



**smart AKIS**  
Smart Farming Thematic Network



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## Two-stage procedure based on smoothed ensembles of neural networks applied to weed detection in orange groves



Title	Two-stage procedure based on smoothed ensembles of neural networks applied to weed detection in orange groves
Title (native language)	
Category	<ul style="list-style-type: none"> <li>Recording or mapping technology</li> </ul>
Short summary for practitioners (Practice abstract) in English)	<p>We introduce a procedure for weed detection in orange groves which consists of two different stages. In the first stage, the main features in an image of the grove are determined (Trees, Trunks, Soil and Sky). In the second, the weeds are detected only in those areas which were determined as Soil in the first stage. Due to the characteristics of weed detection (changing weather and light conditions), we introduce a new training procedure with noisy patterns for ensembles of neural networks. In the experiments, a comparison of the new noisy learning was successfully performed with a set of well-known classification problems from the machine learning repository published by the University of California, Irvine. This first comparison was performed to determine the general behavior and performance of the noisy ensembles. Then, the new noisy ensembles were applied to images from orange groves to determine where weeds are located using the proposed two-stage procedure. Main results of this contribution show that the proposed system is suitable for weed detection in orange, and similar, groves.</p>
Short summary for practitioners	
Website	
Audiovisual material	
Links to other websites	
Additional comments	
Keywords	Farming practice   Plant production and horticulture   Biodiversity and nature management
Additional keywords	Agricultural robotics; Agricultural sensing; Terrain classification
Geographical location (NUTS)	EU
Other geographical location	
Cropping systems	Tree crops
Field operations	Weed control   Crop and soil scouting
SFT users	Farmer   Contractor
Education level of users	All
Farm size (ha)	0-2   2-10   10-50   50-100   100-200   200-500   >500

# Scientific article

Title	Two-stage procedure based on smoothed ensembles of neural networks applied to weed detection in orange groves
Full citation	Torres-Sospedra, J.; Nebot, P. (2014). Biosystems Engineering, DOI:10.1016/j.biosystemseng.2014.05.005

## Effects of this SFT

Productivity (crop yield per ha)	Some increase
Quality of product	No effect
Revenue profit farm income	Some increase
Soil biodiversity	Some increase
Biodiversity (other than soil)	Some increase
Input costs	Some decrease
Variable costs	Some decrease
Post-harvest crop wastage	No effect
Energy use	Some decrease
CH4 (methane) emission	No effect
CO2 (carbon dioxide) emission	No effect
N2O (nitrous oxide) emission	No effect
NH3 (ammonia) emission	No effect
NO3 (nitrate) leaching	No effect
Fertilizer use	No effect
Pesticide use	No effect
Irrigation water use	No effect
Labor time	Some decrease
Stress or fatigue for farmer	Some decrease
Amount of heavy physical labour	No effect
Number and/or severity of personal injury accidents	No effect
Number and/or severity of accidents resulting in spills property damage incorrect application of fertiliser/pesticides etc.	Some decrease
Pesticide residue on product	No effect
Weed pressure	Large decrease
Pest pressure (insects etc.)	No effect
Disease pressure (bacterial fungal viral etc.)	No effect

## Information related to how easy it is to start using the SFT

This SFT replaces a tool or technology that is currently used. The SFT is better than the current tool	strongly agree
The SFT can be used without making major changes to the existing system	agree
The SFT does not require significant learning before the farmer can use it	agree
The SFT can be used in other useful ways than intended by the inventor	no opinion
The SFT has effects that can be directly observed by the farmer	agree
Using the SFT requires a large time investment by farmer	disagree
The SFT produces information that can be interpreted directly	agree

[View this technology on the Smart-AKIS platform.](#)

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