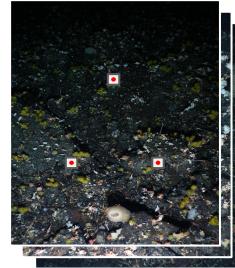


All images

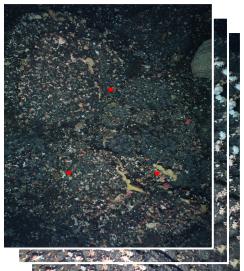


Train images

- 1 For small subset of images, label laser points using labelME



Unlabelled images



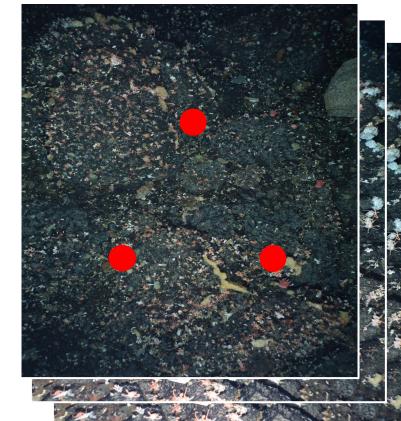
Trained model

(with learnt parameters storing information about laser color and layout)

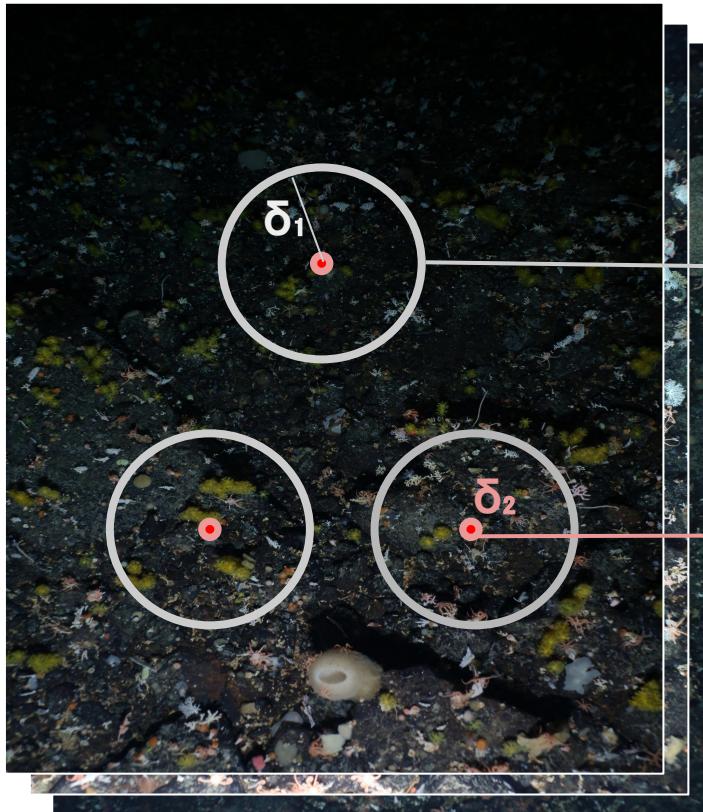
- 2 Color feature learning: What shades of red are the laser points?
Spatial layout modelling: Where are the laser points on an image?

- 3 Run inference and predict laser point locations on the unlabelled images

Automatically detected laser points



Train images



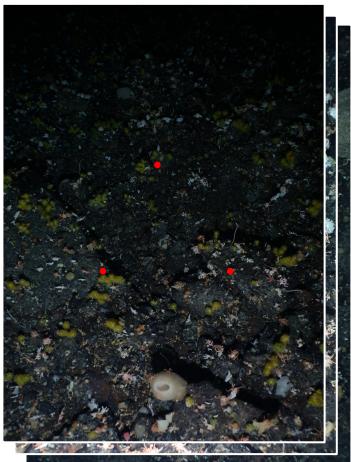
List of Background
Pixel RGB values

List of Laser point
Pixel RGB values

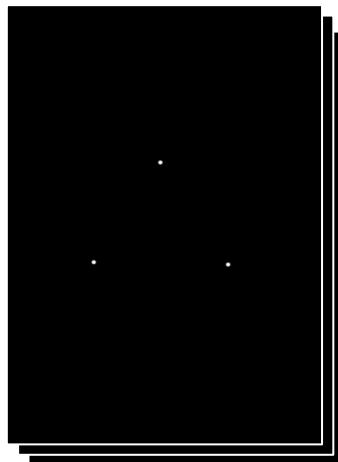
Combined list of
Pixels in RGB

K-means
clustering
(No. of clusters = 7)

