**PAPER TITLE :-** Machine learning-based approaches for tomato pest classification

**DATE:-** April 2, 2022

**JOURNAL/CONFERENCE:-** TELKOMNIKA Telecommun Comput El Control

**AUTHOR:-** Gayatri Pattnaik, Kodimala Parvathi

**PROBLEM MENTIONED/SOLUTION OBTAINED:-** Insect pests pose a significant threat to agricultural production, causing damage to crop yields. Excess use of chemical pesticides is hazardous and detrimental to the ecosystem.

Automatic detection and classification of tomato pests using image processing with machine learning-based approaches. Machine learning (ML) and image processing methods have been explored for automatic pest detection and classification. Integrated pest management (IPM) is a scheme created to limit the use of chemical pesticides.

**ALGORITHM USED:-** Gray level co-occurrence matrix (GLCM), local binary pattern (LBP), histogram of oriented gradient (HOG), and speeded up robust features (SURF) were used for feature extraction . The SURF (Speeded Up Robust Features) algorithm was used for interest point detection and description in the image segmentation process . The k-means clustering algorithm was used for segmenting the intended area (pest) from the background. Support vector machine (SVM), k-nearest neighbor (k-NN), and decision tree (DT) were the three classification methods used. The SVM classifier achieved the highest precision of 81.02% when using the feature extracted by the LBP algorithm. The decision tree (DT) algorithm, proposed by Quinlan, was also used for classification.

## TOOLS USED/IMPLEMENTED:-

MATLAB

Waikato Environment

## RESULTS AND DISCUSSION:-

Machine learning-based approaches were used for tomato pest classification, using texture features extracted by algorithms like GLCM, LBP, HOG, and SURF. The SVM classifier with LBP features achieved the highest recognition accuracy of 81.02%. The study aimed to improve tomato crop quality and productivity by using machine learning for early detection of pest infestations. Combining different feature extraction methods is suggested to overcome the limitations of complex feature engineering work and improve accuracy

## IMPORTANT REFERENCE:-


1. Padilla, F.M.; Gallardo, M.; Pena-Fleitas, M.T.; de Souza, R.; Thompson, R.B. Proximal optical sensors for nitrogen management of vegetable crops: A review. Sensors 2018, 18, 2083. [CrossRef]

2. He, Y.; Peng, J.; Liu, F.; Zhang, C.; Kong, W. Critical review of fast detection of crop nutrient and physiological information with spectral and imaging technology. Trans. Chin. Soc. Agric. Eng. 2015, 31, 174–189. [CrossRef]

3. Liu, H.; Mao, H.; Zhu, W.; Zhang, X.; Gao, H. Rapid diagnosis of tomato N-P-K nutrition level based on hyperspectral technology. Trans. Chin. Soc. Agric. Eng. 2015, 31, 212–220. [CrossRef]

4.Li, L.; Zhang, Q.; Huang, D. A review of imaging techniques for plant phenotyping. Sensors 2014, 14, 20078–20111.

5. [PubMed] Mishra, P.; Asaari, M.S.M.; Herrero-Langreo, A.; Lohumi, S.; Diezma, B.; Scheunders, P. Close range hyperspectral imaging of plants: A review. Biosyst. Eng. 2017, 164, 49–67. [CrossRef]

6. Barbedo, J.G.A. Detection of nutrition deficiencies in plants using proximal images and machine learning: Areview. Comput. Electron. Agric. 2019, 162, 482–492. [CrossRef]

7. Baresel, J.P.; Rischbeck, P.; Hu, Y.; Kipp, S.; Hu, Y.; Barmeier, G.; Mistele, B.; Schmidhalter, U. Use of a digital camera as alternative method for non-destructive detection of the leaf chlorophyll content and the nitrogen nutrition status in wheat. Comput. Electron. Agric. 2017, 140, 25–33. [CrossRef]

8. Tavakoli, H.; Gebbers, R. Assessing nitrogen and water status of winter wheat using a digital camera. Comput. Electron. Agric. 2019, 157, 558–567. [CrossRef]

9. Wang, Y.; Wang, D.; Shi, P.; Omasa, K. Estimating rice chlorophyll content and leaf nitrogen concentration with a digital still color camera under natural light. Plant Methods 2014, 10, 36. [CrossRef] .