CLAIMS

What is claimed is:

1. A method of generating thin slice images from thick slice images, the method comprising:

receiving a first image having a first resolution at a neural network;

performing a convolution on the first image with the neural network;

performing a non-linear activation function on the first image with the neural network;

repeating the convolution and non-linear activation function;

generating a residual based on the convolution; and

summing the residual and the first image with the neural network to generate a second image having a second resolution, wherein the second resolution is higher than the first resolution.

2. The method of claim 1, wherein the performing the convolution and performing the non-linear activation function are performed and repeated in a plurality of layers of the neural network, wherein the first image is an input of a first layer of the plurality of layers, an output of the first layer of the plurality of layers is an input of a second layer of the plurality of layers, and an output of a last layer of the plurality of layers is the residual.

3. The method of claim 1, further comprising training the neural network on a training data set, wherein the training data set includes a plurality of first images and a plurality of second images.

4. The method of claim 1, further comprising testing the neural network on a testing data set, wherein the testing data set includes a plurality of first images.

5. The method of claim 1, wherein performing the convolution includes performing a three dimensional convolution.

~~6. The method of claim 1, wherein training the neural network includes dividing the first images into a plurality of pixel patches.~~

~~7. The method of claim 1, wherein the non-linear activation function includes a form of R(x) = max(0,x).~~

~~8~~1. A method of generating thin slice images from thick slice images, the method comprising:

receiving a first image having a first resolution at a neural network;

performing a convolution on the first image with the neural network;

performing a non-linear activation function on the first image with the neural network;

repeating the convolution and non-linear activation function;

generating a residual based on the convolution; and

summing the residual and the first image with the neural network to generate a second image having a second resolution, wherein the second resolution is higher than the first resolution~~The method of claim 1~~, further comprising acquiring the first image from an imaging system.

~~9~~2. The method of claim ~~8~~1, wherein the imaging system is a magnetic resonance imaging system.

~~10. A system for generating thin slice images from thick slices images, the system comprising:~~

~~a non-transitory computer readable medium including instructions for implementing a neural network, wherein the neural network comprises a level including a convolution block and a rectified linear unit non-linear activation block, wherein the level is configured to generate a residual from a first image having a first resolution received by the neural network, wherein the neural network is configured to sum the first image and the residual to generate a second image having a second resolution, wherein the second resolution is higher than the first resolution; and~~

~~a processor configured to execute the instructions to implement the neural network.~~

~~11~~3. A system for generating thin slice images from thick slices images, the system comprising:

a non-transitory computer readable medium including instructions for implementing a neural network, wherein the neural network comprises a level including a convolution block and a rectified linear unit non-linear activation block, wherein the level is configured to generate a residual from a first image having a first resolution received by the neural network, wherein the neural network is configured to sum the first image and the residual to generate a second image having a second resolution, wherein the second resolution is higher than the first resolution; and

a processor configured to execute the instructions to implement the neural network~~The system of claim 10~~, further comprising a display configured to display the second image.

~~12. The system of claim 10, wherein the convolution block applies a three dimensional convolution and thresholding using rectified linear unit function to the first image.~~

~~13. The system of claim 10, wherein the neural network includes a plurality of levels, wherein an output of a first level of the plurality of levels is provided as an input to a second level of the plurality of levels.~~

~~14. The system of claim 13, wherein a last level of the plurality of levels does not include the rectified linear unit non-linear activation block.~~

~~15. The system of claim 13, wherein a last level of the plurality of levels has a dimension less than others of the plurality of levels.~~

~~16. The system of claim 10, wherein the neural network divides the first image into a plurality of pixel patches.~~

~~17. The system of claim 16, wherein the plurality of pixel patches overlap.~~

~~18. The system of claim 17, wherein the plurality of pixel patches overlap by 50%.~~

~~19. The system of claim 10, wherein the convolution block applies a zero-padded convolution and an output of the zero-padded convolution is cropped to an original size of the input image.~~

~~20. The system of claim 10, wherein the convolution block outputs a plurality of feature maps.~~

~~21. A system for generating high resolution images from low resolution images, the system comprising:~~

~~an image acquisition unit configured to acquire a first image of a feature of interest at a first resolution;~~

~~a computing system configured to implement a deep learning system, wherein the deep learning system is configured to receive the first image of the feature of interest and, based at least in part on the first image, generate a second image of the feature of interest at a second resolution, wherein the second resolution is higher than the first resolution; and~~

~~a display configured to display the second image of the feature of interest.~~

~~22~~4. A system for generating high resolution images from low resolution images, the system comprising:

an image acquisition unit configured to acquire a first image of a feature of interest at a first resolution;

a computing system configured to implement a deep learning system, wherein the deep learning system is configured to receive the first image of the feature of interest and, based at least in part on the first image, generate a second image of the feature of interest at a second resolution, wherein the second resolution is higher than the first resolution; and

a display configured to display the second image of the feature of interest~~The system of claim 21~~, wherein the image acquisition unit is a magnetic resonance imaging system.

~~23. The system of claim 21, wherein the deep learning system generates the second image by supplementing the first image.~~

~~24. The system of claim 21, wherein the computing system is configured to implement a second deep learning system and the second image of the feature of interest is provided as an input to the second deep learning system.~~