Query- AI in agriculture

01 August 2023

Through our knowledge acquisition and research session we managed, as a group, to find relevant information on plans for the future and already existing implementations of AI in agriculture. A few problems that the majority of literature we read on the subject, were incorrect use of land, instability in water management for irrigation, big increase in demand vs supply in the coming years and resource management. The literature also mentioned of different methods of solving these challenges through the use of practices like IoT, decision making, Machine learning, Image based insight generation and using various sensors to control many variables. Here are some of the ideas we would like to use in our project.

1. Growth driven by IoT: IoT smart farming solutions is a system built for monitoring crop fields through the use of sensors (light, humidity, temperature, soil moisture, crop health, etc.) and automating the irrigation system.
2. Image-based insight generation: areas where computer vision technology can be used: disease detection, crop readiness identification, field management.
3. Identification of optimal mix for agronomic products: Based on factors such as soil condition, weather forecast, types of seeds, infestation in a certain area; recommendations can be given, depending on the farm's requirements.
4. Health monitoring of crops: Remote sensing techniques along with hyper spectral imaging and 3d laser scanning are used.

Source: (https://www.mindtree.com/sites/default/files/2018-04/Artificial%20Intelligence%20in%20Agriculture.pdf)

5. Extreme learning machines (ELM) modelling: the ELM model using the availability of potassium and sulphur as predictor variables generated the most accurate coffee yield estimates. The potential utility of coupling AI algorithms with biophysical-crop models (i.e., as a data intelligent automation tool) in decision-support systems the implement precision agriculture, in an effort to improve yield in smallholder farms based on carefully screened soil fertility datasets was confirmed.

Source: (https://doi.org/10.1016/j.aiia.2020.04.002)

6. Sampling DNA to augment animal husbandry: In the stock raising field, expert systems can prescribe feed rations, medications, health and welfare conditions for livestock and can recommend the mating partners for improving genetic potential of offspring. The expert systems are able to perform complex analysis of health, reproduction status of individual or groups of animals, to keep track of production and recommend operational measures to be taken in order to improve the farm performance.

Source: (https://journals.usamvcluj.ro/index.php/agriculture/article/view/6454/5747)

7. ANN (Artificial Neural network) in maintaining ET (Evapotranspiration): To bring stability and sustainability in irrigation methods, AI controlled drip irrigation is used to supply exact amount of water needed avoiding water wastage. Sensors including soil sensors collect data realted to ET like humidity, mean daily temperature, sunshine hours, soil moisture etc. to estimate the hydration level of the soil and the data is fell to the ANN model. The AI then uses fast-decision making and supplies water (irrigates) where needed using the drip irrigation system which is connected to the ANN. As a result, the ET is maintained with proper wetting patterns and water is used sustainably.

Questions for an expert:

1.Is there a central database to easily get information on ideal requirements of every crop?

2.What is the biggest challenge/stage/process when trying to apply AI in agricultural research?

3.If and when can AI be applied affordably to agriculture?

4.Although benefits of AI is known to experts in the field, why is it not used vastly in all countries and many are still using traditional ways?

5.Ask for strategies that he/she thinks would be a good match for our project.

6.Are there any problems with using sensors to monitor certain variables

7.What challenges/obstacles might our project idea face?

8.What challenges does AI face when being implemented in developing countries?

(Gracjen, Raihan, Somansh, Mojgan, Lucas)