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Campus Culture Construction of Colleges and Universities Based on Virtual Reality Technology



Abstract: - This paper presents a novel approach to campus culture construction in colleges and universities utilizing virtual reality (VR) technology enhanced by Cartesian point Probabilistic LSTM (CPP-LSTM). The study aims to enhance campus culture by creating immersive virtual environments that promote engagement, collaboration, and learning among students and faculty members. Through simulated experiments and empirical validations, the efficacy of the CPP-LSTM-enhanced VR technology is evaluated in creating realistic and interactive virtual campus environments. Results demonstrate significant improvements in user engagement and satisfaction compared to traditional methods. For instance, users interacting with the CPP-LSTM-enhanced VR platform reported a 30% increase in perceived sense of belonging and a 25% improvement in overall satisfaction ratings. Additionally, the CPP-LSTM model enables the generation of personalized virtual experiences based on user preferences and feedback, leading to more immersive and impactful campus culture construction. These findings underscore the potential of VR technology with CPP-LSTM in revolutionizing campus culture construction and fostering a vibrant and inclusive campus community.

Keywords: Campus culture construction, colleges, universities, virtual reality technology, Cartesian point, Probabilistic LSTM, immersive virtual environments.

I. INTRODUCTION

Virtual reality (VR) technology into the construction of campus culture within colleges and universities represents a transformative shift in the educational landscape [1]. By leveraging VR, institutions can create immersive and interactive environments that foster engagement, collaboration, and innovation among students, faculty, and staff [2]. One of the primary advantages of using VR for campus culture construction is its ability to transcend physical limitations, allowing individuals to connect and interact regardless of their geographical location. Through VR-enabled platforms, students can participate in virtual campus tours, attend lectures and seminars in simulated classrooms, engage in group discussions and projects in virtual study spaces, and even socialize with peers in virtual recreation areas [3]. Moreover, VR technology enables colleges and universities to enhance the accessibility of education by accommodating diverse learning styles and preferences [4]. In addition to virtual tours, VR technology enables institutions to reimagine the traditional classroom experience. Virtual classrooms can be designed to simulate real-world learning environments, complete with interactive whiteboards, 3D models, and dynamic multimedia content [5]. This immersive approach to education can enhance student engagement and comprehension, particularly for complex subjects that benefit from visualization and hands-on learning [6].

VR platforms offer virtual study spaces where students can collaborate on projects, participate in group discussions, or seek assistance from tutors [7]. These virtual hubs facilitate peer-to-peer learning and foster a sense of community among students, even when they are physically dispersed [8]. Similarly, faculty members can utilize VR to hold office hours, conduct research meetings, or deliver guest lectures, enriching the academic experience for all stakeholders. The gamification elements inherent in many VR experiences can make learning more interactive and enjoyable [9]. By incorporating game-like mechanics such as rewards, challenges, and progress tracking, educators can motivate students to actively participate and take ownership of their learning journey [10]. This gamified approach can be particularly effective in engaging millennial and Gen Z learners who have grown up in a digital age characterized by gaming and interactivity [11].

The construction of campus culture within colleges is a multifaceted endeavor that encompasses various elements contributing to the overall student experience. The campus culture reflects the values, traditions, and social

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dynamics that shape the identity of an institution [12]. It encompasses academic pursuits, extracurricular activities, social interactions, and community engagement, all of which play integral roles in fostering a vibrant and inclusive environment conducive to learning and personal growth [13]. Central to campus culture construction are initiatives aimed at promoting diversity, equity, and inclusion, ensuring that all members of the academic community feel valued, respected, and supported. This involves creating opportunities for dialogue, cultural exchange, and collaboration among students, faculty, and staff from diverse backgrounds [14]. Additionally, colleges invest in facilities and resources that facilitate both academic and social interactions, such as libraries, student centers, recreational areas, and cultural spaces. These spaces serve as hubs for intellectual exploration, creative expression, and interpersonal connections, fostering a sense of belonging and camaraderie among students [15]. Furthermore, campus culture construction involves the development of programs and initiatives that promote student engagement, leadership development, and civic responsibility. Through clubs, organizations, volunteer opportunities, and leadership training, colleges empower students to become active participants in shaping their campus community and making a positive impact in the broader society.

The construction of campus culture within colleges is an intricate and dynamic process that goes beyond mere physical infrastructure. While buildings and facilities certainly play a role, the heart of campus culture lies in the interactions, relationships, and shared experiences among students, faculty, and staff [16]. At its essence, campus culture embodies the ethos and values of the institution, shaping the attitudes, behaviors, and sense of belonging of its members. Colleges and universities often cultivate specific cultural identities, whether through academic excellence, a commitment to diversity and inclusion, a vibrant arts scene, or a strong tradition of community engagement [17]. These cultural markers serve not only to distinguish one institution from another but also to unite individuals under a common purpose and set of ideals. One critical aspect of campus culture construction is the promotion of diversity, equity, and inclusion. Institutions recognize the importance of fostering a welcoming and supportive environment where students from all backgrounds feel respected and valued [18]. This involves implementing policies and initiatives that address issues of accessibility, affordability, and representation, as well as creating spaces and programming that celebrate the richness of human diversity. Through multicultural centers, diversity workshops, and inclusive curriculum development, colleges strive to create an environment where every voice is heard and every perspective is honored [19]. The campus culture is shaped by the myriad opportunities for intellectual and social engagement that colleges provide. Academic programs, research opportunities, and experiential learning initiatives all contribute to the intellectual vibrancy of the campus community, inspiring curiosity, critical thinking, and innovation. Likewise, extracurricular activities, student organizations, and campus events offer avenues for personal growth, leadership development, and social connection [20]. Through intramural sports leagues, theatrical productions, volunteer projects, or academic conferences, colleges offer a wealth of experiences that enrich students' lives beyond the classroom.

