



Document details

< Back to results | < Previous 10 of 215 Next >

↗ Export ↴ Download 🖨 Print ✉ E-mail 📄 Save to PDF ☆ Add to List More... >

View at Publisher

Communications in Computer and Information Science

Volume 1194 CCIS, 2020, Pages 473-485

1st International Conference on Applied Technologies, ICAT 2019; Quito; Ecuador; 3 December

2019 through 5 December 2019; Code 238249

Semantic Segmentation of Weeds and Crops in Multispectral Images by Using a Convolutional Neural Networks Based on U-Net (Conference Paper)

Chicchón Apaza, M.Á.^a ✉, Monzón, H.M.B.^a ✉, Garrido, R.P.A.^b 🔍

^a Exponential Technology Group (GITX-ULIMA), Institute of Scientific Research (IDIC), University of Lima, Lima, Peru

^b Telematics Engineering Department, Technical University of Madrid (UPM), Madrid, Spain

Abstract

↕ View references (22)

A first step in the process of automating weed removal in precision agriculture is the semantic segmentation of crops, weeds and soil. Deep learning techniques based on convolutional neural networks are successfully applied today and one of the most popular network architectures in semantic segmentation problems is U-Net. In this article, the variants in the U-Net architecture were evaluated based on the aggregation of residual and recurring blocks to improve their performance. For training and testing, a set of data available on the Internet was used, consisting of 60 multispectral images with unbalanced pixels, so techniques were applied to increase and balance the data. Experimental results show a slight increase in quality metrics compared to the classic U-Net architecture. © 2020, Springer Nature Switzerland AG.

SciVal Topic Prominence ⓘ

Topic: Agriculture | Crops | Weed detection

Prominence percentile: 97.580 ⓘ

Author keywords

Convolutional neural network Deep learning Precision agriculture Semantic segmentation U-Net

Indexed keywords

Engineering controlled terms:

Convolution Crops Deep learning Deep neural networks Image segmentation Network architecture Precision agriculture Semantic Web Semantics

Engineering uncontrolled terms

Learning techniques Multispectral images NET architecture Quality metrics Semantic segmentation Training and testing

Engineering main heading:

Convolutional neural networks

Funding details

Funding text

This research was supported by National Agriculture Innovation Program (PNIA) of Peru and the Institute of Scientific Research (IDIC) of the University of Lima.

Metrics ⓘ View all metrics >



PlumX Metrics

Usage, Captures, Mentions, Social Media and Citations beyond Scopus.

Cited by 0 documents

Inform me when this document is cited in Scopus:

Set citation alert >

Set citation feed >

Related documents

UAV image based crop and weed distribution estimation on embedded GPU boards

Fawakherji, M. , Potena, C. , Bloisi, D.D. (2019) *Communications in Computer and Information Science*

Fully convolutional networks with sequential information for robust crop and weed detection in precision farming

Lottes, P. , Behley, J. , Milioto, A. (2018) *IEEE Robotics and Automation Letters*

Crop and Weeds Classification for Precision Agriculture Using Context-Independent Pixel-Wise Segmentation

Fawakherji, M. , Youssef, A. , Bloisi, D. (2019) *Proceedings - 3rd IEEE International Conference on Robotic Computing, IRC 2019*

View all related documents based on references

Find more related documents in Scopus based on:




Authors > Keywords >

ISSN: 18650929
ISBN: 978-303042519-7
Source Type: Book series
Original language: English

DOI: 10.1007/978-3-030-42520-3_38
Document Type: Conference Paper
Volume Editors: Botto-Tobar M., Zambrano Vizueté M., Torres-Carrion P., Montes Leon S., Pizarro Vasquez G., Durakovic B.
Publisher: Springer

References (22)

[View in search results format >](#)

All [Export](#)  Print  E-mail  Save to PDF [Create bibliography](#)

-
- 1 Sa, I., Chen, Z., Popovic, M., Khanna, R., Liebisch, F., Nieto, J., Siegart, R.
WeedNet: Dense Semantic Weed Classification Using Multispectral Images and MAV for Smart Farming

