

## Tomato-Weed Classification by RetinaNet One-Step Neural Network

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**Abstract :** The increased number of weeds in tomato crops highly lower yields. Weed identification with the aim of machine learning is important to carry out site-specific control. The last advances in computer vision are a powerful tool to face the problem. The analysis of RGB (Red, Green, Blue) images through Artificial Neural Networks had been rapidly developed in the past few years, providing new methods for weed classification. The development of the algorithms for crop and weed species classification looks for a real-time classification system using Object Detection algorithms based on Convolutional Neural Networks. The site study was located in commercial corn fields. The classification system has been tested. The procedure can detect and classify weed seedlings in tomato fields. The input to the Neural Network was a set of 10,000 RGB images with a natural infestation of *Cyperus rotundus* L., *Echinochloa crus galli* L., *Setaria italica* L., *Portulaca oeracea* L., and *Solanum nigrum* L. The validation process was done with a random selection of RGB images containing the aforementioned species. The mean average precision (mAP) was established as the metric for object detection. The results showed agreements higher than 95 %. The system will provide the input for an online spraying system. Thus, this work plays an important role in Site Specific Weed Management by reducing herbicide use in a single step.

**Keywords :** deep learning, object detection, cnn, tomato, weeds

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