

PANOPTIS

Development of a Decision Support System (DSS) for increasing the resilience of transportation infrastructures based on combined use of terrestrial and airborne sensors and advanced modelling tools

Newsletter N° 2 - May 2019

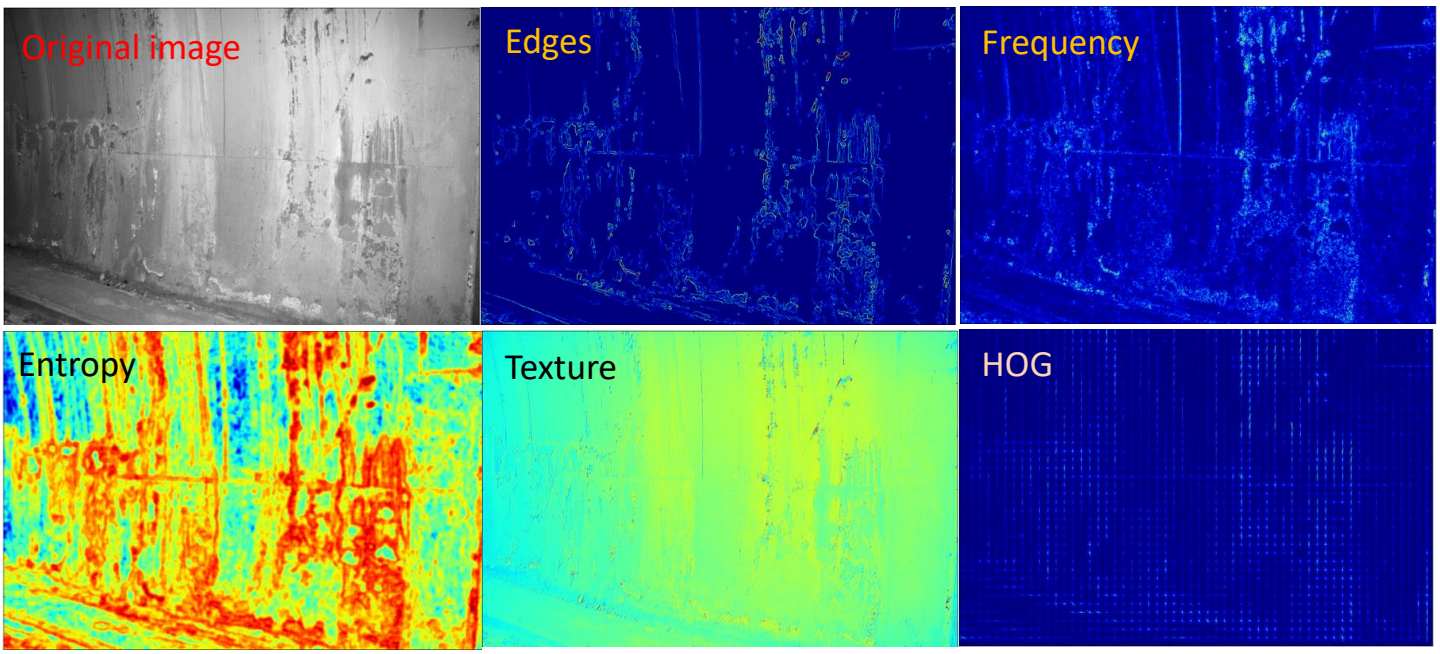
How computer vision & deep learning approaches facilitate experts in transportation infrastructures monitoring.



