The Classification of Skateboarding Tricks by Means of the Integration of Transfer Learning Models and *K*-Nearest Neighbors

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Abstract The skateboarding scene has reached new heights, especially with its first appearance at the now postponed Tokyo Summer Olympic Games. Therefore, owing to the scale of the sport in such competitive games, advanced innovative assessment approaches have increasingly gained due attention by relevant stakeholders, especially with the interest of a more objective-based evaluation. We employed pretrained Transfer Learning coupled with a fine-tuned k-Nearest Neighbor (k-NN) classifier to form several pipelines to investigate its efficacy in classifying skateboarding tricks, namely Kickflip, Pop Shove-it, Frontside 180, Ollie and Nollie Front Shove-it. From the five skateboarding tricks, a skateboarder would repeatedly perform it for five successful landed tricks captured by YI action camera. From that, the images would be feature engineered and extracted through five Transfer Learning models, namely VGG-16, VGG-19, DenseNet-121, DenseNet-201 and InceptionV3, then classified by employing the k-Nearest Neighbor (k-NN) classifier. It is demonstrated from the preliminary results, that the VGG-19 and DenseNet-201 pipeline, both attained a classification accuracy (CA) of 97% on the test dataset, followed by the DenseNet-121 and InceptionV3, in which both obtained a test CA of 96%. The least performing pipeline is the VGG-16, where a test CA of 94% is recorded. The result from the current study validated it could providing an objective judgment for judges in classifying skateboard tricks for the competition.

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