- **Output:** The output can be experienced in various forms like visual outputs, including moving of cursor on the screen or changing of channel, audio outputs may change the volume of a device, etc.

Real-Time Rendering

Real-time rendering is a field of computer graphics focused on analyzing and producing images in real-time. Metaverse video game platform uses real-time rendering for metaverse avatars, because of avatar realistic-ness. 3D rendering is the process of producing an image based on three-dimensional data stored on our computer. It's also considered to be a creative process, much like photography or cinematography, because it makes use of light and ultimately produces images. With 3D rendering, computer graphics convert 3D wireframe models into 2D images with 3D photorealistic, or as close to reality, effects. Rendering can take from seconds to even days for a single image or frame [34].

IV. EXPLANATION, FEATURES, AND FRAMEWORK OF THE METAVERSE IN EDUCATION

A. Definition of the metaverse in education

In the last few decades, the study sector has undergone effective changes. Resembling the motion with the rapidly evolving technological environment and educators have also elevated their education systems, from word-of-mouth illustrations and blackboard drawings or designs to digital intellectual classes. Today's lectureship practices aim only at students' lessons and focus on making a fascinating and immersive situation where they can get concepts better. Many educators and researchers introduced providing various future agendas and effectuation scenarios in their educational practices and increasing interest in the educational landscape may stalk from a mass range of possibilities together with the virtual space that offers real-like representations of interest that possibly enhance the social view of teaching and knowing. However, the term is comparatively new and there is a need to test the state-of-the-art exploration of Metaverse and this is where this learning steps into. Fairly speaking, the metaverse will qualify many students to become fully immersive multimedia environments that leverage both the anatomical and numeral worlds. For example, in a geometry class, students might know geometric equations by watching and manipulating geometric shapes in a VR sphere whilst at the same time hearing an expert mathematician provide context and lead. Education will become more decentralized and metaverse programs will go out as students increasingly seek immersive, interactive, and monumental online learning environments. Virtual education activities will increasingly involve game mechanics and game design elements, such as competition, points, and rewards. As gamified elements become more immersive and fascinating, they are likely to become more exoteric with children and young society. One instance is Virtual Reality (VR) and which enables the source of immersive learning experiences that can help raise student realization of a subject and also enables users with VR headsets to become involved in an array of real-world or fictional environments. Another radical metaverse technology is Augmented Reality (AR). With AR, one can overlay images, videos, and sounds onto an existing environment to "augment" a real-world continuity. A transformative third associated with metaverse technology is artificial intelligence (AI). Artificial intelligence enables computers to make tasks commonly associated with human knowledgeable processes and it creates dramatic variation in the workplace, as computers replace human labor, however, AI in the study has been largely limited to teaching software that purpose to make curriculum amendment more individualized for students. The most important benefit of the metaverse is that it allows the community to put in with one another while obeying online practical medical courses, unlike the current one-way study. Healthcare will fulfill it in medical learning for simulation education rather than learning dissemination. For instance, advanced skills and interactions need extra technology in metaverse-based medical education, to be successful. Surgery, for example, requires not just an understanding of the metaverse but also the use of instruments that need skillful very strong abilities.

B. Metaverse's applications in education

Metaverse is doing outstanding in the educational domain, also educational ultra-digital revolution started with the metaverse. It starts with making a digital identity instead of a physical identity, it's doing all the educational activities like a real offline world. In this section, we are going to explain the applications of a metaverse in Fig. 7.

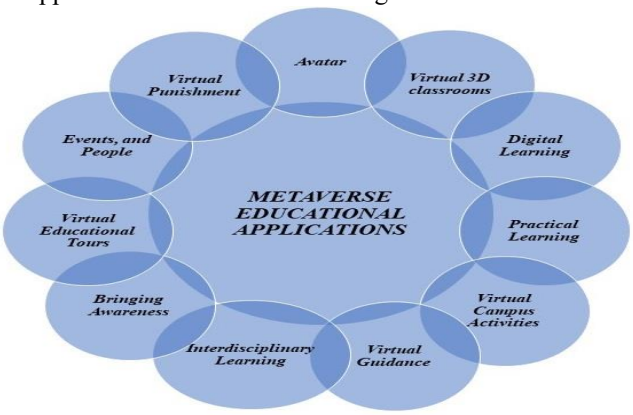

Fig. 7. Metaverse educational applications

Avatar

Avatars are virtual representations of a person or a physical object. You are not limited by the environment, a particular region, or any feature of physicality. A metaverse avatar gives you the ability to look however you want in any environment [35]. On the metaverse, there are two types of avatars, full body avatars, and VR avatars. Building a user avatar for an institutional primary requirement for the metaverse education process to start the learning or teaching process [36].

Virtual 3D classrooms

Through eLearning, education may be facilitated whenever and anywhere. However, the advantages of traditional classrooms cannot be equaled or duplicated in a distance learning setting. This gap between actual and virtual schools can only be filled by a virtual 3D classroom or Metaverse. The students can create their virtual personas and participate in class with other students in a 3D virtual

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