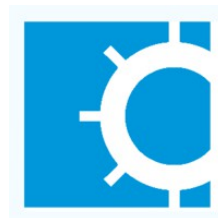




CANCER CENTER .AI

Affordable, fast, high-quality diagnosis



Our WHY



www.CancerCenter.ai

We won!

MICCAI: International Conference On Medical Image Computing & Computer Assisted Intervention

- 2015: MRI + Biopsy (brain tumor)
- 2016: PET Segmentation (lungs)
- 2017 MITEF Accelerator (prostate)



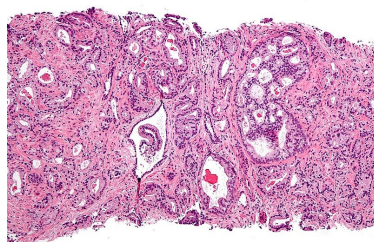
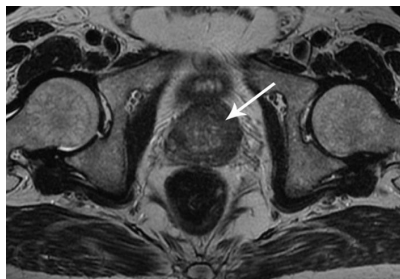
The Diagnostic Workflow



MRI or CT



Scan → Pathology → Decision

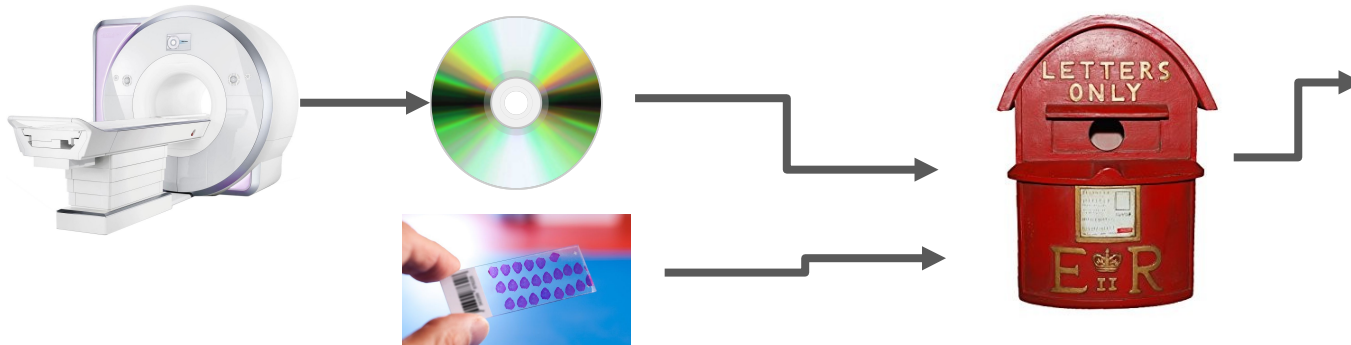


The problem(s)

1. Patients:
 - a. diagnostic workflow takes too long (pathology stuck)
2. Doctors:
 - a. manpower shortage (2nd opinion experts)
 - b. Legacy tech & processes = lower efficiency
3. Data Scientists:
 - a. Low accessibility to quality datasets to train algorithms



Second opinion



Our Solution

Secure and Compliant Cloud Platform

Components:

1. Web-based pathology and radiology viewer
2. Expert marketplace: 2nd opinion validation+AI
3. API driven (supporting an app ecosystem)

Impact:

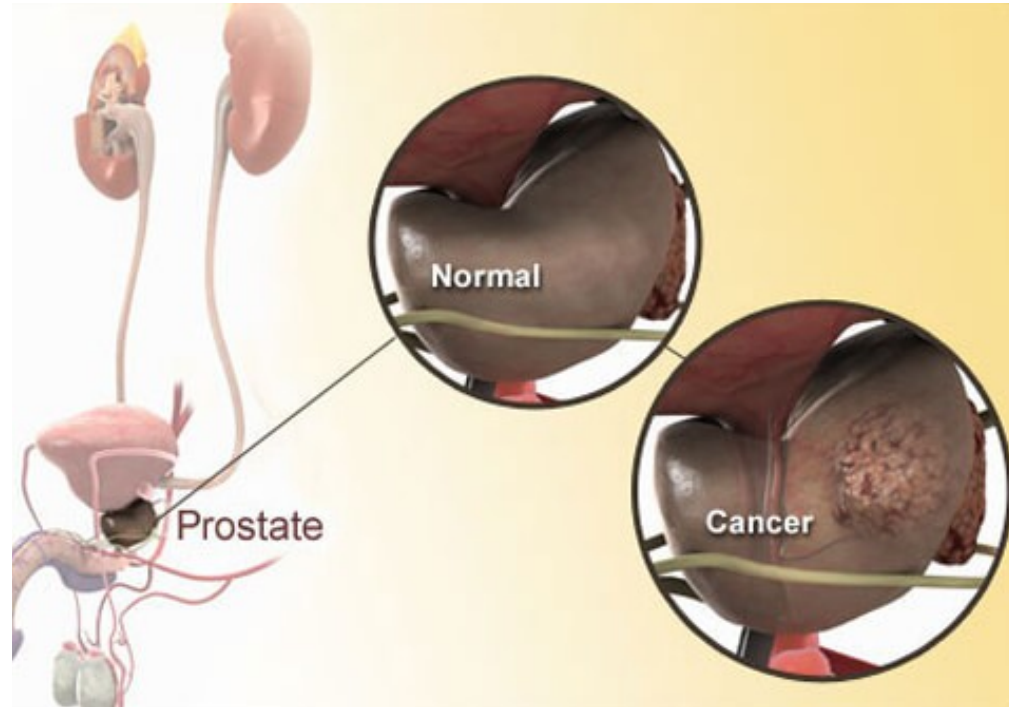
5x higher number of patients per day per doctor
2x cost savings due to simpler procedure



Our focus: prostate cancer

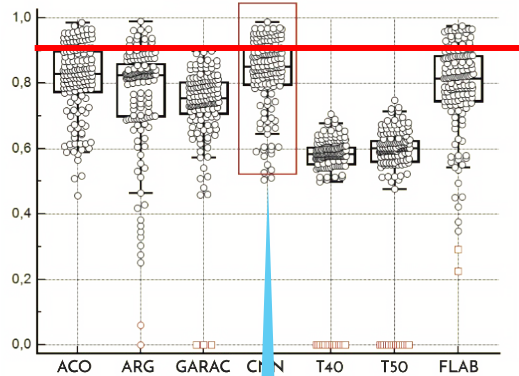
- 1 in 8 men get prostate cancer
- 1.1 mil new cases /yr
- ~307,000 deaths

2

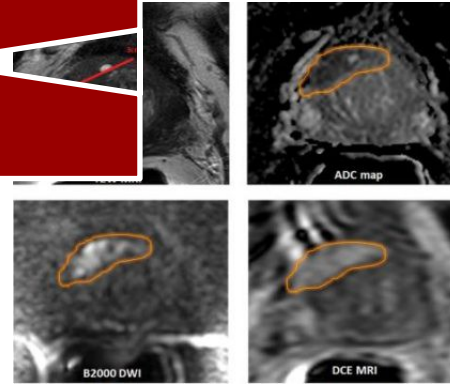


Current Status

- Deep Learning Algorithms: 85+% classification accuracy
- GPU-based solution is 5x faster than standard procedure



