Artificial Intelligence Techniques To Obtain Data From Photographic Images In The Agricultural Sector

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Resumen—El presente artículo describe las técnicas de inteligencia artificial, definiciones, análisis automático de imágenes y con ejemplos de obtener datos de imágenes fotográficas en el sector agrícola Al utilizar técnicas especializadas de procesamiento de imágenes es posible conocer con gran detalle características propias del fenómeno en análisis, realizar clasificación basada en dichas características e inferir comportamientos

Palabras claves: inteligencia artificial, técnica de imágenes, agricultura, imagen satelital

Abstract—This article describes the techniques of artificial intelligence, definitions, automatic image analysis and with examples of obtaining data from photographic images in the agricultural sector. By using specialized image processing techniques it is possible to know in great detail the characteristics of the phenomenon in question. analysis, perform classification based on these characteristics and infer behaviours

Keywords: artificial intelligence, imaging technique, agriculture, satellite image

Agriculture constitutes for farmers a great outlet for their economic needs, which means that farms face an increasingly competitive sector with greater demand at lower prices.

The use of technology revolutionizes more and more in all disciplines, and helps society to solve all kinds of problems, without a doubt this constitutes a great advance for science.

Currently, large companies are betting on the use of A.I. Luo et al., (2018) states that technological giants such as Apple, Google and Microsoft are investing more and more resources to seize the artificial intelligence market. Without a doubt, this constitutes a rapid acceleration of the use and improvement of it.

Artificial intelligence (AI) according to [2] defines it as a "scientific discipline concerned with creating computer programs that perform operations comparable to those performed by the human mind, such as learning or logical reasoning". (p. 1), as a result of what was defined, it could be contextualized that computers can think figuratively by making use of special algorithms for their correct applicability.

The use of artificial intelligence is recommended for decision making, to improve effectiveness, as well as to obtain large profits. Guadalima-inga et al. (2020) states:

AI allows the agricultural sector to double its production in a sustainable way, promoting a more profitable business, currently several intelligent systems have been proposed for the diagnosis of plant diseases, in this way, plants and crops can be monitored to prevent the spread of diseases that can ruin the entire harvest. (p.67).

Information technologies among one of its fields is Artificial Intelligence. Talwar & Koury, (2017) mentions that the first conceptual approaches to AI take place in the year 1955. This implies that this discipline is without a place one of the oldest, the same one that has been perfected with its techniques.

While few occupations are fully automatable, 60 percent of all occupations have at least 30% technically automatable activities. Operators of sewing machines, graders and sorters of agricultural products [4]. Generating even more the desire to perfect the activities, making them automatable for better and optimal performance.

I. DEFINITIONS

I n   recent decades we have been participants in a profound change in the agricultural field, Artificial Intelligence techniques are valuable and powerful supports playing a fundamental and indispensable role not only in the agricultural sector but in all fundamental aspects of society giving the next step towards a futuristic and perfectionist world necessary to address these new paradigms that make clear the need for effective help supports to make decisions in the agricultural sector Currently, Artificial Intelligence is being applied to numerous activities carried out..

Artificial Intelligence is defined as that intelligence exhibited by artifacts created by humans (ie, artificial). Often this is hypothetically applied to computers. The name is also used to refer to the field of scientific research that attempts to come close to creating such systems. Artificial Intelligence tries to get computers to simulate human intelligence in a certain way. His techniques are used when it is necessary to incorporate knowledge or characteristics of the human being into a computer system.

Artificial Intelligence has had a great boom in our days, having applicability in computing, science, health and other fields. It has been a great challenge trying to bring the mind of a machine closer to human thought, and without doubting that in the not too distant future we will not be able to distinguish whether we are in the presence of an Artificial Intelligence or a true human mind.

A. Some fields of application

Ancient mathematical games, such as that of the towers of Hanoi (approx 3000 BC), demonstrate the interest in the search for a solver loop, an Artificial Intelligence capable of winning in the fewest possible moves..

In 1903 Lee De Forest invented the triode (also called a vacuum tube or tube). It could be said that the first great intelligent machine designed by man was the ENIAC computer, made up of 18,000 vacuum tubes, bearing in mind that the concept of "intelligence" is a subjective term that depends on the intelligence and technology that we have in that epoch. An Amazon Indian in the 20th century could describe a record player as intelligent, when in truth he is not so intelligent.

