Software Using a Genetic Algorithm to Automatically Build Convolutional Neural Networks for Medical Image Denoising

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Technology description

Reduces Noise in Medical Images Using Deep Neural Networks Automatically Built by Genetic Algorithms

This software automatically selects the most suitable parameters to develop convolutional neural networks able to denoise medical images. The noise in medical images produced from CT or MRI scans can cover or distort the true image, making accurate diagnosis difficult. The global medical imaging market is projected to exceed $55 billion by 2025. Convolutional neural networks employ deep machine learning that mimics how the brain operates. These networks are useful for analyzing images primarily because of their ability to group images based on similarity and to recognize objects within them. The advantage of using convolutional neural networks to denoise medical images is that they can learn traditionally hand engineered filters without relying on prior work or human input. Available convolutional neural networks for medical image denoising require manual design based on empirical knowledge to eliminate a specific type of noise. However, those denoising algorithms take a long time to create and aren’ t efficient due to noise type limitations.
Researchers at the University of Florida have developed a genetic algorithm-based convolutional neural network evolution system in order to improve medical image denoising. This algorithm automatically constructs convolutional neural networks that can effectively denoise a medical image containing complicated and mixed noise types.

Technology

This software is a medical image denoiser development system uses genetic algorithm-based evolution to automate the creation of convolutional neural networks that perform medical image denoising more efficiently than traditional, manually programmed ones. A genetic algorithm is a metaheuristic modeled after natural selection that is most useful for solving complex optimization problems. This system’ s genetic algorithm works by exploring the combinations of convolutional neural network parameters and then evolving the most promising of those parameters to create the best image denoiser. The neural networks evolve via selection, crossover, and mutation. This process selects the

convolutional neural network most suitable for removing the noise in a medical image. The selected convolutional neural network is able to remove complex noise combinations to improve the accuracy of medical diagnoses based on images from CT and MRI scans. Additionally, this software is applicable in other medical image analyses, such as disease classification and lesion segmentation.

Application area

Evolutionary deep learning algorithm that automatically constructs convolutional neural networks for medical image denoising

Advantages

Automatically develops a deep learning-based image denoising algorithm through an evolutionary framework, speeding up the traditional manually driven design process
Removes complicated mixture of noise from medical images, improving diagnostic accuracy
Improves constantly through evolution, increasing effectiveness and reducing risk for misdiagnosis
Is applicable to other medical image analysis fields such as disease classification and lesion segmentation

Institution

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