ML update - 25th Oct

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Previously....

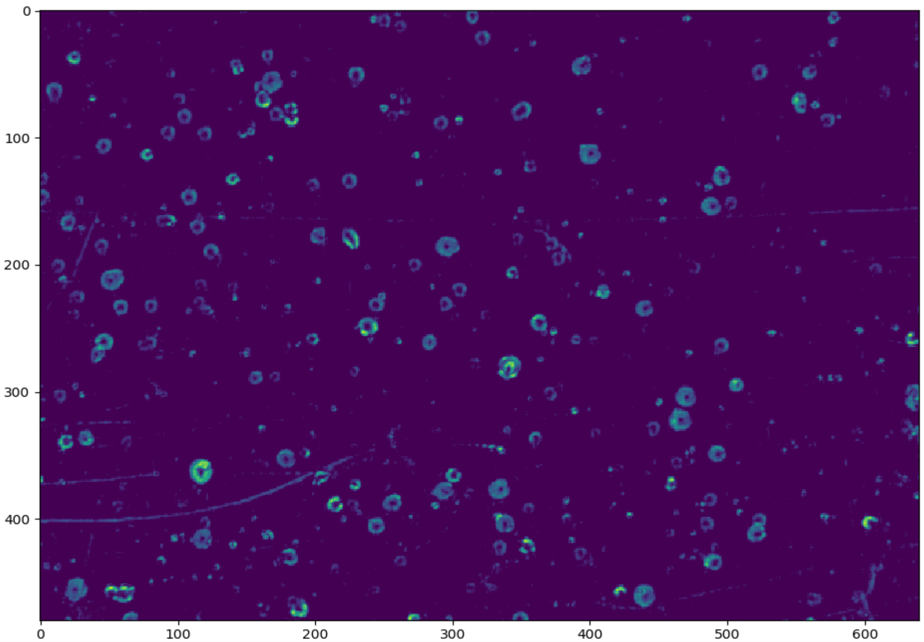
- CNN on 3D images, didnt do well.
- Unstable learning

- Cropping cutting of full structure of objects

- Poor statistics for candidates vs bkg

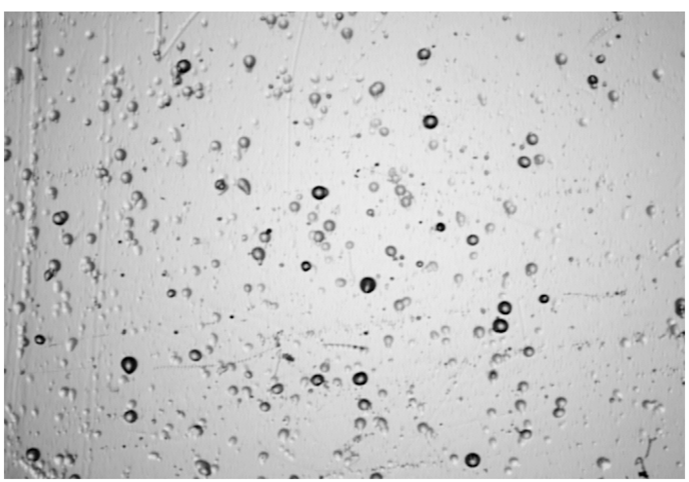
- Noisy images

Image Clean-up

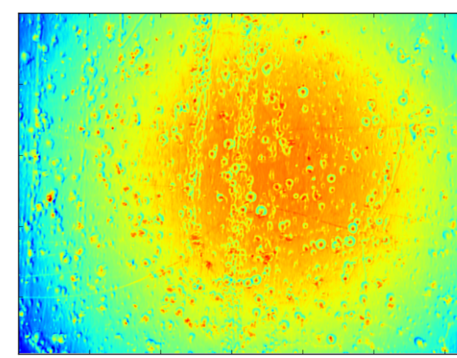


Clean up / denoise techniques

- Redefining zero relative to Image Average.
- Thresholding – remove shallow background features
- Techniques for filtering out small objects (currently using binary opening/closing, more work todo)
  - since we know pit size ~ ionisation