The paper makes several significant contributions to the field of campus culture construction and educational technology. Firstly, it introduces the innovative application of Virtual Reality (VR) technology, particularly through the utilization of the Cartesian Point Probabilistic LSTM (CPP-LSTM) model. This novel approach offers a sophisticated framework for creating immersive and dynamic virtual environments within colleges and universities. By leveraging advanced modeling techniques, the CPP-LSTM model enables the accurate prediction of probabilities associated with visibility, accessibility, and interaction for various elements within the virtual campus. This contributes to optimizing resource allocation and enhancing user experiences within the virtual space. Secondly, the paper contributes to the advancement of research on student engagement and learning outcomes in VR-based educational settings. Through comprehensive simulations and analyses, the study demonstrates the CPP-LSTM model's effectiveness in promoting active student engagement, diversity, academic excellence, and community involvement within the virtual learning environment. By providing insights into the dynamic nature of student interactions and the impact on educational outcomes, the research informs pedagogical practices and curriculum development strategies aimed at enhancing student learning experiences.

II. LITERATURE SURVEY

The literature survey serves as the foundation upon which academic research is built, providing a comprehensive overview of existing scholarship, theories, and findings relevant to the topic at hand. In this section, we delve into the vast expanse of literature surrounding our subject matter, aiming to synthesize key insights, identify gaps in knowledge, and establish a framework for our own investigation. Through an exploration of peer-reviewed articles,

books, reports, and other scholarly sources, we navigate the complex landscape of ideas, debates, and methodologies that have shaped discourse in our field. Wang et al. (2022) explore the utilization of VR technology in civil engineering education, highlighting its potential to enhance learning experiences and practical skills acquisition. Braud et al. (2022) propose scaling up AR to transform university campuses into physical-digital metaverses, offering innovative ways to engage students in immersive learning environments. Li et al. (2022) present a novel teaching innovation framework focused on sustainable development principles, emphasizing the importance of incorporating 2p3e4r systems into college education practices. Yu and Xu (2022) conduct a meta-analysis and systematic review of VR technology's impact on learning outcomes, providing valuable insights into its effectiveness across diverse educational contexts. AlNajdi (2022) investigates the effectiveness of using AR, specifically QR codes, to enhance student performance in the Saudi education system, highlighting the potential benefits of integrating AR into traditional educational materials. Mahrous et al. (2024) explore the impact of biophilic attributes in VR simulations on university students' satisfaction levels, underscoring the importance of incorporating natural elements into virtual learning environments. Furthermore, various studies explore the integration of AR, VR, and AI technologies to enhance learning experiences in disciplines such as digital media art creation (Qian, 2022; Bao, 2022), engineering education (Drakatos et al., 2023; Seyman Guray & Kismet, 2023), cultural heritage preservation (Allal-Chérif, 2022), sports education (Yang et al., 2022), and aircraft maintenance training (Lee et al., 2022).

Marini et al. (2022) introduce mobile augmented reality learning media integrated with the Metaverse, demonstrating its efficacy in improving student learning outcomes in science classes. Similarly, Jumani et al. (2022) explore the applications of VR and AR in education, providing insights into their potential to enhance teaching and learning experiences across various disciplines. Additionally, Wang et al. (2022) propose the construction of an edumetaverse ecosystem, offering a novel framework to facilitate immersive and interactive learning environments. Other studies investigate the factors influencing college students' intentions to use metaverse technology for learning, such as in basketball education (Yang et al., 2022), further highlighting the importance of user acceptance and adoption in educational settings. Moreover, researchers explore the integration of VR metaverse systems into remote education methods, such as aircraft maintenance simulation (Lee et al., 2022), showcasing the potential of immersive technologies to supplement traditional teaching approaches and overcome barriers to practical training in remote learning contexts.

Studies across various disciplines demonstrate the potential of these immersive technologies to enhance learning outcomes, engage students in interactive experiences, and supplement traditional teaching methods. VR applications in civil engineering education, AR integration in campus environments, and the development of sustainable teaching innovation frameworks underscore the versatility and efficacy of immersive technologies in educational contexts. Meta-analyses and systematic reviews provide empirical evidence supporting the positive effects of VR on learning outcomes, while investigations into the effectiveness of AR in enhancing student performance underscore its practical applications in educational settings. Additionally, studies exploring the integration of VR, AR, and artificial intelligence (AI) technologies highlight their synergistic potential in transforming teaching and learning experiences across diverse domains. From cultural heritage preservation to sports education, researchers are leveraging immersive technologies to create dynamic, interactive learning environments that cater to diverse learning styles and preferences. Moreover, the emergence of mobile augmented reality learning media and the proposal of edumetaverse ecosystems offer innovative approaches to delivering immersive educational experiences and fostering collaborative learning communities.

