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# Deep Learning and Crop Inspection: Bigger Yields, Better Harvests and Safer Crops

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## Abstract

Since the dawn of agriculture, crop monitoring and inspection remains a mainstay of every farmer's routine. Today, many farmers visually inspect their crops armed with a variety of tools to help ensure ideal plant health and performance. Although human visual inspection remains an essential part of agriculture, it has many challenges and many limitations. Research over the last decade or so has assessed the applicability of computer vision and deep learning to address the crop inspection challenge. These approaches have shown tremendous promise, they are only just now beginning to go beyond the research phase into commercialization. Around 2015, image processing methods using deep neural networks began to replace the earlier classical computer vision approach, providing both better performance and more generalizable results. Again, through the early work of the CMU team, a StalkNet [Bawe2018] architecture was developed, which combines an RCNN feature detector with a GAN based pixel segmenter. To date, StalkNet has been trained to measure dozens of widely varying features in different crops, ranging from leaf necrosis to fruit ripeness to sorghum seed size for grain yield. The first market Bloomfield has chosen to address is grape growing and vineyard inspection, but we see CEA as a natural next step in the progression of our technology and a large opportunity. Flash combines high-resolution flash lighted stereo RGB images with a cloud-based deep learning pipeline to inspect and assess the health and performance of each and every plant in a field or grow, one plant at a time. The result, so far, with Bloomfield's vineyard customers is yield estimation, pest/disease detection, labor saving and digitalization. This comprehensive analysis forms the foundation for Bloomfield's health and performance assessment of each geo-located plant, one plant at a time through a web-based dashboard accessible via tablet, cellphone or computer. Bloomfield's approach to inspecting and assessing plants contrasts sharply with the visual inspection which includes sparse subjective judgements of randomly sampled plant data.

## Biography

George Kantor is a Research Professor in Carnegie Mellon University. He is a founder and Chief Scientist at the Robotics Institute & Bloomfield Robotics. He is a Serial tech entrepreneur, lecturer and educator always looking for interesting things to do.

 