An Android application checks how roasted coffee beans are

June 27 2022, by Ingrid Fadelli

Fig. 1. Represents an example dataset of group of coffee beans photographed in lightbox.

Fig. 2. Represents an example dataset of group of coffee beans photographed in natural light.

Credit: Ontoum et al.

Coffee, one of the most popular and consumed drinks worldwide, is made from water and coffee beans. Coffee beans are the seeds of the Coffea plant, which is grown in several parts of central and South America, as well as in Africa, the Middle East and Asia.

The quality and flavor of coffee depends on various factors, including the conditions in which the Coffea plants are grown, as well as the processes through which coffee beans are stored, processed and roasted. Determining the extent to which coffee beans are roasted is not always easy for humans, as it sometimes requires specialized training or experience.

Researchers at King Mongkut's University of Technology Thonburi in Thailand have recently developed a smartphone application that could help to determine the how much a batch of coffee beans have been roasted simply by analyzing images of them. This application, presented in a paper pre-published on arXiv, is based on deep learning techniques.

"As the flavor of each variety of coffee is dependent on the degree of roasting of the coffee beans, it is vital to maintain a consistent quality related to the degree of roasting," the researchers wrote in their paper. "Each barista has their own method for determining the degree of roasting. However, extrinsic circumstances such as light, fatigue and other factors may alter their judgment."

The deep learning model developed by Sakdipat Ontoum and his colleagues at King Mongkut's University of Technology Thonburi is

based on a [convolutional neural network](#) (CNN). The researchers trained their model on a dataset containing images of coffee beans roasted at a [coffee shop](#) in JJ Mall Jatujak.
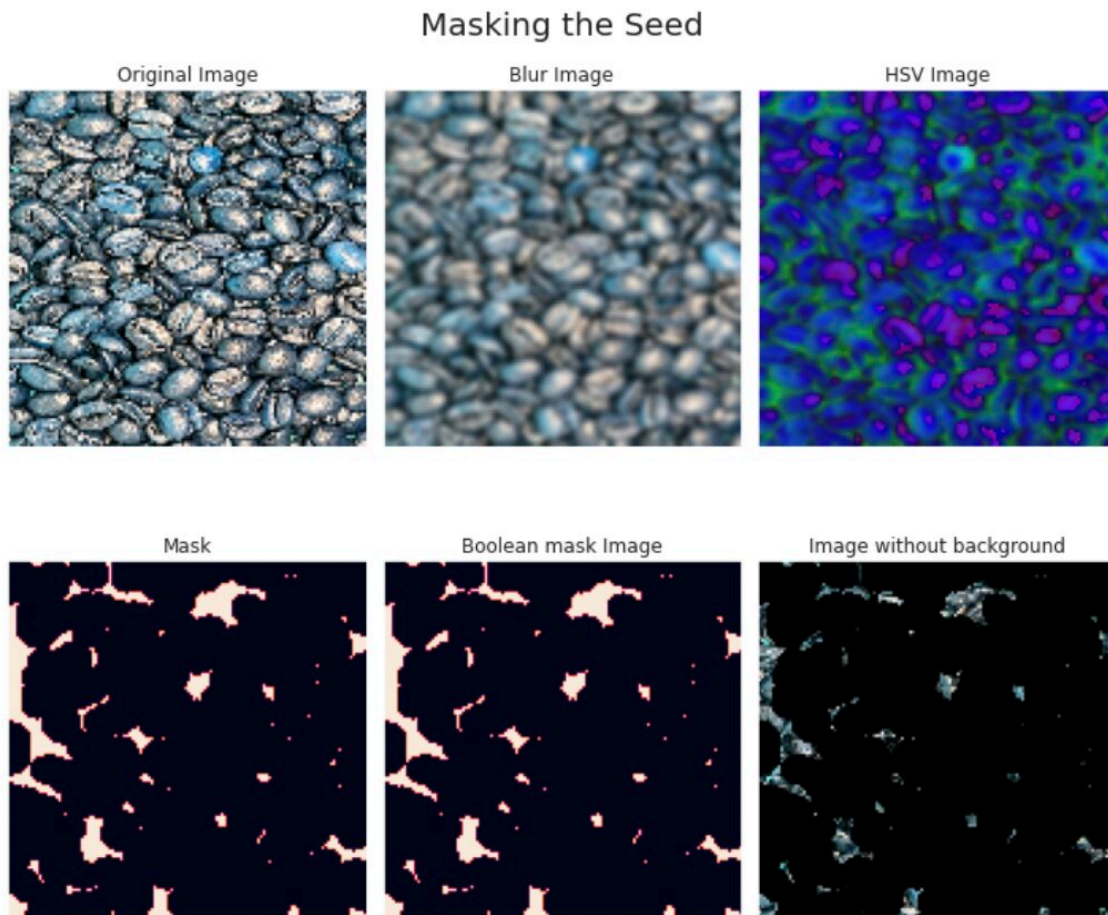
Credit: Ontoum et al.

The coffee beans were of four different varieties, namely green, unroasted coffee beans, lightly roasted Laos Typica Bolaven coffee beans, medium roasted Doi Chaang coffee beans, and dark, heavily

roasted Brazil Cerrado coffee beans. The dataset contained a total of 4,800 photos, 1200 for each variety.

The researchers' deep learning method works by specifically analyzing the color of coffee beans. After they trained their CNN-based approach, the researchers applied it to an Android application, which allows users to quickly determine the extent to which a specific batch of beans have been roasted, simply by submitting a picture of them.

"Ours is a machine learning-based study of roasted coffee bean degrees classification produced as an Android application that identifies the color of coffee beans by photographing or uploading them while roasting," the researchers explained in their paper.

In initial tests, the researchers' deep learning approach achieved promising results. However, their network does not account for the origin of coffee beans, which can also influence their color, sometimes resulting in errors. In their next studies, the researchers hope to improve their technique's performance further, yet to do this they will need a more varied dataset.

"A dataset of coffee beans from the same provider must be accessible in order to continue developing this project," the researchers added in their paper. "This will aid in the prediction of the efficiency and correctness of outcomes."

In the future, if the researchers' algorithm is perfected and trained on a more varied dataset, it could be used by baristas and coffee connoisseurs to evaluate the quality of coffee beans. In addition, their work could inspire other teams to devise similar machine learning techniques for evaluating coffee beans.

More information: Sakdipat Ontoum et al, Coffee roast intelligence.

arXiv:2206.01841v1 [cs.CV], arxiv.org/abs/2206.01841