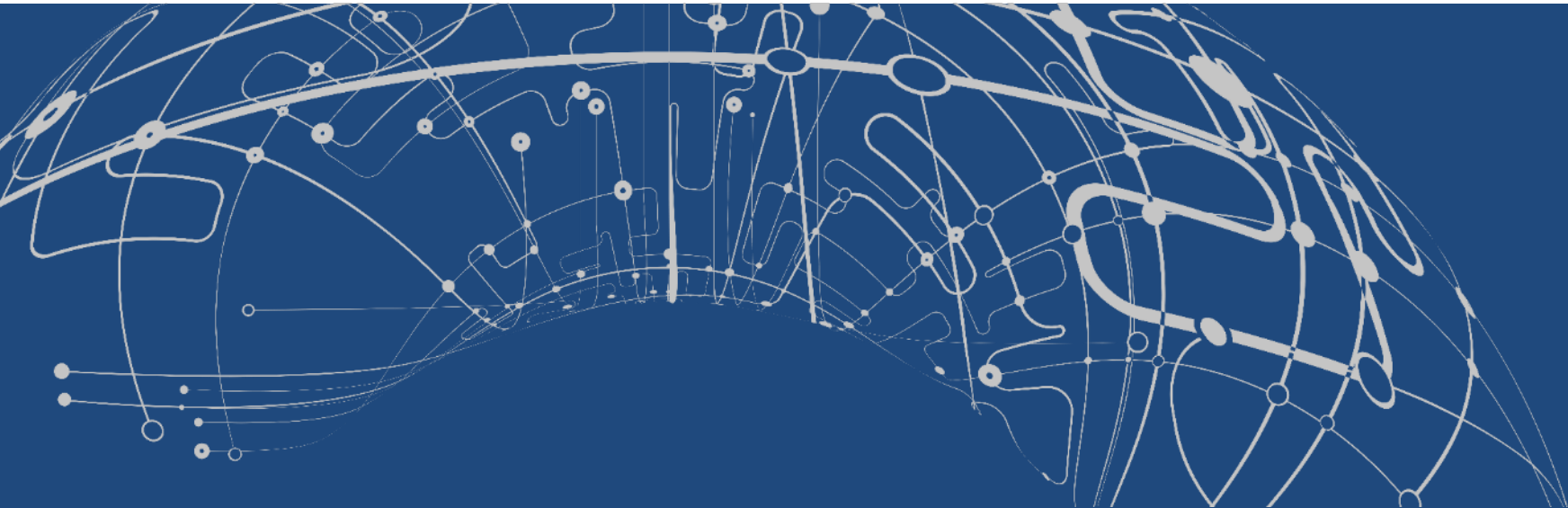


KOLEKTOR

ROSUS 2019

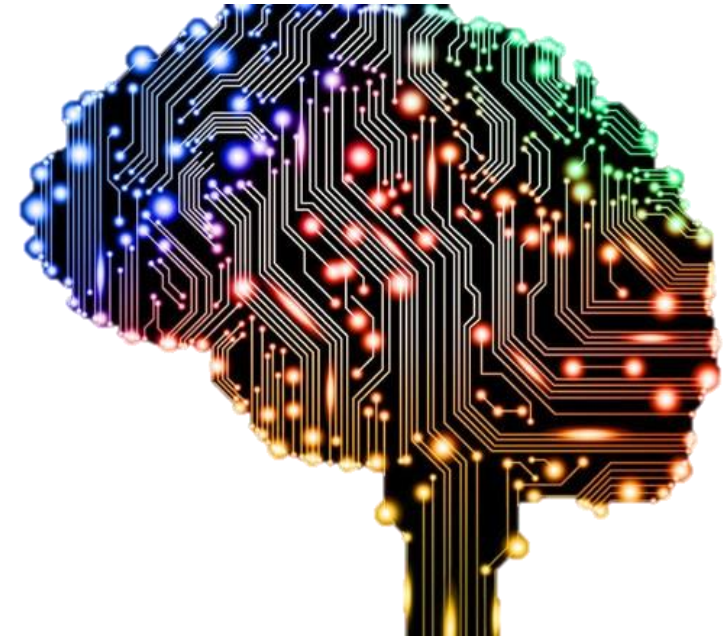
Praktična uporaba metod umetne inteligence v industrijskem okolju

Samo Šela



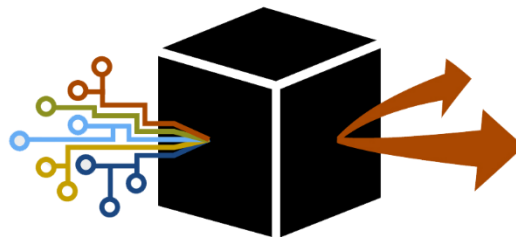
Vsebina

- Uvod
- Projekt s strojnim učenjem
- Kako ravnati s podatki
- Pregled programskih orodij za industrijske aplikacije
- Praktični primeri industrijskih aplikacij
- Zaključek



Strojno učenje

Strojno učenje je sposobnost računalnikov, da se naučijo opravljati zahtevne naloge brez eksplicitnega človeškega programiranja.

