HONEY FROM SPACE: DETECTION OF RED GUM FLOWERING EVENTS FROM SATELLITES

Tristan Campbell[1], Peter Fearns[1], Kenneth Dods[2]
Curtin University, Remote Sensing and Satellite Research Group[1]
ChemCentre[2]

Introduction

With the increasing availability of satellite imagery to the general public, there have been several efforts to use this data to detect and predict flowering events for improved beehive management.

These efforts, notably in the US[1], Europe[2] and SE Australia[3], have focused on measuring seasonal variation in 'greenness' of vegetation and have found some broad correlations with honey production.

In Western Australia, we have the almost unique potential of direct detection of flowers from the Red Gumtree (*Corymbia calophylla*) due to the profligate amount of flowers this species produces.

Scope

- The scope of the research to date has been to develop two classification tools:
  - Detect flowers in RGB drone imagery as a calibration tool
  - Spectral separation analysis of hyperspectral data on the ground, to develop a satellite detection tool

Materials and Methods

- Initial work used RBG images from a standard DSLR camera taken during the 2015 flowering season.
- Spectral data was acquired using an ASD FieldSpecPro instrument over 2015-2016.
- Spectral data was analysed using a variety of statistical methods using code developed for the project.
- Qualitative honey yield data from Mundaring area was collected from 2002 – 2017 for testing of the spectral analysis results.
- MODIS satellite data was used to test the detection method against the honey yield data.