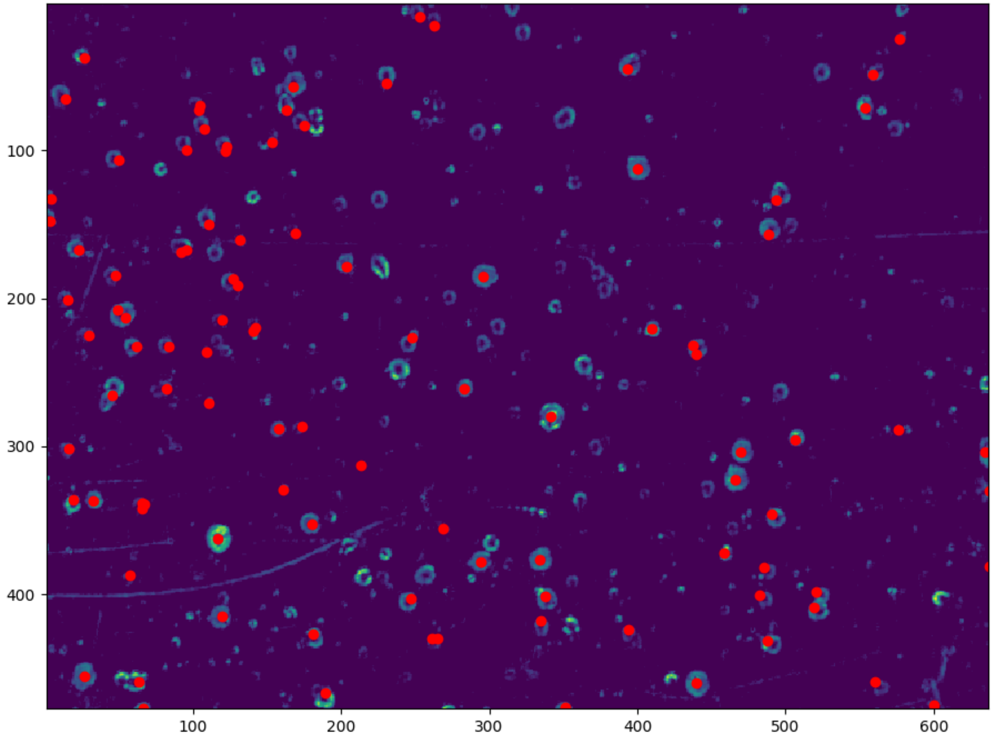


Eg, averaging two slides in different positions highlights central illumination bias



Position labelling

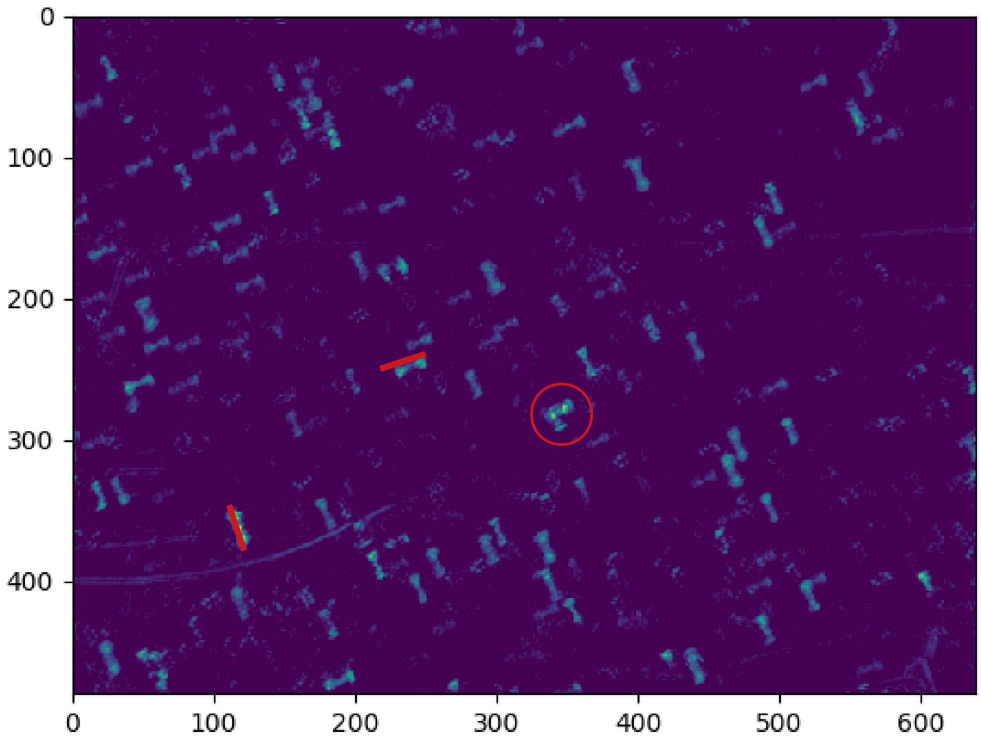
- Decouple position and classification
- Localisation based on image segmentation from classical image processing
- Choice of masks to use. Combining with backlit / halo images improves noise discrimination