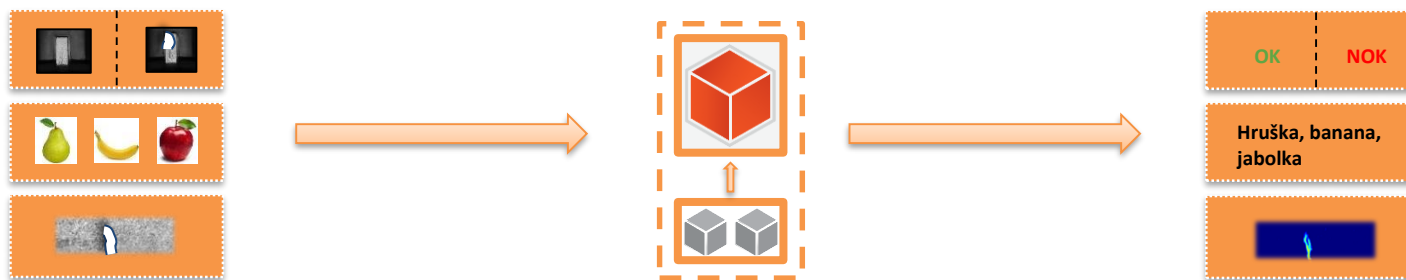
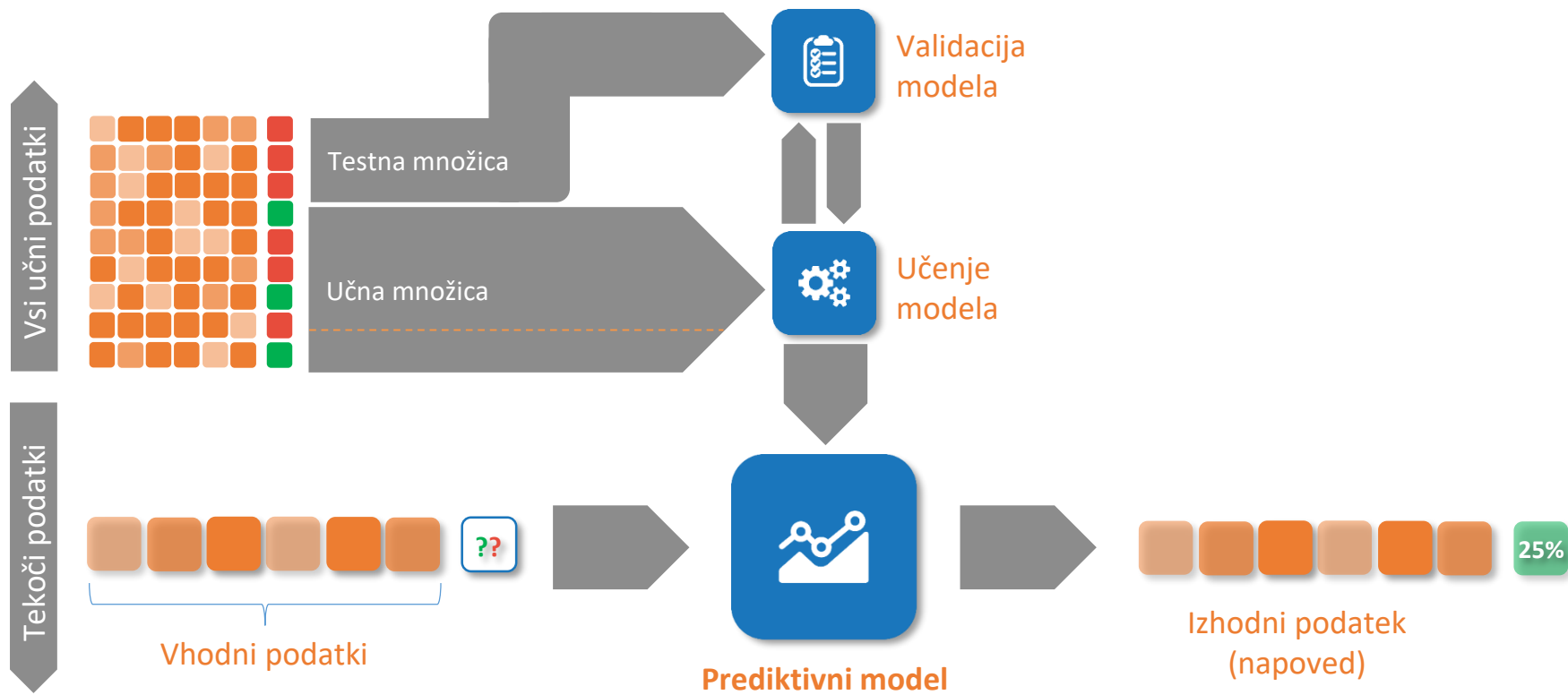


Gre za algoritme, ki računalniku omogočajo:

- da se uči iz preteklih **podatkov** brez eksplicitnega programiranja,
- da se izboljšuje s pridobivanjem svežih **podatkov**,
- da učinkovito prepoznava vzorce v kompleksnih **podatkih**, pridobljenih iz raznolikih virov.



Potek projekta



Rokovanje s podatki

• Popis problematike

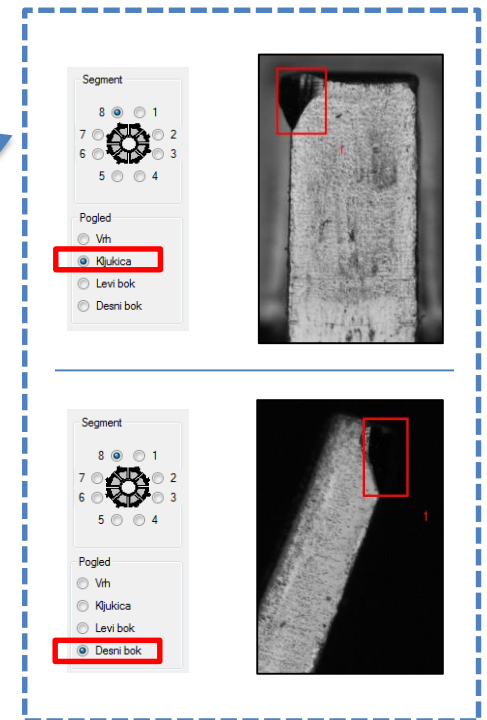
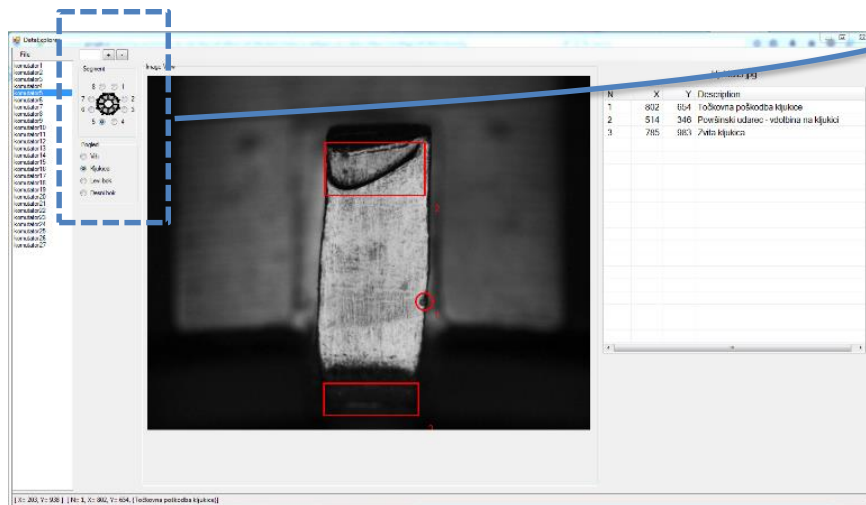
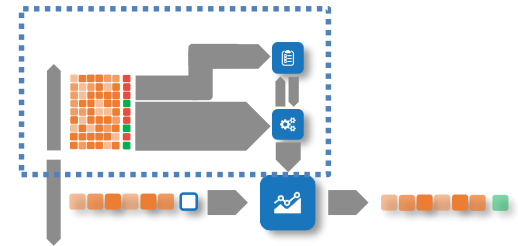
- Izdelava dokumenta TPP - *Tehnično prevzemni pogoji*

• Priprava

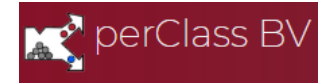
- Priprava množice vzorcev

• Izvedba

- Zajem slik
- Izdelava modelov strojnega učenja
- Analiza rezultatov



Orodja namenjena industrijski rabi



- MVTec Halcon
- Adaptive Vision
- perClass



- VisionPro Vidi
- Pekat vision
- Squeeze Brains
- Sualab





```

* Read classifier.
read_ocr_class_cnn ('Universal_Rej.occ', OCRHandle)
* Segment characters.
binary_threshold (Image, Region, 'max_separability', 'dark', UsedThreshold1)
dilation_circle (Region, RegionDilation, 3.5)
connection (RegionDilation, ConnectedRegions)
intersection (ConnectedRegions, Region, RegionIntersection)
sort_region (RegionIntersection, Characters, 'character', 'true', 'row')
* Classify.
do_ocr_multi_class_cnn (Characters, Image, OCRHandle, Class, Confidence)
    
```