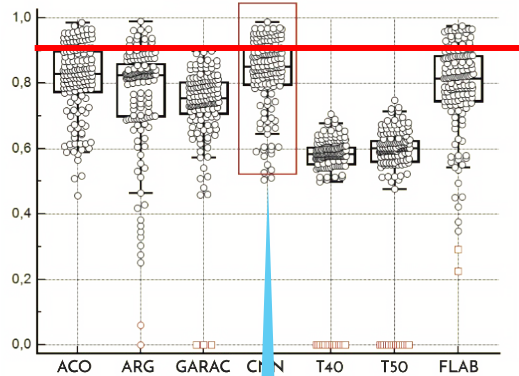
**> 85%
accuracy**



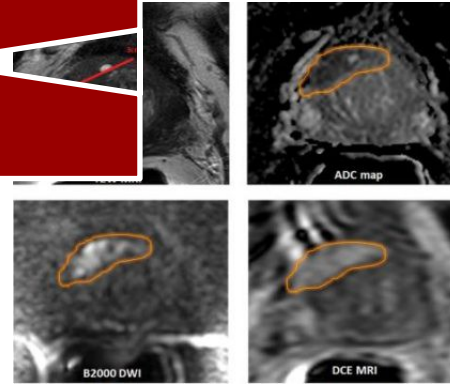
CANCER
CENTER

Current Status

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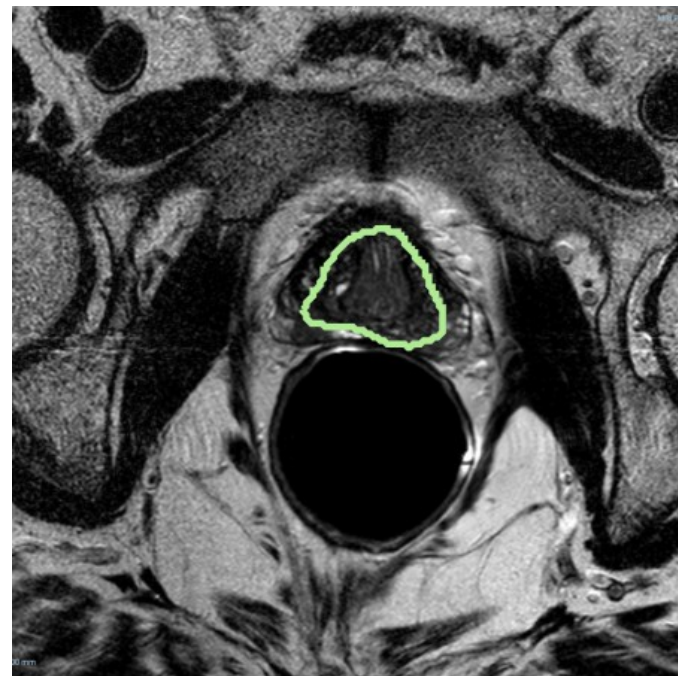
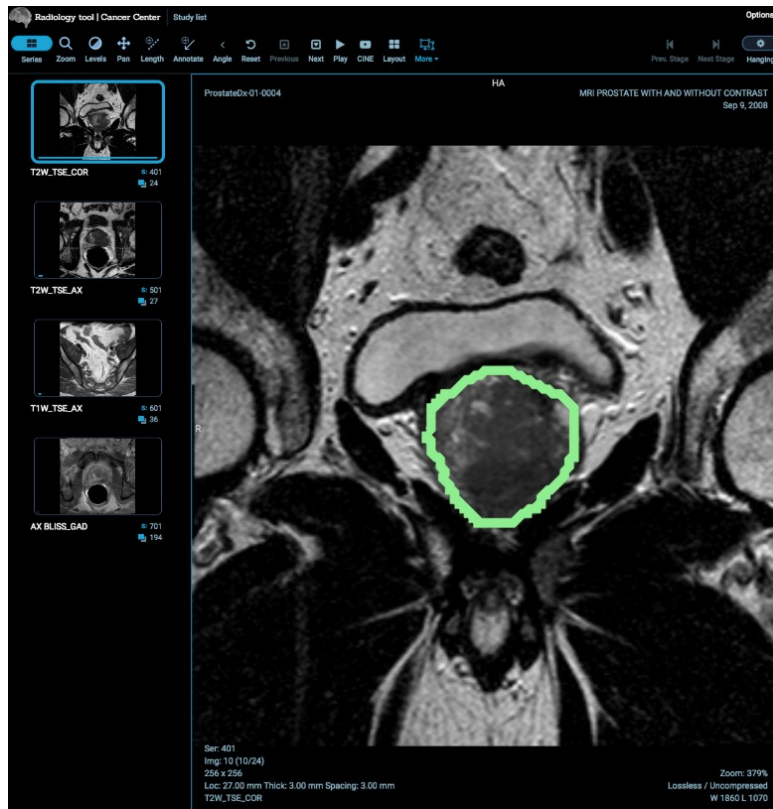