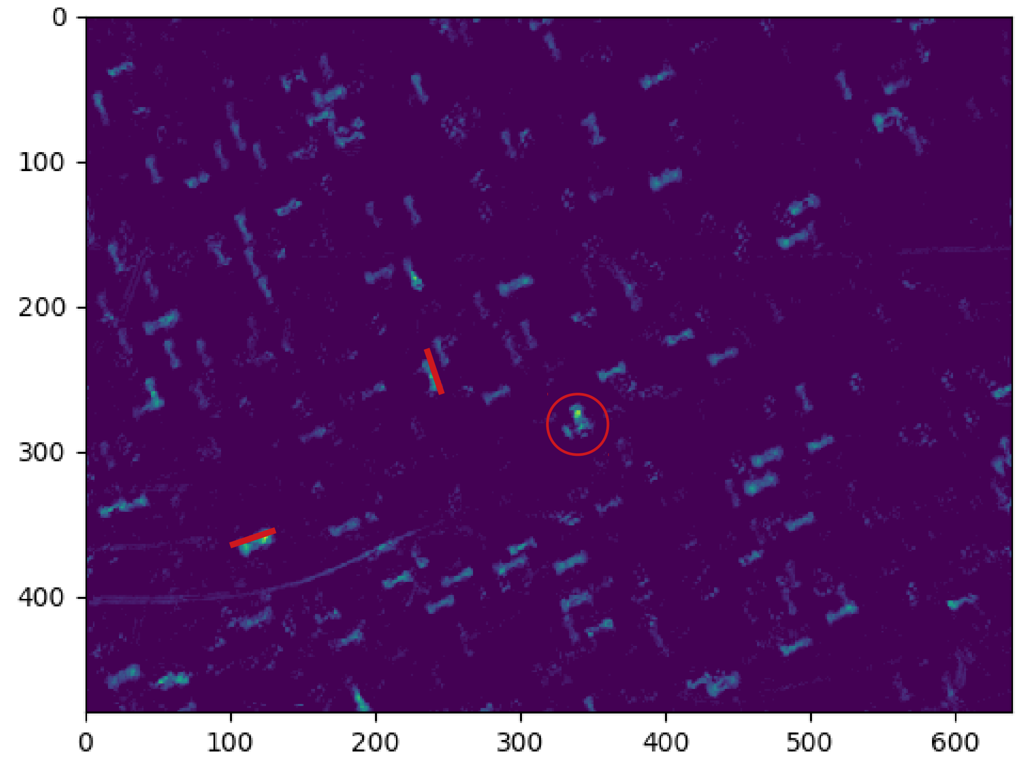
Spent time trying to perfect pit localisation accuracy.
However pit localisation doesnt have to be perfect!
Just has to pre-select training examples for CNN

Phase Information

In Phase



In Anti-Phase



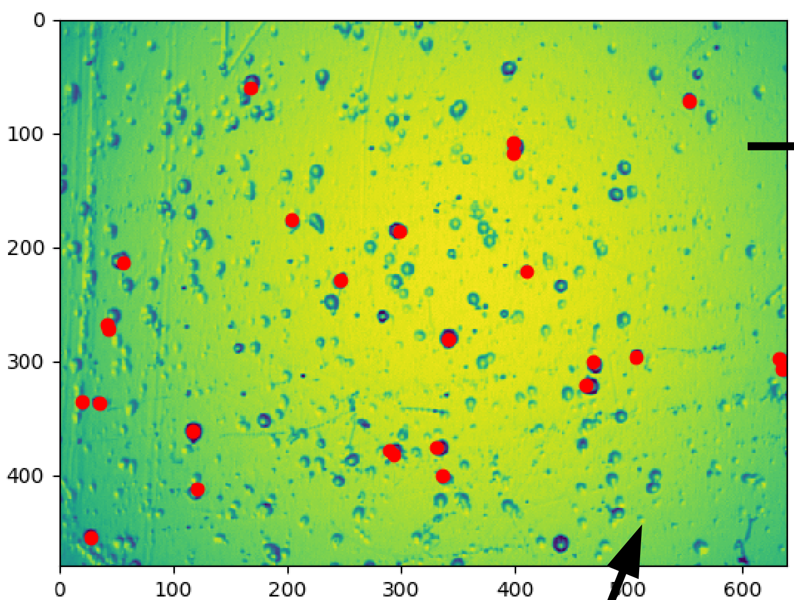
Illumination angle determines if pits are on top or bottom surface

Filtered/ transformed and projected into 2d Dilute what desnt match pattern

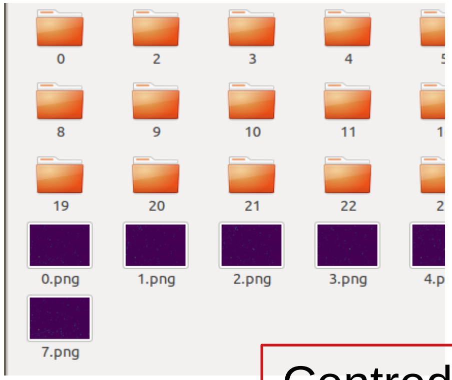
Candidate holes show features of both.

Many Many examples of top surface and bottom surface pits. Possible to train feature learning on these.

Position labelling

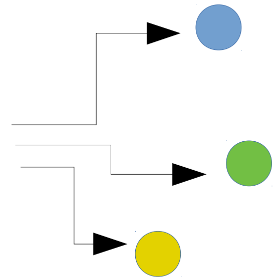


Transforms image segmentation map into list of X,Y coordinates. Similar to zooniverse label structure



Automated cropping Of source images / processed images based on list

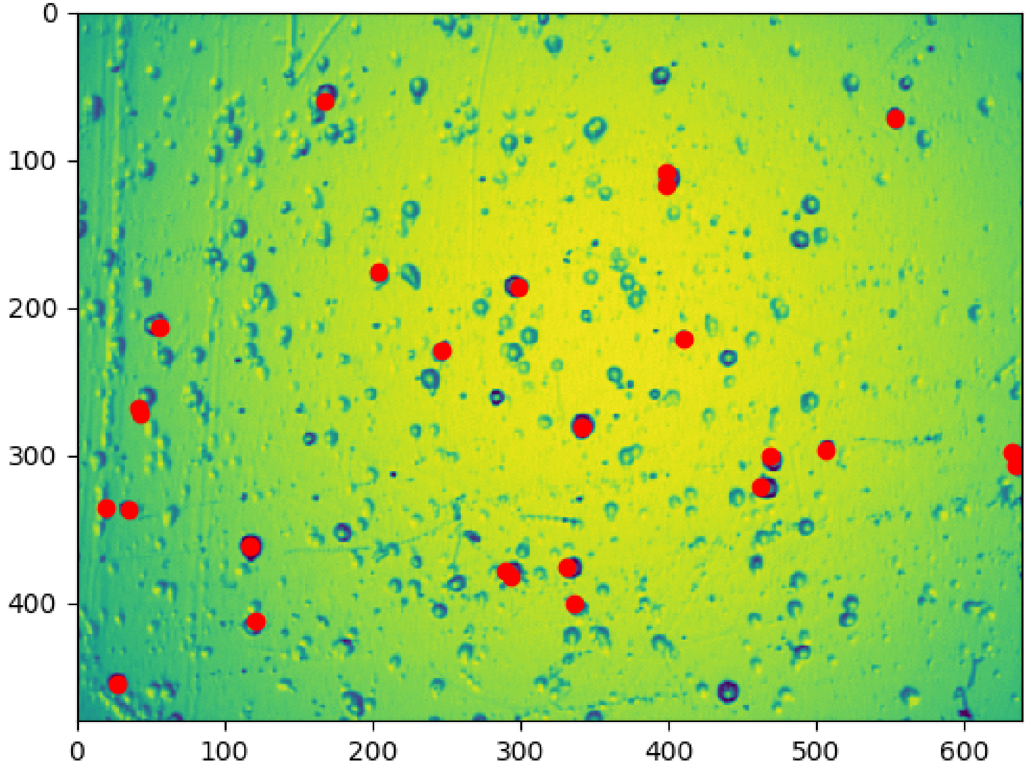
Centred / pre-selected images for labelling Much less empty space Filters can provide initial clarification, T/B/C