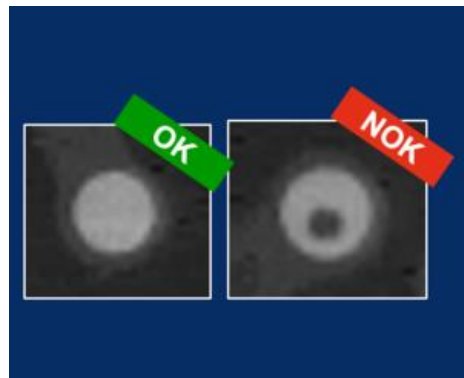
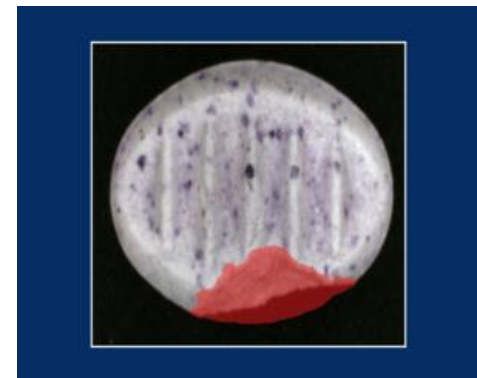


Image Classification



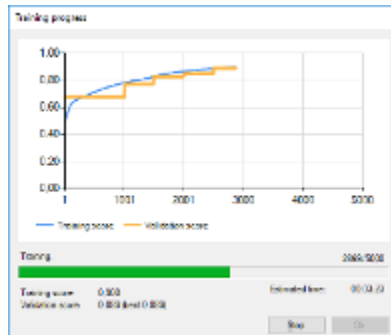
Object Detection



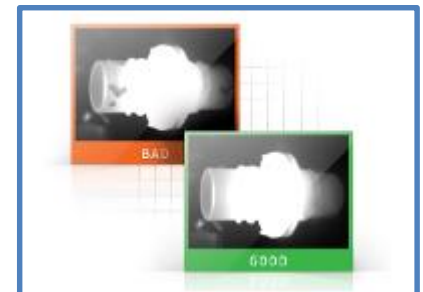
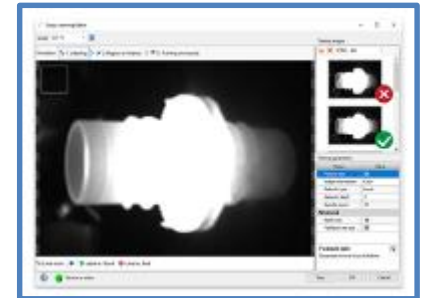
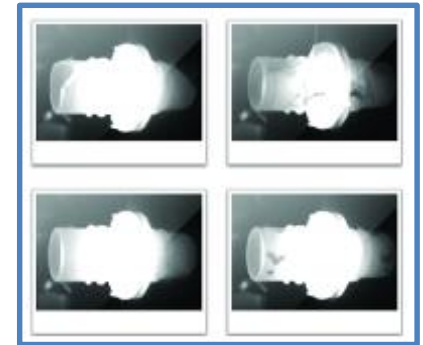
Semantic Segmentation

Adaptive Vision

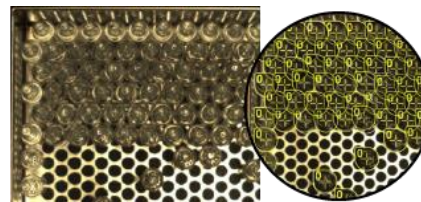
1. Collect and normalize images
2. Training
 - DeepLearning_ClassifyFeatures
 - DeepLearning_DetectAnomalies
3. Execute



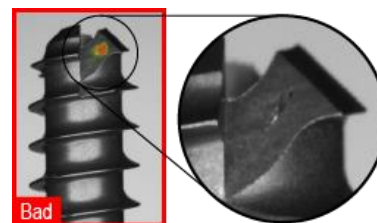
 **Adaptive Vision**



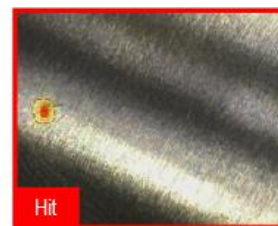
- Locates features



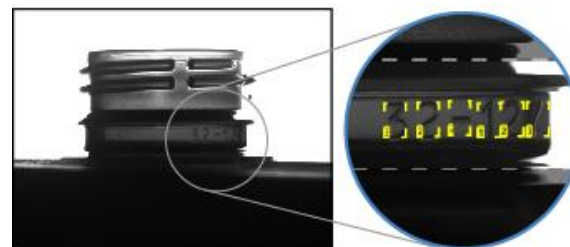
- Detects anomalies and aesthetic defects



