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Description automatically generated **ISO/IEC JTC 1/SC 29/WG 2 N364**

**ISO/IEC JTC 1/SC 29/WG 2  
MPEG Technical Requirements   
Convenorship: SFS (Finland)**

**Document type:** Output Document

**Title:** Use Cases for AI-based Point Cloud Coding

**Status:** Approved

**Date of document:** 2024-04-26

**Source:** ISO/IEC JTC 1/SC 29/WG 2

**Expected action:** None

**Action due date:** None

**No. of pages:** 3 (with cover page)

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**Committee URL:** <https://sd.iso.org/documents/ui/#!/browse/iso/iso-iec-jtc-1/iso-iec-jtc-1-sc-29/iso-iec-jtc-1-sc-29-wg-2>

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**MPEG TECHNICAL REQUIREMENTS**

**ISO/IEC JTC 1/SC 29/WG 2 N364**

**Rennes, France, April 2024**

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| **Title** | **Use Cases for AI-based Point Cloud Coding** |
| **Source** | **WG2, MPEG Technical Requirements** |
| **Status** | **Approved** |
| **Serial Number** | **23874** |

# Use Cases

This section outlines the use cases addressed within the CfP. The primary use cases identified are Immersive Technologies, characterized by dense point clouds capturing rich details, and Autonomous Navigation and Robotics, represented by sparse point clouds. These use cases will be detailed in the next subsections.

## C1: Dense Point Clouds for Immersive Applications

Dense point clouds denote representations captured with sufficient density to provide realistic rendering suitable for human viewing in immersive applications.

### Extended Reality (XR)

XR encompasses all immersive technologies, including Virtual Reality (VR), Augmented Reality (AR), Mixed Reality (MR), and any other technology that blends the physical and virtual worlds, altering or enhancing our perception of reality. In this context, point clouds serve as a foundational element for XR experiences by providing accurate spatial information, enabling realistic interactions between digital and physical worlds, and enhancing the overall immersive quality of these technologies. They can serve, for instance, as valuable documentation tools for preserving cultural heritage, offer accessibility to individuals who might not have the opportunity to visit physical locations, provide educational opportunities and enable highly immersive exhibits.

### Gaming

Gaming refers to the activity or process of playing electronic games, typically through various platforms such as consoles, computers, mobile devices, or dedicated gaming systems. Graphical content holds substantial importance in gaming for several reasons, like immersive experience, visual appeal, gameplay clarity, storytelling, and atmosphere. Incorporating point cloud data into game environments allows for highly detailed and realistic representations of real-world locations. This level of detail can significantly enhance the visual fidelity and authenticity of in-game environments for deeper immersive experiences.

## C2: Sparse Point Clouds for Autonomous Navigation and Robotics

Sparse point clouds represent data captured by spinning LiDAR sensors at larger intervals, resulting in a less detailed depiction of objects or scenes. This format is well-suited for Autonomous Navigation and Robotics, encompassing both indoor and outdoor scenarios.

### Autonomous Navigation

Autonomous navigation refers to the ability of a system, typically a vehicle or a robot, to move through its environment without direct human intervention. This capability involves perceiving the surroundings, making decisions, planning path, and controlling movement to reach a destination or perform tasks autonomously. Point clouds play a crucial role in autonomous navigation for several reasons, that include environment perception, obstacle detection and avoidance, mapping, and localization.

## Building Information Modeling (BIM)

Building information modeling (BIM), refers to the 3D modeling of an asset's geometric design. BIM work may be undertaken by professional disciplines such as architectural, structural, and MEP (mechanical, electrical & plumbing), and the use of 3D models enhances coordination and collaboration between disciplines. A 3D model represented by a point cloud of the building or facility can be captured via laser scanning technology. However, the CfP does not provide BIM data for testing while it can be potentially applied.