RAMA UNIVERSITY

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FACULTY OF AGRICULTURAL SCIENCES & ALLIED INDUSTRIES

TECHNIQUES IN PLANT PROTECTION MSH-304

LECTURE 07

DETECTION & PREDICTION OF PESTS/DISEASES USING DEEP LEARNING

INTRODUCTION

Deep Learning technology can accurately detect presence of pests and disease in the farms. Upon this Machine learning algorithm CART can even predict accurately the chance of any disease and pest attacks in future. A normal human monitoring cannot accurately predict the amount and intense of pests and disease attacked in farm for spraying correct and enough fertilizers/pesticides to eliminate the host. Therefore, and artificial Percepton tells the accurate value and give corrective measure of amount of pesticides/fertilizers to be sprayed at specified target areas. The aim of the project is to help the farmers to protect his farm from any kind of pests and disease attacks and eliminate them without disturbing the decorum of the soil and untouched parts of other plants. Mostly in India farmers use manual monitoring and some apps which have huge database limitations and are only bound to detection part. Since, Prevention is better than cure, our project aims at predicting attack of pests/diseases in future thereby making farmer to prevent such attacks. Technology is playing a crucial in developing farms and agro-based industries. Today, it is possible to grow crops in deserts by using technology. Technology has dived into depths in agriculture sector. Automation technology is the present most demanded tool in agriculture. Many companies have come up with latest solutions in Machine Learning, Artificial Intelligence transforming agriculture into a Digital Agriculture. Many tests have proved that deploying technology in farms, will increase crop yield and farmer's revenue thereby. This paper discusses and tests Deep Learning technology implementation in agriculture. Diagnosis is always a concern for farmers in India. At the same time due to fear of attack of pests/diseases, farmer uniformly sprays pesticides/fertilizers in whole farm which may lead to damage of soil as well as plant. The aim of this project is to make the farmer to spray a limited and enough pesticide/fertilizer at a specified target area where either pest/disease is present or maybe an occurrence of attack in future. This helps the farmers mainly to prevent any such attacks on his farm as well as eliminate them if present any by spraying in limited amount and

not polluting soil and other parts of plants. Major advantage of this is to increase farmer's annual monetary revenue and minimising crop loss caused by pests/disease attacks.

LITERATURE SURVEY

In India, there is a drastic change in Agri-Tech. Not most of the farmers are using latest tech gadgets in their farms. We often see IoT related agriculture in several journals but none of them are properly adopted in Indian farms. There is a huge gap between technology and farmers in India. Many start-ups have emerged to bridge this gap between the technology and the farmers. Now, even many MNCs are investing in Agri-Tech in India. Food demand is exponentially increasing due to rise in population. People talking about tractors and heavy machinery in farms era is now replaced by smart technology such as Internet of Things, Artificial Intelligence and Machine Learning. Smart sensors are replaced by heavy machinery in American farms. Farmers are using technology such as temperature and moisture sensors, drones, smart irrigation, terrain contour mapping, self-driving and GPS enabled tractors/rovers - to produce food more sustainably. According to "The Economist", farmers are being "teched up" when it comes to growing crops/food more sustainable and profitable. It is often heard that pests and diseases attack crops and therefore food gradually reduces due to these attacks. By 2050, earth's population is expected to grow 9.7 billion. Therefore, a clear graph of rise in food demand is visible.

Modern Agriculture faces tremendous challenges. Today, the agricultural sector has grown into a highly competitive and globalized industry, where farmers and other actors have to consider local climatic and geographic aspects as well as global ecological and political factors in order to guarantee economic survival and sustainable production. Feeding a growing world population asks for continuous increases in food production, but arable land remains a limited resource. New requests for bio energy or changing diet preferences put additional strains on agricultural production, while settlement and transport consume increasing shares of land. Expected and observable changes in global climate, shifting rainfall patterns, global warming, droughts, or the increasing frequency and duration of extreme weather events endanger traditional production

areas and bring new risks and uncertainties for global harvest yields. To cope with these challenges, Agriculture requires a continuous and sustainable increase in productivity and efficiency on all levels of agricultural 3 production, while resources like water, energy, fertilizers etc. need to be used carefully and efficiently in order to protect and sustain the environment and the soil quality of the arable land. The complexity of the challenge is increased by other short-term events which are difficult to predict, such as epidemics, financial crisis, or price volatility for agricultural raw materials and products.

