AI usage for surgical pathology for diagnosis.

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Surgical pathology is the most significant and timeconsuming area of practice for most anatomical pathologists. Surgical pathology involves gross and microscopic examination of surgical specimens, as well as biopsies submitted by surgeons and nonsurgeons such as general internists, medical subspecialists, dermatologists, and interventional radiologists. The practice of surgical pathology allows for definitive diagnosis of disease (or lack thereof) in any case where tissue is surgically removed from a patient. This is usually performed by a combination of gross (i.e., macroscopic) and histologic (i.e., microscopic) examination of the tissue, and may involve evaluations of molecular properties of the tissue by immunohistochemistry or other laboratory tests. There are two major types of specimens submitted for surgical pathology analysis: biopsies and surgical resections. A biopsy is a small piece of tissue taken primarily for the purpose of surgical pathological analysis and is most often taken to make a definitive diagnosis. The pathologist's interpretation of a biopsy is important in the diagnosis of benign or malignant tumors, distinguishing between different types and degrees of cancer and determining the activity of specific molecular signaling pathways within the tumor. This information is important for assessing a patient's prognosis and choosing the best treatment. Biopsies are also used to diagnose diseases other than cancer, including inflammatory, infectious, or idiopathic diseases of the skin and gastrointestinal tract, to name a few. Surgical resection is obtained by therapeutic surgical removal of the affected area or the entire organ. These procedures are often intended as the definitive surgical treatment for diseases for which diagnosis is already known or strongly suspected. However, pathological analysis of these specimens confirms the previous diagnosis, classifies the extent of malignant tumors, determines whether the entire affected area has been removed, identifies the presence of unexpected comorbidities, and postoperatively. It is important to provide information for management.

Machine learning (ML)

It is defined as a computer system based on a set of algorithms that attempts to analyze vast amounts of diverse data using multiple layers of analysis. There are several ways to program your computer to make intelligent decisions, and it is important to use the appropriate algorithm for your particular purpose. ML is one of the most commonly used AI technologies for processing big data. This is a self-adaptive system that provides better analysis and patterns with added experience and new data. These techniques have evolved hand – in – hand with the digital era which has brought about an explosion of data in all forms from all parts of the world. Enormous amount of data, known simply as big data is easily and readily accessible and can be shared through applications like cloud computing. ML applies statistical methods to automatically learn from data and experience without explicit instructions. It has seen an explosion of interest in recent years. One technique in particular, known as deep learning, has produced ground breaking results in many important problems including image classification and speed recognition. Recent growing interest and efforts to incorporate AI into any number of industries is mainly due to the rise of deep learning. Also known as deep neural learning or deep neural network or convoluted neural network (CNN), it is a type of machine learning algorithm that uses multiple layers of data for example multiple layers of image processing to access higher level features from the image. It is a function of AI which is inspired by the neurons of the human brain and imitates the functioning of the human brain in processing data and creating patterns which can be used in decision making. It is capable of learning unsupervised from data. Deep or convoluted neural networks are the most used ML techniques in the biomedical world. These artificial neural networks are interconnected and follow mathematical models. Their field of application is vast and allows the management of `big data` in genomics and molecular biology. They are most commonly applied for analyzing visual images. Through deep learning, AI recognizes patterns using various forms of neural networks based on the availability of big data repositories. The process is inexpensive and the computational processing power is easily accessible. The neural networks can acquire data rapidly via image scanners, digital cameras, remote sensors, electronic appliances or the Internet of Things (IoT). It uses a hierarchical level of artificial neural networks to carry out the process of ML. Artificial neural networks used in AI are built, as mentioned above, like the human brain with neuron nodes connected together like a web. This is in contrast with traditional computer programs which build analysis with data in a linear way. The hierarchical design of deep learning systems enables machines to process data via a nonlinear approach.

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