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Guy is in the second year of his PhD at the University of Sydney, supervised by Drs Brett Whelan and Michael Walsh from the School of Life and Environmental Sciences, Dr Asher Bender from the Australian Centre for Field Robotics and Dr Paul Neve from the University of Copenhagen. The PhD project seeks to understand how crop and weed morphological variability interact with image-based weed detection and recognition for site-specific weed control. Some of these interactions include crop-weed growth stage variability and crop-weed similarity, opportunities for unsupervised learning and risk of crop mimicry from image-based selection. The project commenced with the development of a simple, open-source platform for DIY weed detection, known as the OpenWeedLocator. The system uses simple green colour-based detection to find weeds in fallow fields.
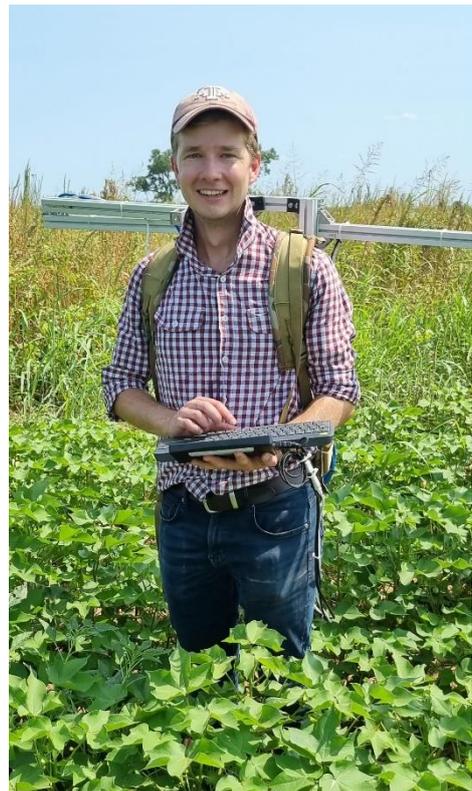
As part of the growth stage research aspect of the project, Guy spent 7 months at Texas A&M University (TAMU) in 2021 under the direction of Dr Muthukumar Bagavathiannan with a Fulbright Future Scholarship. One aspect of the research in Texas (pictured left in a TAMU cotton field) addressed how growth stages of Palmer amaranth (*Amaranthus palmeri*) in cotton could change weed recognition performance. The research found that whilst including eight separate growth stage classes reduced overall performance when compared to a single class, the loss of performance was from the model confusing similar growth stages. There was only a 3% drop in the algorithm recall, its ability to find weeds in the dataset suggesting that the additional growth stage information may be a worthwhile trade-off for targeted weed control treatments. Larger algorithm architectures and higher image resolutions were also found to improve model performance. By showing that growth-stage detection as possible in Palmer amaranth, it raises the idea of growth-stage specific weed control in crop.

Guy will use the CAWS Student Travel Award to attend the 22nd Australasian Weeds Conference in Adelaide in September 2022 and visit weed science and high throughput phenotyping facilities at the Waite Research Precinct. At the conference, he will present on laser weeding and the validation results for the OpenWeedLocator system. The 22AWC is the primary weeds conference in Australia and is a key opportunity to present research to Australasian weed scientists, receive feedback on research plans and network with research, government and industry leaders. The conference theme: *A Weed Odyssey: Innovation for the Future* fits well with the machine learning-focused PhD research and will be a valuable opportunity to engage with weed science in the region.