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Emerging Technologies in Solving the Challenges of Medical Images

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Editorial

Medical imaging technology developments over the last century have enabled non-invasive diagnostics in ways never before imaginable, making medical imaging is a crucial component of modern healthcare systems. One of the most cutting-edge fields that show these changes is the interdisciplinary science of medical image processing. Approaches in this rapidly evolving field enable the entire data flow in modern medical imaging systems, from raw data collecting to digital image transfer. These systems now offer ever-increasing spatial and intensity resolutions as well as faster collecting times, resulting in a vast volume of high-quality raw image data that must be carefully processed and reviewed for correct diagnostic results.

Imaging in medicine has improved the quality of life for an uncountable number of people, and this trend is only going to continue. It is extremely important to recognize diseases in their early stages. If have reason to feel that something is wrong with the body, must undergo the diagnostic scans to find out whether or not there is cause for concern. It could very well end up saving our life.

Medical imaging techniques are incredibly useful for the diagnosis of many of the cancers such as cervical, brain, breast, leukemia blood cells etc. To increase a patient's chances of surviving such a dreadful disease, it is crucial that they receive a diagnosis at the earliest feasible time. Medical imaging techniques enable the diagnosis of tumors at progressively earlier stages.

Currently, in the field of medical area nanotechnology has evolved rigorous applications and it is being applied to the development of novel imaging techniques for medical purposes. It is highly probable that the development of nano-scale imaging will advance medicine by enabling the creation of more comprehensive images of the activities of cellular components. The capabilities of currently existing medical imaging equipment are being enhanced so that they can be utilized at the nanoscale more effectively. In addition, contrast agents are being developed to facilitate the monitoring of implanted nanoparticles throughout the body. Especially, nanoparticle implantation helps in cancer like diseases to cure the particular area proliferated in the body instead of affecting other parts through the oral medicines. It can also apply in the process of protein detection, optical coding and cell manipulation etc.

Molecular imaging agents based on nanoparticles are currently being manufactured. These nanoparticles will reveal whether there are mutations in cancer-causing genes or how tumor cell's function. It has been demonstrated that nanoparticles can be employed therapeutically as anatomical structural contrast agents. This information can be used to suggest a treatment plan or modify an existing one. By altering their properties in response to biological stimuli or processes, bioactivatable nanoparticles serve as dynamic recorders of *in vivo* conditions, revealing how diseases evolve and the efficacy of treatments.

In the fight against cancer, early detection is tantamount to gaining a decisive advantage. The development of new molecular contrast agents and materials, made feasible by nanotechnology, offers the path for an earlier and more accurate initial cancer diagnosis as well as continuous monitoring of cancer treatment. There are already a number of nanoparticle-based medical screenings and diagnostics available on the market. The most prevalent usage of nanoparticles, however, is in the treatment of a wide range of medical conditions, including stomach and intestinal diseases, nerve and intestine obstructions, and many more can be captured by the capsule cameras.

For cancer prevention, nanodevices designed to capture blood-borne biomarkers are being explored. Biomarkers include cancer-associated proteins, spread around the tumor cells, tumor DNA, and exosomes produced by the tumor. Sensors enabled by nanotechnology are capable of readings with high sensitivity, specificity, and multiplexing. The next generation of diagnostic

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technologies combines sample collection with genetic analysis to improve understanding of a patient's cancer, potential treatments, and disease progression.

In the field of image acquisition, hardware advances that improve the quality of raw data and increase its informational value are favorable. Integrated front-end solutions offer quicker scan times, higher resolutions, and unique structures, such as CT/PET/X-ray, ultrasound/mammography, and PET/MRI combination systems. An accurate automatic prediction based on the image processing faces many challenges like time consumption, efficiency through numerous trending technologies such as machine learning algorithms like naïve Bayes, KNN, SVM etc. and deep learning algorithms such as CNN, RNN, LSTM, GAN (Generative Adversarial Networks), RBFN (Radial Basis Function Networks), SOM (Self Organizing Maps) are working in a way. This process involves particular steps like pre-processing, feature extraction, segmentation classification etc. Similarly, visual images face, expressions etc. and other images like EEG plays an imperative role in the fields of cognitive science and neuroscience to predict the behavior of the people. It is an admitted fact that despite giving good results, still we are unable to introduce fully in real-time applications as giving challenges in many aspects.

The most trending technologies like quantum computing and cloud storage can address the challenges which are given by existing systems over the year in terms of time complexity and massive storage. In fact, the results in some cases that take few years will be made in seconds. The imagery which is captured through the edge cutting technologies can be stored in the cloud. Due to these unparalleled services of aforementioned technologies on image processing brings the quality life nearer to the human life with the faster and pure services. Most of the largest countries are making the massive investments in the fields of above to solve the challenges towards the many fields in the society such as health care, finance, security, technology, forecasting etc.