**> 85%
accuracy**



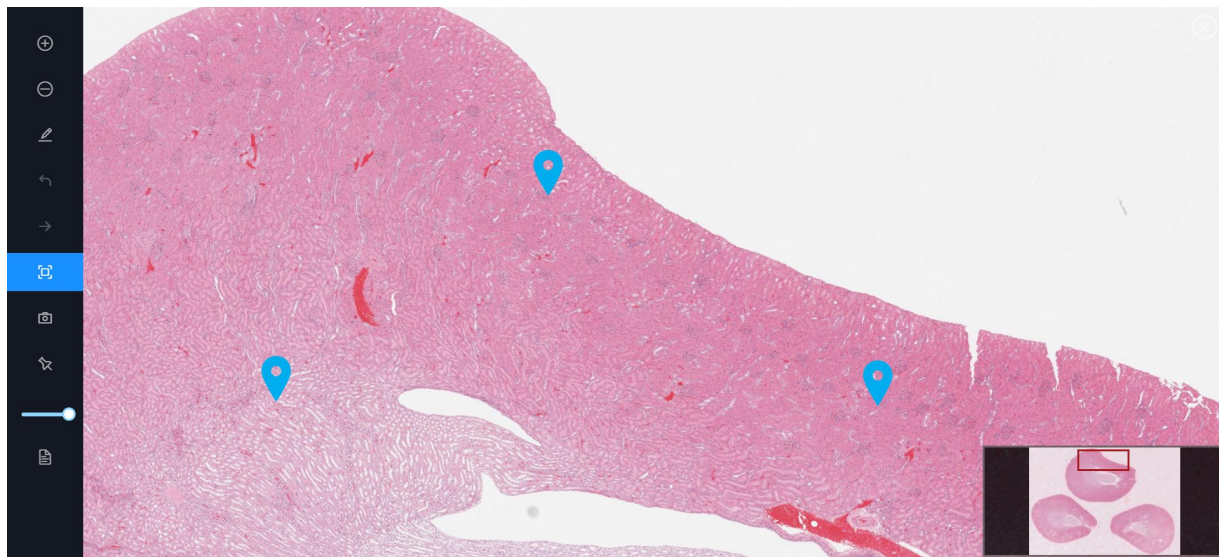
Current Status

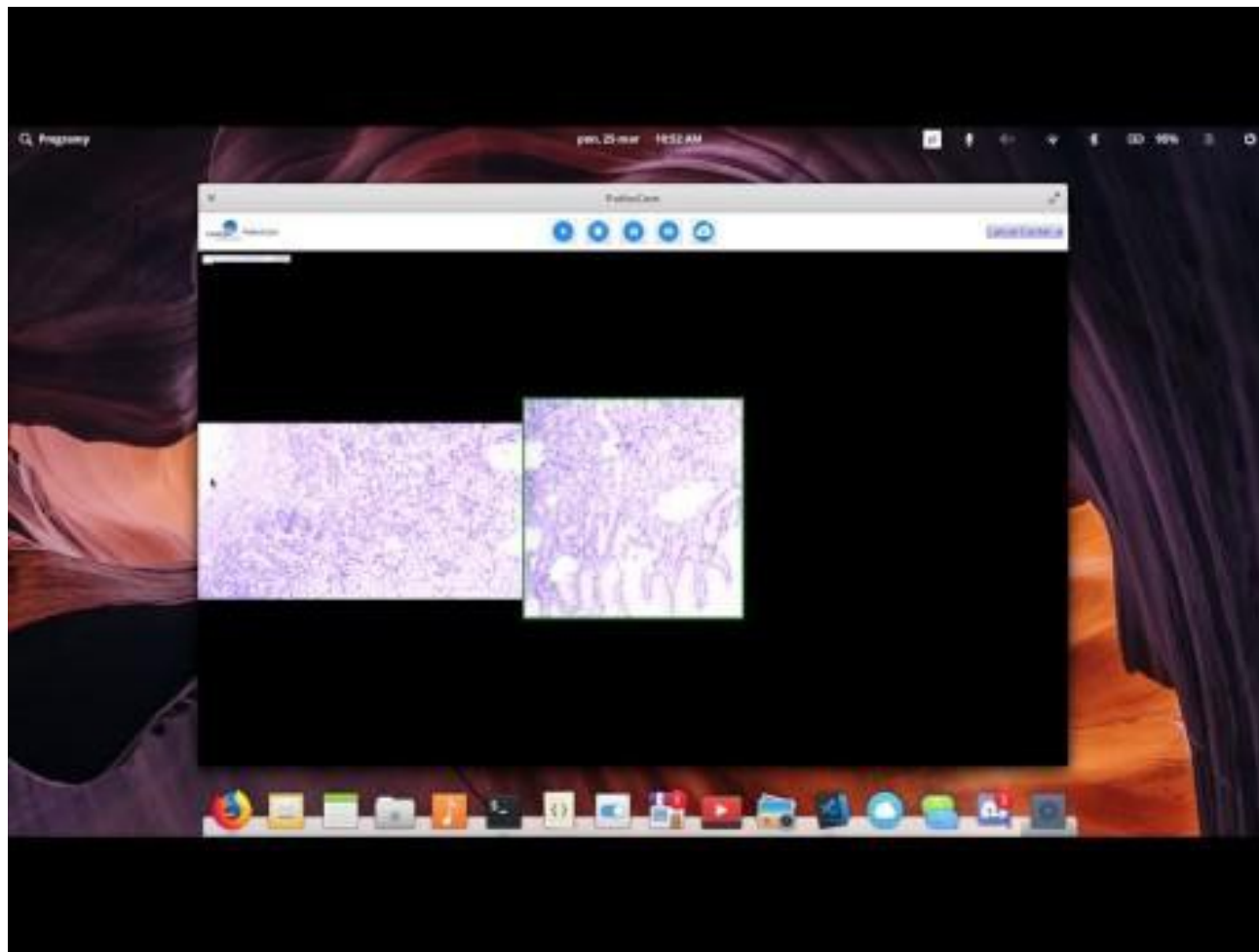
Delineation and Classification web viewer



Current Status

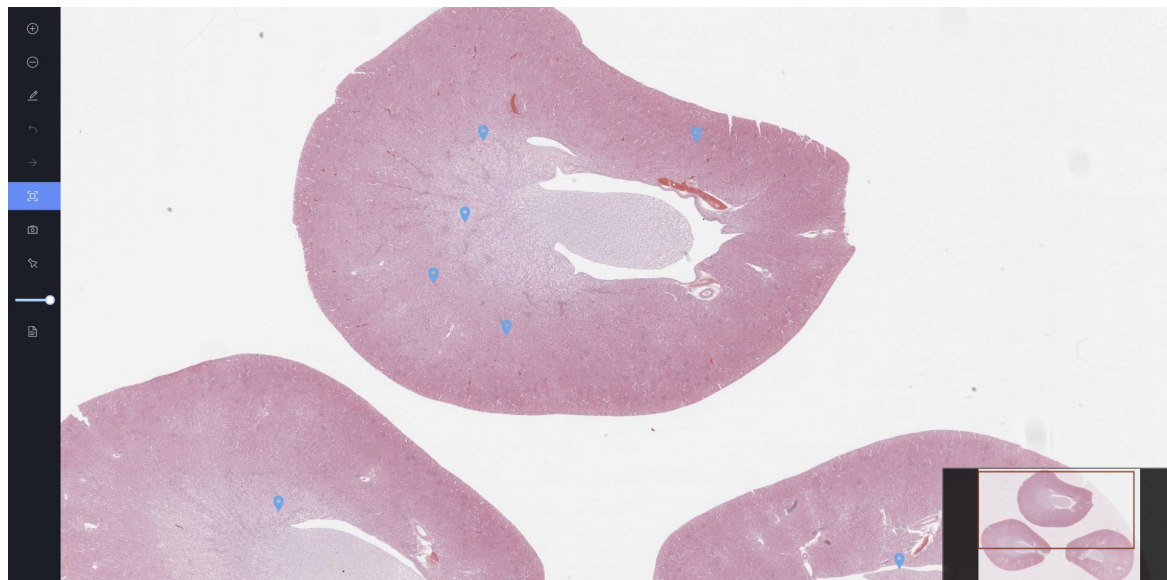
Histopathology Web Viewer & PathoCam software



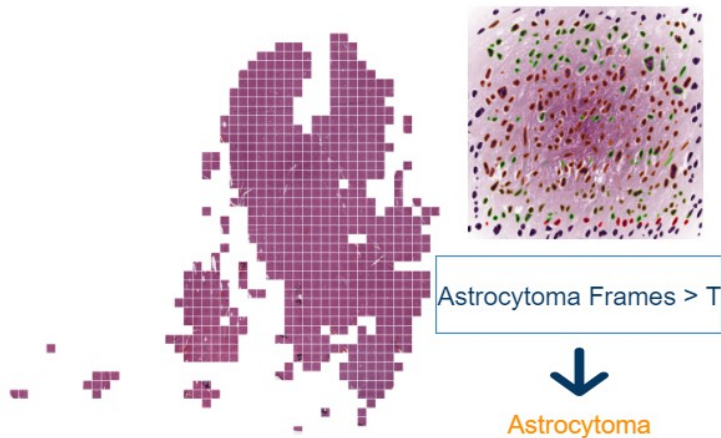
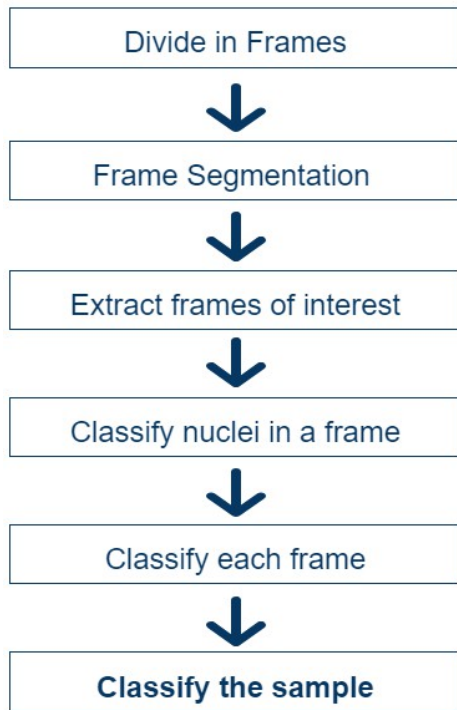


PathoViewer

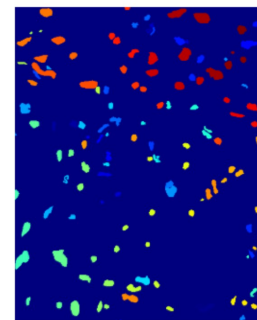
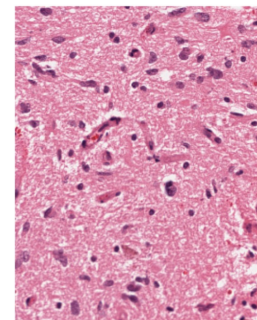
- Easy annotations
- Sharing
- Image segmentation



Pathology Classification/Segmentation



If the amount of frames classified as certain cancer type is over specified threshold the whole sample is classified as that type





Halo effect



Shape

Area
Circumference
Connectivity
Hu moments
Ellipse attributes
Density of nuclei

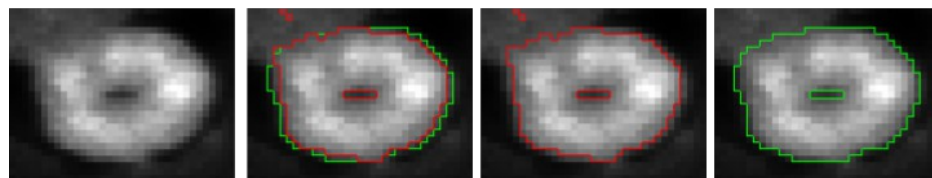
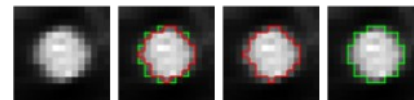
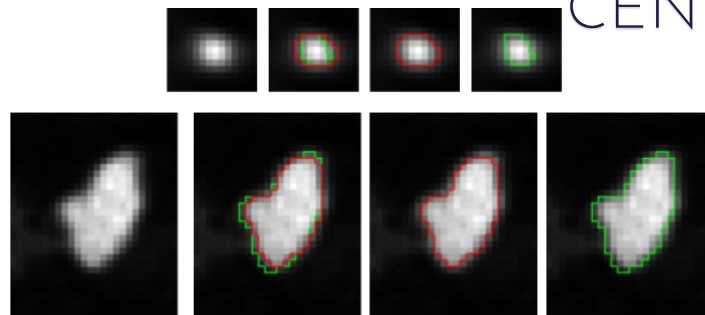
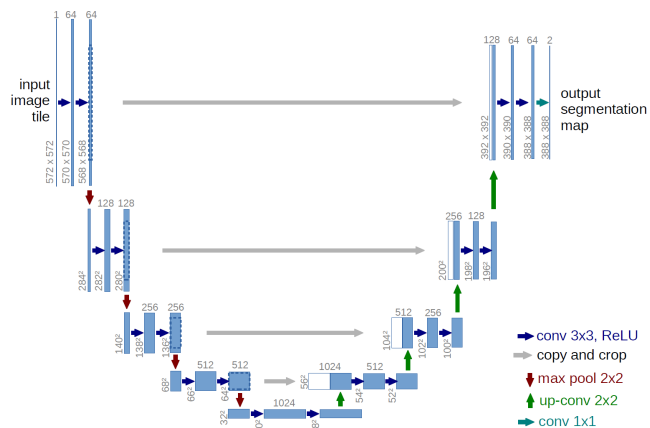


Color

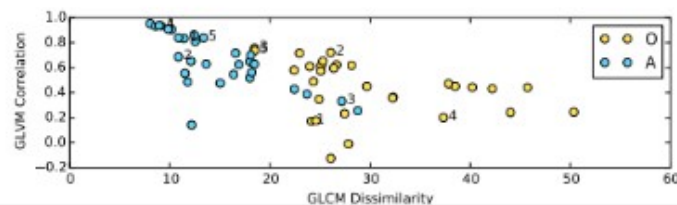
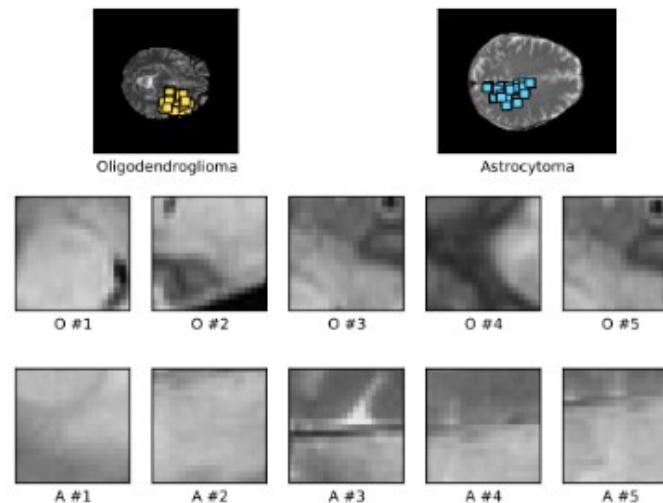
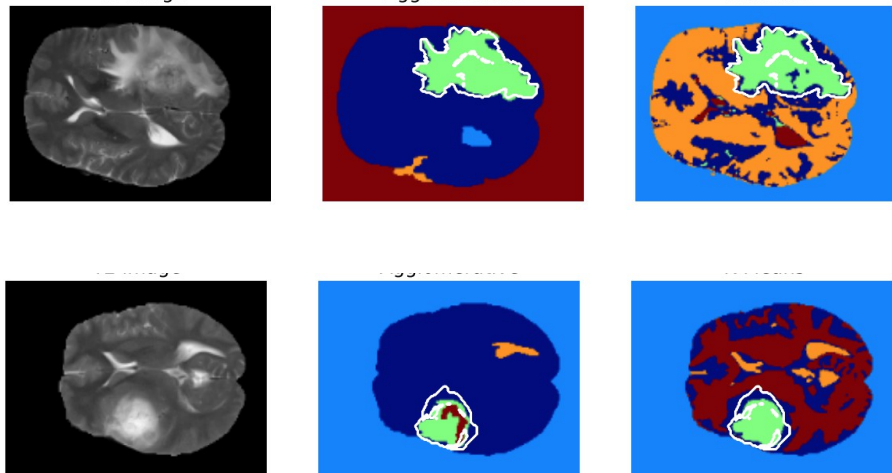
Fuzzy coefficient
Core of nucleus
Interior structure
- RGB
- Gray scale
- Hematoxylin and eosin

