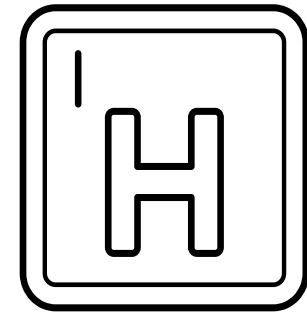


Background

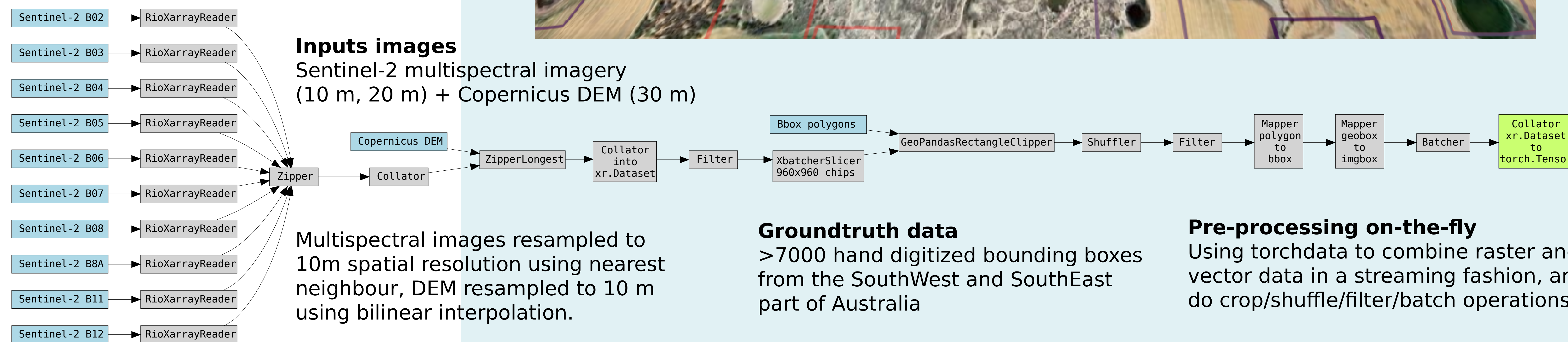


- **Ovoidal shaped** surface depressions associated with **natural hydrogen seeps** in places like Yorke Peninsula, Australia; Carolina Bays, United States; etc
- Potential **source of clean energy** for the zero carbon world
- Can we **map the locations of these oval features** on a continental scale using machine learning?