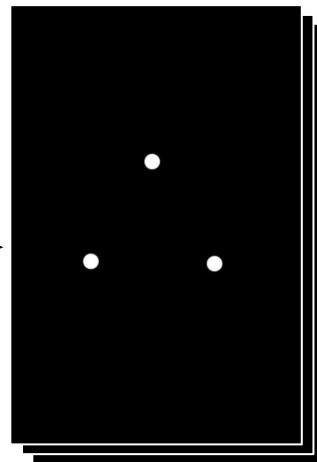
Train images



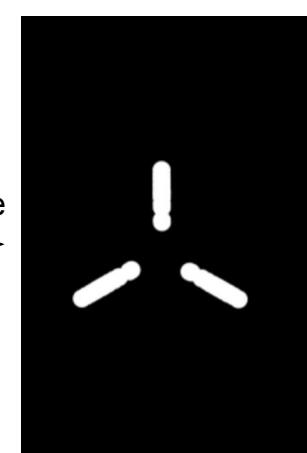
Laser point masks



Dilated masks



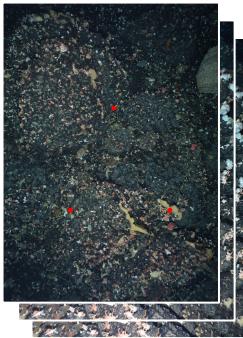
Master Mask



Dilate
by δ_1

Combine

Unlabelled images

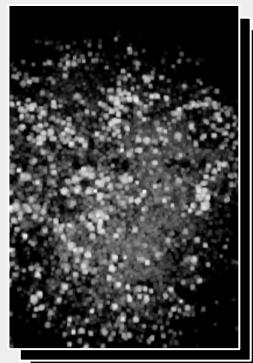


Automatically detected laser points

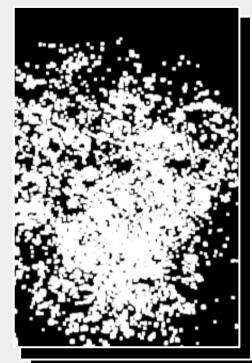


Trained model

Colour-based
detection



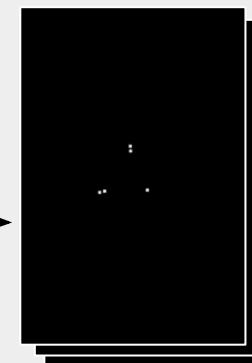
Morphological
opening



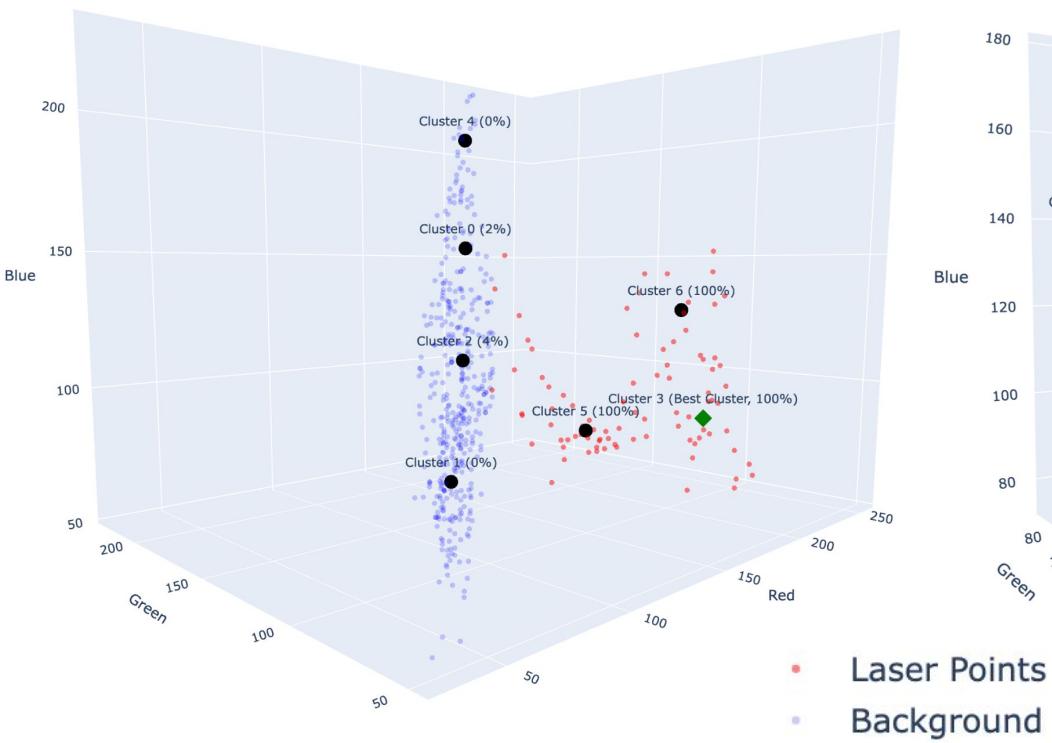
Spatial layout
detection



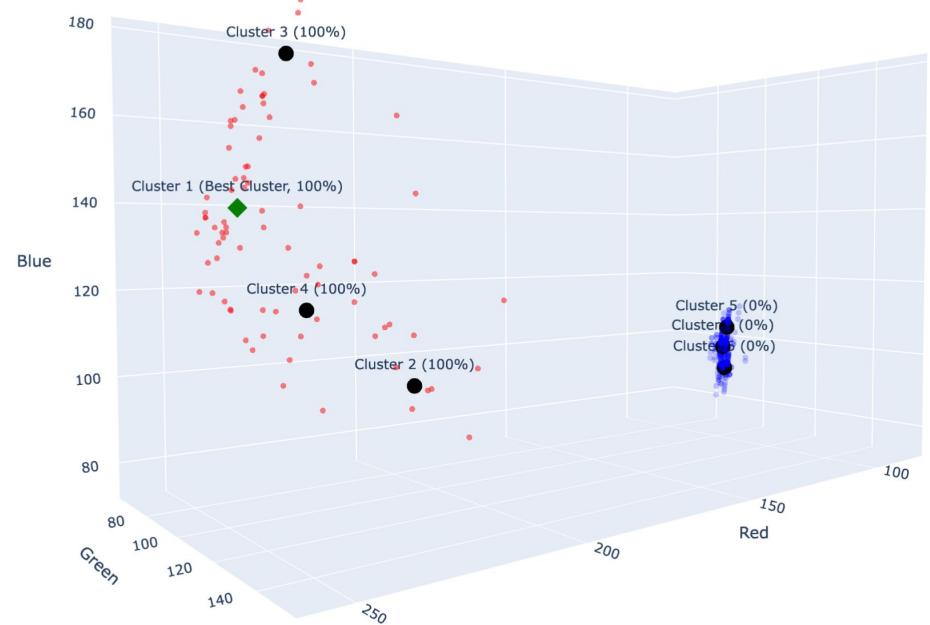
Region
selection
(No. of regions = 5)