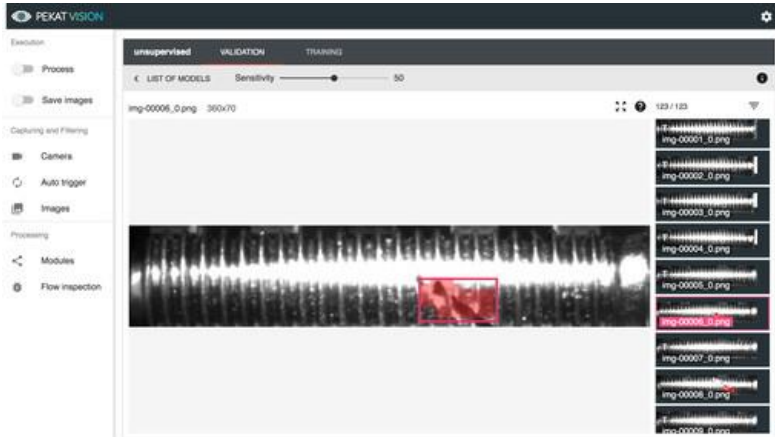
- Classifies objects or scenes



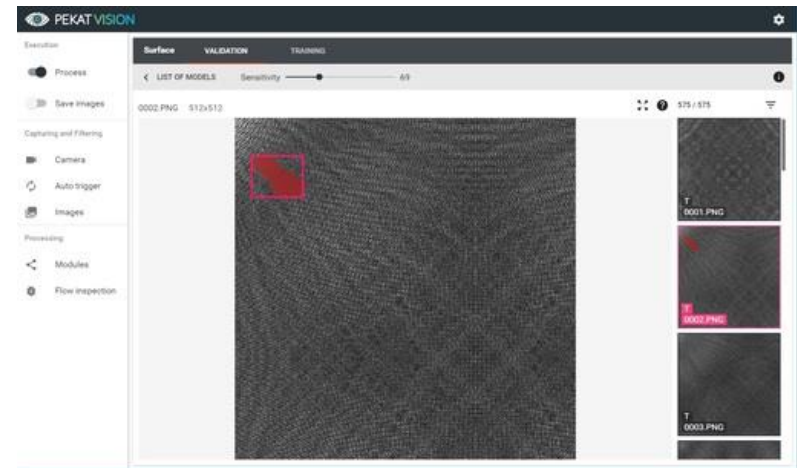
- Reads text and characters



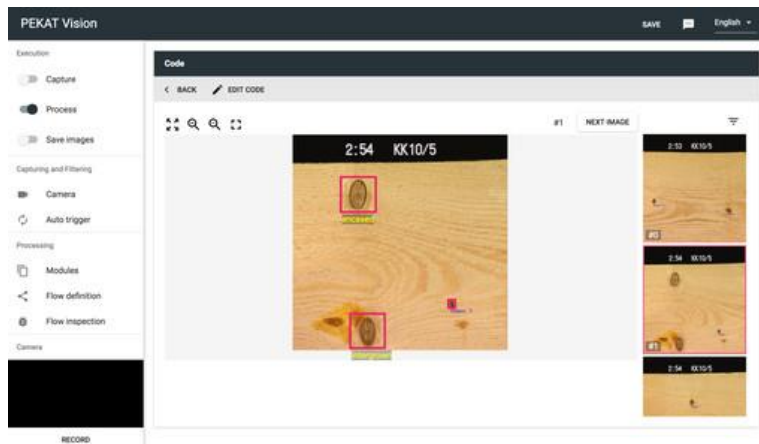
- Unsupervised anomaly detector



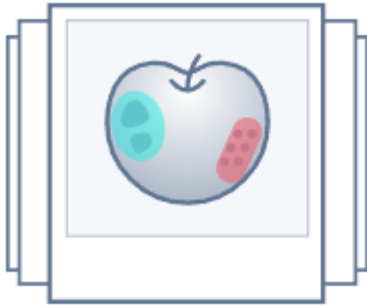
- Supervised surface check



- Object detector and classifier



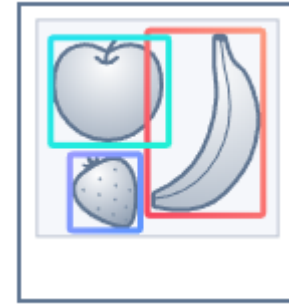
• SuaKIT Core Functions



Segmentation



Classification



Detection

• SuaKIT Training Methods



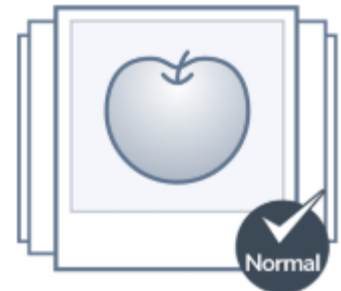
Single Image Analysis



Image Comparison



Multi Image Analysis



One Class Learning

Squeeze Brains

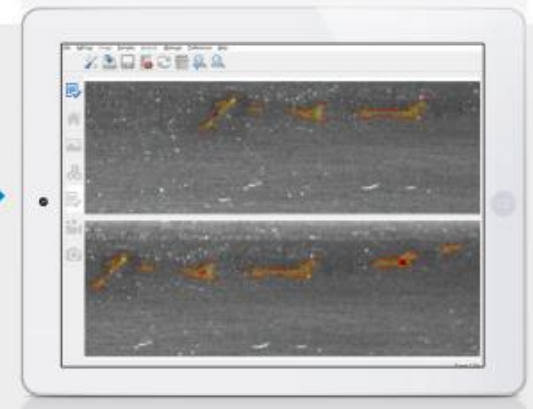
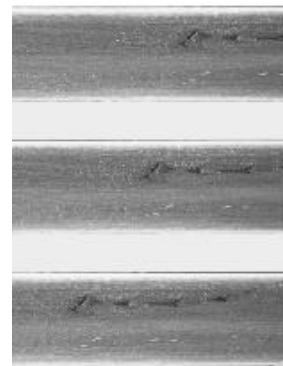
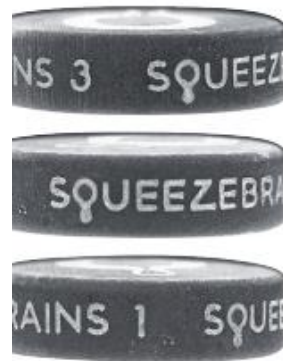
- RETINA - Object detection
- SURFACE - Surface defects

- GUI

- configure models
- manage samples of the image
- run SVL
- classify images
- analyse images

- C/C++ library

- The library has a complete set of functions to manage all the features of RETINA and SURFACE.

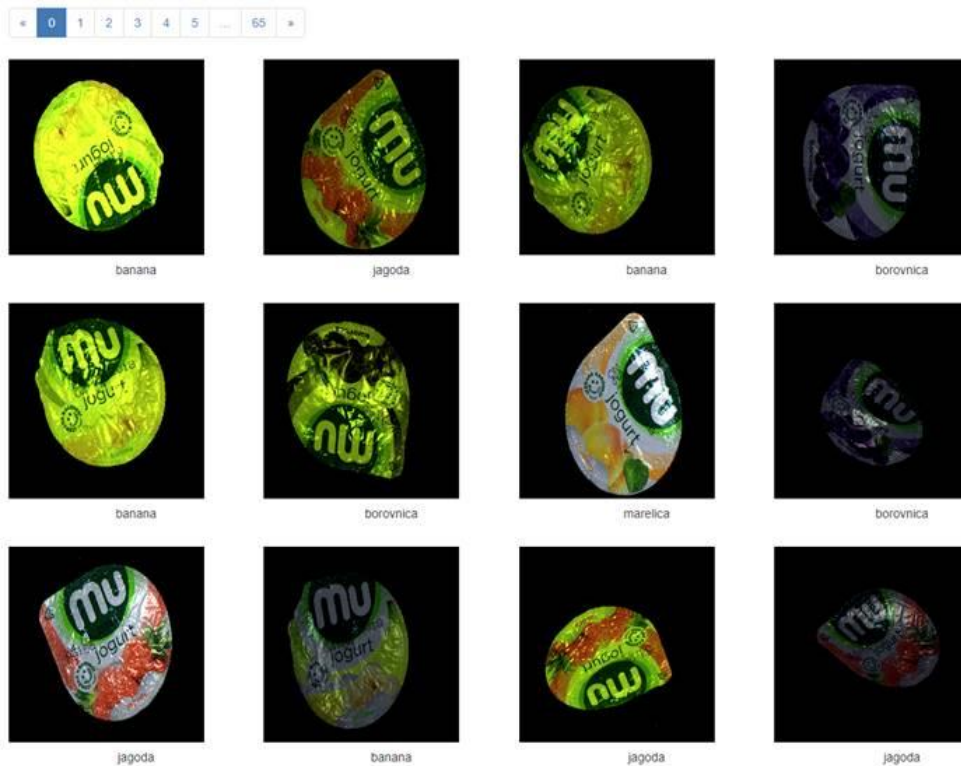


Praktični primeri uporabe

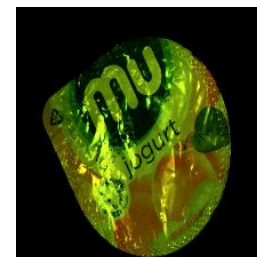


Prepoznava tipa sadnega jogurta

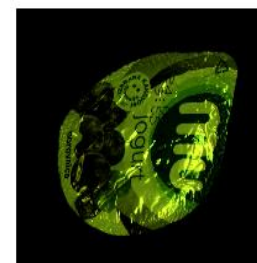
Podatkovna zbirka sadnih jogurtov



Testiranje modela



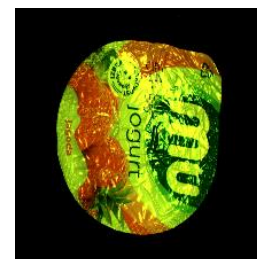
marelica	99.57%	99.57%
borovnica	0.43%	
jagoda	0.0%	
banana	0.0%	