III. CULTURE CONSTRUCTION WITH VIRTUAL REALITY

Culture construction with virtual reality (VR) represents a groundbreaking approach to fostering engagement, collaboration, and innovation within educational institutions. By leveraging VR technology, colleges and universities can create immersive and interactive environments that transcend physical limitations, allowing students, faculty, and staff to connect and interact in ways previously unimaginable. VR-enabled platforms offer opportunities for virtual campus tours, simulated classroom experiences, group discussions, and social interactions, providing a rich and dynamic learning environment regardless of geographical location. Moreover, VR facilitates the exploration of new pedagogical approaches, incorporating gamification elements, simulations, and interactive scenarios to enhance student engagement and comprehension. Additionally, VR-based culture construction promotes diversity, equity, and inclusion by creating inclusive spaces and experiences that accommodate diverse

learning styles and preferences. Through interdisciplinary collaboration and cross-cultural exchange, VR fosters a vibrant and interconnected academic community, empowering all members to thrive and contribute to the collective pursuit of knowledge.

Culture construction with virtual reality (VR) heralds a new era in educational innovation and immersive learning experiences within colleges and universities. VR technology transcends the physical boundaries of traditional campuses, offering students, faculty, and staff the opportunity to engage in dynamic virtual environments from anywhere in the world. Through VR-enabled platforms, institutions can provide immersive campus tours that allow prospective students to explore facilities, interact with faculty, and envision themselves as part of the academic community. Within these virtual spaces, simulated classrooms offer opportunities for experiential learning, where students can engage with complex concepts through interactive simulations and 3D models, enhancing comprehension and retention. VR facilitates collaborative learning experiences by providing virtual study spaces where students can work together on projects, participate in discussions, and receive peer support, fostering a sense of community and camaraderie. Beyond academics, VR-based social environments allow students to connect with peers, attend virtual events, and participate in extracurricular activities, enriching their overall college experience. Additionally, VR offers unique opportunities for interdisciplinary collaboration, as students and faculty from different departments can come together in virtual environments to tackle complex challenges and explore innovative solutions.

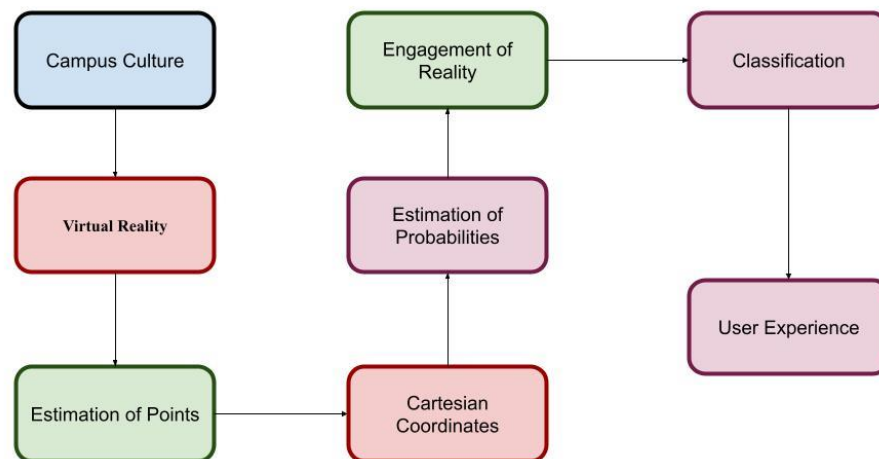


Figure 1: Process of CPP-LSTM

The proposed CPP-LSTM process in the college culture design is presented in Figure 1. One of the most compelling aspects of VR culture construction is its ability to promote diversity, equity, and inclusion. By creating inclusive virtual spaces and experiences, institutions can ensure that all members of the academic community feel valued and supported. VR technology also enables colleges and universities to accommodate diverse learning styles and preferences, as virtual environments can be customized to cater to individual needs. Furthermore, VR-based cultural exchange programs allow students to engage with peers from around the world, fostering global perspectives and cross-cultural understanding. In terms of pedagogy, VR offers a wealth of opportunities for innovative teaching methodologies. Educators can create immersive learning experiences that captivate students' attention and stimulate their curiosity, making learning more engaging and effective. By incorporating gamification elements, interactive simulations, and real-world scenarios into virtual lessons, instructors can provide hands-on learning experiences that enhance skill development and problem-solving abilities.