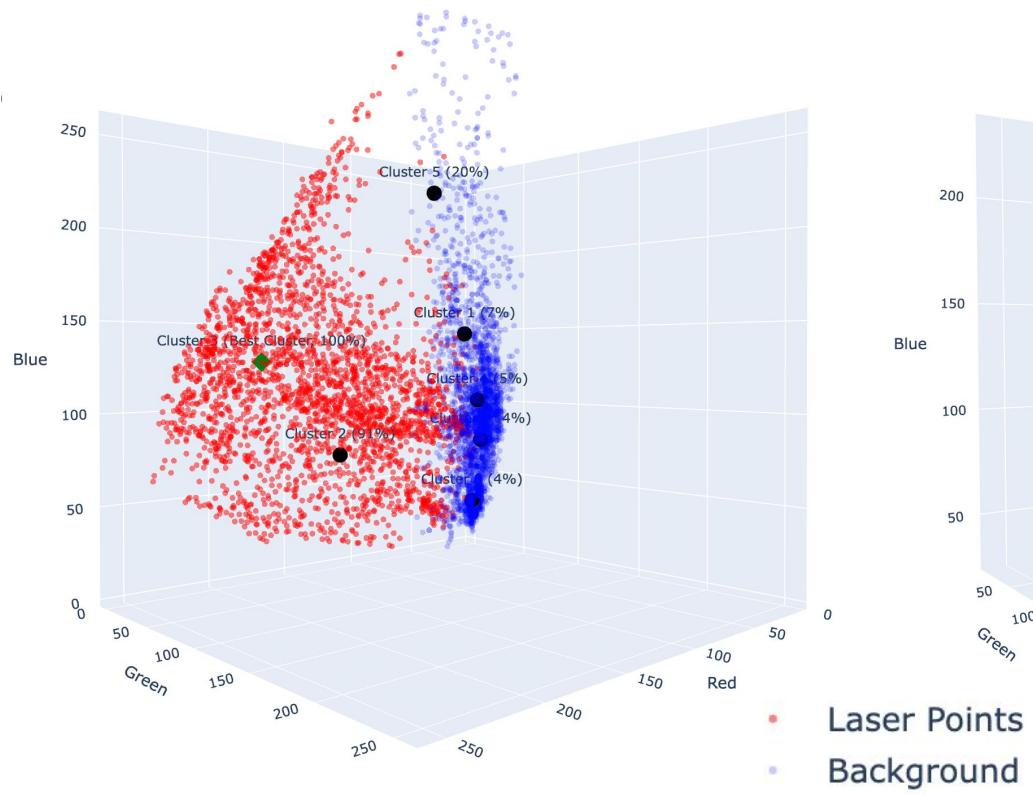
t1 Colour Clustering with 1 Training Image



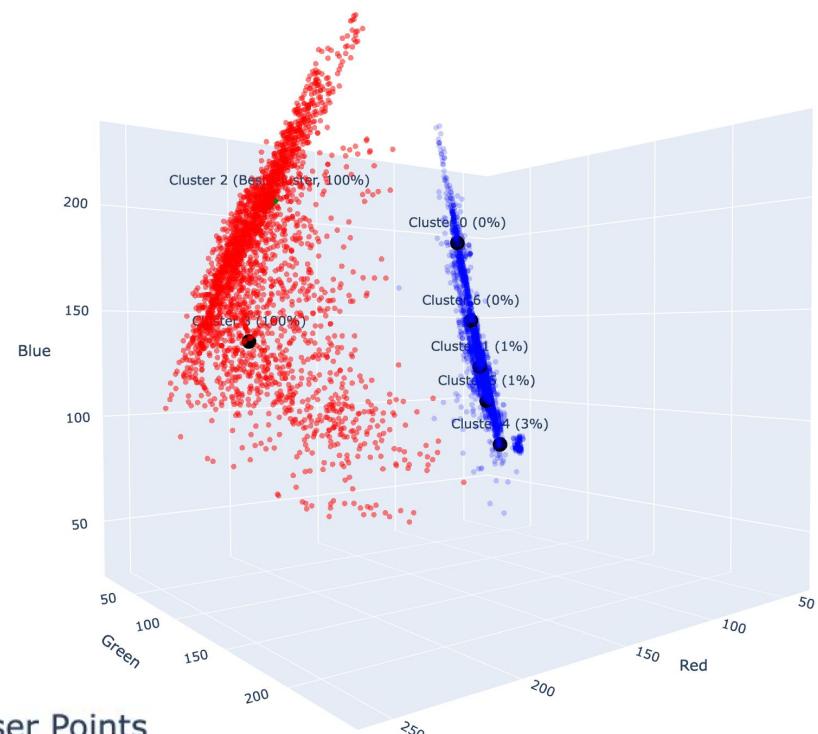
t2 Colour Clustering with 1 Training Image



t1 Colour Clustering with 30 Training Images



t2 Colour Clustering with 30 Training Images



t1 Failed Predictions with 30 training images:

Image 0859 | GT: 3 | Pred: 3



Image 1220 | GT: 3 | Pred: 1

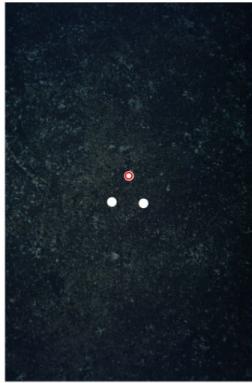


Image 1124 | GT: 3 | Pred: 0



Image 0555 | GT: 3 | Pred: 3



Image 0828 | GT: 3 | Pred: 3



Image 0700 | GT: 3 | Pred: 2



t1 Failed Predictions with 30 training images:

