6.3 Problem Formulation for Crop Disease Detection:

Initial State:

The system starts with no information about the crop health status.

Sensors are inactive, and there is no collected data.

Goal State:

The goal is to accurately identify and classify crop diseases in real-time. Provide actionable insights and information through a user interface.

States:

State 1: Data Collection

Sensors are active, collecting raw image data from crops.

State 2: Data Preprocessing

Raw image data is preprocessed to enhance its quality.

State 3: Neural Network Analysis

Convolutional Neural Networks (CNNs) analyze preprocessed data to extract features.

State 4: Database Integration

Integrate a comprehensive disease database for training.

State 5: Training Neural Network

Train the neural network with learned features and the disease database.

State 6: Identifying Diseases

The trained model identifies and classifies diseases in real-time.

State 7: Real-time Monitoring

Continuously monitor and analyze crop health in real-time.

State 8: User Interaction

Users interact with the system through a user interface to receive insights.

Actions:

Action 1: Activate Sensors

Transition: State 1 → State 2

Description: Activate sensors to start the data collection process.

Action 2: Collect Data

Transition: State 2 → State 3

Description: Sensors collect raw image data from crops.

Action 3: Preprocess Data

Transition: State 3 → State 4

Description: Preprocess raw image data to enhance quality.

Action 4: Analyze with Neural Network

Transition: State 4 → State 5

Description: CNNs analyze preprocessed data to extract features.

Action 5: Integrate Database

Transition: State 5 → State 6

Description: Integrate a comprehensive disease database for training.

Action 6: Train Neural Network

Transition: State 6 → State 7

Description: Train the neural network with learned features and the disease database.

Action 7: Identify Diseases

Transition: State 7 → State 8

Description: The trained model identifies and classifies diseases in real-time.

Action 8: Real-time Monitoring

Transition: State 8

Description: Continuously monitor and analyze crop health in real-time.

Action 9: User Interaction

Transition: State 8

Description: Users interact with the system through a user interface to receive insights.

Constraints:

The system must operate in real-time for timely disease identification.

Accuracy in disease identification is crucial for effective decision-making

Limited computational resources may constrain the complexity of the neural network model.