In 1937, the English mathematician Alan Mathison Turing (1912-1953) published a highly influential article on "Calculable Numbers", which can be considered the official origin of Theoretical Computing. In this article, he introduced the Turing Machine, an abstract mathematical

entity that formalized the concept of an algorithm and turned out to be the forerunner of digital computers. With the help of his machine, Turing was able to demonstrate that there are unsolvable problems, of which no computer will be able to obtain their solution, which is why Alan Turing is considered the father of the theory of computability.

In 1939, Joseph Barn created the elektro robot, a humanoid of more than two meters, making 26 different movements, being able to speak approximately 700 words and performing different actions.

He is also considered the father of Artificial Intelligence, for his famous Turing Test, which would allow checking if a computer program can be as intelligent as a human being.

In 1951 William Shockley invented the junction transistor. The invention of the transistor made possible a new generation of much faster and smaller computers.

In 1956, the term "artificial intelligence" was coined at Dartmouth during a conference called by McCarthy, attended by, among others, Minsky, Newell, and Simon. At this conference, triumphalist forecasts were made for ten years that were never fulfilled, which caused the almost total abandonment of research for fifteen years.

In 1973 the first radiotelephone was created by Martin Cooper in the United States, considered the father of cellular telephony, but it was not until 1979 that it was launched on the Market

In 1980, history repeated itself with the fifth-generation Japanese challenge, which gave rise to the rise of expert systems, but fell short of many of its goals.

The first laptop was created by Bill Moggridge in 1982, bearing the name GRid Compass 101, having the most advanced technology of the time with a 320 x 240 pixel LED screen.

Since 2008, smartphones began to be manufactured, this being the fourth generation of cell phones offering users greater speed in terms of broadband.

Since artificial intelligence techniques are important and indispensable for agricultural development in the last decade, it has been decided to develop a novel monitoring technique that uses drones to control crops from the air, generating a very good image quality, in a slightly closer approach. closer to the crop gives a much better expectation, being able to detect small details that are not seen if the focus is higher. With these devices considerable time can be saved since in a single flight they cover thousands of hectares of crops, efficiently managing the economic resources of the farmer. Through advanced software systems that are complemented by smartphones, tablets or computers, it is possible to process the images taken on the flights to create models of the crop surface, having very precise results, being an essential key to improving the quality of the crops.
For farmers, digital images obtained by drones could reveal pest patterns, risk problems and even more complicated factors that are affecting the harvest and therefore harming the farmer's economy, notably degrading the quality of the final product.

A. Artificial Intelligence Techniques

Among the commonly used AI techniques are Artificial Neural Networks (ANNs), the most popular, with different training algorithms.
The backpropagation algorithm is a supervised training, which is considered an operating stage where an input pattern is presented to the trained network and this is transmitted through the successive layers of neurons until an output is obtained, and then a stage of training or learning where the weights of the network are modified in such a way that the desired output coincides with

the output obtained by the network.[5]. Being backpropagation the most used and proven that provides very good results in the milling process.

B. Translation results

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C. Neural networks

The main types of neural networks are: multilayer perception, conventional networks, recurrent neural networks and radial basis. convolutional. One of the pioneers of the AI theory is Warren Mc Culloc and Walter Pitts, who conducted studies on it in 1943. Medina-Chicaiza & Martínez-Ortega, (2020) this Artificial Intelligence research was based on their model neural network, where they used the following concepts: basic physiology, functioning of neurons in the brain and the theory of Alan Turing. Without a doubt, a great advance.

D. Translation results

functioning of neurons in the brain and the theory of Alan Turing. Undoubtedly a great advance.

E. CONVULSIONAL NEURAL NETWORKS

According to one of the main characteristics of this type of convulsive networks, "they have shown strong learning capabilities in computer vision tasks such as classification and detection. Especially with the introduction of excellent detection models like YOLO (V1, V2 and V3) and Faster R-CNN" [7, p. twenty-one]. You have to consider the importance of your study of each of the models based on the various solutions it can offer. A. Machine learning The ability of intelligent systems to learn and improve through experience gained from historical data is known as machine learning. (Párraga et al., 2021, p5). Machine learning is an appropriate

A. Use of A.I.

The use of artificial intelligence in conjunction with its algorithms currently constitutes a powerful tool that seeks to solve various problems. Guadalima-inga et al. (2020) The last decade has provided a machine learning-based solution for the agricultural society, helping farmers to detect pathologies at an early stage (p.60). What entails without a doubt that the importance of this is a great contribution to science. Computer vision is one of the disciplines that uses artificial intelligence.