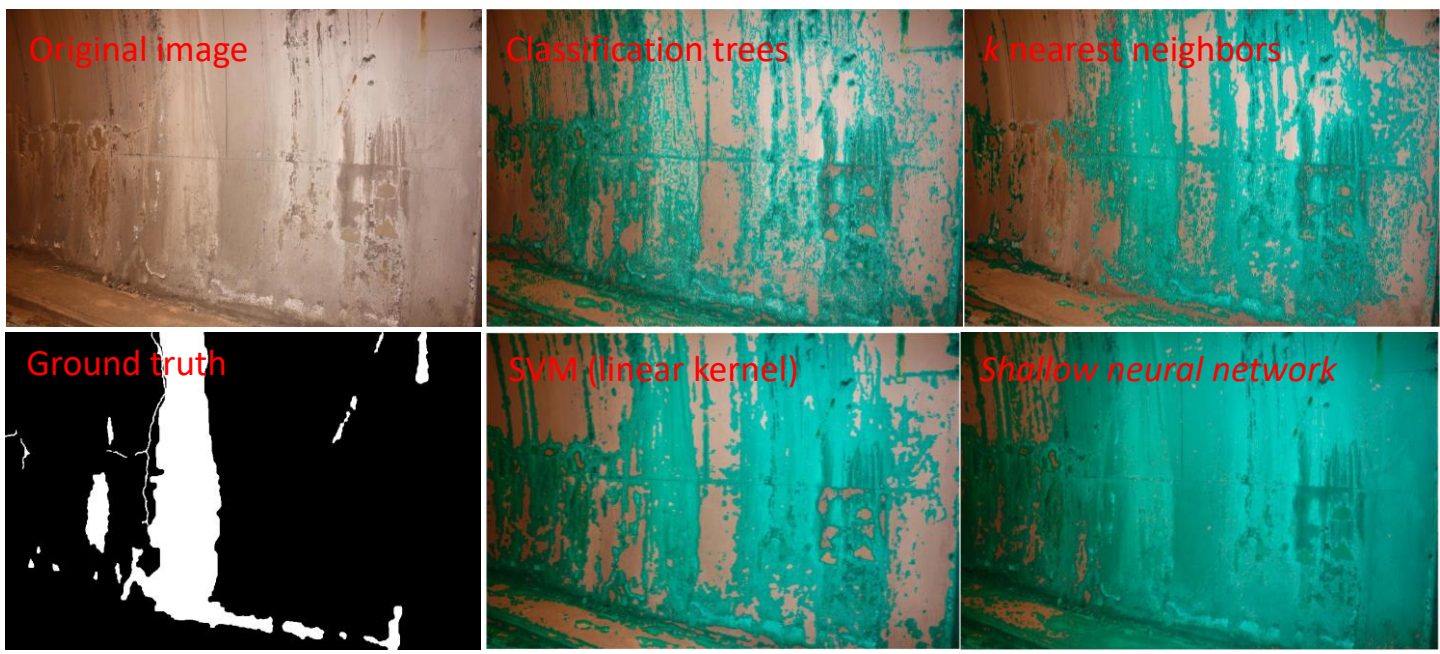
Defect identification over RGB images
(Traditional approach)



Manual feature extraction: Requires an expert or extensive testing.



Classifier selection: Select the best possible model to minimize Type I and II errors, using as inputs the extracted input features.

