Computer Vision in Agriculture

The era of technology and innovations is rapidly transforming our lives today. The potential of such technologies is extending beyond our imagination. The advent of advanced technologies such as computer vision is contributing enormously across industries. Among several industries, the agriculture industry is one such sector that has started incorporating computer vision in their mode of operations.

Agriculture is considered the economy-boosting sector that makes every nation stand out in the global market. The countries with large produce are significantly dominant in the export market. However, several countries suffer from high-labor costs, underdeveloped methodologies, and lack of automation result in higher production costs.

Humans interpret the real world with a vision processed by their brains to make sense of the surroundings. Computer vision is the branch of computer science that aims to provide a similar outcome using a computer system or machine. As the world is engulfed with human-like capabilities, the sub-branch that is computer vision aims to train computers for interpreting and understanding the visual world. With computer vision, machines can accurately identify and detect objects, analyze and make meaningful interpretations out of a sequence of images.

The field of computer vision is gaining a stronger foothold in agriculture. From better productivity to lowering production costs with automation, computer vision has improved the agricultural sector's overall functioning. In agriculture, computer vision has started gaining a strong foothold with its automation and detection capabilities.

This article delves into the potential of computer vision in agriculture and its contributions.

Potential Use of Computer Vision in Agriculture

The agricultural industry has witnessed several contributions of computer vision-artificial intelligence (AI) models in areas such as planting, harvesting, advanced analysis of weather conditions, weeding and plant health detection and monitoring. Some of the most noteworthy contributions that exist today are:

- **Drone-based crop monitoring**

In recent years, drone technology has captured a massive chunk of the market due to its autonomous flying capabilities. Drones have become an essential factor in precision agriculture and farming. With the ability to fly and cover a significant distance, drones can capture vast amounts of data through a pre-installed camera. The computer vision-enabled camera can be trained to detect unfavorable conditions, crop health information, aerial view of the entire farming land, and identifying the soil conditions with its geo sensing possibilities.

The techniques such as semantic segmentation and image annotations are approaches for detecting and identifying a particular object.

- **Yield analysis**

The combination of deep learning techniques for building state-of-the-art computation models is used for crop yield analysis. The use of the collected data from drones, satellite images, and critical information on nitrogen levels, moisture, weather conditions, and soil factors is fed into the smart systems trained to handle large volumes of complex data. The reports from such analysis allow us to attain important predictions beforehand. Such an approach is helpful for man-management and to be prepared for unexpected natural disruptions.

- **Smart systems for crop grading and sorting**

AI-powered computer vision machines are in high demand in farming. The possibility to automate monotonous and time-consuming tasks such as sorting out the good and the wrong crops and finding the appropriate ones among them for shipping requirements have acted as a boon for farming. It is becoming an integral part as the smart systems can identify the crops' longevity and find the percentage of infections in the crops, resulting in lesser crop damages. The fruits and vegetables are graded as per their quality to find which batches of the product should be shipped first and which ones may sustain for a longer time and can be sent to far destinations.

- **Automated pesticide spraying**

In agriculture, spraying pesticides for saving the produces is a common practice. Computer vision-based drones and equipment are steadily gaining demand in the market. These machines can monitor and detect the infected crop and spray the right amount of pesticide as per the need. Such contributions have led to the workforce being healthy without being exposed to inhalation of any of the pesticides.

- **Phenotyping**

Nowadays, the use of phenotyping to identify the crop traits for precision agriculture is immensely performed. Advanced computer vision algorithms have made phenotyping an efficient approach. The computer vision algorithms are incorporated with image processing features to eliminate unwanted crop data or information from the images while keeping only the relevant information on precise measurements. The techniques such as depth estimation, color enhancement, identifying and segmenting the region of interest are possibilities for delivering reliable outcomes for further analysis with the acquired information. This information has significantly improved the crop breeds.

- **Forest information**

Aerial capabilities of smart systems and drones with computer vision have made it possible to acquire data of trees that are spread out across several acres of land. Some of the possible detection based activities are tree detection, tree classification, and its types, stem analysis data, yield estimation, tree health, unused land, farming land borders, and drainage information.

- **Livestock**

Most agriculture and farming are closely related to livestock. Computer vision can identify livestock's count, health, and growth to gain crucial information about harvesting quality.

- **Smart farming**

In computer vision and AI research, the topic of interest gaining traction is autonomous tractors for performing plowing related tasks without human intervention.

Success Stories of Computer Vision-Based Startups in Agriculture

Some of the notable startups that have successfully implemented computer vision in the field of agriculture are.

- **XSUN:** The primary idea behind this startup is to provide aerial survey and imaging.

Country: France

- **TerraClear:** The company started with computer vision's applicability to clear out rocks from the cultivable land areas.

Country: USA

- **SWIR Vision Systems:** The company is associated with monitoring soil moisture capabilities with their machine vision offering.

Country: USA

- **Cromai:** The startup focuses on attaining farm and crop diagnostic data.

Country: Brazil

- **Occipital Technologies:** The startup is offering grading and sorting services with the use of machine vision.

Country: India

In Final

The contribution of artificial intelligence across disciplines is expanding continually. As the deep learning models continue to become smarter, they can handle complex tasks with the utmost ease. Agriculture is a sector that can gain a lot out of the technology. With several countries not meeting the demand and the supply requirements, it is imperative to adopt technologies that can aid in better production and bring overall efficiency. Computer vision is making the right strides towards agriculture. Although there are challenges, as with every technology in the market, the AI-powered computer vision offerings will need to address the related problems before achieving complete adoption of the technology. There are several factors to be aware of before implementing such advanced technologies. However, with technological advancements and transformations, we are stepping foot into a world of digitization. It is only right to embrace the positives to achieve the best agricultural productivity with future technologies.

At Deeplai, our focus is quality image standardization which allows us to better handle images from many different natural settings, scenes and environments. We also understand our clients requirements are varied, so we offer highly customizable workflow for high volume image processing.

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