



Green Spaces - the challenge



- Natural Capital. What % of UK gardens are covered in vegetation?



BlueSky aerial imagery via Public Sector Mapping Agreement (PSMA)



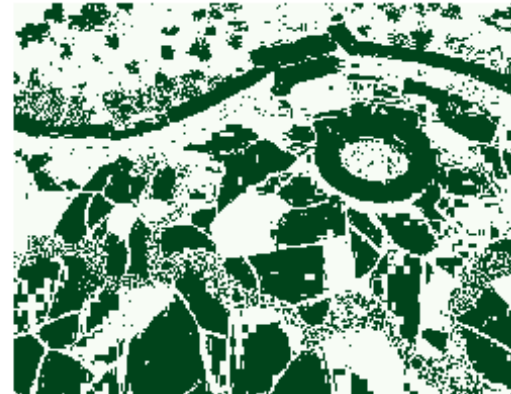
Ordnance Survey MasterMap Greenspace polygons define private gardens

Why?

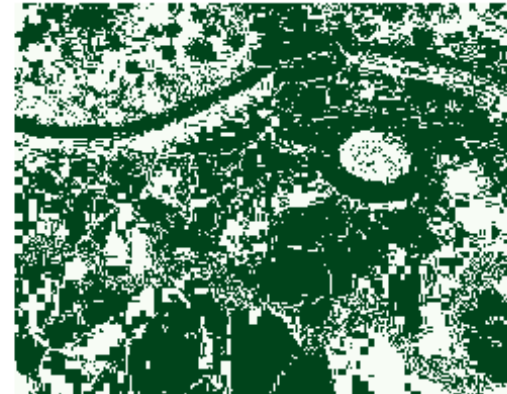


- Flood risk mapping
 - Estimate the benefits of sustainable urban drainage such as vegetation.
- Urban heat calculation
 - Improving accuracy by including vegetation coverage
- House price predictions
 - Preplace current estimation of green space
- Carbon footprint estimation
 - Differentiate between trees and grass

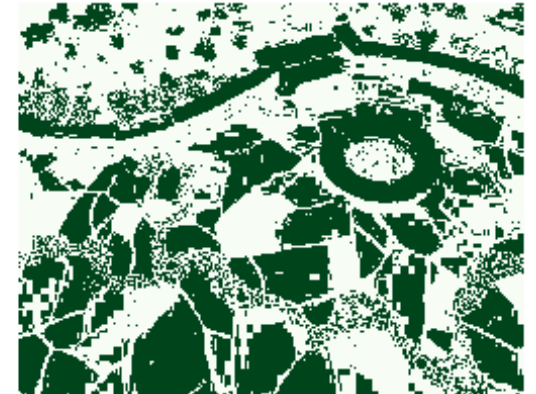
Off the shelf approaches are not perfect!



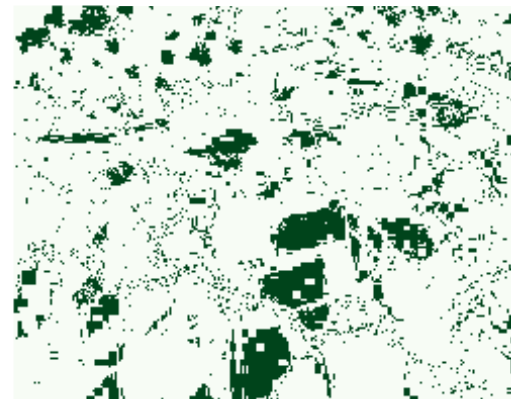
vNDVI (48.3%)



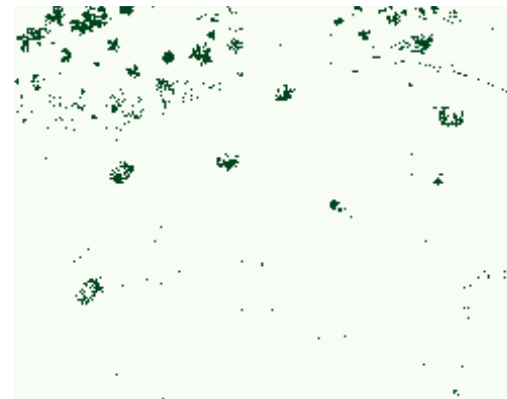
GLI (63.7%)



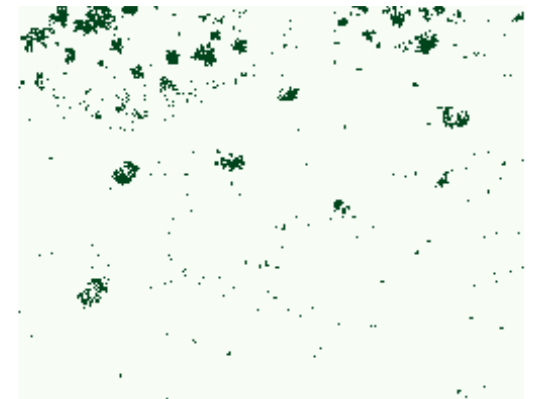
VARI (48.1%)



HSV (16.2%)



Lab(a*) (2.5%)