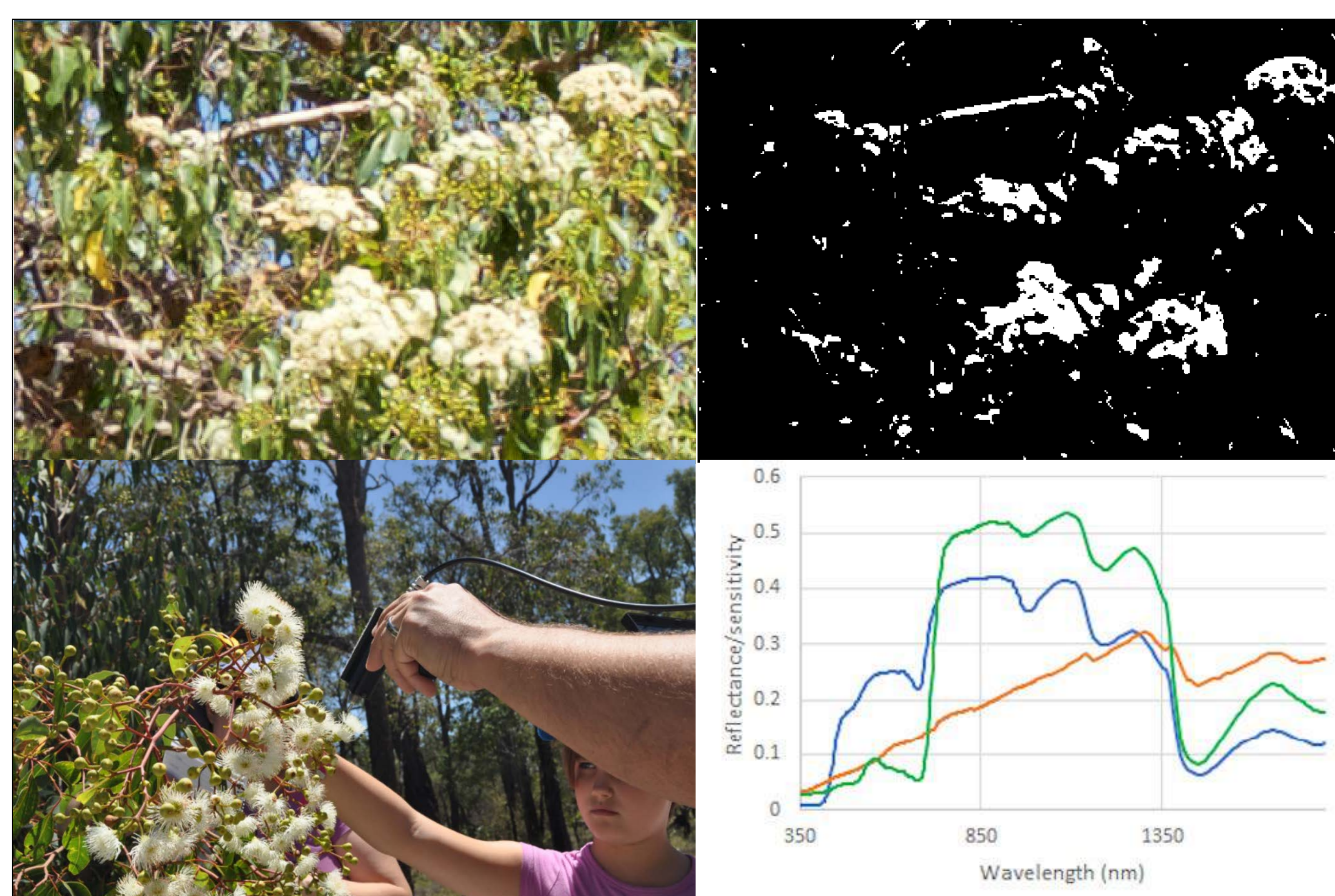
Top left: Raw RBG image, Top right: Classified RGB image
Bottom left: Field collection of spectral data. Bottom right: Average spectra recorded
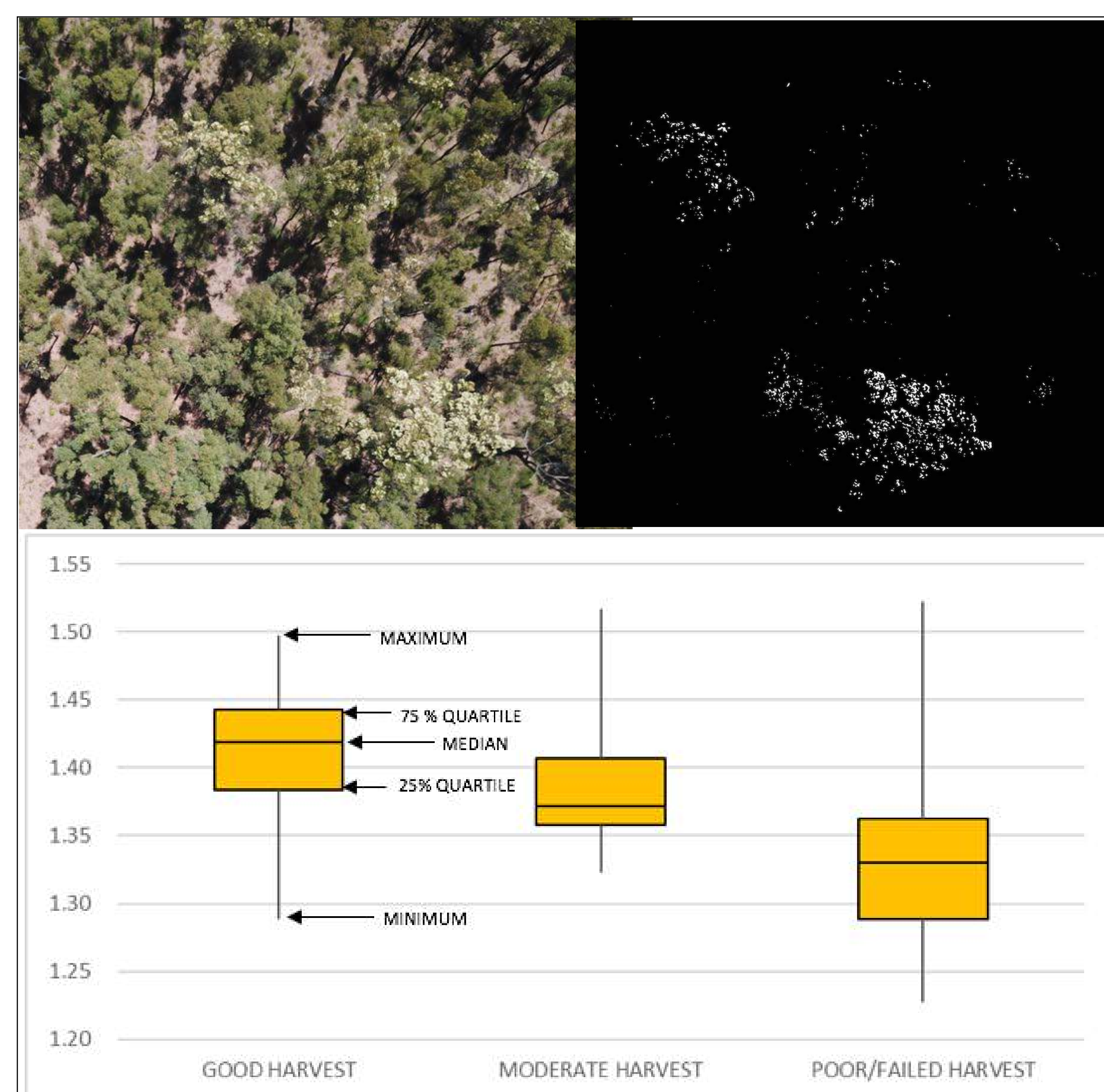
Top left: Raw drone image, Top right, classified drone image
Bottom: Outcome of MODIS data into three levels of harvest quality

Result and Discussion

- Initial results classifying drone data from the 2018 season are promising, but as the figure above shows, some refinement is required to ensure more flowers are detected, without miss-classifying the background.
- The best classification tool from the MODIS data was proven to be the green band divided by the UV band (high flower response and low flower response respectively).
- Collation of all MODIS data for February from 2002 to 2017 showed good separation of good vs moderate vs poor years (figure above).
- Using a cutoff metric of 1.35, years could be separated into good and moderate vs poor to 80% accuracy.
- No evidence has been found yet to use these datasets for predictive honey flow tools.

Summary and Future work

- Initial testing of drone and satellite methods for detection of red gum flowering events has yielded positive results.
- Results to date are for a single location; further work is underway to test the approach across other locations and regions.
- New weather satellites giving temperature and humidity every 10 minutes, are promising for development of a predictive model.

References

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