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Prediction of qualities and disorders of fruits and vegetables, by “DEEP LEARNING”

Deep learning system enables us to reproduce professional eyes on the qualities & disorders of fruits and vegetables, potentially acting as prompt prediction. This technique also might be applicable to prediction of the preferences in marketing or of patterns of DNA sequences, etc. Furthermore, recent progress in back propagation of neural network enabled visualization of “what is a deep learning model looking”, developing further utilization of this technology.



FIG. Diagnosis of "fruit crop species" by ResNet50, and backpropagation of the contributors to the original picture

Research on fruit “shapes” and “ripening”



FIG. Representative variations in persimmon fruit shape

As major characters affecting fruit quality, shape and ripening are our research targets, with genome-wide transcriptomic or genetic approaches. Persimmon (柿) shows a wide diversity in their fruit shape and ripening. Utilizing their genetic diversities, with GWAS and/or transcriptomic network analyses, we are attempting to identify genetic factors conferring various shapes and ripening characters. Also, planning to launch onto tomato ripening system, focusing on evolutionally conserved ethylene receptors and chemical compounds accessible to them.

Study on sex determination in horticultural crops

Sexuality is one of the most important strategies to maintain the genetic diversity within a species. In horticultural crops, the sexuality also involves breeding, cultivation, and fruit qualities. Harnessing various sexual systems (or sex expressions) would derive many applications. We have been researching on the sex determination systems of persimmon, in which the first finding of plant sex determining gene was made, kiwifruit, and white campion. Their independent but convergent evolution of the sexualities tells us potentially various ways to artificially modify sex expressions in crop.



FIG. Production of synthetic hermaphrodite in kiwifruit