(2018) *IEEE Robotics and Automation Letters*, 3 (1), art. no. 8115245, pp. 588-595. Cited 49 times.
<http://ieeexplore.ieee.org.ezproxy.ulima.edu.pe/servlet/opac?punumber=7083369>
doi: 10.1109/LRA.2017.2774979

[View at Publisher](#)

-
- 2 Milioto, A., Lottes, P., Stachniss, C.
Real-Time Semantic Segmentation of Crop and Weed for Precision Agriculture Robots Leveraging Background Knowledge in CNNs

(2018) *Proceedings - IEEE International Conference on Robotics and Automation*, art. no. 8460962, pp. 2229-2235. Cited 46 times.
ISBN: 978-153863081-5
doi: 10.1109/ICRA.2018.8460962

[View at Publisher](#)

-
- 3 Haug, S., Ostermann, J.
Cited 3 times.
https://doi-org.ezproxy.ulima.edu.pe/10.1007/978-3-319-16220-1_8

-
- 4 Pulido-Rojas, C.A., Molina-Villa, M.A., Solaque-Guzmán, L.E.
Machine vision system for weed detection using image filtering in vegetables crops
([Open Access](#))

(2016) *Revista Facultad de Ingeniería*, 2016 (80), pp. 124-130. Cited 4 times.
<http://aprendeenlinea.udea.edu.co/revistas/index.php/ingenieria/article/download/24301/20782808>
doi: 10.17533/udea.redin.n80a13

[View at Publisher](#)

-
- 5 Søggaard, H.T.
Weed classification by active shape models
- (2005) *Biosystems Engineering*, 91 (3), pp. 271-281. Cited 85 times.
doi: 10.1016/j.biosystemseng.2005.04.011

[View at Publisher](#)

-
- 6 Ahmad, I., Siddiqi, M.H., Fatima, I., Lee, S., Lee, Y.-K.
Weed classification based on Haar wavelet transform via k-Nearest Neighbor (k-NN) for real-time automatic sprayer control system

(2011) *Proceedings of the 5th International Conference on Ubiquitous Information Management and Communication, ICUIMC 2011*, art. no. 17. Cited 12 times.
ISBN: 978-145030571-6
doi: 10.1145/1968613.1968634

[View at Publisher](#)

-
- 7 Voorhoeve, L.
(2018) *Machine Learning for Crop and Weed Classification*
-
- 8 Lottes, P., Stachniss, C.
Semi-supervised online visual crop and weed classification in precision farming exploiting plant arrangement

(2017) *IEEE International Conference on Intelligent Robots and Systems*, 2017-September, art. no. 8206403, pp. 5155-5161. Cited 13 times.
ISBN: 978-153862682-5
doi: 10.1109/IROS.2017.8206403

View at Publisher
-
- 9 Kamilaris, A., Prenafeta-Boldú, F.X.
Deep learning in agriculture: A survey

(2018) *Computers and Electronics in Agriculture*, 147, pp. 70-90. Cited 317 times.
www.elsevier.com/inca/publications/store/5/0/3/3/0/4
doi: 10.1016/j.compag.2018.02.016

View at Publisher
-
- 10 Cereda, S.
(2017) *A Comparison of Different Neural Networks for Agricultural Image Segmentation*. Cited 3 times.
-
- 11 Potena, C., Nardi, D., Pretto, A.
Fast and accurate crop and weed identification with summarized train sets for precision agriculture

(2017) *Advances in Intelligent Systems and Computing*, 531, pp. 105-121. Cited 42 times.
<http://www.springer.com.ezproxy.ulima.edu.pe/series/11156>
ISBN: 978-331948035-0
doi: 10.1007/978-3-319-48036-7_9

View at Publisher
-
- 12 Bah, M.D., Hafiane, A., Canals, R.
(2018) *Deep Learning with Unsupervised Data Labeling for Weeds Detection on UAV Images*. Cited 6 times.
-
- 13 Kantipudi, K., Lai, C., Min, C.-H., Chiang, R.C.
Weed detection among crops by convolutional neural networks with sliding windows
(2018) *14Th International Conference on Precision Agriculture, Quebec*
-
- 14 Lottes, P., Behley, J., Milioto, A., Stachniss, C.
Fully convolutional networks with sequential information for robust crop and weed detection in precision farming

