THE POWER OF ARTIFICIAL NEURAL NETWORKS IN MODERN MEDICINE: REVOLUTIONIZING SURGERY AND DIAGNOSTIC VISUALIZATION

Summary: This article explores how artificial neural networks are revolutionizing medicine. It discusses their role in robotic surgery, enhancing precision and accessibility. Additionally, it highlights their effectiveness in diagnostic visualization, enabling early cancer detection and faster analysis of medical imaging. Overall, artificial neural networks are transforming healthcare by improving surgical outcomes and facilitating accurate diagnoses.

The AI market in healthcare was valued at US$8.23 billion in 2020 and is expected to reach US$194.4 billion in 2030 with an average growth of 38.1% between 2021 and 2030. Business growth as they enable "intelligence" to learn quickly and efficiently. In this article, we will discuss how artificial neural networks are used in medicine today.

Robotic Surgery Surgery requires in-depth medical knowledge, high precision, adaptability and long-term care. Although well-trained surgeons often have these qualities, they are still human and prone to make mistakes, especially in busy schedules. According to research at Johns Hopkins University, more than 4,000 surgeries occur each year in the United States alone. For example, surgeons placed foreign bodies on patients at least 39 times a week and performed the wrong operation, or performed the wrong operation on the body more than 20 times a week, Piam.

Robotic surgery can help solve this problem. In particular, artificial intelligence-based neural networks can be used for surgical modeling and planning, evaluation of surgeons, and simplification of surgical operations. Robots with robotic arms can also perform surgical procedures independently, which reduces and accelerates service costs, and facilitates technological operations. The best surgeons may not want to live in poor countries in Africa or Asia, but robotic surgeons can be deployed wherever electricity is available. More than words: The Medical Robotics Industry Is Currently Worth $40 Billion And Doing Well: Neural Networks Analyze Data From Medical Records Before Displaying Products Reduce hospital admissions by 21% or more using Early Treatment. A study [1] involving 379 orthopedic patients showed a five-fold reduction in surgical complications based on robotic neural networks compared to single surgeons. The tiny robot Heartlander [2] assisted cardiac surgeons. It enters a small section of the chest for permanent detection, mapping and treatment of the heart. Its use when access to the heart is required minimizes harm to the patient. A surgeon with the Smart Tissue (STAR) system successfully performed a difficult task (repairing both ends of the stomach) on the soft tissue of the pig, giving better results than the surgeons.

Diagnostic Visualization

Visualization in medicine is the process of creating an image representation of the body for diagnosis, treatment, and visual representation of the function of some body or tissue. Visualization improves diagnosis when using X-rays, computed tomography (CT), mammography, MRI, PET, ultrasound, and other procedures.
The medical community has long recognized that visualization can increase the chances of detecting diseases. However, even a well-trained human eye can have difficulty detecting small details in an image. There is also a phenomenon called "perceptual blindness". Researchers at Harvard University added images of gorillas to their X-rays and showed them to radiologists; 83% of radiologists disapprove of gorilla images on x-rays [3].

Convolutional Neural Networks (CNNs) are good for clinical view [4]. According to researchers at Stanford University, CNNs are designed to process images and make them suitable for medical applications such as analyzing MRI or X-ray results. CNNs are often better than humans for accuracy. For example, melanoma diagnosis by dermatologists is 65% to 85% accurate, while solutions like TensorFlow, scikit-learn or Keras are 87% to 95% accurate [5].

Also, they work faster than humans, they don’t have days off or holidays. Researchers at the Icahn School of Medicine at Mount Sinai have developed a neural network that can diagnose brain diseases, including strokes and brain hemorrhages, 150 times faster than the same researchers.

In 2019, researchers used neural networks built on the ResNet50 and InceptionV3 architectures to analyze medical images and dermoscopy. The solution provides the same level of accuracy as a professional human diagnosis. Early breast cancer detection equipment developed by the Institute of Medicine in Houston can interpret mammograms with 99 percent accuracy and provide diagnostic information 30 times faster than the same people. A group of Chinese scientists has developed a neural network system to analyze X-rays for early signs of pneumonia caused by COVID-19. The device allows doctors to quickly identify, classify and treat patients, saving up to 40% of diagnostic time. A team of researchers from Spain developed a neural network-based deep learning algorithm to improve MRI resolution. It helps diagnose brain diseases, including cancer, speech disorders, and physical injuries. Facebook AI (now Meta) and NYU Langone Health have created an artificial intelligence called fastMRI that offers a new way to create MRI images that speeds up the scanning process by 4x. When these images were presented to radiologists, they were unable to distinguish between the patterns detected and those produced by the MRI scan.

References: