Week 7

Mining Asset Detection (MAD)

Holiday recap

- Lasso concluded with main learnings:
    a. Different bands matter for different mine types/ regions
    b. Quick and dirty yolo model worked pretty well
- How should we now proceed with yolo training?

Following is a list of the different training possibilities

Tree of possibilities - Cleanup the satellite images

General idea…

- The quality of the model probably depends on the quality of the input pictures.

=> Try to increase the image quality as much as possible

- Try different sources for the satellite images?
- Use single satellite images instead of accumulations?

Requires redownloading and some filtering of the images (Essentially done)

Tree of possibilities - Use cleaned satellite images

Train on this, instead of

this.

Tree of possibilities - Perturbate instead of grid

General idea…

- The final training set is very small (2GB, as it is jpeg), maybe too small for model retraining

=> Try to increase the dataset size by perturbation

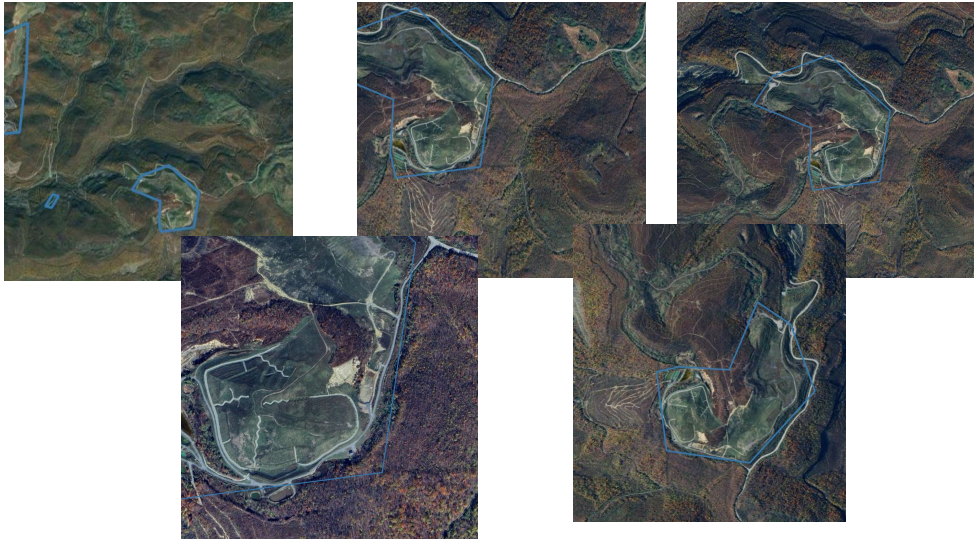
- So instead of only using the grid images, per Maus polygon, use multiple images perturbed as…
  - From different Zoom levels
  - Different centering in the image
- Use this inflated dataset to train the model again and compare the inputs against the baseline

Either redownload the perturbed images, or stitch them together from existing ones.

Tree of possibilities - Perturbate instead of grid

Instead of this, train on

this



Tree of possibilities - Models per region

General idea…

- From the lasso we know that different ecoregions may influence mine characteristics

=> Train different models for different ecoregions

- Separate the images by ecoregions

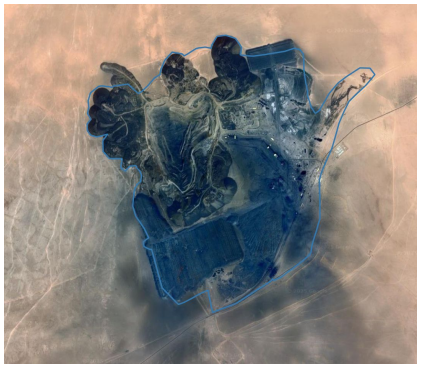
Dispatch would need to be implemented, given an image, dispatch to the correct model based on metadata.

Tree of possibilities - Models per region

Use different models for different Ecoregions

Model1

Model2



Model3

Tree of possibilities - Use different bands

General idea…

- From lasso we suspect that using multiple bands might increase precision

=> Find a way to utilise the multiple bands

- Use the bands after model inference (to make the output more precise)
- Use the bands for the training (Train models for different band combinations)

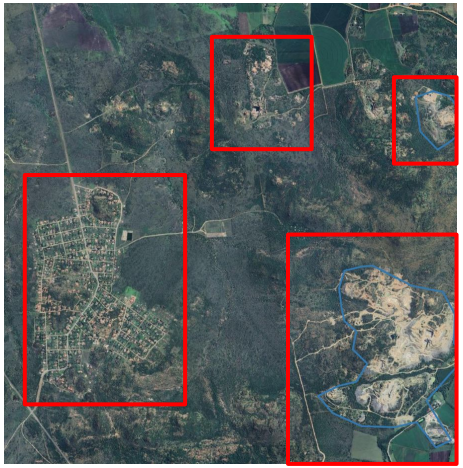
Bands after inference: Define a quality, discriminate based on that.

Bands for training: Would require changing the underlying model and not allow for using existing model, or doing a hack.

Tree of possibilities - Use different bands - Precision

Use Lasso prediction

+ Model output

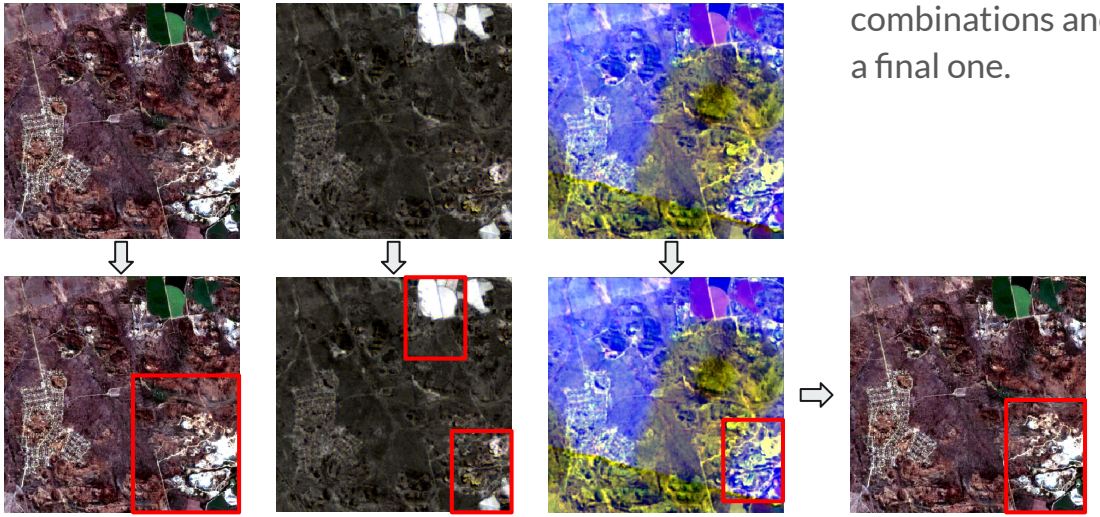


To determine true hits

Tree of possibilities - Use different bands - Inference

RGB

B6, B7, B8 B10, B11, B12



Use different models for different band combinations and then use all predictions to get a final one.

Tree of possibilities - Use labelled mine data

General idea…

- Use different models specialised for different mine types

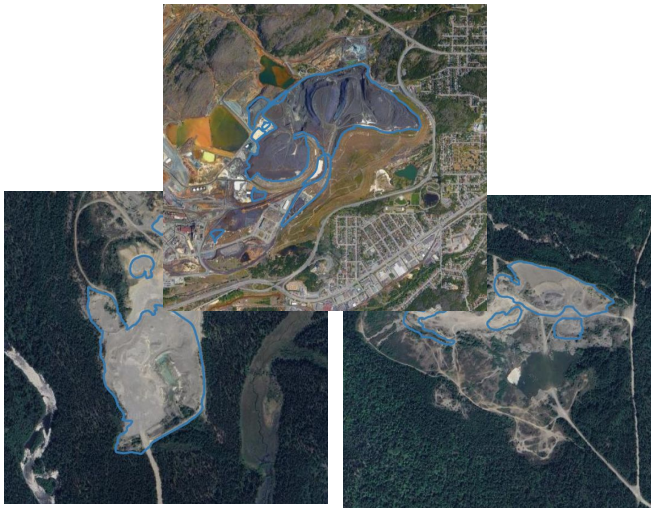
=> Generate labels for mines

- Use the labelled mine dataset (from Julie) to classify different mines
- Use a more mature model to label what type our images are
    - Use human supervision to check if the labels seem reasonable

Requires generating the labelling data, other parts should be similar to simply training yolo.

Tree of possibilities - Use labelled mine data

Cobalt mines



Use labelled data (cobalt mines) to label our data

With the labelled data train specialised models for each labelling type.

Tree of possibilities - How to proceed

1. Create a universal test set for which models are tested
2. Generate a baseline model with the cleaner S2 satellite images
3. For each other model idea, train the model and compare it to the baseline based on the universal test set.

Tree of possibilities - What we have

- Around 2.5TB of Sentinel 2 satellite images
- Given a set of .tif images:
  - We generate a dataset for training a yolo model automatically
  - The training is done (For the first trial, 50k images, ca. 5hrs on a single GPU)
  - The final model can be used to infer
- Should be scalable enough to define different characteristics for the dataset generations for all scenarios

Final output

What should the model be utilised for?

- Integration with something like QGIS? (Select AOI and see labelled mines?)
- One large global run with a dataset of findings?
- Typical Model output (as in a square around mine) or the exact area as a polygon?
- Classification between different mine types?