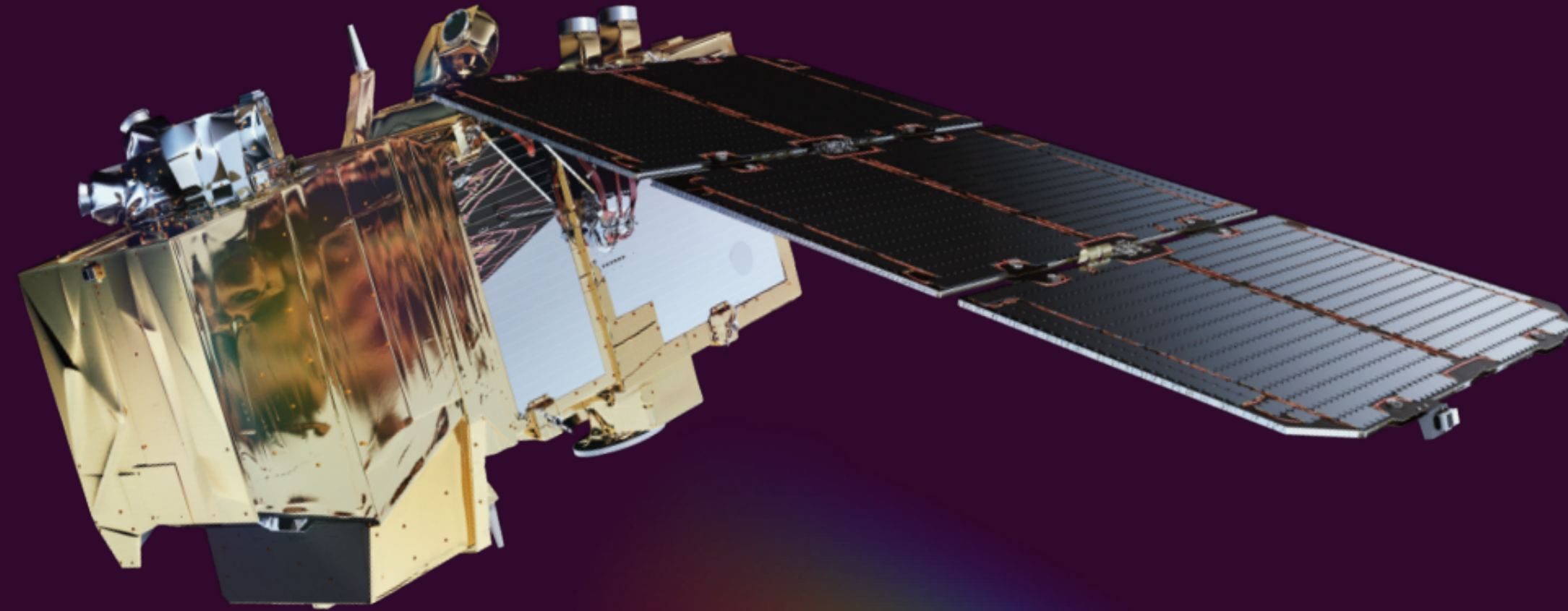
Tools used



Data pipeline

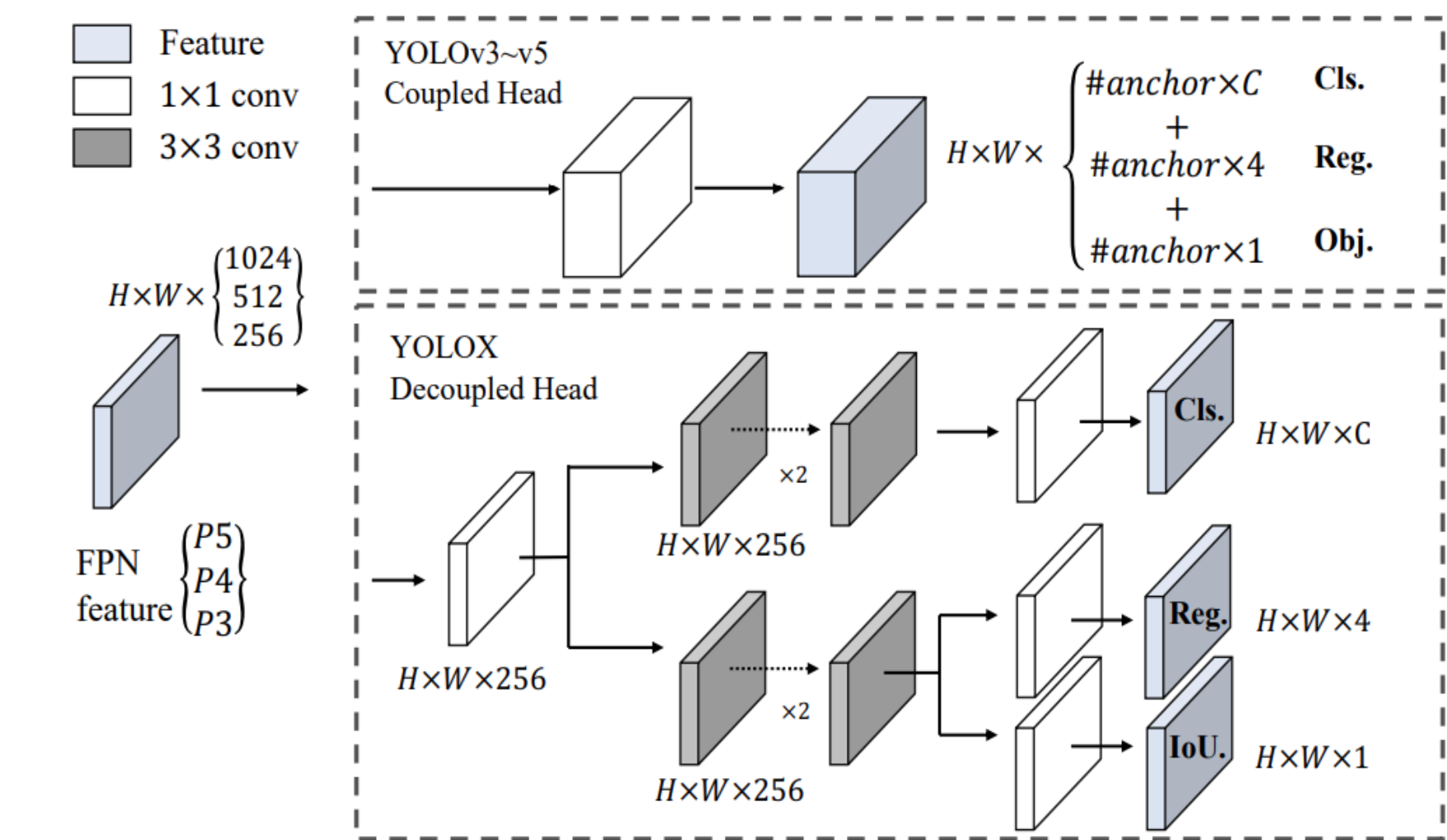


Detecting Fairy Circles from Sentinel-2 imagery in Australia



Poster

H2OvalNet with YOLOX

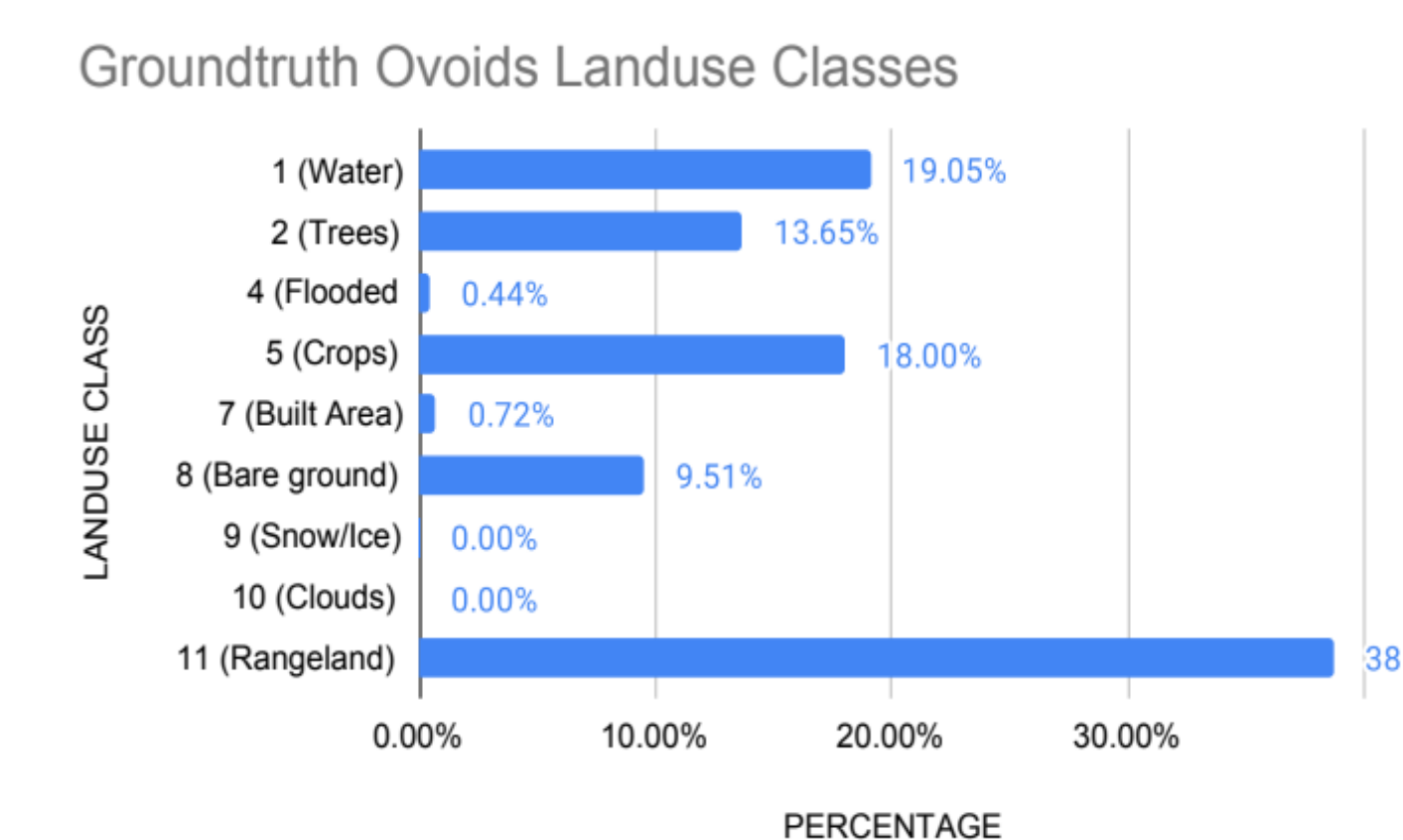
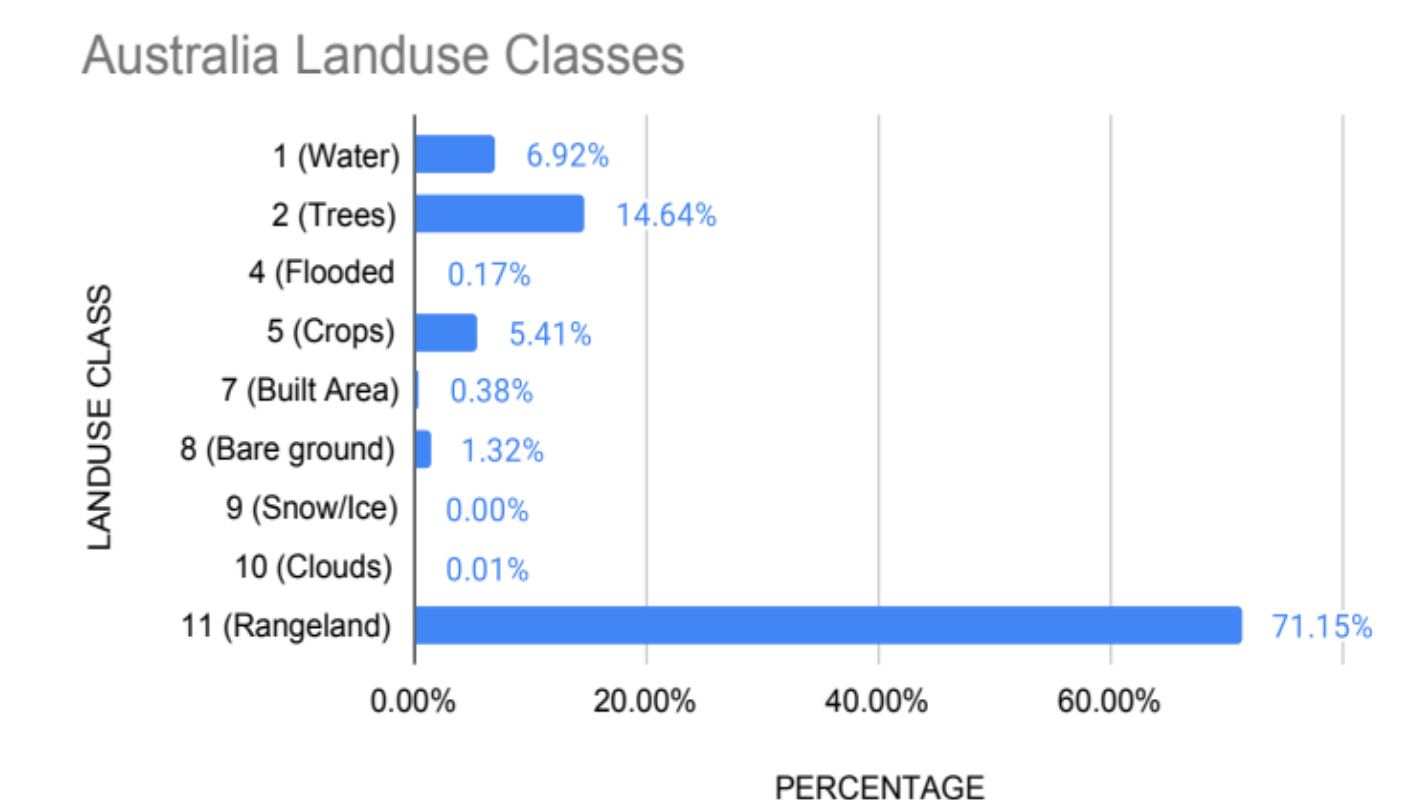


- YOLOX (2021) based **Convolutional Neural Network** built with Pytorch Lightning and mmdetection.
- **Light GPU memory** use = faster inference speeds (Australia in <1 week on T4 GPU).

Continental scale inference

- **Cloud-based** (Microsoft Planetary Computer) workflow to get bounding box predictions across 100s of Sentinel-2 tiles.
- Ran inference on **12 of the least cloudy Sentinel-2 images** in a year, on chips of size 9.6 x 9.6 km, with a batch size of 16.
- Resulting database of predicted bounding boxes are further postprocessed using a **custom weighted box fusion algorithm** to obtain high confidence oval feature locations.

Landuse class distribution



Comparing the typical land cover classification of the Australian continent versus that of oval feature locations

- Many ovoids **water filled** and over Rangeland landcover types.
- Need **more training data over vegetated (i.e. Trees and Crops) areas** like Queensland and New South Wales.