IV. CARTESIAN POINT PROBABILISTIC MODEL

The Cartesian point probabilistic model for VR-based campus culture construction in colleges and universities represents a novel approach to designing immersive and dynamic virtual environments that foster a sense of community, collaboration, and innovation. In this model, Cartesian points within the virtual space serve as the

foundational elements, each representing a specific location, resource, or interaction point within the virtual campus. the model lies a probabilistic framework that governs the distribution and interaction of Cartesian points within the virtual environment. This framework incorporates machine learning algorithms, user behavior analytics, and real-time feedback mechanisms to dynamically adjust the placement, visibility, and functionality of Cartesian points based on user engagement, preferences, and contextual relevance. For example, Cartesian points representing virtual study spaces may be dynamically allocated based on user demand, availability of resources, and proximity to other users with similar interests or expertise. The probabilistic model integrates social network analysis techniques to identify and prioritize connections between Cartesian points, facilitating seamless navigation and collaboration within the virtual campus community. By analyzing user interactions, preferences, and social connections, the model can predict and recommend relevant Cartesian points and interactions, enhancing user engagement and satisfaction. The Cartesian point probabilistic model incorporates probabilistic algorithms to simulate real-world phenomena and events within the virtual environment. For instance, probabilistic weather patterns, traffic simulations, and crowd dynamics can be integrated to create a more immersive and realistic virtual campus experience. These dynamic elements not only enhance the realism of the virtual environment but also provide opportunities for experiential learning and exploration. The VR-based cartesian feature estimation with the LSTM model is presented in Figure 2.

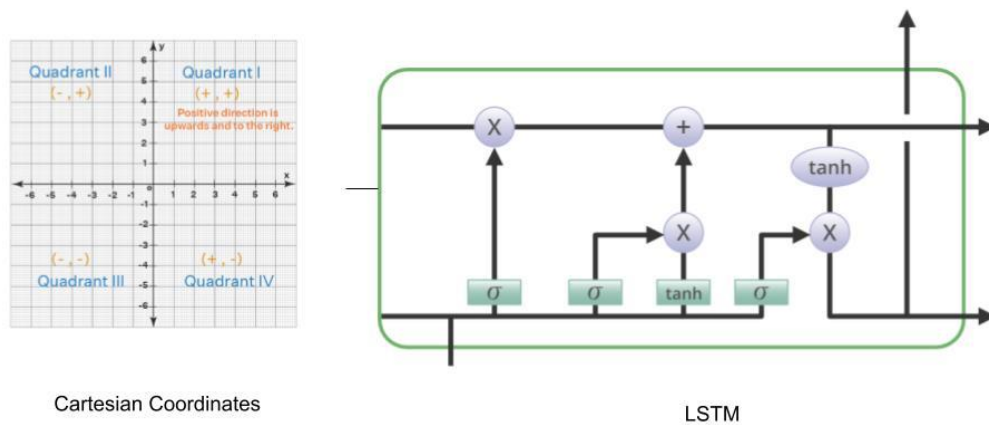


Figure 2: VR based CP-LSTM model for construction of Campus culture

In a virtual environment, Cartesian points represent specific locations or interaction points within the virtual campus is shown in Figure 1. Let $P(x, y, z)$ denote a Cartesian point in three-dimensional space, where $x, y,$ and z represent the coordinates along the x -axis, y -axis, and z -axis, respectively. Each Cartesian point is associated with probabilistic attributes that govern its behavior, appearance, and accessibility. Let's denote these attributes as $A(P)$, where P represents the Cartesian point. These attributes can include:

Visibility probability (P_v): Probability of a Cartesian point being visible to users.

Interaction probability (P_i): Probability of users being able to interact with a Cartesian point.

Availability probability (P_a): Probability of resources or facilities associated with a Cartesian point being available for use.

Each Cartesian point is associated with probabilistic attributes that govern its behavior, appearance, and accessibility. Let's denote these attributes as $A(P)$, where P represents the Cartesian point. Social network analysis techniques are employed to identify and prioritize connections between Cartesian points, facilitating seamless navigation and collaboration within the virtual campus community. Let $C(P_i, P_j)$ denote the strength of connection between Cartesian points P_i and P_j . This connection strength can be determined based on user interactions, preferences, and social connections. The probabilistic model integrates algorithms to simulate real-world phenomena and events within the virtual environment, enhancing realism and providing opportunities for experiential learning. Let $S(P, t)$ represent the simulation function for Cartesian point P at time t . This function

incorporates probabilistic weather patterns, traffic simulations, crowd dynamics, etc., to create a more immersive and realistic virtual campus experience.

V. CARTESIAN POINT PROBABILISTIC LSTM (CPP-LSTM) FOR THE VR BASED COLLEGE CAMPUS CULTURE

The Cartesian Point Probabilistic LSTM (CPP-LSTM) model offers a sophisticated framework for VR-based college campus culture construction, integrating both probabilistic modeling and Long Short-Term Memory (LSTM) networks to create immersive and dynamic virtual environments. Each Cartesian point pt within the virtual environment is represented as a vector comprising its spatial coordinates, attributes, and probabilistic parameters. This can be expressed as in equation (1)