 Thus, in the context of artificial vision, image processing is essential to facilitate subsequent operations" (Alvear, 2017). The importance of the classification is due to the optimization that it can generate to the interpretation algorithms.

Within artificial intelligence it offers us many advantages, among them are decision-making. "Decision support systems for agriculture allow optimization of cultivation processes, by using the least amount of resources (land, water and fertilizers)" (Brenes Carranza et al. 2020, p.217).

Without a doubt, the optimization of resources will allow significant savings to be obtained and will allow farmers to act efficiently.

Systems that have high technology: this level includes facilities that have automated climate control (greater independence from the external climate), automated and precision irrigation, CO2 injections, [11]. To do this, they have sensors and devices that operate the irrigation and ventilation systems, screens thermal for the control of lighting and cultivation in substrates.

F. Unmanned Aerial Vehicles (UAVs)

Unmanned aerial vehicles according to Meneses et al., (2015) "states that they are remotely or autonomously controlled aircraft or multirotors that follow a preprogrammed flight line" (p.17), these devices have the ability to perform a flyover for different agricultural activities.

II. AUTOMATIC IMAGES ANALYSISEL

A. Resultados de traducción

The approach that the computer tries to provide to these machines is the sense of sight whose objective is to extract information from the images and be able to use it in different practices. It usually revolves around shape recognition, although there are many more usable features of an image, such as color. Each pixel that makes up a digital image contains a vector of three values that contains the level of red, blue and green, respectively. [13]

Figura 1. Etapas del análisis automático de una imagen.

Among the image preprocessing techniques there are two main areas: processing with a human observer or processing without a human observer. Processing without a human observer is more useful in computer vision systems.

B. The most common technique would be:

Histogram transformation: the histogram of an image is a graph that represents the gray levels on the abscissa axis and the number of pixels of each level on the ordinate axis. Although on some occasions the histogram only gives the possibility of increasing or decreasing the contrast levels of an image, on other occasions it is enough to separate objects within an image, facilitating the interpretation stage. There are different types of segmentation techniques: Grouping by common features: segment images using data grouping algorithms. This technique segments images automatically and unattended without requiring prior knowledge of existing object classes.

• **Extraction of edges**: separates objects from their edges. This technique is inspired by a very intuitive and simple principle, since the pixels located on the edges of the different objects present large variations in their characteristics with respect to the neighboring pixels. For example, a dark object on a light background

III.   SATELLITE IMAGE PROCESSING METHODOLOGY

ACCORDING TO THE COLOMBIAN AUTHORS [14] THEY AFFIRM THAT MANY WORKS OF INTERPRETATION AND identification employ a manual methodology. For the visual review of images, whether they are in digital or analog format, there is a person who is in charge of this manual process and when the information is available in digital format made by means of a computer, this is considered an assisted methodology, using artificial intelligence techniques. as a tool for the extraction and identification of the features present in the image.

A. Image pre-processing

Before analyzing any information coming from a satellite, it is necessary to consider the defects coming from the various sources, among which it is possible to find:

• Defects in the sensing system which will cause defective images

• Loss of data during transmission from the satellite to the ground station

• The corruption of information in the means of distribution

• Scale distortions in images

Although such defects are not commonly observed in commercially available satellite images, they are generally among the tasks required at the time of analysis.

Métodos de mejoramiento

• After the corrections made during the pre-processing, considering the objective of the study, the criteria to be highlighted are established.

The most common improvement techniques consider:

1. Redistribution of the statistical information of the image

2. The manipulation of the characteristics of the color space (Intensity, Saturation and Purity

3. Filtering

B. Transformation methods

Manipulation of multiple bands is usually involved through mathematical operations with which a new image with enhanced (highlighted) features is obtained.

One of the most common operations is the subtraction of bands in order to examine changes, as is the case of deforestation studies in which images taken with periods of time between them are used to carry out a multi-temporal study.

C. Classification methods

During classification, the person uses visual elements to group the representative pixels of each coverage or use of interest. For digital classification, the spectral information consigned in the DNs is the key of the aggrupation

In either case, the objective is to obtain an image where pixels linked by a particular theme are grouped by categories, the

The results obtained must complement each other in order to be useful.