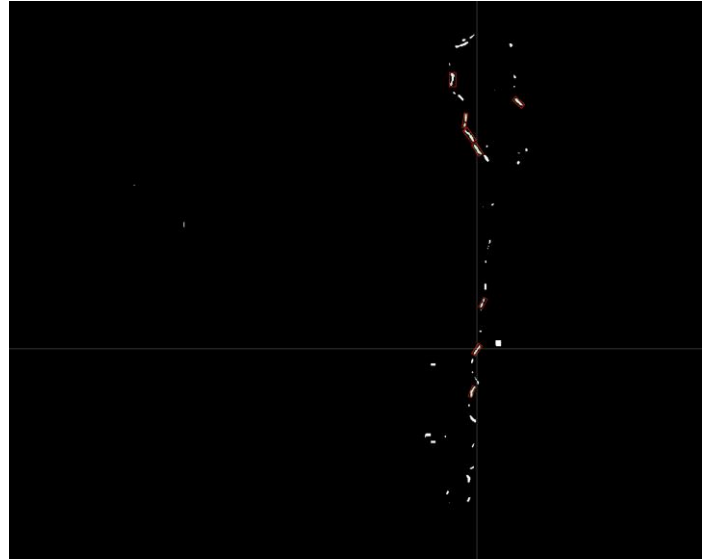
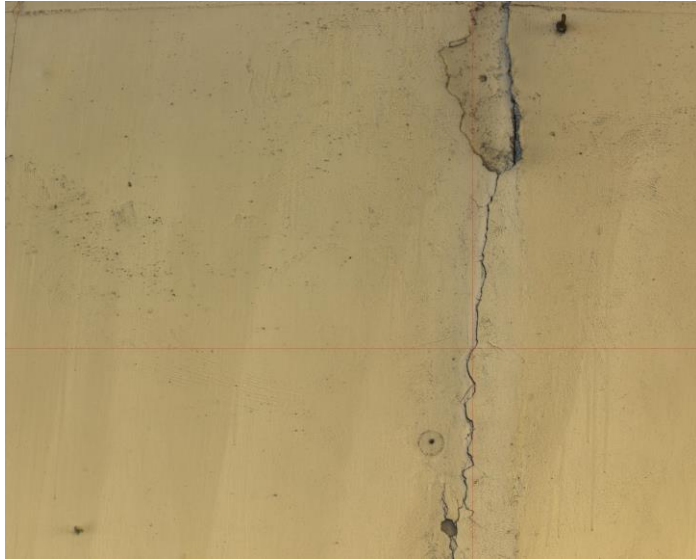


Summarizing: The transportation infrastructure monitoring is a challenging field, in which traditional approaches (i.e. feature & model) selection are difficult to use. Thus, the adaptation of deep learning approaches occurred naturally.

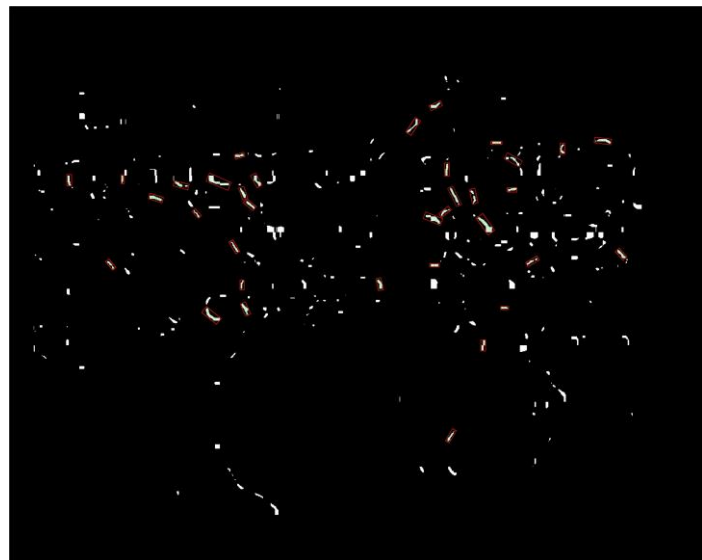
Advanced identification scenarios, using deep learning & post processing heuristics



A good detection case: Limited false positives & most of the crack surfaces are identified (i.e. annotated in white) correctly.



A difficult case: Too many false positives (areas that look like concrete cracks but they are not). Secondary mechanisms to eliminate false positives are required