PET

method	parameters	avg	med.	clin.	phan.	simul.	balanced
KM	k=2, f=1	0.82	0.81	0.77	0.79	0.90	0.82
GMM	n=4, f=1	0.83	0.83	0.77	0.80	0.90	0.82
SDWFCM	c=2, f=1 m=2, $\lambda=0.5$ nb=1	0.82	0.82	0.76	0.81	0.88	0.81
DICT	see Sec. 2.2	0.82	0.81	0.77	0.78	0.90	0.82
CNN	see Sec. 2.3	0.86	0.89	0.78	0.86	0.91	0.85

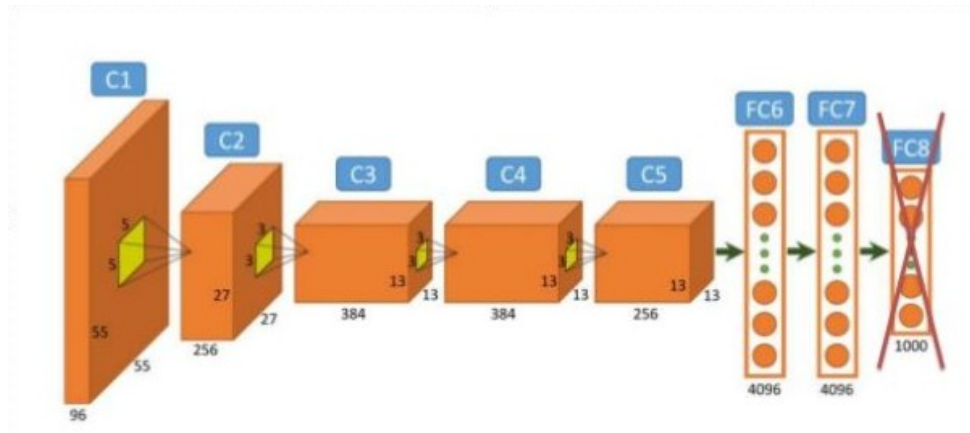
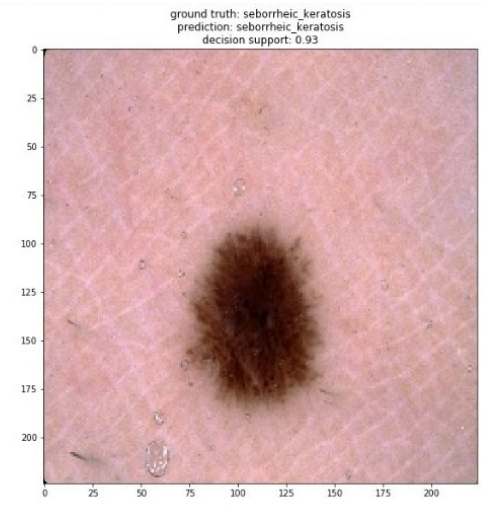
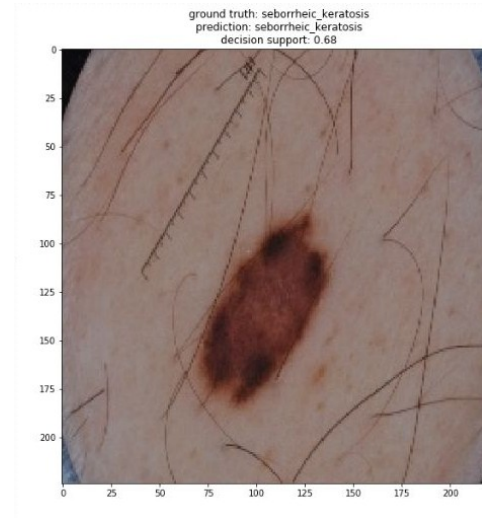


MRI Brain Tumor - Classification / Segmentation

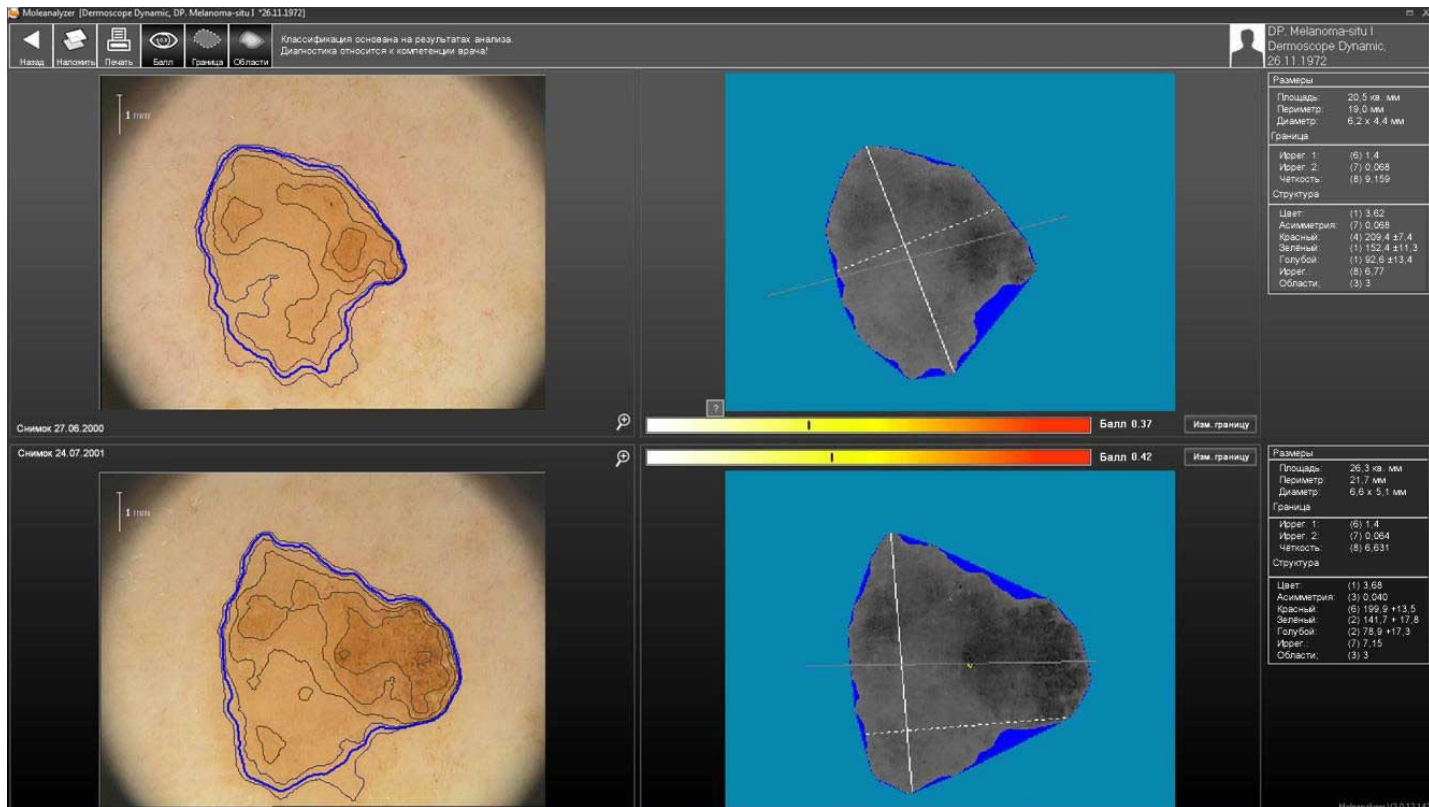


Skin Cancer

- Trending (e.g. CS @ Stanford)
- Transfer learning
- Publicly available datasets



Moleanalyzer



Team, Contributors, Partnerships



Technical Staff



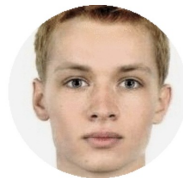
Piotr Giedziun



Witold Dyrka,
PhD



Grzegorz Żurek



Jarosław
Kwiecień



Filip
Drapejkowski



Kuba Czakon



Katarzyna
Stachow
Scrum Master, Accounting

Board and Key Advisors



Piotr Krajewski



prof dr hab.
Karol Kozak



Simon Nadolski



Krzysztof
Rożnowski MD

Urology & Prostate



Jacek Wilkosz MD



Artur Bartczak
MD

Pathology



Paweł Kolodziej
MD



Thank you!