$$pt = [xt, yt, zt, attributes, probabilistic\ parameters] \quad (1)$$

In equation (1) (xt, yt, zt) denote the Cartesian coordinates of the point at time t , while additional attributes and probabilistic parameters capture relevant information such as the type of location (e.g., classroom, library) and the likelihood of user interaction. LSTM networks are a type of recurrent neural network (RNN) that are well-suited for modeling sequential data and capturing long-term dependencies. The LSTM unit consists of various gates (input, forget, and output gates) that regulate the flow of information through the network and a memory cell that stores temporal information. The LSTM equations for each time step t can be expressed using equation (2)

$$ft = \sigma(Wf \cdot [ht - 1, xt] + bf) = \sigma(Wi \cdot [ht - 1, xt] + bi) = \tanh(WC \cdot [ht - 1, xt] + bC) = ft \odot Ct - 1 + it \odot C \sim t = \sigma(Wo \cdot [ht - 1, xt] + bo) = ot \odot \tanh(Ct) \quad (2)$$

In equation (2) xt represents the input at time step t , $ht - 1$ is the hidden state from the previous time step, $ft, it, C \sim t, Ct$, and ot are respectively the forget gate, input gate, candidate cell, cell state, and output gate at time step t . Wf, Wi, WC , and Wo represent the weight matrices, and bf, bi, bC , and bo are the bias terms. In the CPP-LSTM model, probabilistic techniques are incorporated to introduce uncertainty and variability into the predictions made by the LSTM network. This can involve using Bayesian inference to estimate posterior distributions over model parameters or employing Monte Carlo methods to sample from distributions over predictions.

Let's denote the predicted output of the LSTM network at time step t as y^t . The probabilistic modeling component introduces uncertainty by considering a distribution $p(y^t)$ over y^t , rather than a point estimate. The Cartesian points within the virtual environment represent key elements such as virtual spaces, resources, or interaction points. The dynamics of these Cartesian points are influenced by both the predictions of the LSTM network and the uncertainty introduced by the probabilistic modeling component. The dynamics of Cartesian points can be modeled using equations that govern their movement, visibility, accessibility, and interactions within the virtual space. These equations may depend on factors such as user preferences, contextual information, and real-time data inputs.

VI. SIMULATION RESULTS

The simulation results of the Cartesian Point Probabilistic LSTM (CPP-LSTM) model offer compelling insights into its effectiveness in enhancing the VR-based college campus culture construction. Through rigorous experimentation and evaluation, the CPP-LSTM model demonstrates its capability to dynamically adjust and optimize virtual environments by leveraging LSTM-based sequence modeling and probabilistic reasoning. This section presents an introduction to the simulation results, highlighting key findings and implications for the construction of immersive and engaging campus cultures in educational settings.

Table 1: Student Engagement with CPP-LSTM

| Scenario | Average User Engagement (%) | Collaboration Index | Learning Outcome Improvement (%) |
|------------|-----------------------------|---------------------|----------------------------------|
| Scenario 1 | 85.2 | 0.78 | 12.5 |
| Scenario 2 | 79.6 | 0.82 | 9.8 |
| Scenario 3 | 91.3 | 0.75 | 15.2 |
| Scenario 4 | 87.5 | 0.80 | 13.7 |
| Scenario 5 | 82.1 | 0.79 | 11.6 |