borovnica	100.0%	100.0%
banana	0.0%	
marelica	0.0%	
jagoda	0.0%	



banana	99.95%	99.95%
marelica	0.05%	
borovnica	0.0%	
jagoda	0.0%	



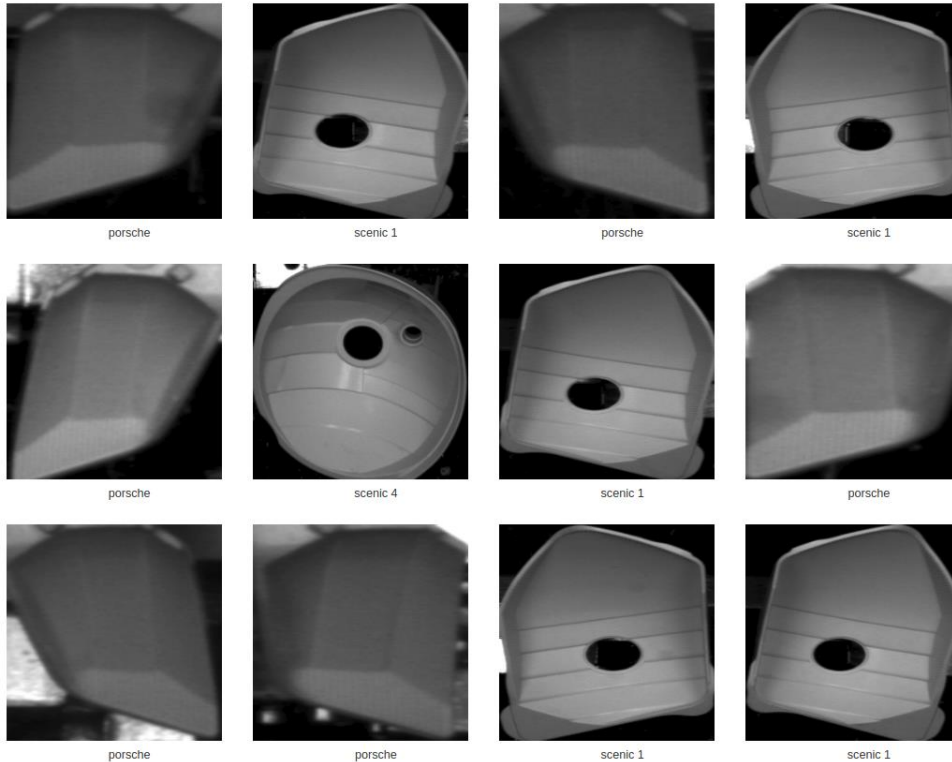
jagoda	100.0%	100.0%
marelica	0.0%	
borovnica	0.0%	
banana	0.0%	

Prepoznavna tipa avtomobilske luči

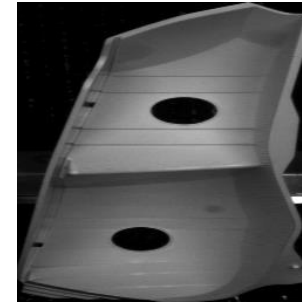
Podatkovna zbirka avtomobilskih luči

Items per page: 10 - 25 - 50 - 100

« 0 1 2 3 4 5 ... 105 »

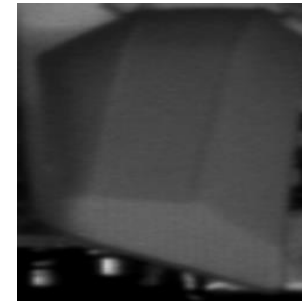


Testiranje modela



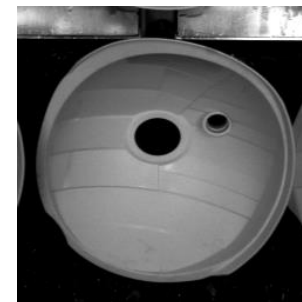
delta	100.0%
scenic 4	0.0%
edison	0.0%
scenic 1	0.0%
scenic 2	0.0%