(2018) *IEEE Robotics and Automation Letters*, 3 (4), pp. 2870-2877. Cited 25 times.
<http://ieeexplore.ieee.org.ezproxy.ulima.edu.pe/servlet/opac?punumber=7083369>
doi: 10.1109/LRA.2018.2846289

View at Publisher
-

15 Dyrmann, M., Karstoft, H., Midtiby, H.S.

Plant species classification using deep convolutional neural network

(2016) *Biosystems Engineering*, 151, pp. 72-80. Cited 114 times.
<http://www.elsevier.com/inca/publications/store/6/2/2/7/9/5/index.htm>
doi: 10.1016/j.biosystemseng.2016.08.024

[View at Publisher](#)

16 Dyrmann, M., Mortensen, A.K., Midtiby, H.S., Jørgensen, R.N.

Pixel-wise classification of weeds and crops in images by using a fully convolutional neural network
(2016) *Proceedings of the International Conference on Agricultural Engineering*, pp. 26-29. Cited 10 times.
Aarhus, Denmark, pp

17 Ronneberger, O., Fischer, P., Brox, T.

U-net: Convolutional networks for biomedical image segmentation

(2015) *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 9351, pp. 234-241. Cited 6818 times.
<http://springerlink.com.ezproxy.ulima.edu.pe/content/0302-9743/copyright/2005/>
ISBN: 978-331924573-7
doi: 10.1007/978-3-319-24574-4_28

[View at Publisher](#)

18 Akeret, J., Chang, C., Lucchi, A., Refregier, A.

Radio frequency interference mitigation using deep convolutional neural networks

(2017) *Astronomy and Computing*, 18, pp. 35-39. Cited 44 times.
<http://www.journals.elsevier.com.ezproxy.ulima.edu.pe/astronomy-and-computing/>
doi: 10.1016/j.ascom.2017.01.002

[View at Publisher](#)

19 Badrinarayanan, V., Kendall, A., Cipolla, R.

SegNet: A Deep Convolutional Encoder-Decoder Architecture for Image Segmentation

(2017) *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 39 (12), art. no. 7803544, pp. 2481-2495. Cited 1994 times.
doi: 10.1109/TPAMI.2016.2644615

[View at Publisher](#)

20 Sa, I., Popović, M., Khanna, R., Chen, Z., Lottes, P., Liebisch, F., Nieto, J., (...), Siegart, R.

WeedMap: A large-scale semantic weed mapping framework using aerial multispectral imaging and deep neural network for precision farming ([Open Access](#))

(2018) *Remote Sensing*, 10 (9), art. no. 1423. Cited 22 times.
https://res.mdpi.com/remotesensing/remotesensing-10-01423/article_deploy/remotesensing-10-01423.pdf?filename=&attachment=1
doi: 10.3390/rs10091423

[View at Publisher](#)

21 Di Cicco, M., Potena, C., Grisetti, G., Pretto, A.

Automatic model based dataset generation for fast and accurate crop and weeds detection

(2017) *IEEE International Conference on Intelligent Robots and Systems*, 2017-September, art. no. 8206408, pp. 5188-5195. Cited 20 times.
ISBN: 978-153862682-5
doi: 10.1109/IROS.2017.8206408

[View at Publisher](#)

🔍 Chicchón Apaza, M.Á.; Exponential Technology Group (GITX-ULIMA), Institute of Scientific Research (IDIC), University of Lima, Lima, Peru; email:chicchon.am@gmail.com
© Copyright 2020 Elsevier B.V., All rights reserved.

< Back to results | < Previous 10 of 215 Next >

^ Top of page

About Scopus

What is Scopus
Content coverage
Scopus blog
Scopus API
Privacy matters

Language

日本語に切り替える
切换到简体中文
切换到繁體中文
Русский язык

Customer Service

Help
Contact us

[Terms and conditions ↗](#) [Privacy policy ↗](#)

Copyright © Elsevier B.V. ↗. All rights reserved. Scopus® is a registered trademark of Elsevier B.V.

We use cookies to help provide and enhance our service and tailor content. By continuing, you agree to the use of cookies.