Image 0121 | GT: 3 | Pred: 0



**t1 Consistent
Successful
Predictions:**

Image 0282 | 15/17 successes



Image 1134 | 6/17 successes

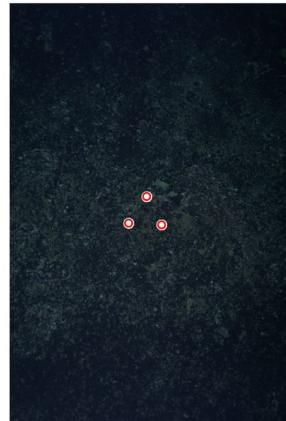


Image 0859 | 4/17 successes



**t2 Consistent
Successful
Predictions:**

Image 0154 | 15/17 successes



Image 0138 | 15/17 successes



Image 0225 | 15/17 successes



t1 Fail Case #1:
Dark images

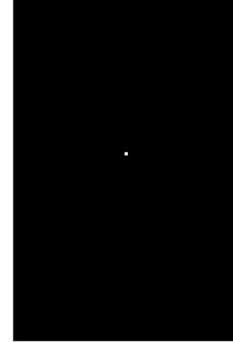
Grey image values 1220



Morphological opening 1220



Master Mask filter 1220



Region selection 1220

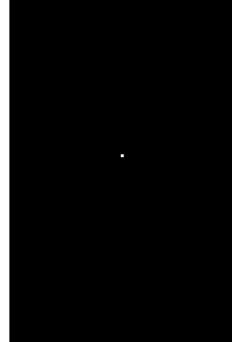
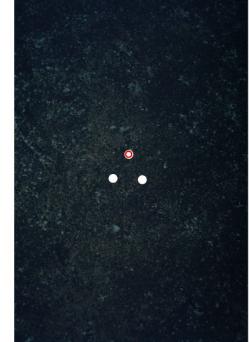
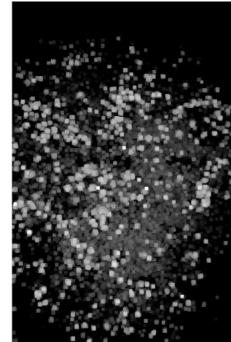


Image 1220 | GT: 3 | Pred: 1

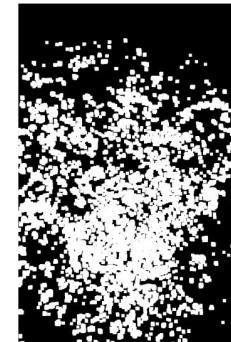


t1 Fail Case #2:
Noisy images

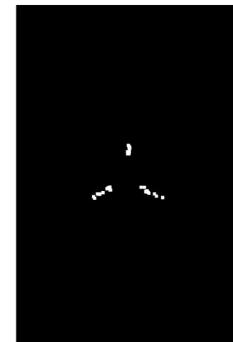
Grey image values 1106



Morphological opening 1106



Master Mask filter 1106



Region selection 1106

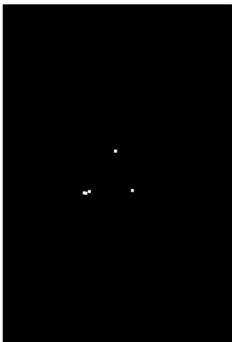
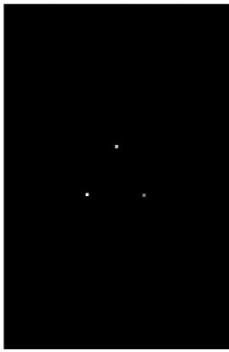


Image 1106 | GT: 3 | Pred: 3



t2 Fail Case #1:
Dark images

Grey image values 0531



Morphological opening 0531



Master Mask filter 0531



Region selection 0531

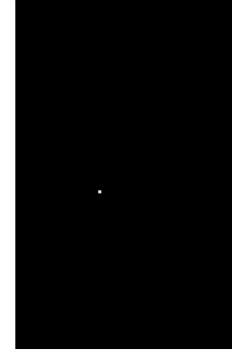


Image 0531 | GT: 3 | Pred: 1

