The challenges of applying IA in the agricultural sector

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Introduction

In recent years, artificial intelligence is being used as a tool in different problems, one of them is agriculture. In an increasingly relevant sector, the application of these techniques will allow forecasting and estimating the necessary resources. Artificial intelligence is nowadays closely linked to the treatment of large volumes of information or BigData. Although it is true that many sectors have large databases, there are still numerous "small data" problems to be tackled. The agrarian sector is one of those that suffers from this problem.

IA in the agricultural sector

Technology has changed the way we communicate, relate, learn, work and, in short, live. Even those tasks that have traditionally been manual have become tasks to be minimized and optimized. Artificial intelligence reaches the agricultural sector with the aim of developing technologies that allow precision farming. In recent years, many advances have been made:

- Sensorized greenhouses with integrated control systems.

- Automatic fertirrigation systems.
- Automatic work in the field with previously programmed machines.
- Making business decisions based on climatological predictions.
- Estimations associated with peaks of maximum and minimum productivity.
- Detection of pests from drone images.

These advances have been possible thanks to the companies that invest in R & D, governmental and non-governmental organizations and universities, which seek to join forces in pursuit of sustainable agriculture for the planet.

However, resistance to change and fear of the unknown still have many allies in this sector, and many are the problems that remain to be solved.

Most common problems

From the experience of a company whose objective is the development of predictive models for the agricultural sector, the main problem we face when starting a project is the lack of data.

The correct data collection is of vital importance. It is well known that the application of artificial intelligence techniques requires the use of a historical set of data that the system can use to make predictions or recommendations. However, in the agriculture sector, this data collection is a relatively recent action. For all this, the treatment of the scarce information available becomes a fundamental aspect for the proper functioning and use of these systems.

Additionally, the reticence of the workers of the sector. On the one hand, the difficulty of using new technologies for small farmers and on the other hand the lack of confidence in the operation of these techniques. This, together with the lack of agronomic profiles with knowledge of new technologies, makes their implementation progress at a lower rate than desired.

Even in cases where there is historical data, the quality of these data is doubtful, having absence or values outside of ranges, mainly in the initial years. This may be due to changes in data acquisition systems, introduction of new tools or recalibration of existing ones, sensor failure and monitoring.

The commercial decisions of management affect in numerous occasions the behavior of the system, nevertheless, these decisions do not remain collected of any form, for the later analysis of group with the rest of the available data.

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Solutions

To face these problems, solutions must be designed that make the most of the available data.
In "small data" environments, predictive systems cannot learn all the knowledge related to the problem, therefore, the prediction must be accompanied by a series of indicators that reinforce this result.
Additionally, it is advisable to use confidence intervals associated with the predicted value, the customized development of evaluation metrics for the problem addressed and the use of data external to the problem.

In addition, the use of predictive models, such as those that use decision tree techniques or association rules, allow us to understand the cause-effect relationships between the data.

The problem of overfitting is very common in "small data" environments. Several of the proposed solutions would be the use of simple models that detect general patterns, the development of customized validation schemes to avoid the overlap between training and testing and the design of model experiments that evaluate their robustness in different scenarios.

The ultimate goal is to develop solutions that add value to customers. ■

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