100.0%



porsche	100.0%
delta	0.0%
scenic 4	0.0%
scenic 3	0.0%
edison	0.0%

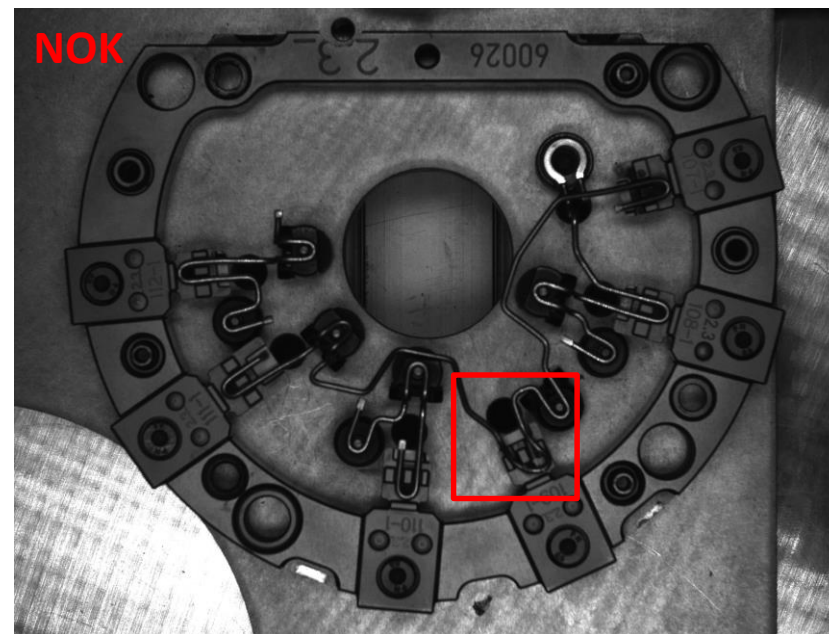
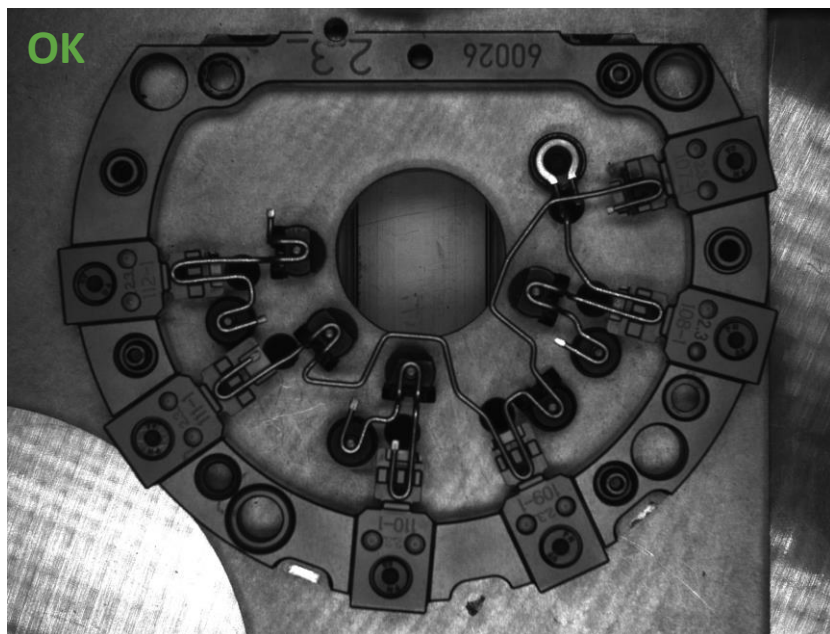
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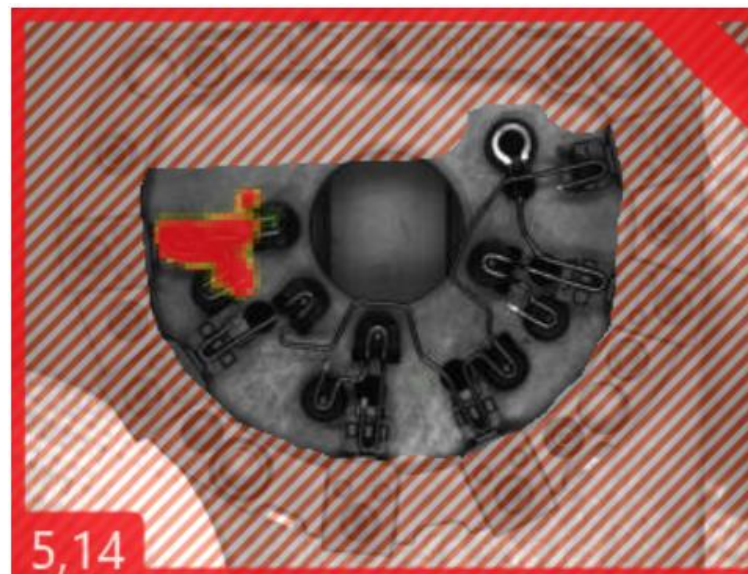
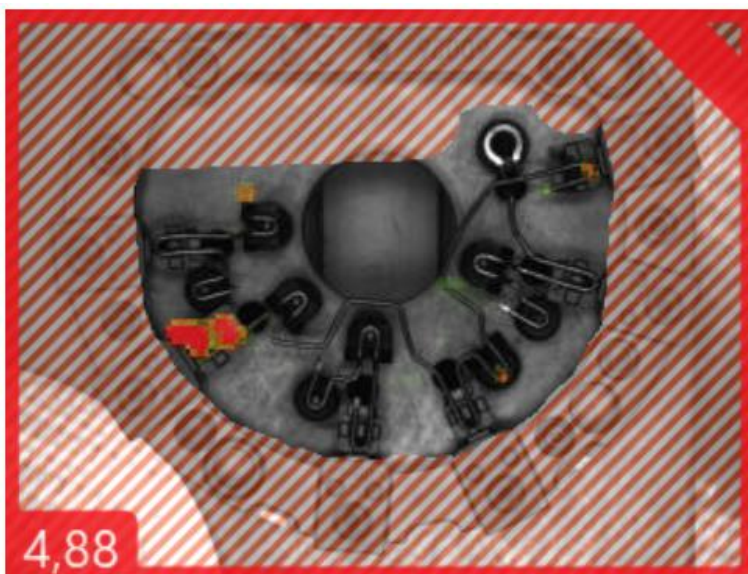
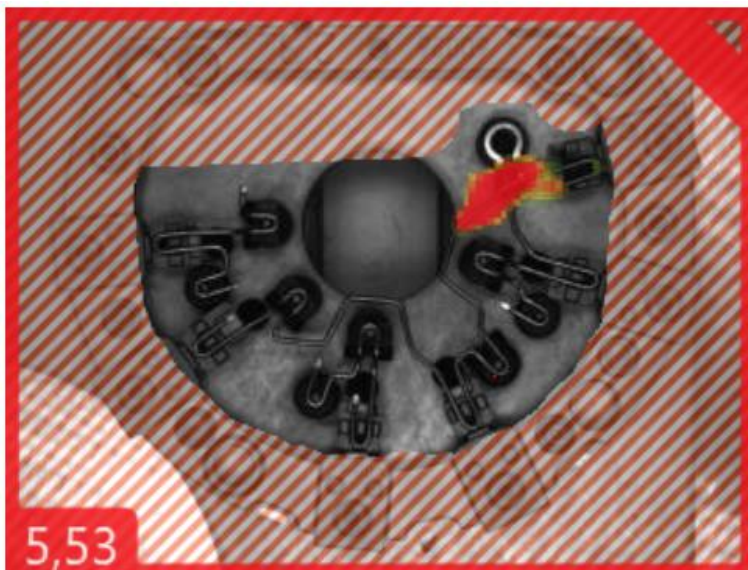
scenic 4	100.0%
edison	0.0%
scenic 3	0.0%
delta	0.0%
porsche	0.0%

100.0%

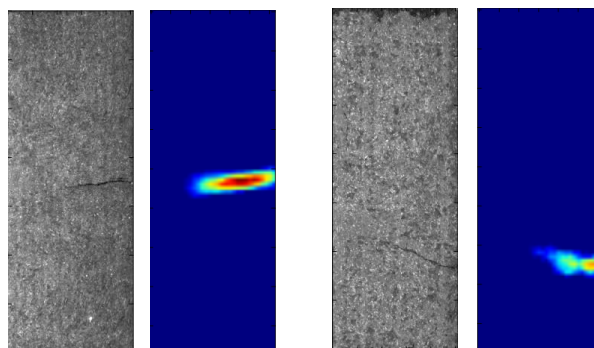
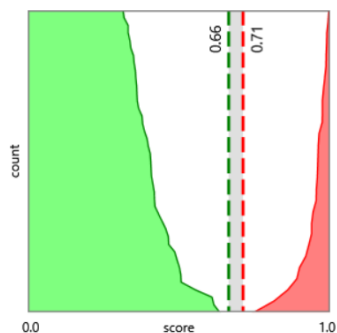
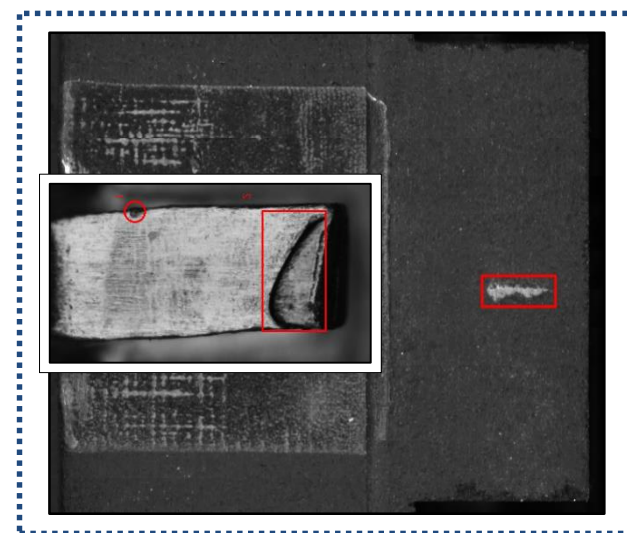
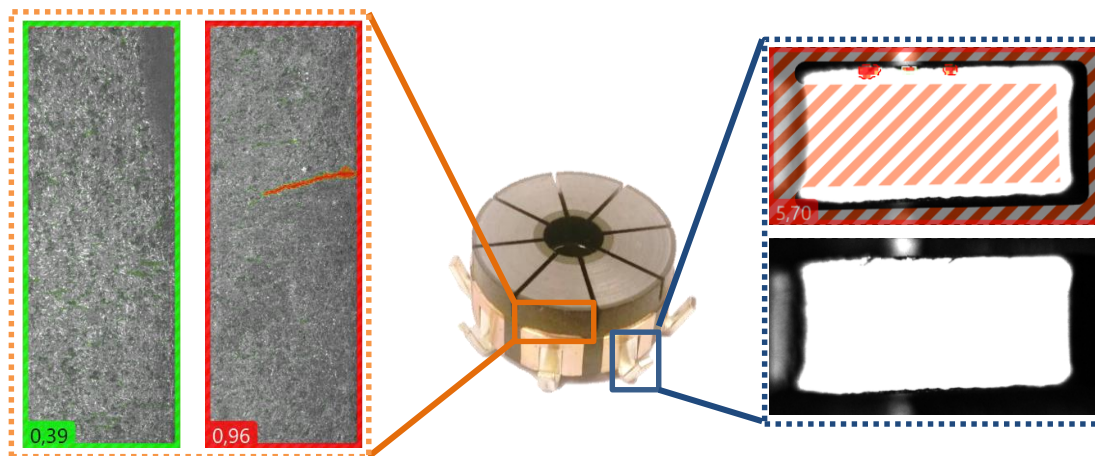
Prepoznavava nepravilno vstavljenega kontakta



