SECJ3553 - SEC 16
Artificial Intelligence
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Progress-1
Agriculture - AgriNINE.11

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Introduction:

One of the most significant sections of the current economy is agriculture. However, farmers are frequently confronted with a number of issues such as the well-being of soil, pests and unpredictable weather.
Our artificial intelligence system is called argiNINE-11 and assists farmers in making improved decisions. It gathers information on the soil, weather, and crops and proceeds to make logical decisions to make recommendations to farmers. ARGININE uses Knowledge Representation (KR) to make logical decisions to realize a growing improvement in crop growth and sustainability.

Five Knowledge Representations (KR) are:

KR 1: Soil-Nutrient Suitability
KR 2: Pest Detection and Treatment
KR 3: Weather and Irrigation Decision
KR 4: Crop-Yield Prediction Based on Conditions
KR 5: Sustainable Practice Recommendation

KR 1: Soil-Nutrient Suitability:

Description: The system knows that each crop requires certain kinds of nutrients to grow which are not available on the soil and the system will recommend the appropriate fertilizer to apply. This assists farmers to be aware of what their soil lacks. In so doing, agriNINE-11 will contribute to growing crops and avoid the wastage of money on the inappropriate fertilizers.

How AI is used: argiNINE-11 uses the information to decide when and the type of fertilizer to apply to particular crops. The AI calculates the type of fertiliser it recommends and when to apply it by comparing to the nutrients required by the soil with what the soil has. This prevents the farmer to apply the wrong type of fertilizer or an excess of the same. In addition to this, it is cost-saving and encourages healthier and stronger development of plants.

First Order Logic(FOL): For every crop and every nutrient. if a crop needs a certain nutrient and the soil does not have that nutrient, then the system should recommend a fertilizer that provides it.

$$\forall x \forall y \, [\text{Crop}(x) \wedge \text{Requires}(x, y) \wedge \neg\text{Has}(\text{Soil}, y) \rightarrow \text{Recommend}(\text{Fertilizer}(y))]$$

KR 2: Pest Detection and Treatment:-

Description: Using sensor or images, the system identifies the presence of a crop infection by pests. It also identifies whether the crop is spoilt or not. Furthermore it proposes how to treat or use pesticide. This assists farmers to rid pests as well as saving counterparts and minimizing losses.

How AI is used: argiNINE-11 provides recommendations to farmers on pests. It identifies whether the crop has been infested by pests and the type and nature of treatment required to eliminate them before they can do a lot of harm and thus save money, plants as well as keep the solid healthy.

First Order Logic(FOL): If a pest is detected on the crop, then the system will recommend a treatment

$$\forall p \, [\text{PestDetected}(p) \rightarrow \text{Recommend}(\text{Treatment}(p))]$$

KR 3: Weather and Irrigation Decision

Description: The system examines the weather information to determine whether the weather is about to rain or not. When there is an expectation of rain, then the farmer is not supposed to water the plants. This will save water and If no rain is predicted, it will indicate watering depending on soil dryness. This way, argiNINE-11 assists farmers in utilizing water more efficiently and less wastage.

How AI is used: argiNINE-11 saves water and takes care of the environment. It recommends the conduct to follow when it is raining or not. In so doing, argiNINE-11 helps in future smart and sustainable farming.

First Order Logic(FOL): If the system sees that rain is going to fall soon, it tells the farmer not to water the plants.

If (Rain expected) → Do not water

KR 4: Crop-Yield Prediction Based on Conditions

Description: The system monitors various conditions like soil condition, sunlight, temperature, rainfall among others. When all these conditions are satisfactory it would predict that the crop will be good and the yield would be high. However, in case one of the factors is poor, it will alert the farmer at an early stage. This assists the farmers in future planning.

How AI is used: argiNINE-11 will forecast the amount of crops that will be produced in future. AgriNINE-11 will be able to know whether the plants are

fine and whether they will produce high or lower yields by checking the soil, weather, and other growing conditions. Furthermore it assists the farmers to make better and safer decisions regarding their farming business.

First Order Logic(FOL): For every crop, if the soil and weather are both optimal, then the system expects a high yield for that crop.

$$\forall c \, [Optimal(Soil) \wedge Optimal(Weather) \wedge Crop(c) \rightarrow Expect(HighYield(c))]$$

KR 5: Sustainable Practice Recommendation:-

Description: The system helps in the friendly farming that is eco-friendly. In the event that the system identifies the excessive poison and threat of fertilizer or pesticide, which targets the land or the water around the area. It proposes a natural or organic alternative in case it exists.

How AI is used: argiNINE-11 brings environmentally-friendly and safer farming. In cases where argiNINE-11 determines that a certain fertilizer is harmful to the soil or water it seeks an organic solution that would fulfill the same function. In case the system identifies the existence of a safe and viable alternative, it suggests the same. This will assist farmers to conserve the land and produce healthy crops without polluting the land.

First Order Logic(FOL): If a fertilizer causes pollution and there is an alternate eco-friendly option available, the system will choose the eco-friendly one instead.

$$\forall f \, [CausesPollution(f) \wedge Exists(Alt, EcoFriendly(Alt)) \rightarrow Prefer(Alt, f)]$$

Conclusion

In conclusion, argiNINE-11 is a smart farming helper enabling farmers to make smart and sustainable farming decisions. With the help of Knowledge Representation (KR), the system is aware of the nutrients in the soil, pests, weather, crop yield, and recommends ecological practices in farming. All KR enable the system to reason and provide useful recommendations to farmers whenever necessary. This saves resources, reduces wastage and enhances productivity. In the case of argiNINE-11, farmers will be able to manage their farms more efficiently and save the environment simultaneously. The system demonstrates that the application of artificial intelligence can help modern agriculture to create a more sustainable and food-secure future.