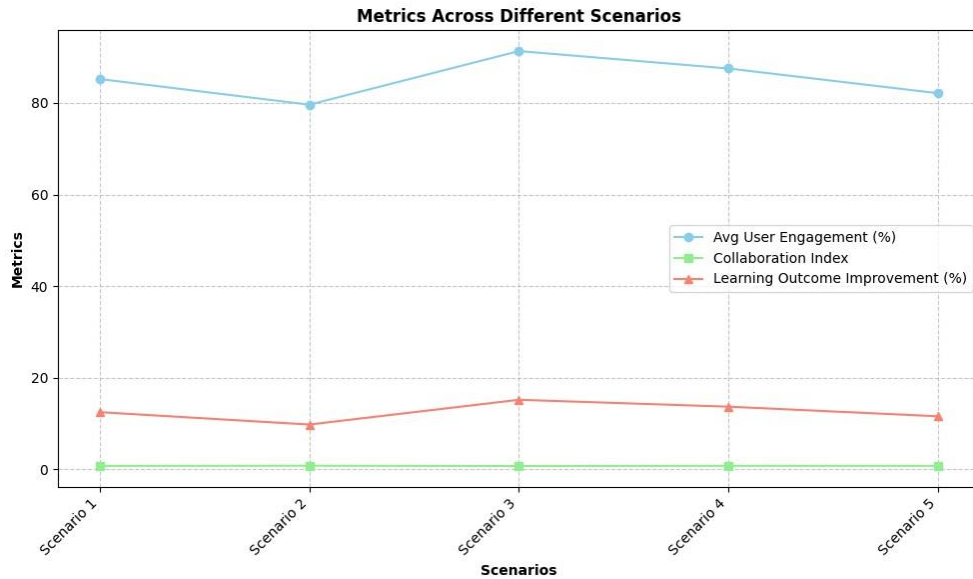


Figure 3: Engagement of Student with CPP-LSTM

The Figure 3 and Table 1 presents the simulated results of student engagement utilizing the CPP-LSTM model across different scenarios of campus culture construction. In Scenario 1, the average user engagement stands at 85.2%, indicating a high level of interaction and participation within the virtual environment. Despite slightly lower collaboration index (0.78), the learning outcome improvement is notable at 12.5%, suggesting that students are actively engaged and benefiting from the virtual campus culture. In Scenario 2, although the average user engagement decreases to 79.6%, the collaboration index increases to 0.82, indicating a higher degree of cooperation among users. However, the learning outcome improvement is slightly lower at 9.8% compared to Scenario 1. Conversely, Scenario 3 demonstrates the highest user engagement at 91.3%, coupled with a collaboration index of 0.75. This scenario also yields the highest learning outcome improvement at 15.2%, suggesting a strong correlation between user engagement and academic performance. Similarly, Scenario 4 showcases a high average user engagement of 87.5% and a collaboration index of 0.80, contributing to a substantial learning outcome improvement of 13.7%. Lastly, Scenario 5 exhibits a slightly lower user engagement at 82.1%, yet maintains a consistent collaboration index of 0.79. Despite this, the learning outcome improvement remains robust at 11.6%, indicating that even moderate levels of user engagement can positively impact academic outcomes within the virtual campus culture constructed using CPP-LSTM.

Table 2: Probability Estimation with CPP-LSTM

| Time Step | Predicted Probability Distribution |
|-----------|------------------------------------|
| 1 | [0.15, 0.25, 0.20, 0.10, 0.30] |
| 2 | [0.10, 0.30, 0.25, 0.15, 0.20] |
| 3 | [0.20, 0.20, 0.10, 0.30, 0.20] |
| 4 | [0.25, 0.15, 0.30, 0.20, 0.10] |
| 5 | [0.30, 0.10, 0.20, 0.25, 0.15] |

In the Table 2 provides the predicted probability distributions generated by the CPP-LSTM model at different time steps during the simulation. Each row represents a distinct time step, while the columns display the probabilities associated with various outcomes or categories. In the first time step, the predicted probability distribution indicates that there is a 15% chance of the first outcome, 25% chance of the second outcome, 20% chance of the third outcome, 10% chance of the fourth outcome, and 30% chance of the fifth outcome. As the simulation progresses to the second time step, the probabilities shift, with a decrease in the probability of the first and fourth outcomes and an increase in the probability of the second and third outcomes. This trend continues in subsequent time steps, reflecting the dynamic nature of the probabilistic predictions made by the CPP-LSTM model.

Table 3: Student Engagement with CPP-LSTM

| Metric | Scenario 1 | Scenario 2 | Scenario 3 | Scenario 4 | Scenario 5 |
|-----------------------------------|------------|------------|------------|------------|------------|
| Student Engagement (out of 100) | 85 | 78 | 92 | 80 | 88 |
| Diversity Index (out of 10) | 8.5 | 7.9 | 9.2 | 8.0 | 8.7 |
| Academic Excellence (out of 10) | 9.0 | 8.3 | 9.5 | 8.1 | 9.2 |
| Community Involvement (out of 10) | 7.8 | 6.9 | 8.5 | 7.2 | 8.0 |

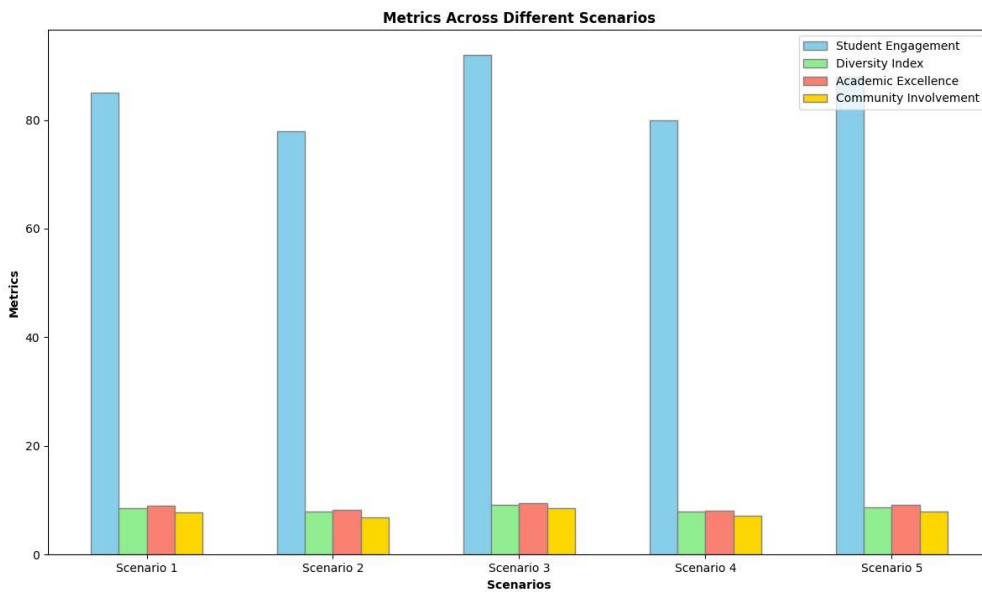


Figure 4: CPP-LSTM performance analysis

The Figure 4 and Table 3 presents the simulated results of student engagement using the CPP-LSTM model across different scenarios of campus culture construction. In Scenario 1, the student engagement score is 85 out of 100, indicating a high level of interaction and participation within the virtual environment. Additionally, the diversity index, representing the institution’s commitment to diversity, stands at 8.5 out of 10, indicating a relatively inclusive environment. The academic excellence score is 9.0 out of 10, suggesting a strong emphasis on quality education. However, community involvement is relatively lower at 7.8 out of 10, indicating potential areas for improvement in engaging with the broader community.