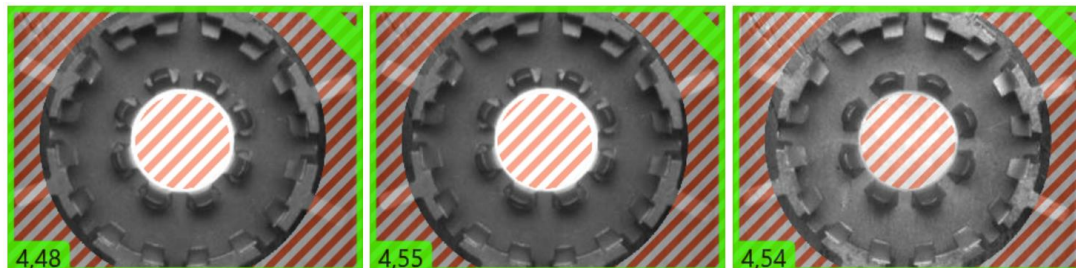
Prepoznavna nepravilno vstavljenega kontakta



Napake pri proizvodnji komutatorja



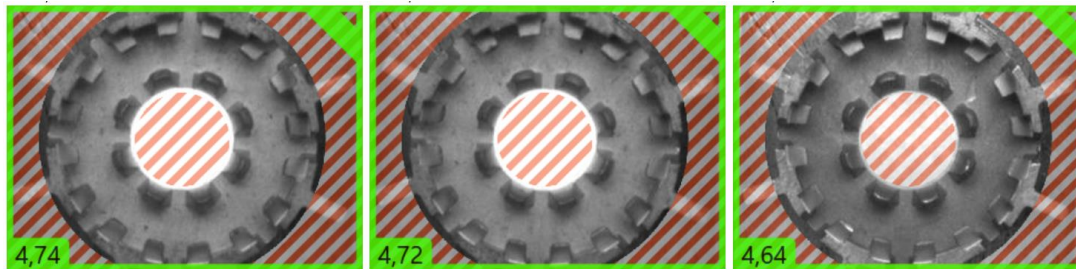
Detekcija bakrenih ostružkov



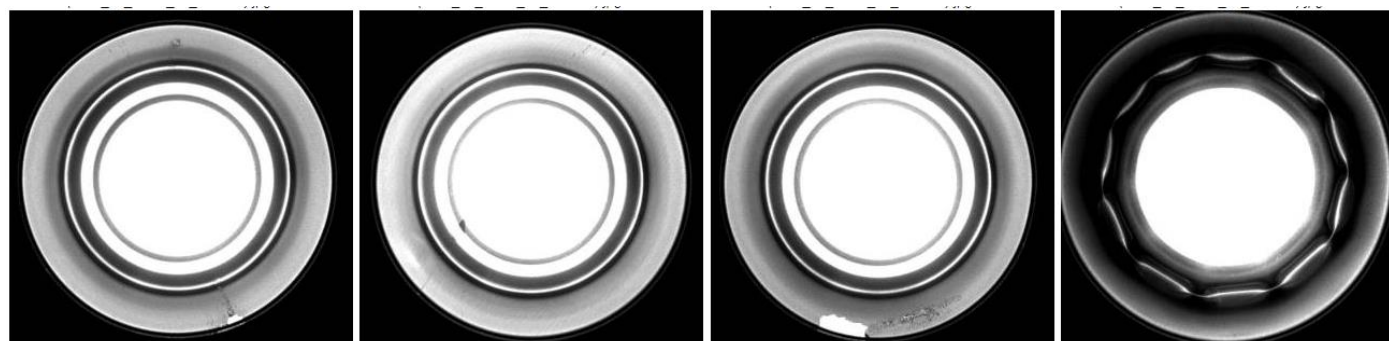
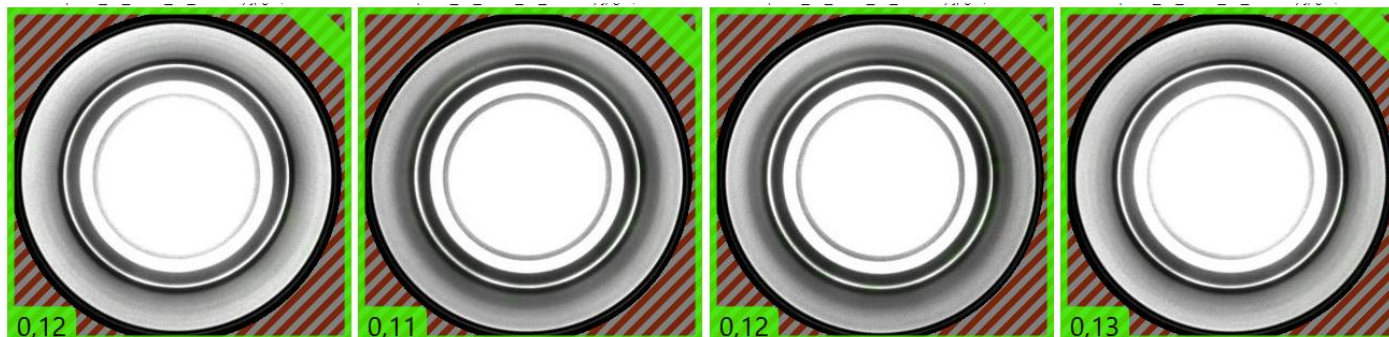
Učni podatki



