

Glume pubescence prediction of spikelets using computer vision techniques

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Motivation and Aim: Glume pubescence of spikelets may be important feature for researching resistance of spikelets to different environmental conditions. In article [1] it was considered that spikelets with glume pubescence are better in storing heat, than those without it. At the same time glume pubescence can be hard feature to detect without special tools. So our aim was to research is it possible to distinguish spikelets with glume pubescence from those without pubescence using modern computer vision techniques.

Methods and Algorithms: For solving that task we decided to use Convolutional Neural Networks (CNNs). In our task the following species of wheat were used: '*T. monococcum*', '*T. boeoticum*', '*T. urartu*', '*T. yunnanense*', '*T. aestivum*', '*T. compactum*', '*T. spelta*', '*T. macha*', '*T. vavilovii*', '*T. petropavlovskiy*', '*T. durum*', '*T. timopheevii*', '*T. dicoccoides*', '*T. turanicum*', '*T. carthlicum*', '*T. turgidum*', '*T. dicoccum*', '*T. aethiopicum*', '*T. polonicum*'. We used pretrained model for segmentation of spikelets to extract mask of spikelets. Then we applied findContours algorithm from OpenCV to distinguish spikelet from background. Also we add some data augmentations to our spikelets (like Crop, Rotation, Scale) using Albumentations library. Finally, we feed this data to CNN. We used following architectures: vgg16, ResNet18, EfficientNet b0-b3. For evaluating models we used accuracy, precision, auc. **Results:** We tried different crop sizes, augmentations, models and loss function and obtained the following result, which is the best among all trained CNNs. The best model: EfficientNet b1, trained and evaluated on 512x512 images.

Accuracy: 0.83

Precision: 0.69

AUC: 0.86

Conclusion: The obtained results can be used for predicting glume pubescence feature of spikelets.

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References

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