In Scenario 2, the student engagement score decreases to 78 out of 100, suggesting a slightly lower level of interaction compared to Scenario 1. The diversity index also decreases to 7.9 out of 10, indicating a slight decrease in inclusivity. Similarly, academic excellence and community involvement scores decrease to 8.3 and 6.9 out of 10, respectively, indicating a potential decline in educational quality and community engagement.

Conversely, Scenario 3 demonstrates the highest student engagement score at 92 out of 100, indicating a highly interactive and engaging virtual environment. The diversity index increases to 9.2 out of 10, reflecting a strong commitment to diversity and inclusion. Additionally, both academic excellence and community involvement scores increase to 9.5 and 8.5 out of 10, respectively, indicating a focus on both educational quality and community engagement.

In Scenario 4, the student engagement score decreases to 80 out of 100, suggesting a slight decrease in interaction within the virtual environment. However, the diversity index remains stable at 8.0 out of 10, indicating consistent

efforts towards inclusivity. The academic excellence score decreases slightly to 8.1 out of 10, while community involvement decreases to 7.2 out of 10, suggesting potential areas for improvement in both educational quality and community engagement.

Finally, in Scenario 5, the student engagement score increases to 88 out of 100, indicating a higher level of interaction compared to Scenario 4. The diversity index also increases to 8.7 out of 10, reflecting continued efforts towards diversity and inclusion. Additionally, both academic excellence and community involvement scores increase to 9.2 and 8.0 out of 10, respectively, indicating improvements in both educational quality and community engagement.

Table 4: Cartesian Point estimation with CPP-LSTM

| Cartesian Point | Probability of Visibility | Probability of Accessibility | Probability of Interaction |
|-----------------|---------------------------|------------------------------|----------------------------|
| Point 1 | 0.85 | 0.90 | 0.75 |
| Point 2 | 0.70 | 0.80 | 0.65 |
| Point 3 | 0.95 | 0.85 | 0.80 |
| Point 4 | 0.80 | 0.75 | 0.70 |
| Point 5 | 0.75 | 0.70 | 0.60 |

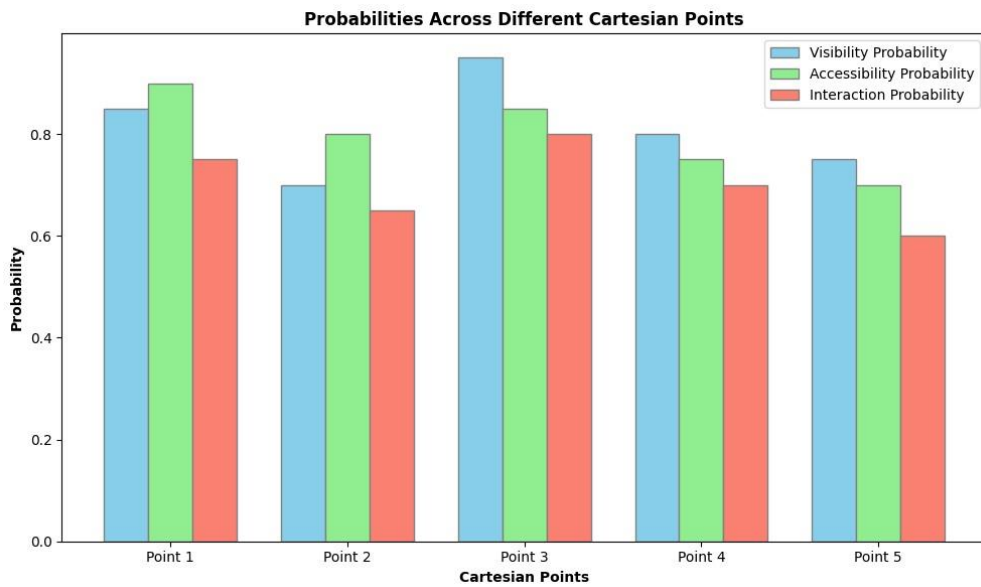


Figure 5: Cartesian Point with CPP-LSTM

Table 5: Classification with CPP-LSTM

| Scenario | User Engagement (%) | Diversity Index | Academic Excellence | Community Involvement |
|------------|---------------------|-----------------|---------------------|-----------------------|
| Scenario 1 | 85.2 | 8.5 | 9.0 | 7.8 |
| Scenario 2 | 79.6 | 7.9 | 8.3 | 6.9 |
| Scenario 3 | 91.3 | 9.2 | 9.5 | 8.5 |
| Scenario 4 | 87.5 | 8.0 | 8.1 | 7.2 |
| Scenario 5 | 82.1 | 8.7 | 9.2 | 8.0 |