Piotr Krajewski - CEO

+48 694 233 234

piotr.krajewski@CancerCenter.eu

Cancer Center Sp. z o.o.

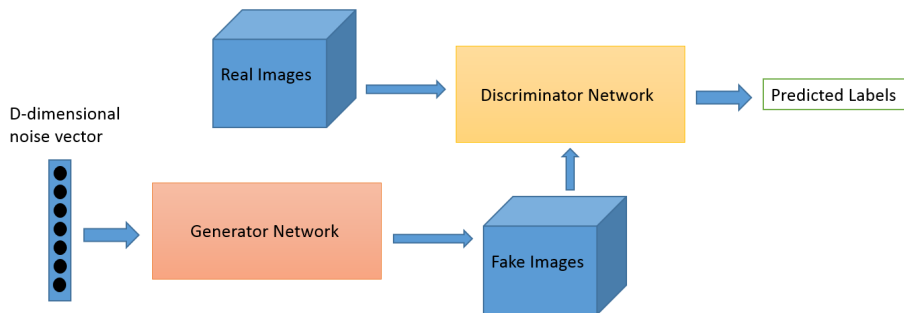
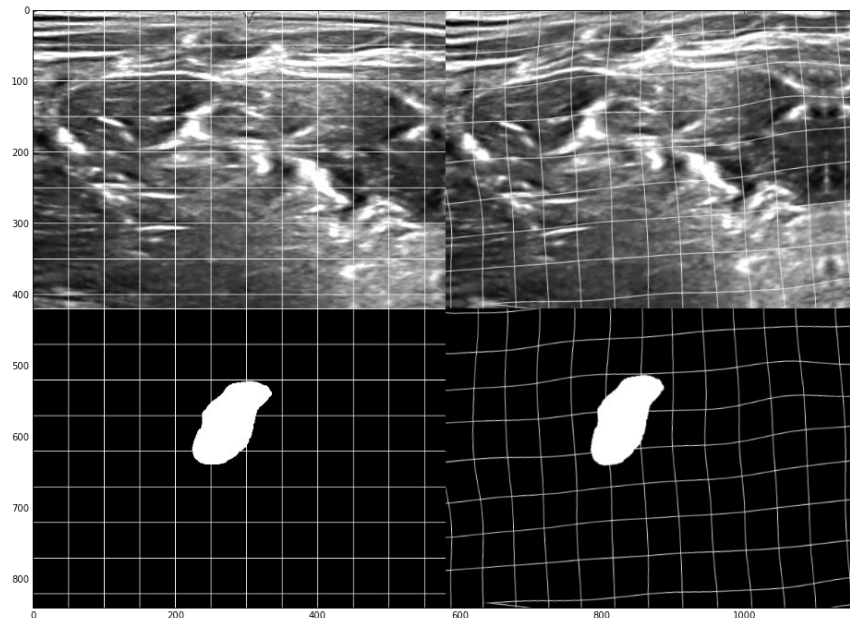
Ksiecia Witolda 49/13

50-202 Wrocław, POLAND

Challenges in Deep Learning.

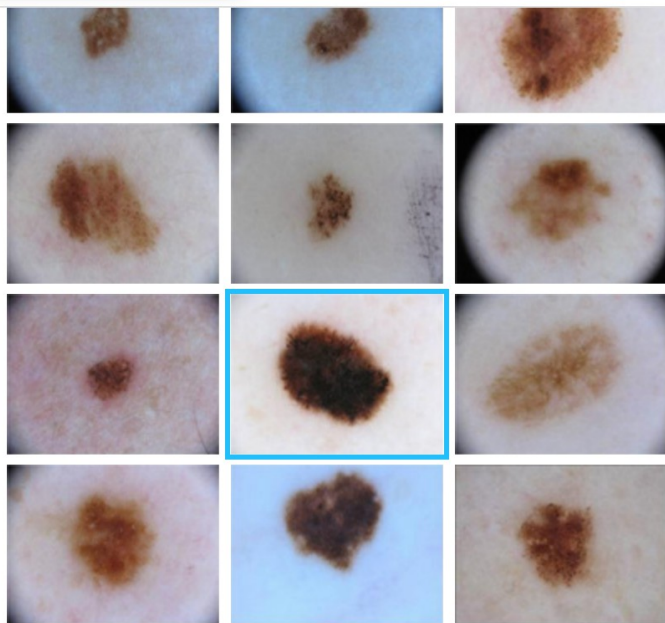
1. Size of dataset - Data augmentation/generation.

- Flip
- Illumination
- Gaussian Noise
- Transformation (Rotation, Scale, Crop)
- **GANs**



2. Quality of annotations - Medical Advisors.

- The International Skin Imaging Collaboration (Archive)



ISIC_0000013



Clinical Attributes

age_approx	30
benign_malignant	malignant
diagnosis	melanoma
diagnosis_confirm_type	histopathology
melanocytic	true
sex	female

