Deep learning model for 3D computed tomography (CT) image reconstruction with single or a few views

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Technology description

Stanford researchers have developed a novel and efficient method for generating real-time 3D volumetric computed tomography (CT) images with 2D single or few-view projections, instead of several hundreds of projections as required in existing CT imaging system. This invention completely alleviates the need of angular sampling required by conventional CT imaging, saving time and costs. The deep learning model uses pre-treatment patient data to train the model to transform 2D projections into 3D images and construct a robust encoding/decoding framework. With online, real-time single projection acquisition, applications include single-view 3D image-guided radiation therapy as well as other image guided interventional procedures such as high intensity focused ultrasound, surgery, biopsy, cardiovascular procedures, and radiofrequency treatments.Figure

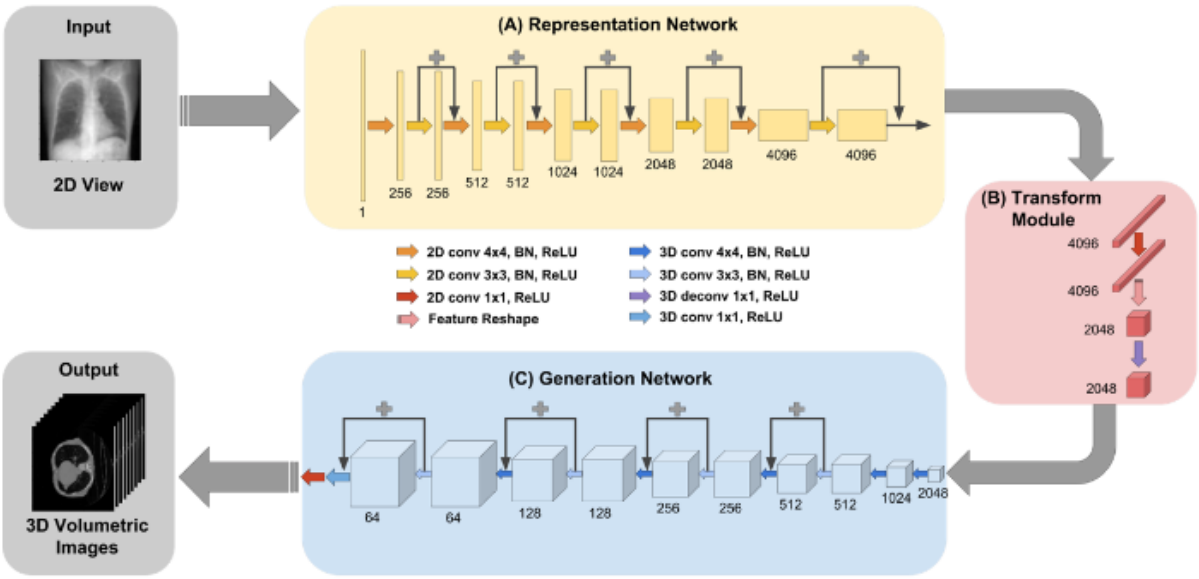

Figure description -Architecture of the proposed deep learning network for single-view and few-view CT image reconstruction

Application area

Real-time 3D image reconstructionfor image-guided radiation therapy (IGRT) Can be provide guidance for other interventional procedures, such ashigh frequency ultrasound (HFU), surgery, biopsy,

cardiovascular procedure, and RF treatmentReal-time quality assurancebased on single-view 3D volumetric reconstruction.

Advantages

Real-time 3D image reconstructionusing sparse dataDramatically more efficient and less expensivethan exiting technologyCompletely alleviates need of angular samplingrequired by conventional tomography imaging. Neural networks learn mapping function using patient dataEnables real-time image guidanceusing a single X-ray projection for radiation therapy and other interventional procedures with online, real-time single projection acquisitionFlexible:
Can to be applied to other projection-based tomography imaging methods, including positron emission tomography, microwave imaging, optical imaging, etc. Can be generalized to improve guidance in many disease sites, such as the lung, liver, brain, and pancreas

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