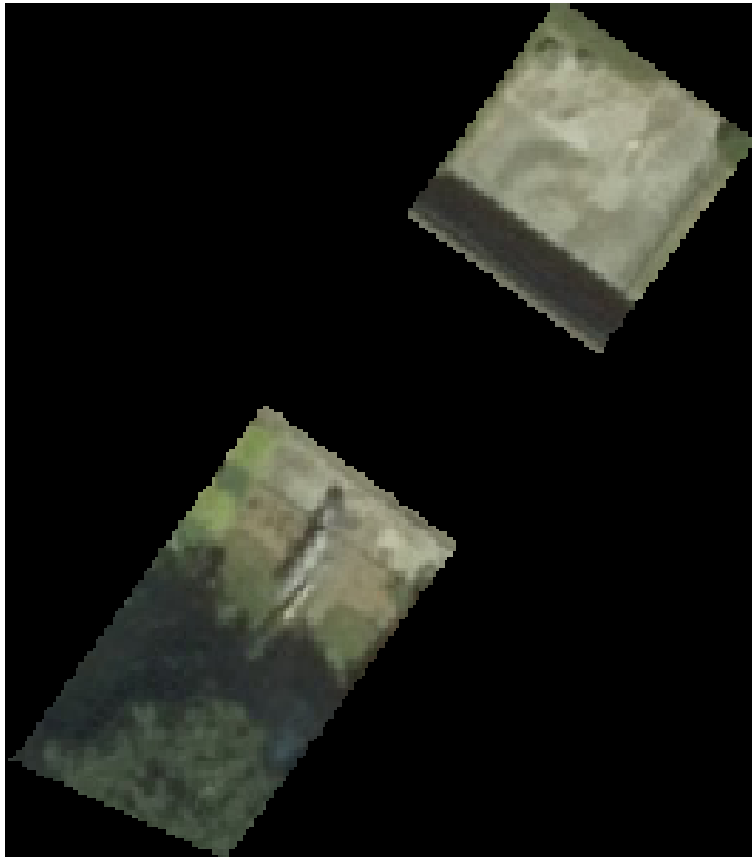


Lab(a*b*) (3.3%)

