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Exploring Real-World Applications of Computer Vision

In the medical field, there are many sections and segments which can be turned into an automated system or rather better itself with the intervention of A.I. One of them is using A.I based computer vision. Out of many uses, medical imaging system can be advanced. As it can be used to analyze medical images and identify patterns that are difficult for humans to detect. It could allow doctors to make more accurate diagnoses and provide better treatment for every individual, essentially another tool for their accuracy. It is a technique and process of imaging the interior of a body for clinical analysis and medical intervention, as well as visual representation for the function of some organs or tissues. One portion of medical imaging is A.I tumor detection. This means it can help doctors diagnose cancer at an early stage, which is critical for successful treatment. It uses computer vision algorithms that can be trained to detect in medical images such as X-rays, CT scans and MRIs with high accuracy. The typical components of a medical imaging usually have:

* Imaging modalities: used to capture images of the body. Using x-rays, computed tomography (CT), magnetic resonance imaging (MRI), and ultrasound.
* Image acquisition: process of capturing images of the body using imaging modalities, using projection radiography, computed tomography and magnetic resonance imaging.
* Image processing: manipulation of images to enhance their quality and extract useful information. Using image filtering, segmentation, feature extraction.
* Image analysis: the interpretation of images to extract meaningful information. Using pattern recognition, machine learning and computer vision.

Other AI and sensors can be used for medical imaging. One example is generative adversarial networks (GANs). Which can be used to generate synthetic medical images that can be used for training Ai algorithms. Explainable AI (XAI) can be used to increase the interpretability of AI models in medical imaging. It allows doctors to understand how AI models make decisions and identify potential biases or errors in the models. Doctors being able to diagnose and treat diseases more accurately and effectively. It is usually recommended for doctors to act and process with deadly problems much faster and effectively with the amount of people that needs their help, allowing them to have a sense of help for a long process makes the doctors a powerhouse especially if they are busy. Additionally, it is non-invasive and doesn’t require surgery or other invasive procedures. It allows to avoid the risks and the complications associated with invasive procedures. And being versatile with a whole range of diseases and conditions. However, there are some potential challenges and limitations. It can be expensive and not be accessible to everyone. Another challenge is the exposure of radiation to the patients. Even though it is usually low, it still increases the risk of cancer for the patients’ overtime. Can the fact that it can introduce false positives and false negative even though it is more accurate in the typical sense. As for the ethical issues, it can disturb the patient privacy and data security.

As mentioned before, some of the other AI based applications that can be used in this field are explainable AI and generative adversarial networks. XAI aims to make AI models more transparent and interpretable, making it much more intuitive to doctors in the near future. As for GANs, it is used to generate synthetic data that can be used for training AI algorithms which will resolve the issue with limited data availability in some parts. Some not so focused but useful advancements would be reinforcement learning, which is a type of machine learning that involves based on rewards and punishments. AI is a positive overall, including enhanced productivity, improved healthcare, and increased access to education. Allowing to solve complex problems and make our daily lives easier and more convenient. But the main concerns within AI advancement are job displacement and income inequality. It being able to create autonomous weapons, which could pose a threat to global security. Ethical issues such as privacy, bias, and transparency could arise.

The reference list:

Goldsmith, J. (2021, July 22). *The Value of Computer Vision in Healthcare. HIMSS Resource Center* <https://www.himss.org/resources/value-computer-vision-healthcare>

Wikipedia contributors. (2023, January 27). *Medical imaging. In Wikipedia, The Free Encyclopedia* <https://en.wikipedia.org/wiki/Medical_imaging>

Viso AI. (n.d.). *Computer Vision in Healthcare* <https://viso.ai/applications/computer-vision-in-healthcare/>

CNVrg.io. (n.d.). *Computer Vision Applications* https://cnvrg.io/computer-vision-applications/