

What is claimed is:

1. A lesion detection method, comprising:

obtaining a first image comprising a plurality of sample slices, the first image being a three-dimensional image comprising an X axis dimension, a Y axis dimension, and a Z axis dimension;

performing feature extraction on the first image, to generate a first feature graph comprising a feature and a position of a lesion; the first feature graph comprising a three-dimensional feature comprising an X axis dimension, a Y axis dimension, and a Z axis dimension;

performing dimension reduction processing on the feature comprised in the first feature graph, to generate a second feature graph; the second feature graph comprising a two-dimensional feature of the X axis dimension and the Y axis dimension; and

detecting the second feature graph, to obtain a position of each lesion in the second feature graph and a confidence score corresponding to the position.

2. The method according to claim 1, wherein obtaining the first image comprising the plurality of sample slices comprises:

resampling an obtained CT image of a patient at a first sampling interval, to generate the first image comprising the plurality of sample slices.

3. The method according to claim 1, wherein performing feature extraction on the first image, to generate the first feature graph comprising the feature and the position of the lesion, comprises:

downsampling the first image by means of a first neural network, to generate a third feature graph;

downsampling the third feature graph by means of a residual module of a second neural network, to generate a fourth feature graph;

extracting features of lesions having different dimensions in the fourth feature graph by means of a DenseASPP module of the second neural network;

after processing by the DenseASPP module, generating a fourth preset feature graph having a same resolution ratio as the fourth feature graph, and upsampling the feature graph processed by the DenseASPP module by means of a deconvolutional layer and the residual module of the second neural network, to generate a third preset feature graph having a same resolution ratio as the third feature graph; and

fusing the third feature graph and the third preset feature graph, to generate a first feature graph having a same resolution ratio as the third preset feature graph, and fusing the fourth feature graph and the fourth preset feature graph, to generate a second feature graph having a same resolution ratio as the fourth preset feature graph; the third preset feature graph and the fourth preset feature graph respectively comprising the position of the lesion; and the position of the lesion being used for generating the position of the lesion in the first feature graph.

4. The method according to claim 1, wherein performing feature extraction on the first image, to generate the first feature graph comprising the feature and the position of the lesion, comprises:

downsampling the first image by means of a residual module of a second neural network, to generate a fourth feature graph;

extracting features of lesions having different dimensions in the fourth feature graph by means of a DenseASPP module of the second neural network;

after processing by the DenseASPP module, upsampling the feature graph processed by the DenseASPP module by means of a deconvolutional layer and the residual module of the second

neural network, to generate a first preset feature graph having a same resolution ratio as the first image; and

fusing the first image and the first preset feature graph, to generate the first feature graph having a same resolution ratio as the first preset feature graph; the first preset feature graph comprising the position of the lesion; and the position of the lesion being used for generating the position of the lesion in the first feature graph.

5. The method according to claim 1, wherein performing feature extraction on the first image, to generate the first feature graph comprising the feature and the position of the lesion, comprises:

downsampling the first image by means of a first neural network, to generate a third feature graph having the resolution ratio less than the first image;

downsampling the third feature graph by means of a residual module of a second neural network, to generate a fourth feature graph;

downsampling the fourth feature graph by means of the residual module of the second neural network, to generate a fifth feature graph having a resolution ratio less than the fourth feature graph;

extracting features of lesions having different dimensions in the fifth feature graph by means of a DenseASPP module of the second neural network;

after processing by the DenseASPP module, generating a fifth preset feature graph having a same resolution ratio as the fifth feature graph, and upsampling the feature graph processed by the DenseASPP module by means of a deconvolutional layer and the residual module of the second neural network, to generate a fourth preset feature graph having a same resolution ratio as the fourth feature graph; or upsampling the feature graph processed by the DenseASPP module by means of the deconvolutional layer and the residual module of the second neural network, to generate a third preset feature graph having a same resolution ratio as the third feature graph; and

fusing the third feature graph and the third preset feature graph, to generate the first feature graph having a same resolution ratio as the third preset feature graph; fusing the fourth feature graph and the fourth preset feature graph, to generate the first feature graph having a same resolution ratio as the fourth preset feature graph; and fusing the fifth feature graph and the fifth preset feature graph, to generate the first feature graph having a same resolution ratio as the fifth preset feature graph; the third preset feature graph, the fourth preset feature graph, and the fifth preset feature graph respectively comprising the position of the lesion; and the position of the lesion being used for generating the position of the lesion in the first feature graph.