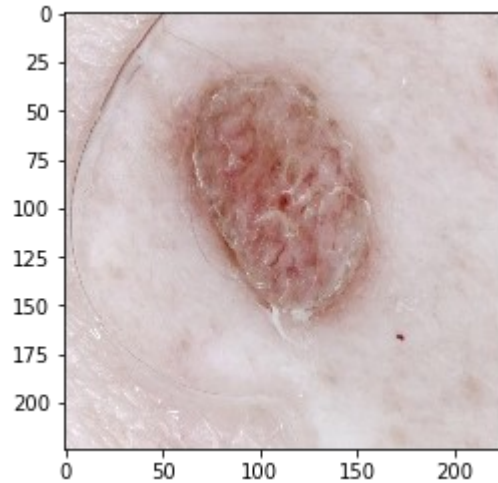
Technological Attributes

Dimensions (pixels)	1022 × 767
image_type	dermoscopic

Unstructured Attributes

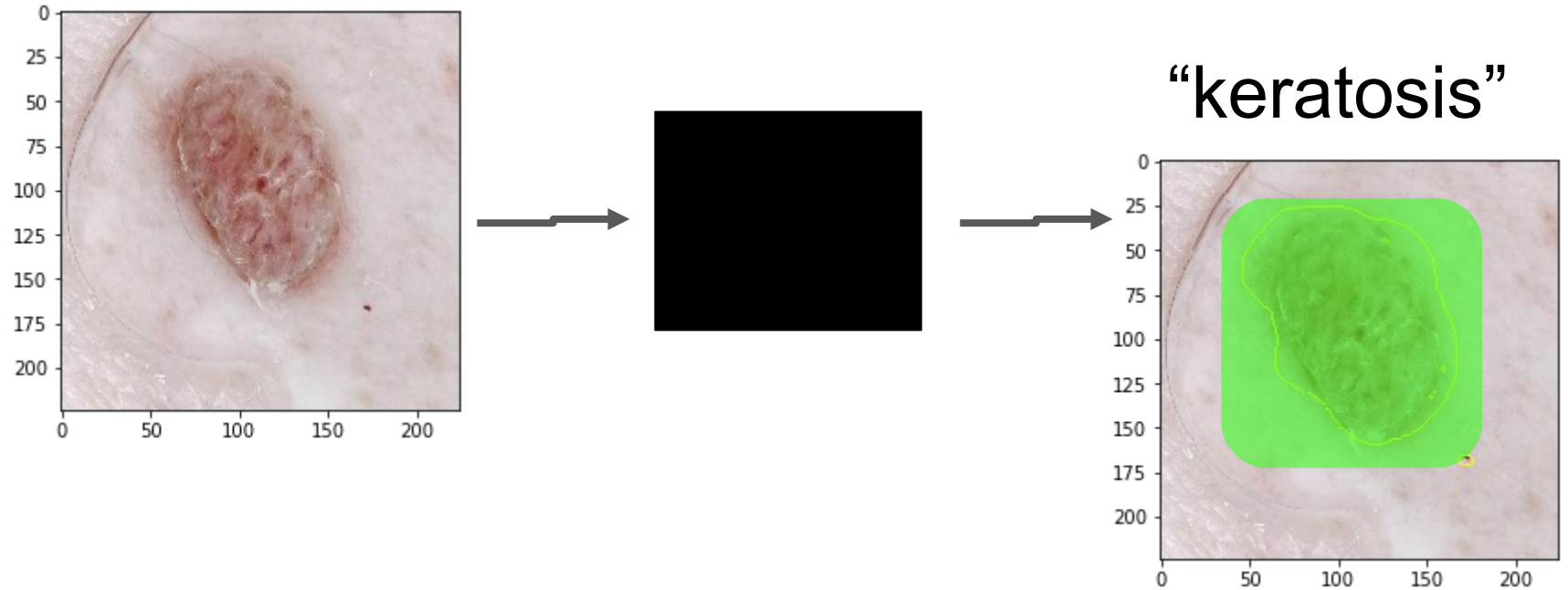
Breslow	0.7
---------	-----

2. Quality of annotations - Features verification.



“keratosis”







2. Quality of annotations - Features verification.

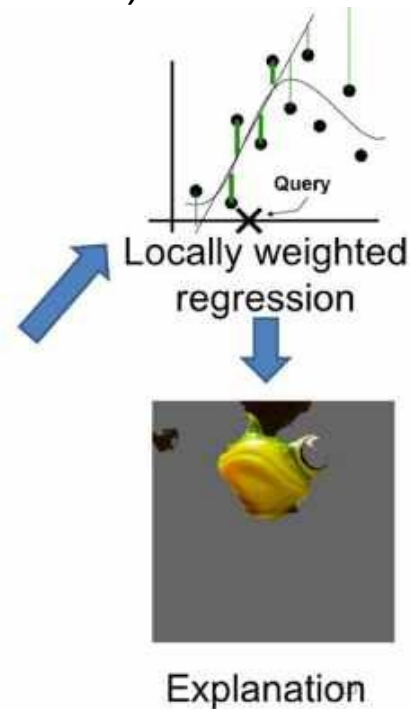


2. Quality of annotations - Features verification.

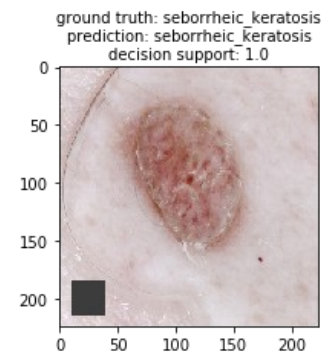
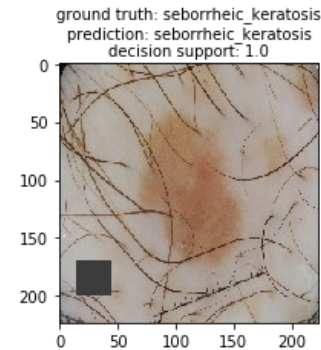
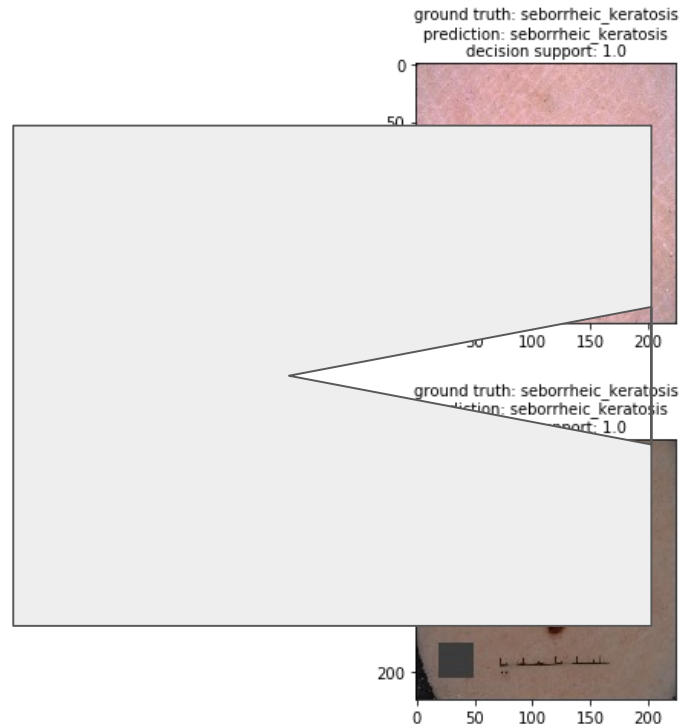
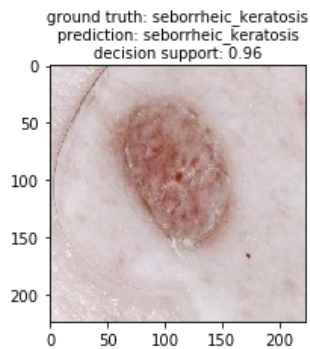
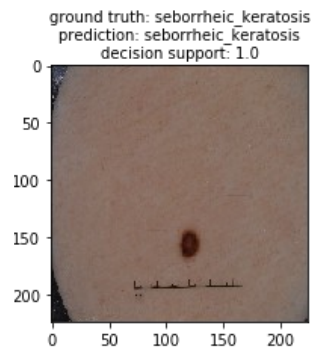
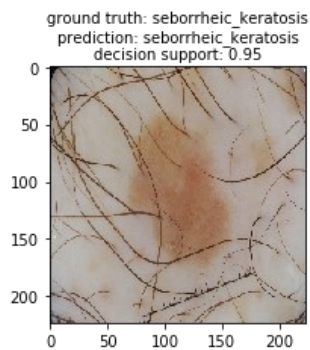
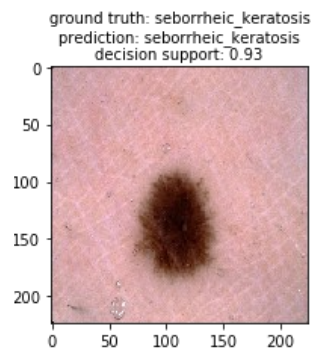
Lime (Local Interpretable Model-Agnostic Explanations)



