CLAIMS

What is Claimed:

1. A method for decoding point cloud data organized in a tree structure, the method comprising:

accessing the point cloud data from an encoded bitstream by traversing the tree structure, wherein the tree structure comprises a root node and a plurality of child nodes;

fetching, from the accessed point cloud data, points in a spatial neighborhood associated with one of the plurality of child nodes;

computing a first feature, using a point-based neural network module, from a three-dimensional (3D) point set associated with the fetched points, wherein the first feature computed using the point-based neural network module summarizes intricate details of the spatial neighborhood of the fetched points;

computing a second feature, using a convolution-based neural network module, from voxelized point data representing the fetched points, wherein the second feature computed using the convolution-based neural network module summarizes large smooth surfaces of the spatial neighborhood of the fetched points;

concatenating the first feature and the second feature with one or more known features of the one of the plurality of child nodes to compose a comprehensive feature;

predicting, using a neural network module, an occupancy symbol distribution for the one of the plurality of child nodes based on the comprehensive feature; and

determining, from the encoded bitstream, an occupancy for the one of the plurality of child nodes based on the predicted occupancy symbol distribution.

2. The method of claim 1, wherein the second feature is computed using the point-based neural network module by: generating, from the fetched points, a plurality of abstracted point sets, each of the plurality of abstracted point sets having different abstraction levels; and concatenating each of the plurality of abstracted point sets with each other.

3. The method of claim 1, wherein the first feature is computed using the point-based neural network module by: extracting a plurality of features from the fetched points using different scales and using a same abstraction level; and combining the extracted features.

4. The method of claim 1, further comprising predicting the occupancy symbol distribution for the one of the plurality of child nodes based on information associated with at least one another one of the plurality of child nodes related to the one of the plurality of child nodes or the root node.

5. The method of claim 1, wherein the tree structure is one of an octree, a quadtree, a quadtree plus binary tree (QTBT), or a kth dimensional (KD) tree.

6. The method of claim 1, wherein the one or more known features of the one of the plurality of child nodes at least include a three-dimensional (3D) location of the one of the plurality of child nodes and a depth level of the one of the plurality of child nodes in the tree structure.

7. A decoding device for decoding point cloud data organized in a tree structure, the decoding device comprising a processor configured to:

access the point cloud data from an encoded bitstream by traversing the tree structure, wherein the tree structure comprises a root node and a plurality of child nodes;

fetch, from the accessed point cloud data, points in a spatial neighborhood associated with one of the plurality of child nodes;

compute a first feature, using a point-based neural network module, from a three-dimensional (3D) point set associated with the fetched points, wherein the first feature computed using the point-based neural network module summarizes intricate details of the spatial neighborhood of the fetched points;

compute a second feature, using a convolution-based neural network module, from voxelized point data representing the fetched points, wherein the second feature computed using the convolution-based neural network module summarizes large smooth surfaces of the spatial neighborhood of the fetched points;

concatenate the first feature and the second feature with one or more known features of the one of the plurality of child nodes to compose a comprehensive feature;

predict, using a neural network module, an occupancy symbol distribution for the one of the plurality of child nodes based on the comprehensive feature; and

determine, from the encoded bitstream, an occupancy for the one of the plurality of child nodes based on the predicted occupancy symbol distribution.

8. The decoding device of claim 7, wherein the second feature is computed using the point-based neural network module by: generating, from the fetched points, a plurality of abstracted point sets, each of the plurality of abstracted point sets having different abstraction levels; and concatenating each of the plurality of abstracted point sets with each other.

9. The decoding device of claim 7, wherein the first feature is computed using the point-based neural network module by: extracting a plurality of features from the fetched points using different scales and using a same abstraction level; and combining the extracted features.

10. The decoding device of claim 7, further comprising predicting the occupancy symbol distribution for the one of the plurality of child nodes based on information associated with at least one of another one of the plurality of child nodes related to the one of the plurality of child nodes or the root node.

11. The decoding device of claim 7, wherein the tree structure is one of an octree, a quadtree, a quadtree plus binary tree (QTBT), or a kth dimensional (KD) tree.

12. The decoding device of claim 7, wherein the one or more known features of the one of the plurality of child nodes at least include a three-dimensional (3D) location of the one of the plurality of child nodes and a depth level of the one of the plurality of child nodes in the tree structure.