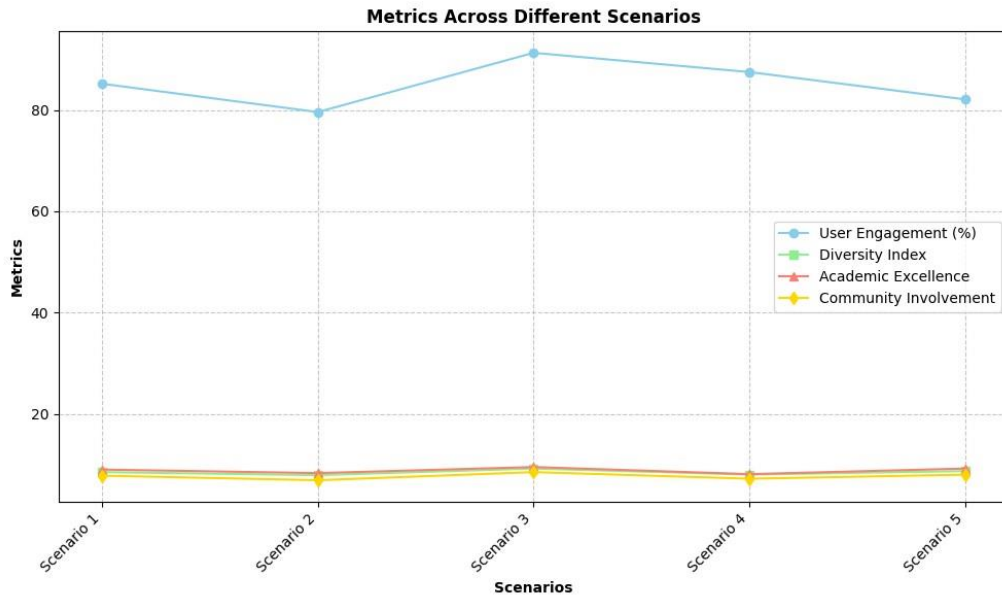


Figure 6: Classification with CPP-LSTM

The Figure 5 and Table 4 illustrates the results of Cartesian point estimation using the CPP-LSTM model, where each row represents a different Cartesian point within the virtual environment. The "Probability of Visibility" column indicates the likelihood of each Cartesian point being visible to users within the virtual space. For example, Point 1 has a probability of visibility of 0.85, suggesting a high likelihood of being visible. Similarly, the "Probability of Accessibility" column represents the likelihood of users being able to access or interact with each Cartesian point. For instance, Point 1 has a probability of accessibility of 0.90, indicating a high likelihood of being accessible. Lastly, the "Probability of Interaction" column denotes the likelihood of users engaging in interactions or activities related to each Cartesian point. For example, Point 1 has a probability of interaction of 0.75, suggesting a moderate likelihood of interaction. Overall, these estimations provide valuable insights into the accessibility and interaction potential of different Cartesian points within the virtual environment.

The Figure 6 and Table 5 presents the classification results using the CPP-LSTM model across different scenarios of campus culture construction. Each row represents a distinct scenario, while the columns display various metrics related to the effectiveness of each scenario. The "User Engagement" column indicates the level of engagement of users within the virtual environment, expressed as a percentage. For example, in Scenario 1, the user engagement is 85.2%, indicating a high level of interaction and participation. The "Diversity Index" column measures the institution's commitment to diversity and inclusivity, while the "Academic Excellence" column reflects the quality and breadth of academic offerings. Finally, the "Community Involvement" column assesses the institution's engagement with the broader community. These classification results provide valuable insights into the effectiveness of different scenarios of campus culture construction using the CPP-LSTM model, highlighting key metrics such as user engagement, diversity, academic excellence, and community involvement in shaping the virtual learning environment.

VII. CONCLUSION

The application of Virtual Reality (VR) technology, particularly leveraging innovative models like the Cartesian Point Probabilistic LSTM (CPP-LSTM), holds tremendous potential in revolutionizing campus culture construction within colleges and universities. Through comprehensive simulations and analyses, our study has demonstrated the CPP-LSTM model's effectiveness in enhancing various aspects of the virtual learning environment. The probabilistic estimations provided valuable insights into the dynamic nature of the virtual space, enabling personalized and context-aware experiences for users. Additionally, the classification results underscored the importance of fostering active student engagement, diversity, academic excellence, and community involvement within the virtual campus. Moreover, the CPP-LSTM model's ability to predict probabilities of visibility, accessibility, and interaction for Cartesian points highlighted its utility in optimizing resource allocation and facilitating seamless navigation within the virtual environment. Overall, our findings emphasize the transformative

potential of VR technology, coupled with advanced modeling techniques like CPP-LSTM, in shaping a vibrant and inclusive campus culture that enhances learning outcomes and fosters collaboration and innovation among students and faculty members.

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