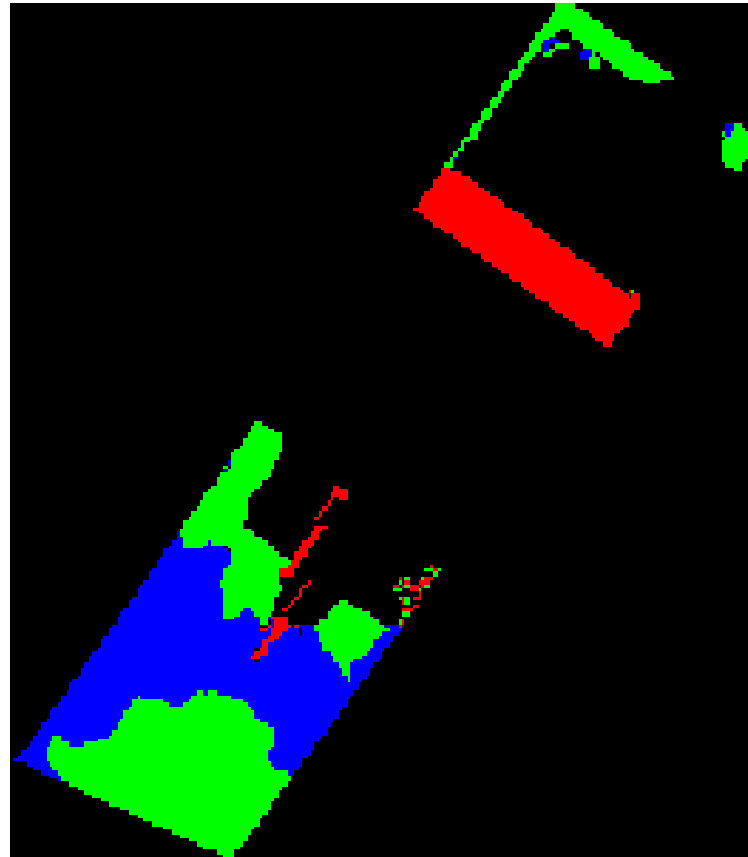
We built a neural network classifier



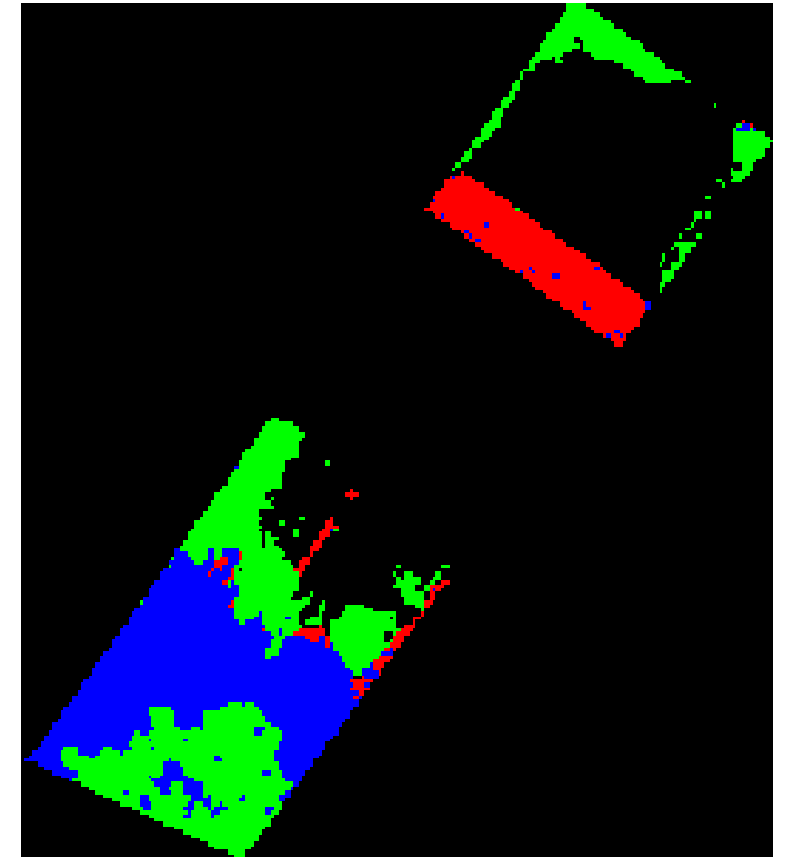
Original Image



The truth



Our prediction

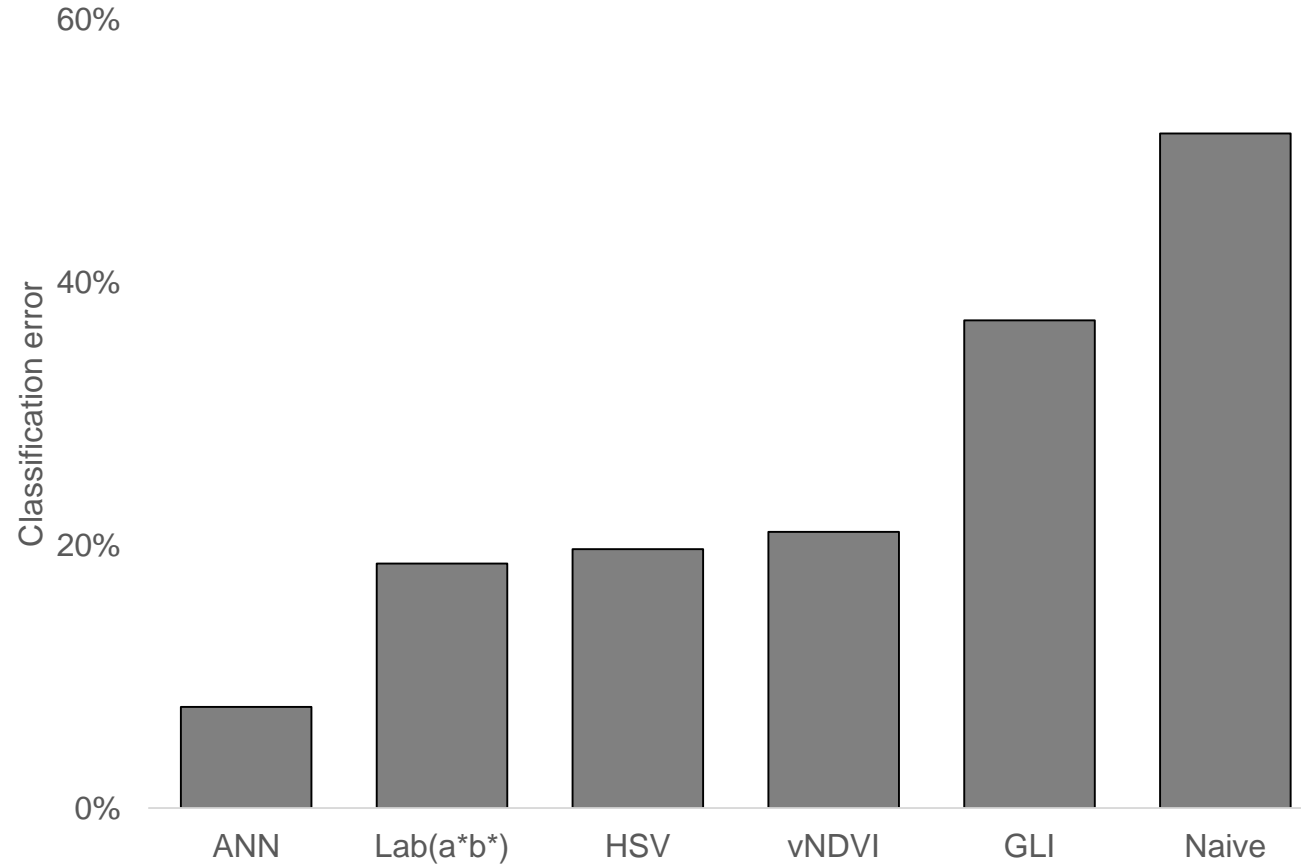


 vegetation

 vegetation in shade

