MRI Image Synthesis for the Diagnosis of Parkinson's Disease using Deep Learning

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Category

Translational Medical Sciences

Parkinson's disease is a neurodegenerative disease that affects an estimated 1 of adults over 65. While the disease itself is not fatal, complications related to PD are rated as the 14th largest cause of death in the United States by the Center of Disease Control and Prevention. These methods include analyzing years of neurological data to determine if the patient has developed the symptoms of PD, including limb rigidity and tremors, both of which are common side effects of several other diseases.

With the rise of automated prediction algorithms paired with the generation of massive amounts of data, the automatic diagnosis of PD has not caught up to traditional means. This is commonly attributed to the lack of useful data, as most computational systems require a tremendous amount of medical data that isn't readily available as gathering the data can be expensive.

This study presents PDGAN, a tool to aid pathologists and neurologists in the diagnosis of PD. PDGAN uses a series of neural networks to classify Magnetic Resonance Images (MRI Images). PDGAN employs Generative Adversarial Networks (GANs) to synthetically generate medical images which is used to augment the classification efforts. The pair of Convolutional Neural Networks exhibited a testing accuracy of 91.4 without the augment of new data, and combined the total accuracy was 96.6, a 16% increase compared to traditional methods at a fraction of the cost and time. PDGAN demonstrates the feasibility of utilizing GANs to generate unseen data for the improvement of classification in medical informatics.

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