6. The method according to claim 3 or 5, wherein

the first neural network comprises: a convolutional layer and a residual module cascaded with the convolutional layer; and

the second neural network comprises: a 3D U-Net network; the 3D U-Net network comprises: a convolutional layer, the deconvolutional layer, the residual module, and the DenseASPP module.

7. The method according to claim 5 or 6, wherein

the second neural network is a plurality of stacked 3D U-Net networks.

8. The method according to claim 5 or 6, wherein

the residual module comprises: a convolutional layer, a batch normalization layer, a ReLU activation function, and a maximum pooling layer.

9. The method according to claim 1, wherein performing dimension reduction processing on the feature comprised in the first feature graph, to generate the second feature graph, comprises:

respectively combining a channel dimension and Z axis dimension of each feature in all features of the first feature graph, so that the dimension of each feature in all features of the first feature graph consists of the X axis dimension and the Y axis dimension; wherein the first feature graph with the dimension of each feature in all the features consisting of the X axis dimension and the Y axis dimension is the second feature graph.

10. The method according to claim 1, wherein detecting the second feature graph comprises: detecting the second feature graph by means of a first detection sub-network, to obtain a coordinate of the position of each lesion in the second feature graph by means of detection; and detecting the second feature graph by means of a second detection sub-network, to obtain a confidence score corresponding to each lesion in the second feature graph by means of detection.

11. The method according to claim 10, wherein the first detection sub-network comprises: a plurality of convolutional layers, each of the plurality of convolutional layers being connected to a ReLU activation function; and the second detection sub-network comprises: a plurality of convolutional layers, each of the plurality of convolutional layers being connected to a ReLU activation function.

12. The method according to any one of claims 1, 2, 3, 5, 6, 7, 8, 9, 10, and 11, before performing feature extraction on the first image, to generate the first feature graph comprising the feature and the position of the lesion, further comprising:

inputting a pre-stored three-dimensional image comprising a plurality of lesion annotations into the first neural network; the lesion annotations being used for annotation of the lesions; and using a gradient descent method to respectively train each parameter of the first neural network, the second neural network, the first detection sub-network, and the second detection sub-network, wherein the position of each lesion in the plurality of lesions are output by the first detection sub-network.

13. The method according to any one of claims 1, 2, 4, 7, 9, 10, and 11, before performing feature extraction on the first image, to generate the first feature graph comprising the feature and the position of the lesion, further comprising:

inputting a three-dimensional image comprising a plurality of lesion annotations into the second neural network; the lesion annotations being used for annotation of the lesions; and using a gradient descent method to respectively train each parameter of the second neural network, the first detection sub-network, and the second detection sub-network, wherein the position of each lesion in the plurality of lesions is output by the first detection sub-network.

14. A lesion detection apparatus, comprising:

an obtaining unit, configured to obtain a first image comprising a plurality of sample slices, the first image being a three-dimensional image comprising an X axis dimension, a Y axis dimension, and a Z axis dimension;

a first generation unit, configured to perform feature extraction on the first image, to generate a first feature graph comprising a feature and a position of a lesion; the first feature graph comprising a three-dimensional feature comprising an X axis dimension, a Y axis dimension, and a Z axis dimension;

a second generation unit, configured to perform dimension reduction processing on the feature comprised in the first feature graph, to generate a second feature graph; the second feature graph comprising a two-dimensional feature of the X axis dimension and the Y axis dimension; and

a detection unit, configured to detect the second feature graph, to obtain a position of each lesion in the second feature graph and a confidence score corresponding to the position.

15. A lesion detection device, comprising: a display, a memory, and a processor coupled with the memory, wherein the display is configured to display a position of a lesion and a confidence score corresponding to the position, the memory is configured to store application program codes, and the processor is configured to invoke the program codes, to execute the lesion detection method according to any one of claims 1 to 13.

16. A computer readable storage medium, wherein the computer storage medium stores a computer program, the computer program comprises program instructions, and when the program instructions are executed by a processor, the processor executes the lesion detection method according to any one of claims 1 to 13.

17. A computer program, comprising computer readable codes, wherein when the computer readable codes run in an electronic device, a processor in the electronic device executes the lesion detection method according to any one of claims 1 to 13.