 urban in shade

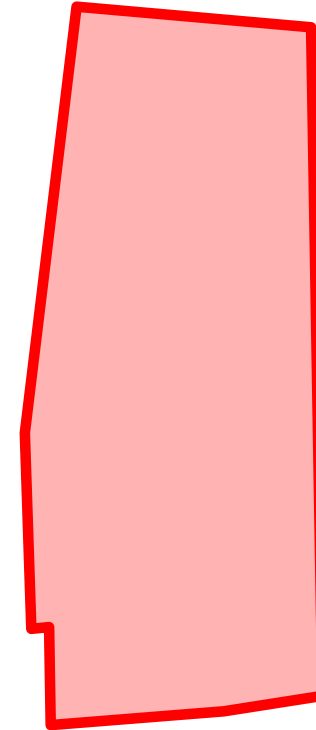
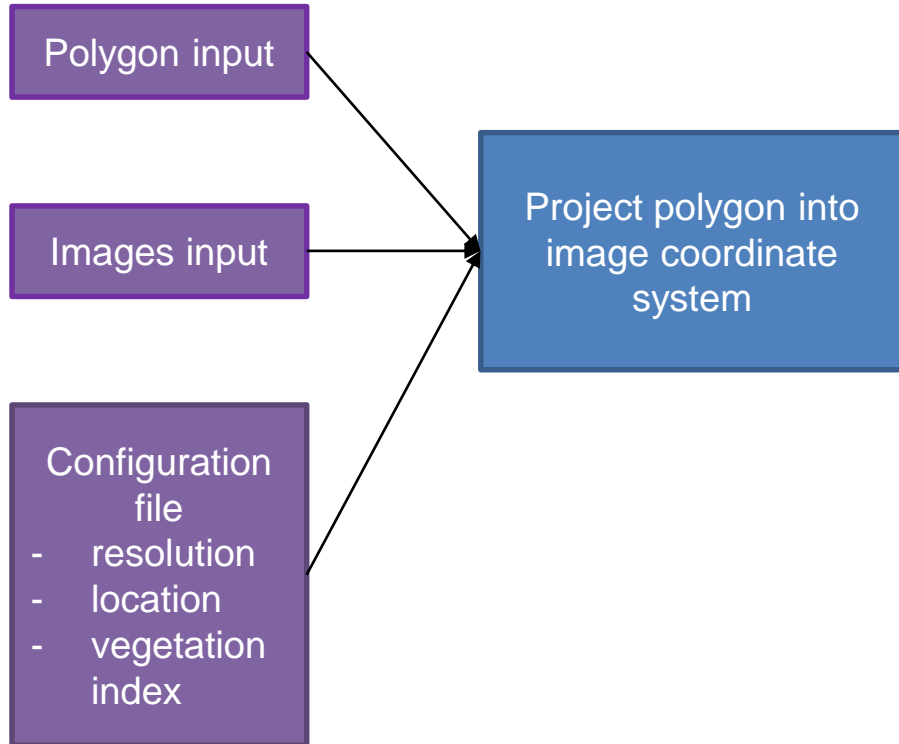
Neural network classifier - results



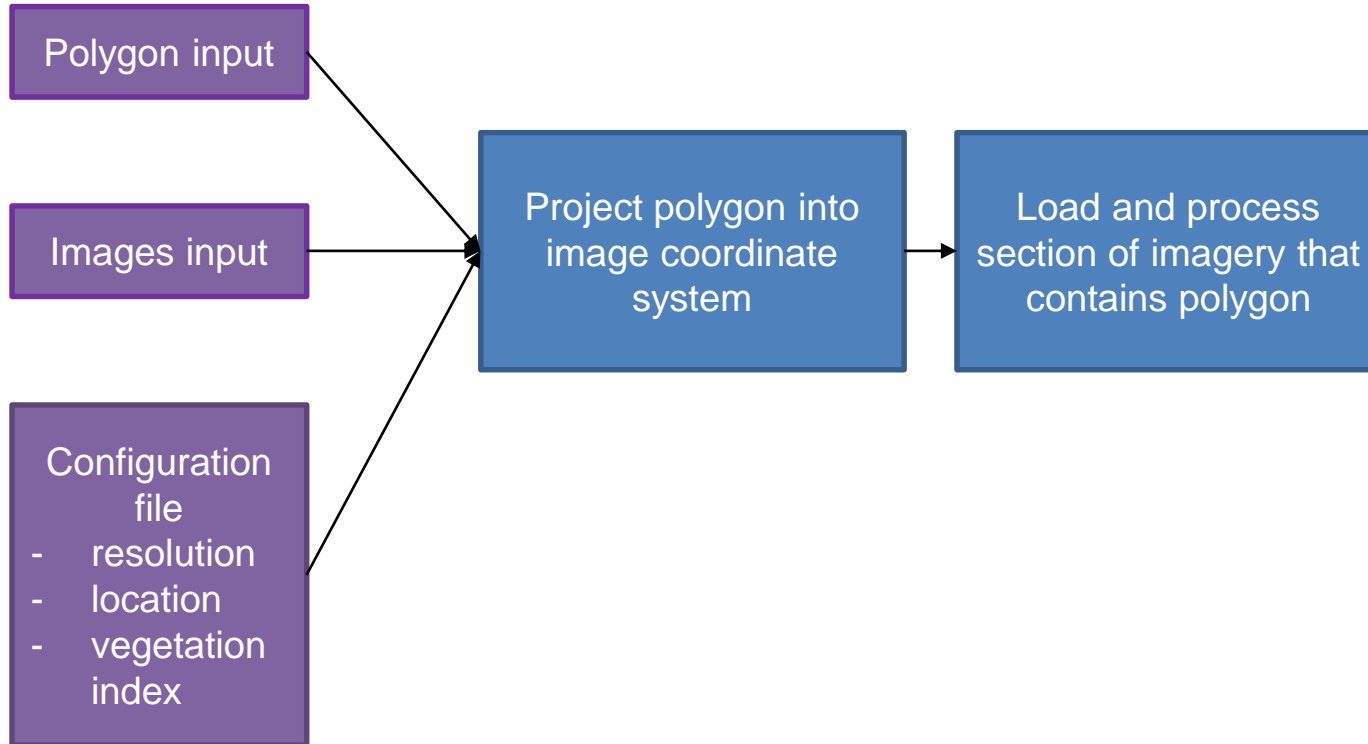
Estimate 61.6% of urban residential gardens is vegetation

