apr. 2025.

[11] Ravi Kumar Banoth, B. V. Ramana Murthy, "Soil image classification using transfer learning approach: MobileNetV2 with CNN," SN Computer Science, vol. 5, art. no. 199, 2024, doi: 10.1007/s42979-023-02500-x.