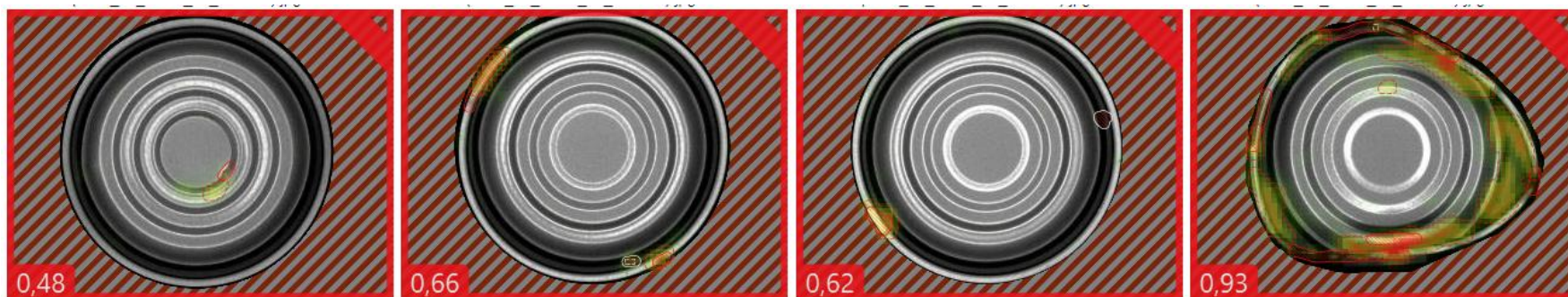
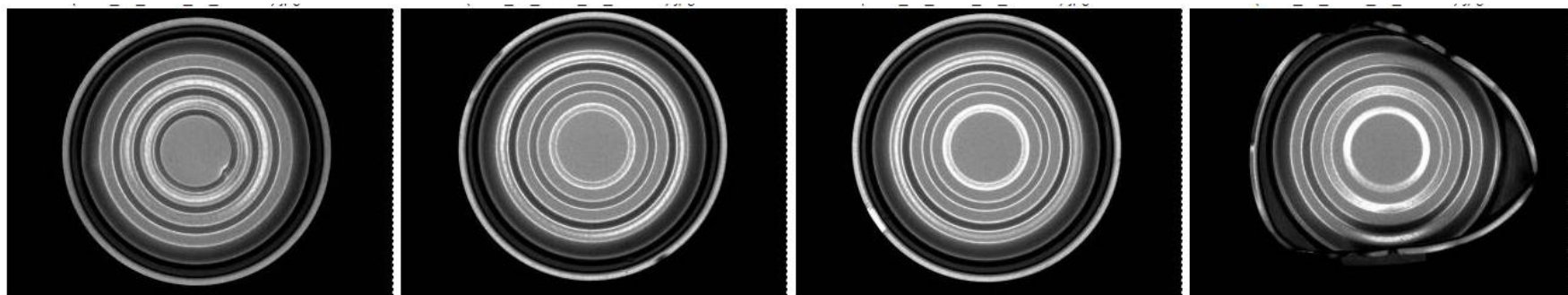
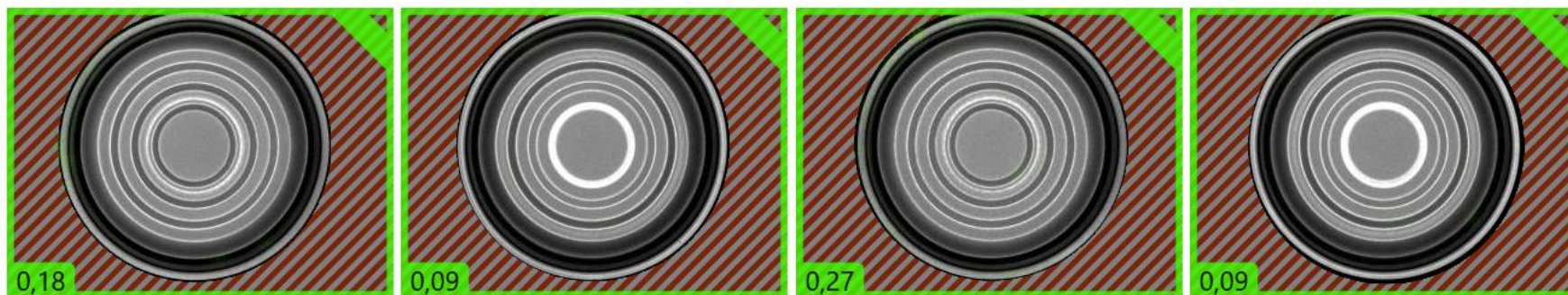
Testni podatki



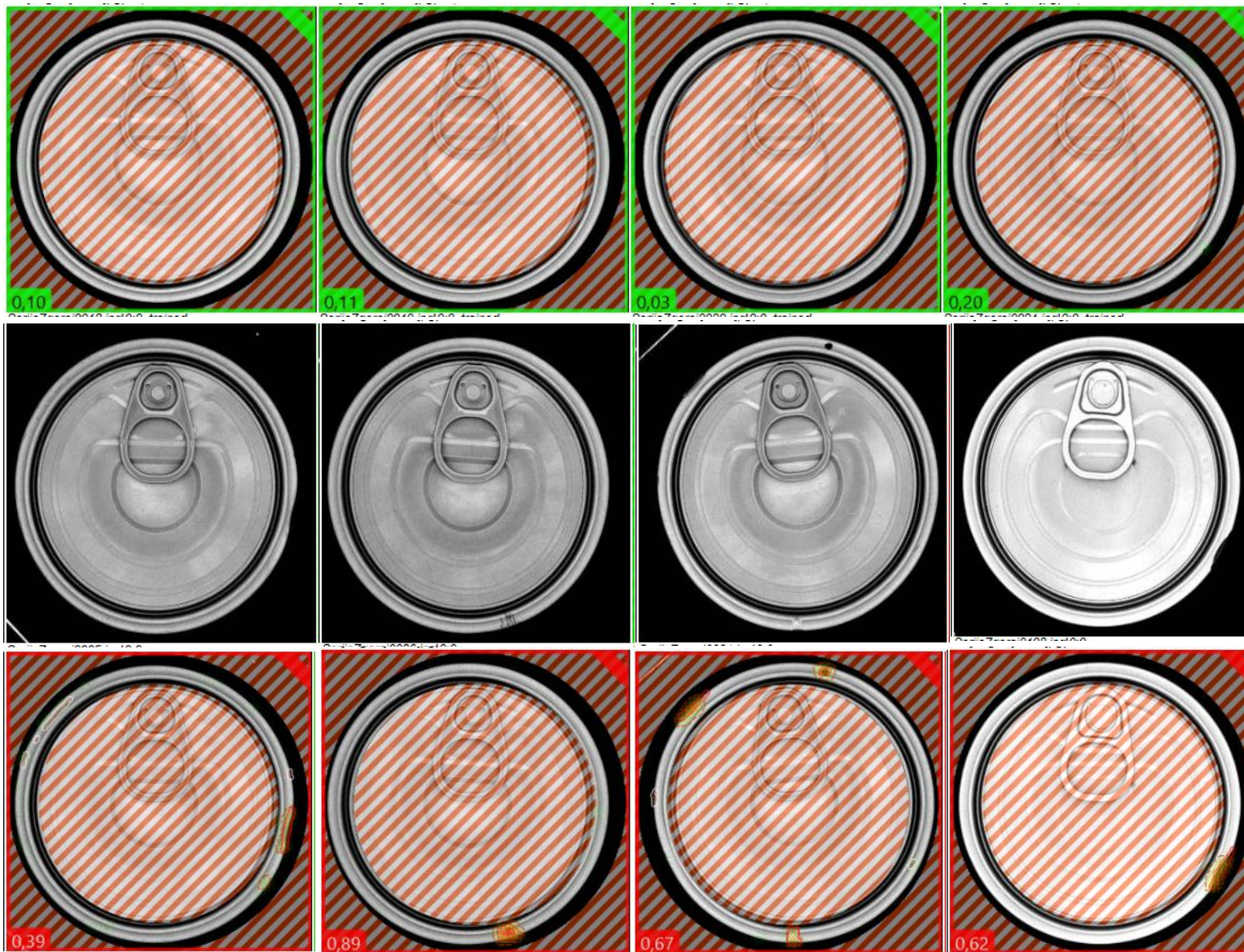
Napake pri izdelavi pločevinaste embalaže



Napake pri izdelavi pločevinaste embalaže



Napake pri izdelavi pločevinaste embalaže



Hvala za vašo pozornost.