Train Classifier

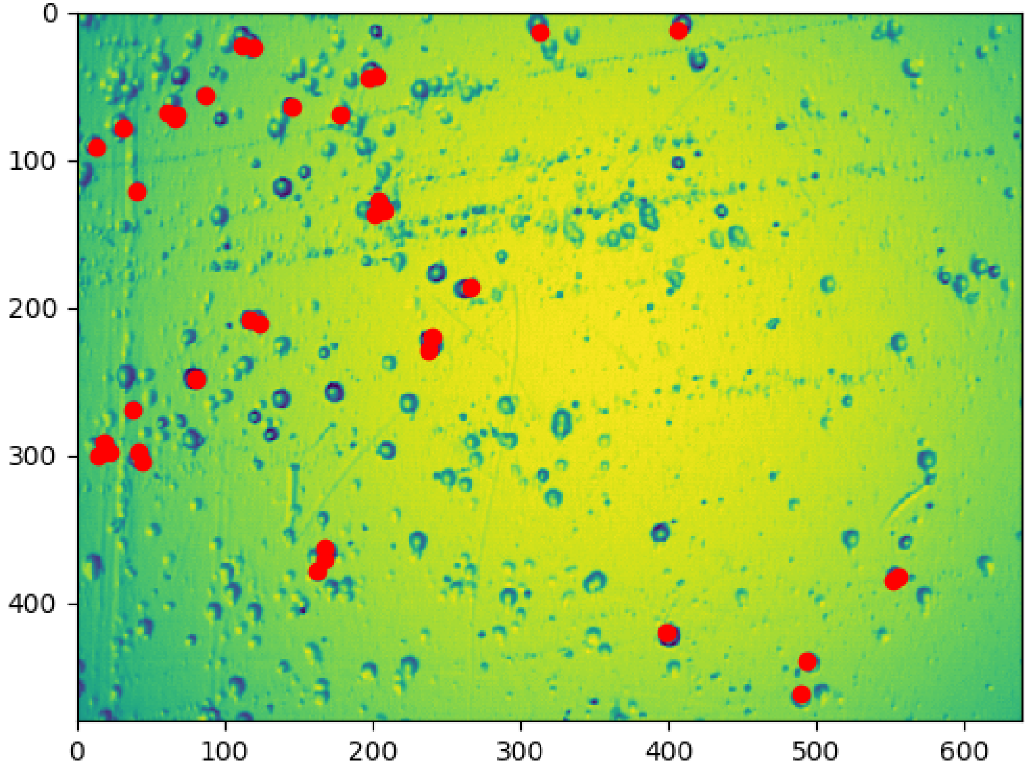
Trained Classifier used for INFERENCE fully convoloutional network to procude accurate image segmentation. Getting positions + Labels