Classification error across labelled images

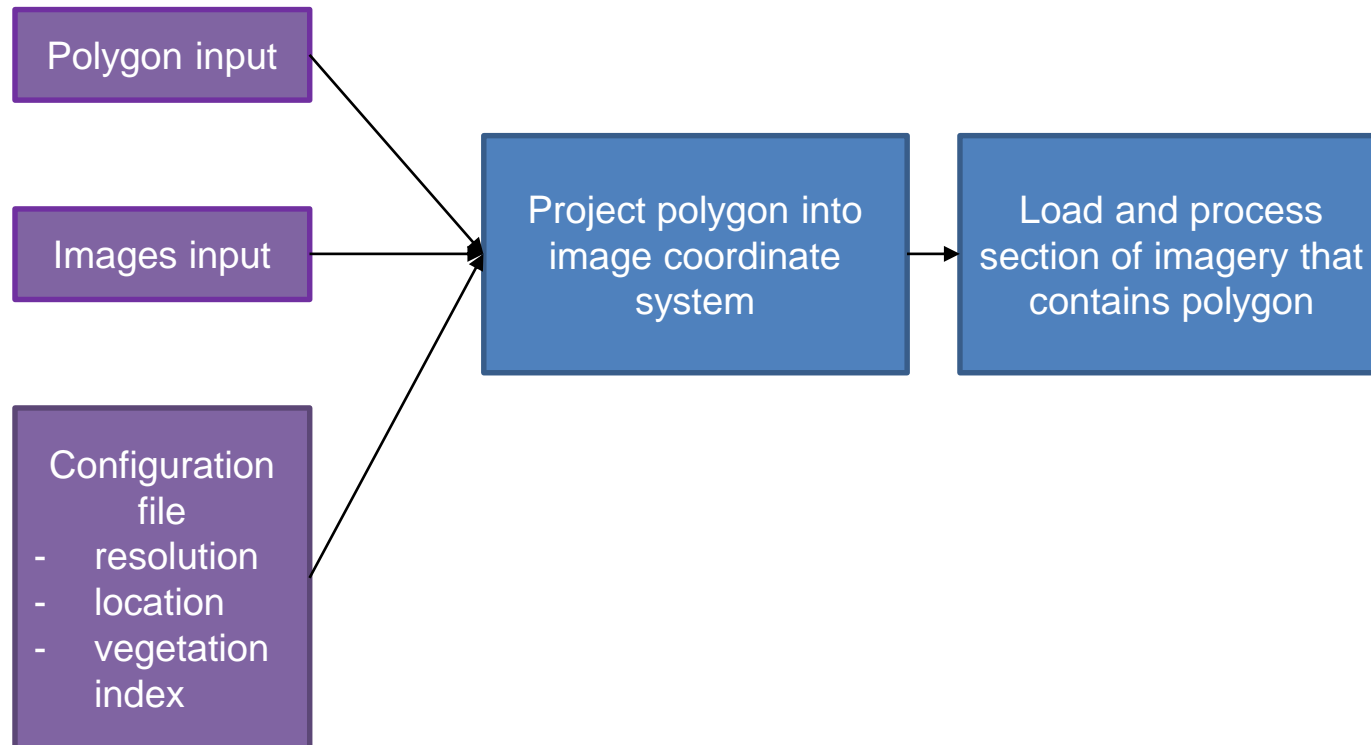
Green Spaces Pipeline



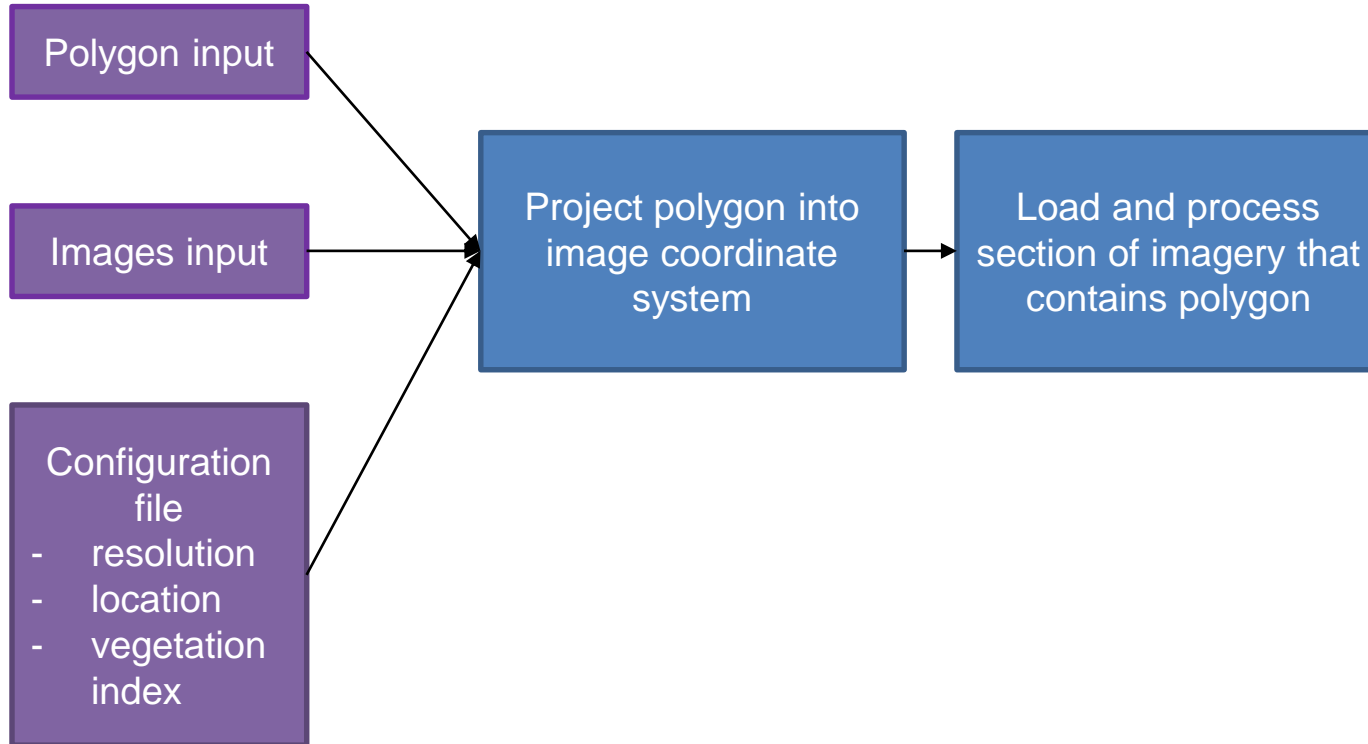
Green Spaces Pipeline



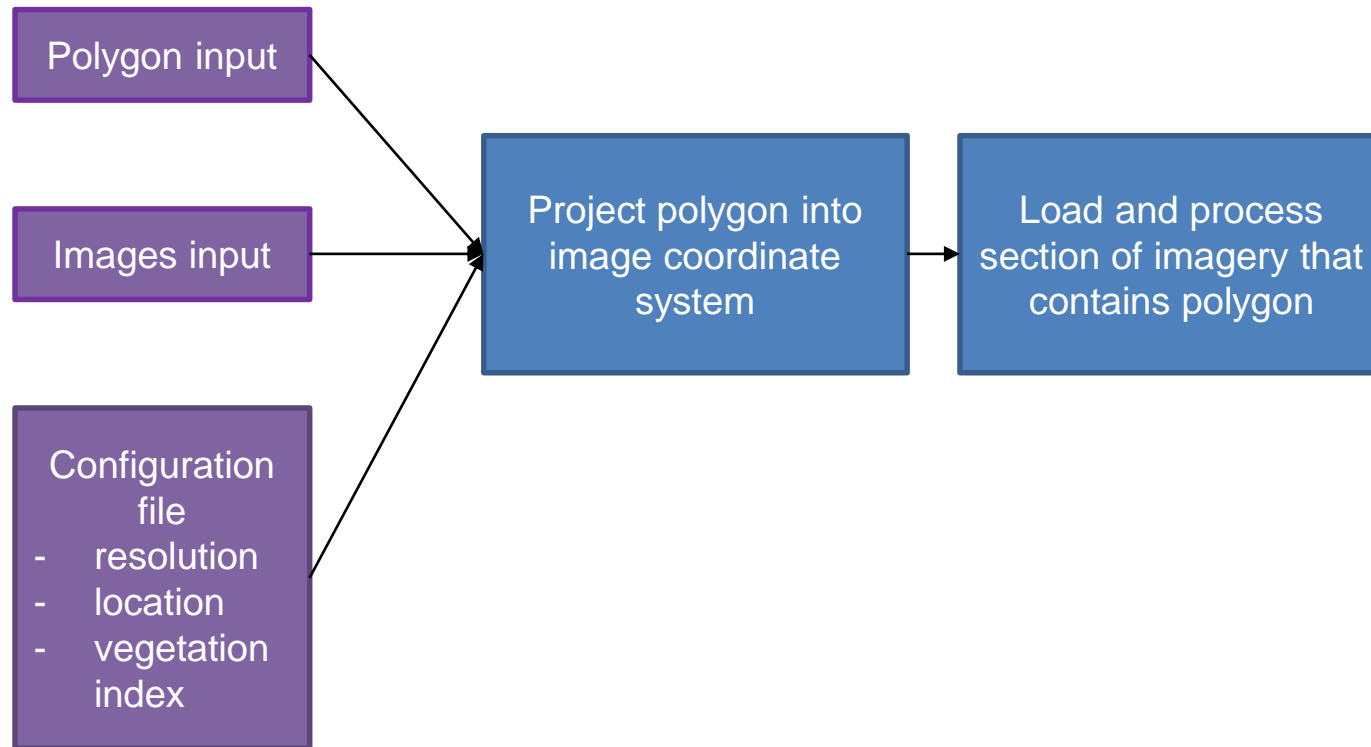
Green Spaces Pipeline



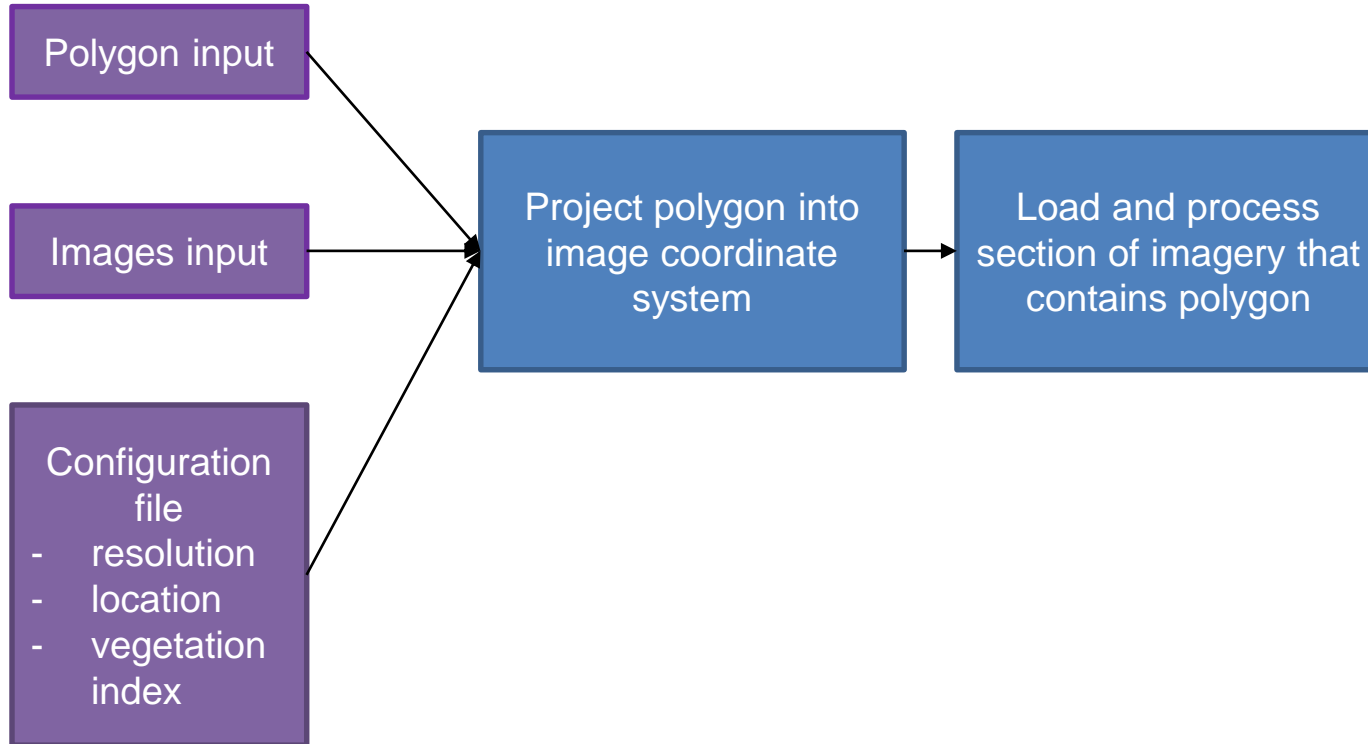
Green Spaces Pipeline