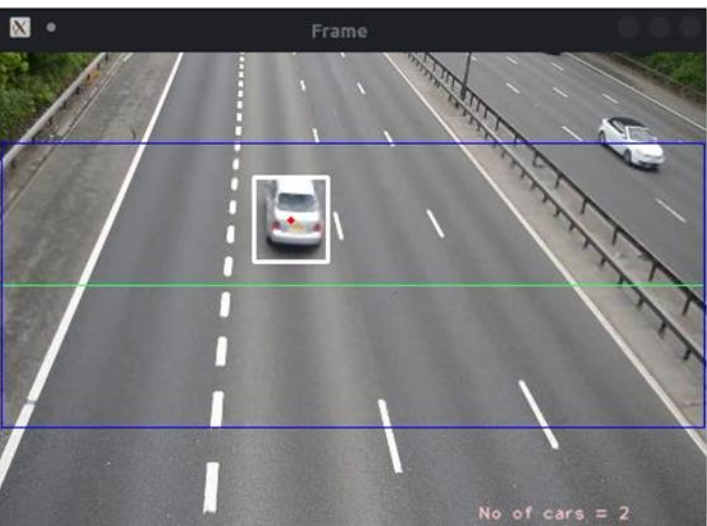


Summarizing: Despite the advantages of deep learning, there are scenarios in which a human expert is required. In such cases, deep learning does the main work (by indicating possible areas of interest (segmentation). The false positive detections are then eliminated using a set of post processing heuristic rules.

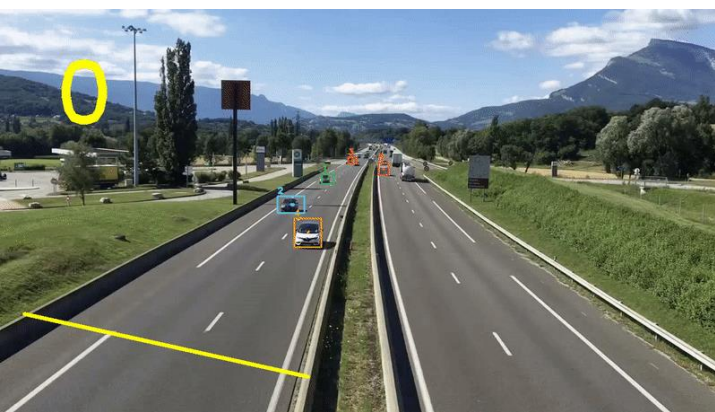
Monitoring the traffic load



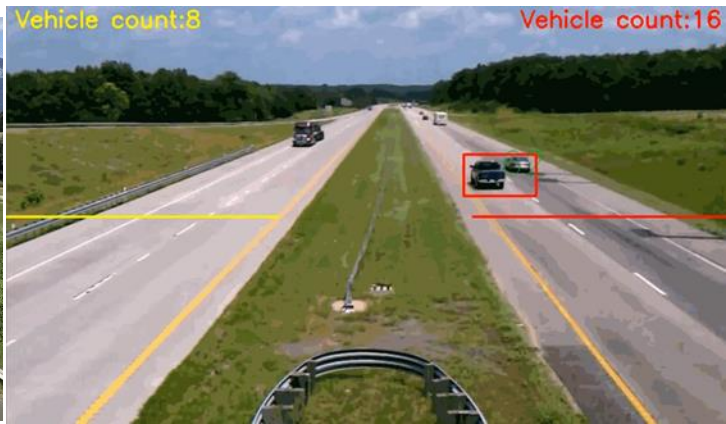
It is possible to use video streams or sets of images to count the number of vehicles. Various techniques can be applied: background subtraction, blob detection, feature extraction & classification schemes, one stage detector (e.g. YOLO), etc.



Car counting using background subtraction
(<https://gurugaurav.github.io/Vehicle-Counting-using-Opencv/>)



Car counting using YOLO
(<https://github.com/guillelopez/python-traffic-counter-with-yolo-and-sort>)



Car counting using blob detection
(https://github.com/ahmetozlu/vehicle_counting)

Summarizing: There are multiple available tools that can be used for vehicle tracking and counting. The number of vehicles will be utilized by the developed holistic risk assessment propagation model, supporting the formulation and development of the new solutions concerned with the risk modeling, identification, prediction, improvement and optimization of the safety of the complex critical infrastructures related to their operation processes and their inside and outside interactions