From the AI point of view, Agriculture offers a vast application area for all kinds of AI core technologies: Mobile, autonomous agents operating in uncontrolled environments, stand-alone or in collaborative settings, allow to investigate, test and exploit technologies from robotics, computer vision, sensing, and environment interaction. Integrating multiple partners and their heterogeneous information sources leads to application of semantic technologies. The complexity of the agricultural production asks for progress in modelling capabilities, handling of uncertainty, and in the algorithmic and usability aspects of locationand context-specific decision support. The growing interest in reliable predictions as a basis for planning and control of agricultural activities requires the interdisciplinary cooperation with domain experts e.g. from agricultural research. Modern agricultural machines shall use self-configuring components and shall be able to collaborate and exhibit aspects of selforganization and swarm intelligence.

Automation technology is the most focussed technology by the Indian start-ups. Automated Drones and Bots are deployed in farms for monitoring and serving the crop. Day by day the technology used is also swapping from normal spraying to specified target spraying of pesticides and fertilizers in the farms. **Artificial Intelligence**, Machine Learning and Deep Learning algorithms are adopted to monitor the crops precisely and detect the faulty areas in the farms, hence spray corrective solution in that specific target area.

Several Start-Ups in India have put up their product in automates technology in agricultural sector. Mostly drones and digital apps are designed to have better crop yield. Drones are deployed and use RADAR to spray the entire field. The latitude and longitude of the entire farm is drawn in the map and RADAR is used to maintain a constant height between the drone and

farm to avoid any sort of collision. This technology spray pesticides and fertilizers in entire farm that too in wide ranges within few minutes. This saves the farmer's time and saves the crop too.

Several digital apps are designed to help farmers to identify diseases attacked in the farm. Even NPK (Nitrogen, Phosphorus and Potassium) values of the plant are calculated to monitor the plant's health.

Many MNCs are investing hugely in using technology in agriculture. Artificial Intelligence, Machine learning, Deep learning and IoT technologies are adopted by startups and tech companies to boost the crop yield.

Some apps are designed in such a way to predict the weather condition and soil condition and give an accurate measure to tell what kind and type of crop must be sown in the soil in order to withstand perfectly till the harvest time based on present and future conditions. So much of background research is going on to study the plant from A to Z mostly for prediction analysis in order to design algorithms using Machine Learning and Deep learning. Based on a single snap of a plant, A to Z analysis of it must be done, such type of research is going on to gather the necessary database.

All technical papers surveyed gave us a first view on this challenging interplay between AI and Agriculture. Taking profit from state-of-the-art sensing and actuator technologies the contribution on DATA MINING AND PATTERN RECOGNITION IN AGRICULTURE addresses challenges and potentials of appropriate methods in Agriculture. Motivated by the need for increased resource efficiency, the paper on ROBOTS FOR FIELD OPERATION WITH COMPREHENSIVE MULTILAYER CONTROL summarizes work on the development of autonomous agricultural machines. A contribution to better understanding between multiple cooperating actors is proposed in a submission on ONTOLOGY-BASED MOBILE COMMUNICATION. Optimizing the operation of a harvesting logistics chain, consisting of multiple cooperating vehicles in the field, will profit from the application of dynamic route planning algorithms, as presented in a paper on SPATIAL-TEMPORAL CONSTAINT PLANNING.

While the report on the iGREEN project spans from support for sharing and exchange among agricultural operators to decision support and application control, the report on TOWARDS SUPPORTING MOBILE BUSINESS PROCESSES focuses on the uncertainty encountered in the nondeterministic agricultural environment and the application of agent technology to cope with that. Innovative ways for agricultural agents to see and perceive their environment are described in DETECTION OF FIELD STRUCTURES, which combines laser scanners and computer vision with sophisticated modeling capabilities to enable the intended structure recognition. In addition, Progress results in successful and interesting doctoral dissertation work: In order 5 to enable self-organized sensor integration in modular machines, BIO-INSPIRED SENSOR DATA MANAGEMENT took inspiration from ant colonies and similar observations. MECHATRONIC SYSTEMS investigate the adaptation of the operating parameters of a modern agricultural machine to the current context and task details in the field.

Finally, our survey concluded after interacting with several farmers that, most of the farmers are preferring apps because it’s free and readily available 24x7 online. The farmer need not do much with it, he simply needs to take a snap of a plant and upload it to the cloud. The backend processing designed do the complete analysis of taken snap and gives a detailed report to the farmer.