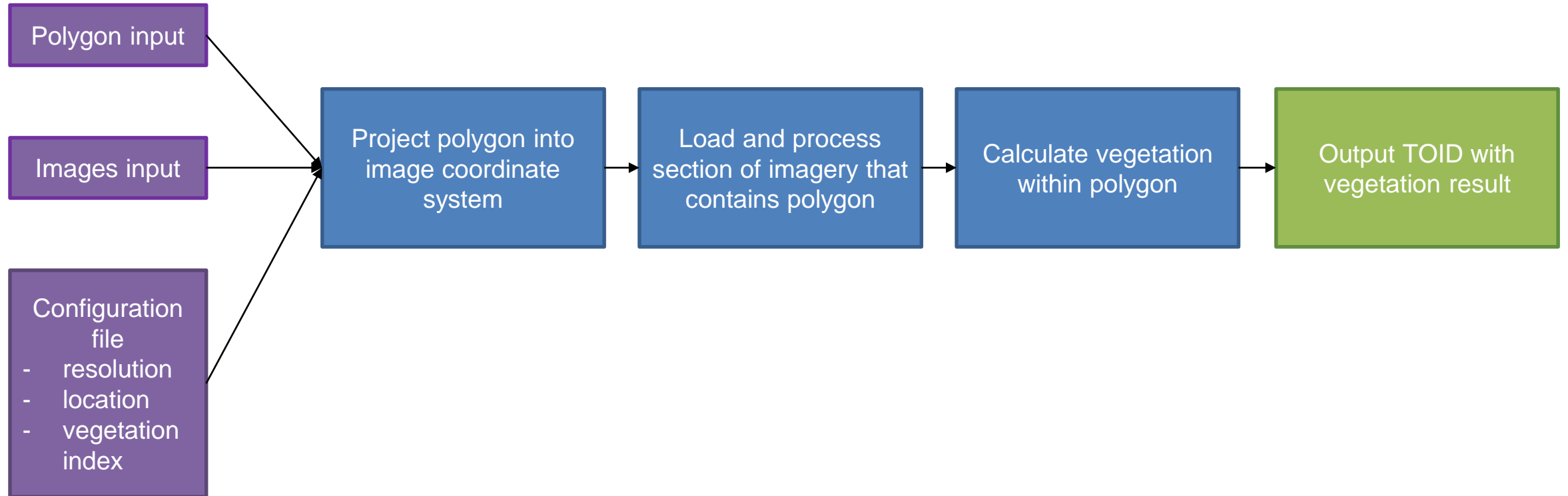
Green Spaces Pipeline



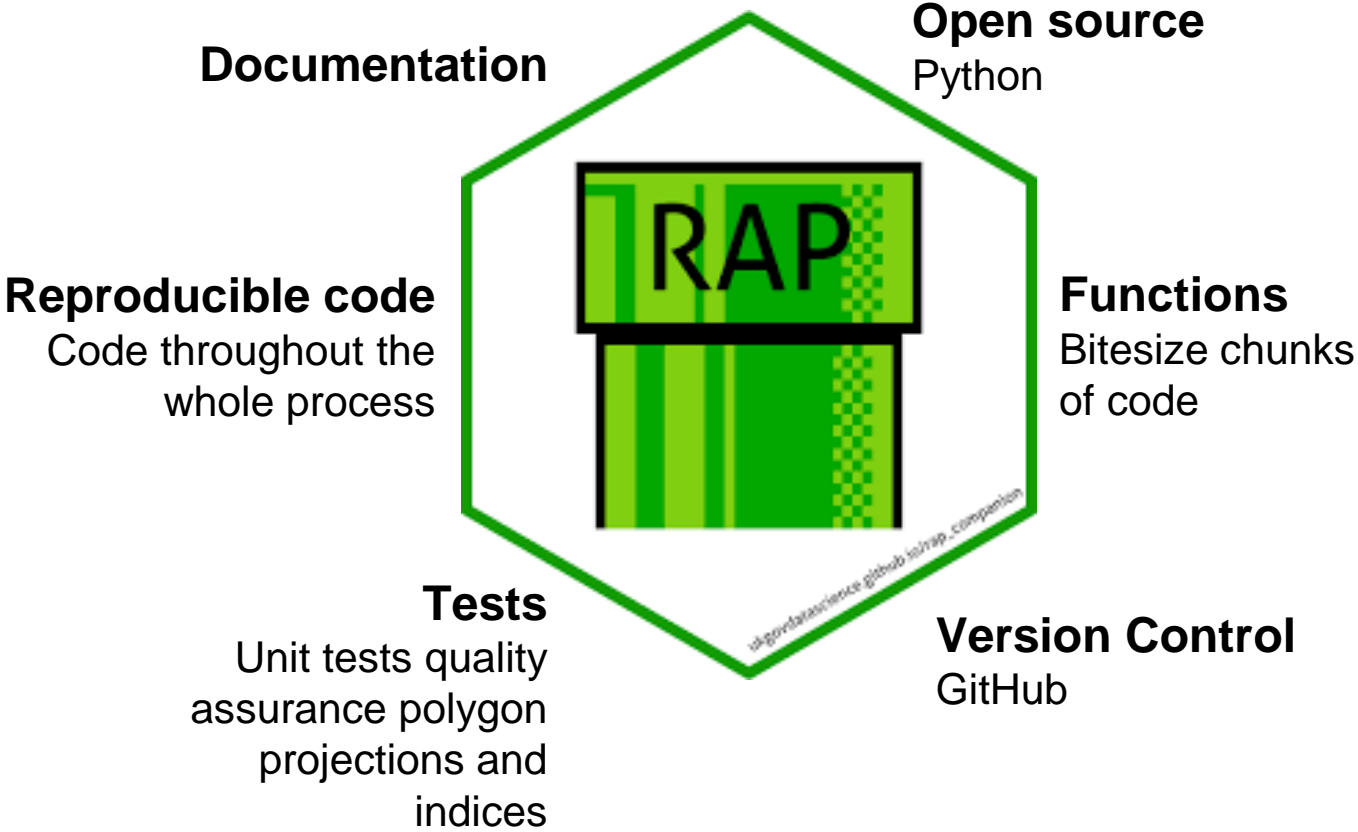
Green Spaces Pipeline



Green Spaces Pipeline



RAP principles used in Green Spaces



Benefits for Green Spaces



- Repeatability - anyone can run it and get the same output
- Less error prone
- Quicker
- Built in tests
- Configuration file to set parameters
- Flexible - can plug in any images, polygons or indices
- Increased transparency
- Handover to another team
- Code can be written in a way that allows data to be partitioned over multiple virtual machines. APGB contains 133,768 images (23.4 terabytes)

GitHub facilitated the process



- Issues
- Pull requests
- All in one place (including documentation)
- Branches for each development/task
- Full audit trail
- Commented (commits)
- Continuous integration (if tests fail won't proceed - forces quality to be high)
- Tells you dependencies (e.g. other repos)



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