Scales easily

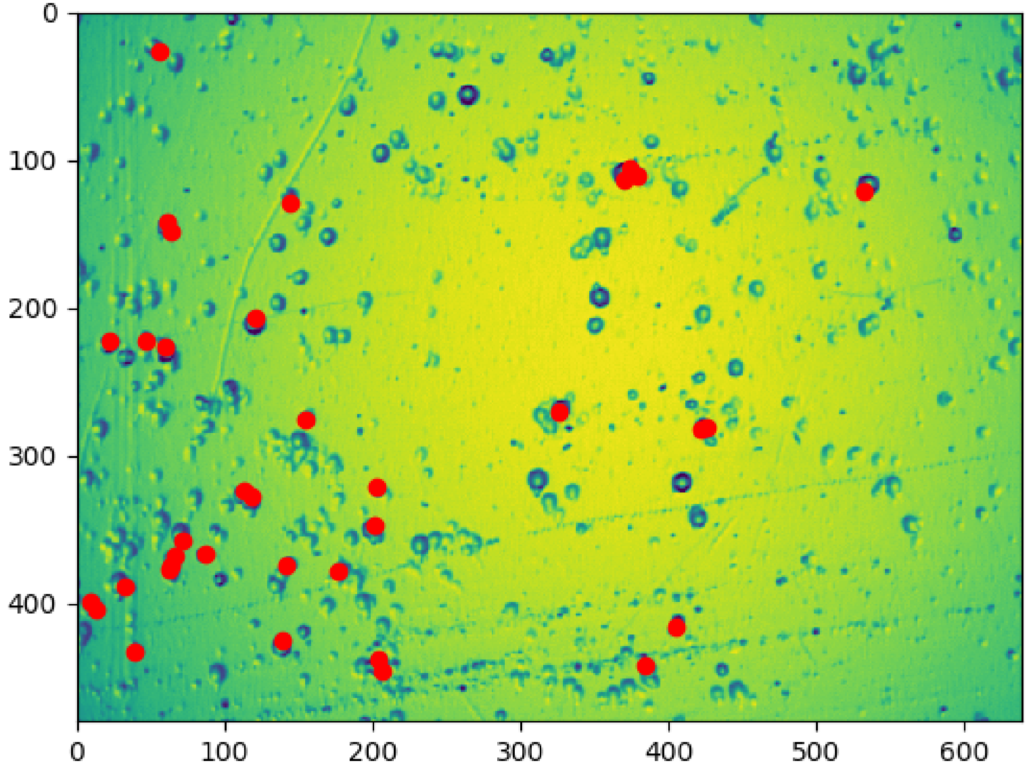


Green colour reflects heatmap of numpy-image-array
X,Y coords derived from
or fraction of Pits selected depends on threshold values, and no. filters required

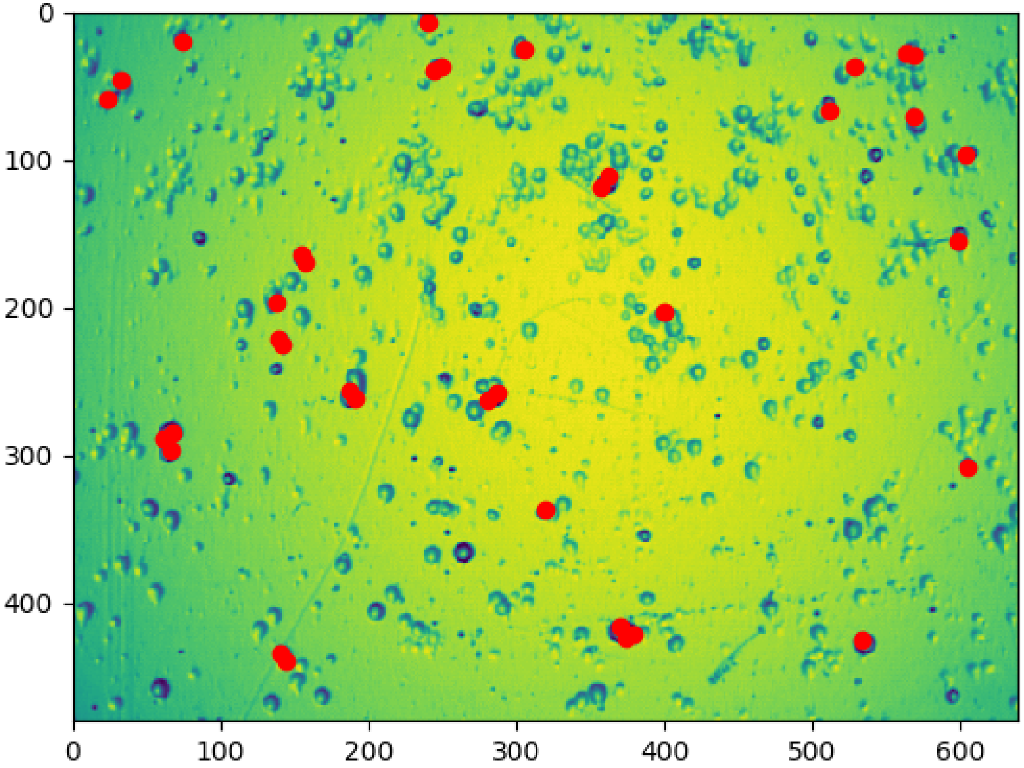
Scales easily



Scales easily



Scales easily



Scales easily