

Is Deep Learning more effective in detecting natural oil slicks?

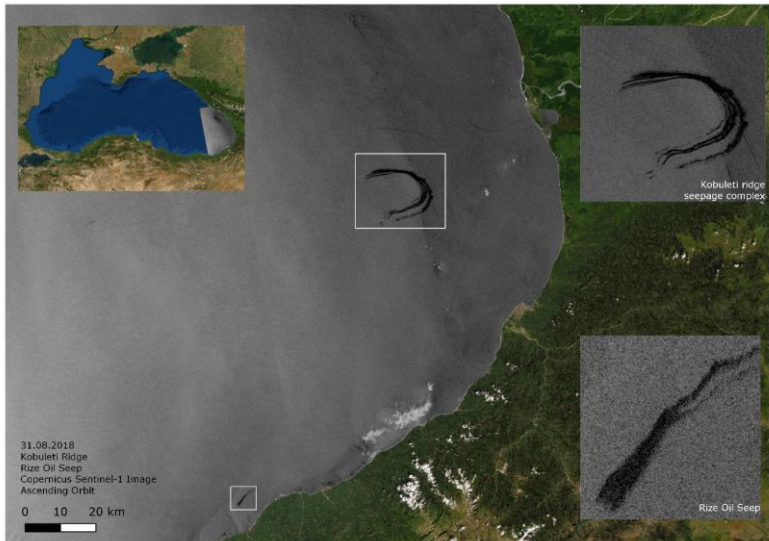
A comparison of semi-automated and AI techniques

Cristina Vrinceanu, Stephen Grebby, Stuart Marsh

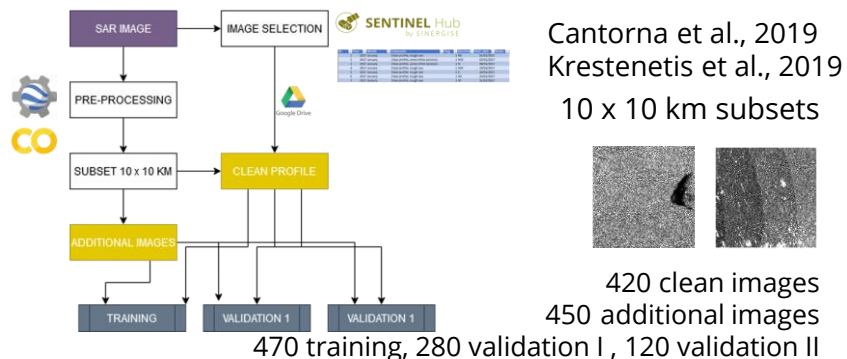
RQ1: How many seepage sites are in the Black Sea and how much do they contribute to the annual oil input?

RQ2: Are semi-automatic classification algorithms enough for detecting and mapping offshore oil seepage or is AI a game-changer?

Research area

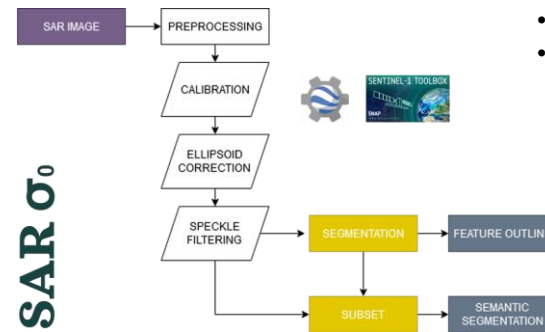


Convolutional Neural Networks



Segmentation

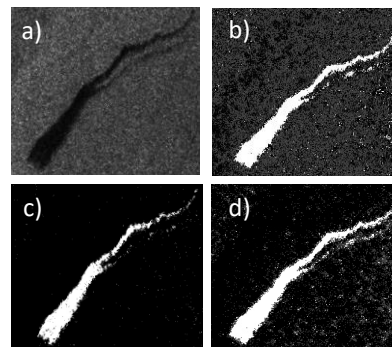
Synthetic Aperture Radar – Copernicus Sentinel-1 imagery (C-band), Interferometric Wide Ground Range Detected (IW-GRD), 10x10 m az x rg



- K-means
- SVM

420 clean images (Jan 2017-
March 2021)

Results



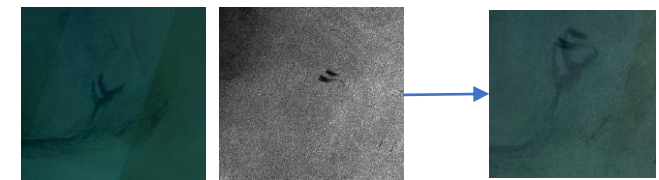
a) Original image
b) Segmentation KM
c) Segmentation SVM
d) Modified CNN (Cantorna et. Al, 2019)

	5-fold validation	Best Precision
K-means	-	0.847 ± 0.155
SVM	-	0.834 ± 0.110
CNN (50 epochs, ReLU, W: 0.07, 0.30, 5 layers)*	0.824 ± 0.012 0.836 ± 0.156	0.832 ± 0.080 0.835 ± 0.103

*Preliminary results

Discussion

- Comparison between popular segmentation and CNN algorithms
- CNN algorithms do not show significant improvement by themselves – usually need to pass various trials
- Data augmentation planned for increasing the number of images (rotation/zoom)
- Algorithm to be enhanced with wind/chlorophyll concentration data – new issue => integrating satellite products at L3/L4
- Similar approach (segmentation vs CNN) for multispectral imagery (Copernicus Sentinel-2)
- Harmonizing Synthetic Aperture Radar and Multispectral open-source framework



Cristina.vrinceanu@nottingham.ac.uk,
@cavrinceanu