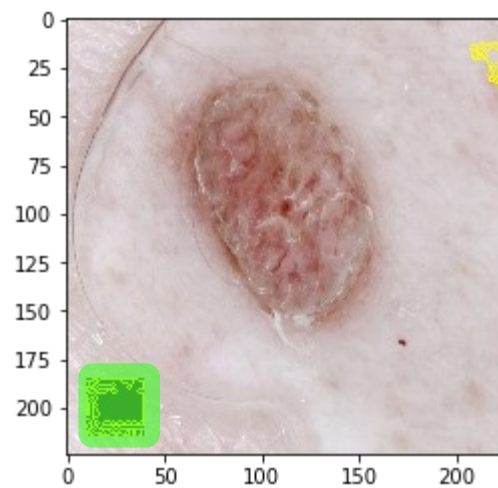
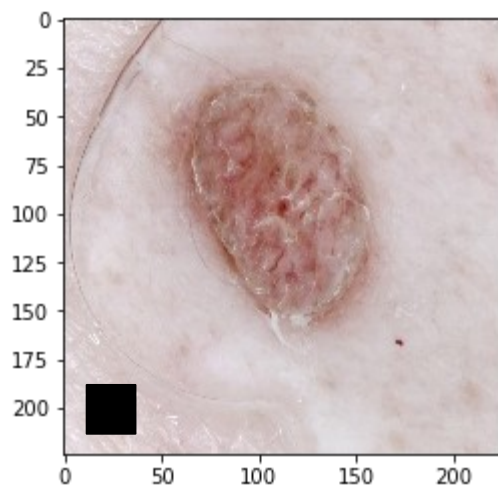
Perturbed Instances	$P(\text{tree frog})$
	 0.85
	 0.00001
	 0.52



2. Quality of annotations - Features verification.



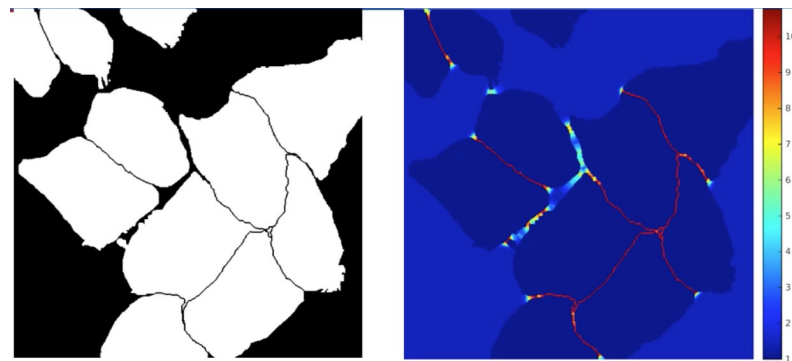
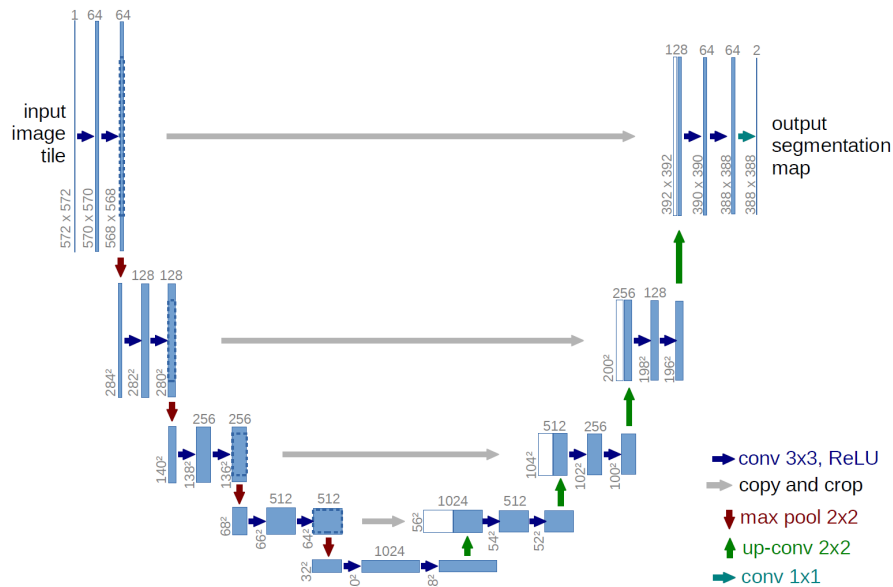
2. Quality of annotations - Features verification.



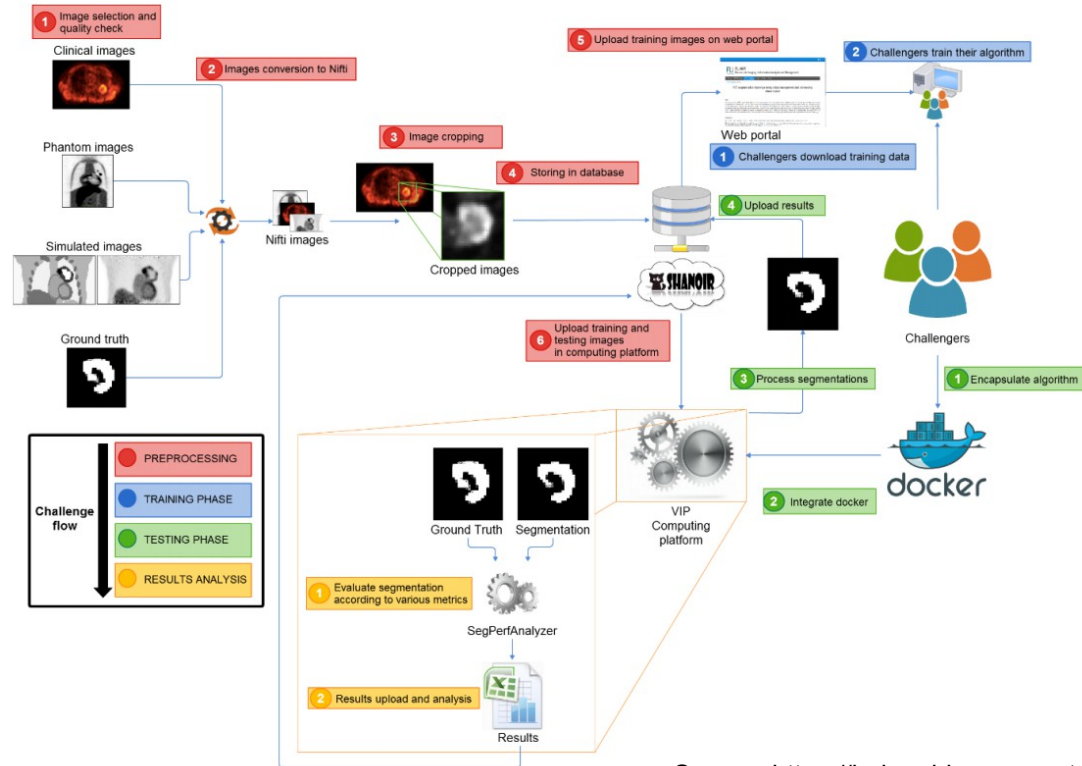
3. Speed/memory footprint - Architecture.

- U-NET

- 640x959 image 4-8 images in one batch with 6GB GPU
- 1280x1918 image you can fit 1-2 images in one batch with 12GB GPU



4. Data privacy (GDPR) - Exchange with docker.



Source: <https://hal.archives-ouvertes.fr/hal-01659162/document/>