IV. **ANALYSIS OF RESULTS**

The steps involved in collecting information derived from the process of scientific research can be seen in Figure

When carrying out land cover studies using remote sensing, satellite (or photographic) images are a fundamental tool, it is possible to observe useful elements for classification such as: tone, texture, pattern, shape, size and geographical location among others. The feasibility of extracting information depends on the type of record made, its spectral information and the scale, among other factors.

Fig. 2 PROCESOS ASOCIADOS AL ANÁLISIS DE INFORMACIÓN
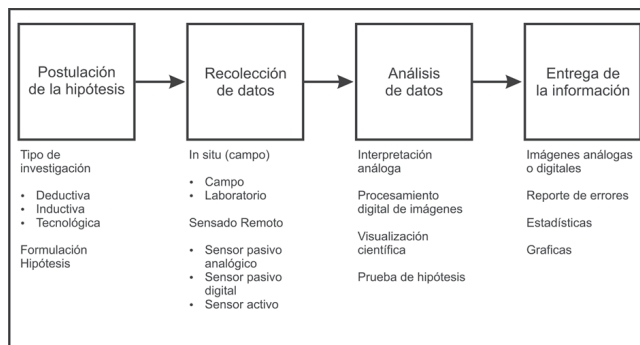
Development Tool

In order to develop the product, the process-oriented structured methodology is used, implemented through the spiral-type work cycle where each iteration of the process delivers a more mature and complete product, called an evolutionary prototype. The package is developed considering the principles of the Free Software Foundation (FSL) through the Net beans IDE with the Java language to which the satellite image is taken to perform the preprocessing and classification by components
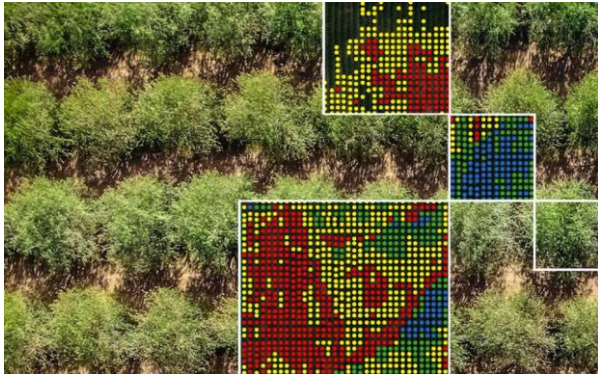
.Fig. 3 PROCESOS DESARROLLADOS
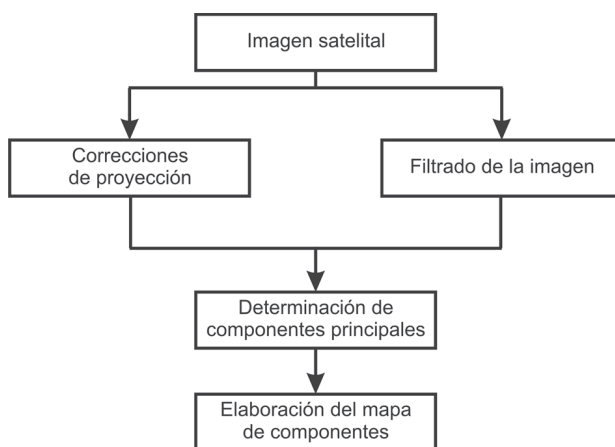
IV. CONCLUSIONS

The use of principal component analysis yields results notably superior to those obtained during phase I, in which the wavelet transform was used as a classifying element.

The deep learning revolution has its roots in computer vision. At the now historic 2012 ImageNet competition, Geoff Hinton and his team presented a neural network, a novel architecture at the time, whose performance dwarfed all previous efforts at computer image recognition. That's when the era of deep learning was born, with computer vision as its original use case. In the decade since then, computer vision capabilities advanced at a breakneck pace

Fuente: https://www.forbesargentina.com/innovacion/vision-artificial-tecnologia-promete-una-ola-startups-multimillonarias-n5267

The recommended methodology for information extraction is based on noise elimination by means of the wavelet transform to subsequently extract the information by means of principal component analysis, which yields acceptable results in most cases, except in those in which mixed vegetation is present. (relatively young vegetation and plants in a mature vegetative state) in which the vegetation responds little to spectral components.

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Biography

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