

AI-based computational Web services on medical image analysis

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<https://image.org.by/>

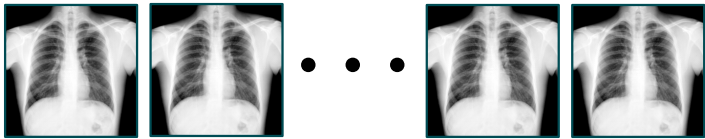
This work was made possible under the condition
of thorough support of
GÉANT, EaP Connect, EYR@EaP

Huawei FusionServer
G5500 Data Center Heterogeneous Server

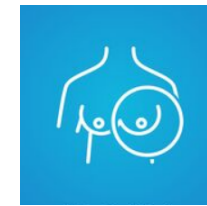
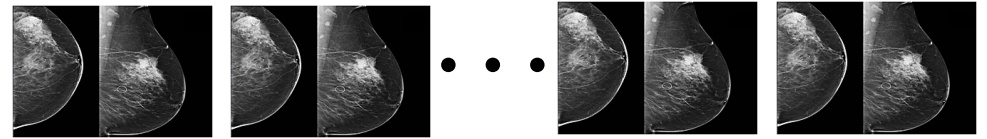
Superb Performance
Flexible Configuration
Fully Modular Design



Our telemedicine systems produce Millions of images



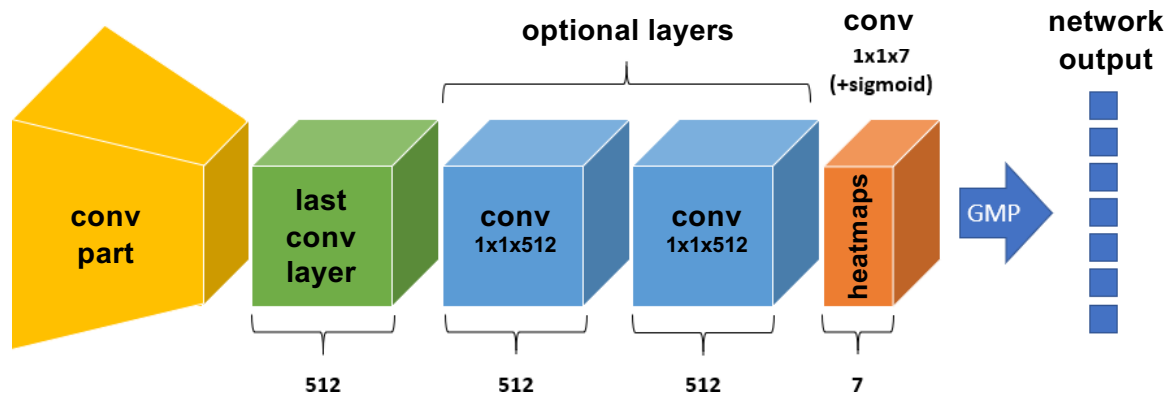
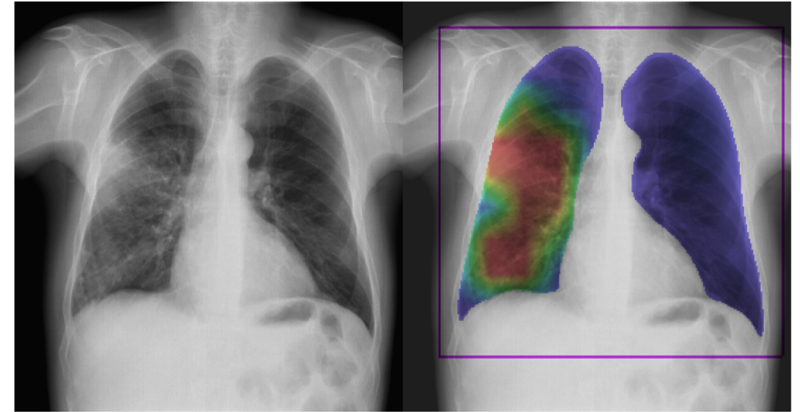
Screening for Lung diseases



Screening for Breast Cancer

X-Ray Lung Disease Diagnosis: Open-access Web Service

- 4 Million chest X-rays for Deep Learning
- Lung, mediastinum and skeleton diseases
- 2-stage training with Transfer Learning
- Rich data augmentation, 3rd party data added
- Special convolution neural network architecture for informative heatmaps (instead of Grad-CAM)



Download Normalized

Download Processed

Abnormal lungs: **100.0 %**

Pneumonia:

Tuberculosis:

Bronchitis:

Focal shadows:

image.org.by/xray_lung

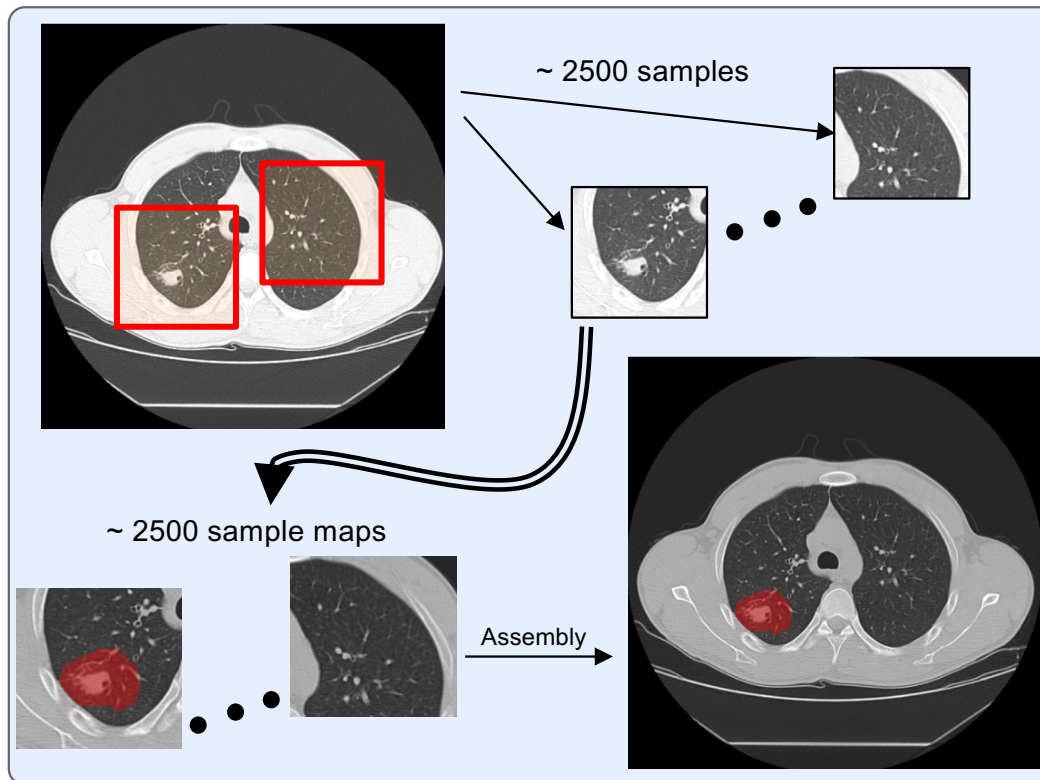
Lesion Detection in tomography: Open-access Web Service

Aim: Automatic Detection of Lung Lesion

Data: 791 annotated CT images (expert radiologist)

6 lesion classes: Focus & Infiltrate; Fibrosis; Atelectasis; Cavities; Pleuritis; Pneumothorax

CNN: MobileNet v2-based + decoder, UNet-like architecture



<https://lungweb.fr.to/>

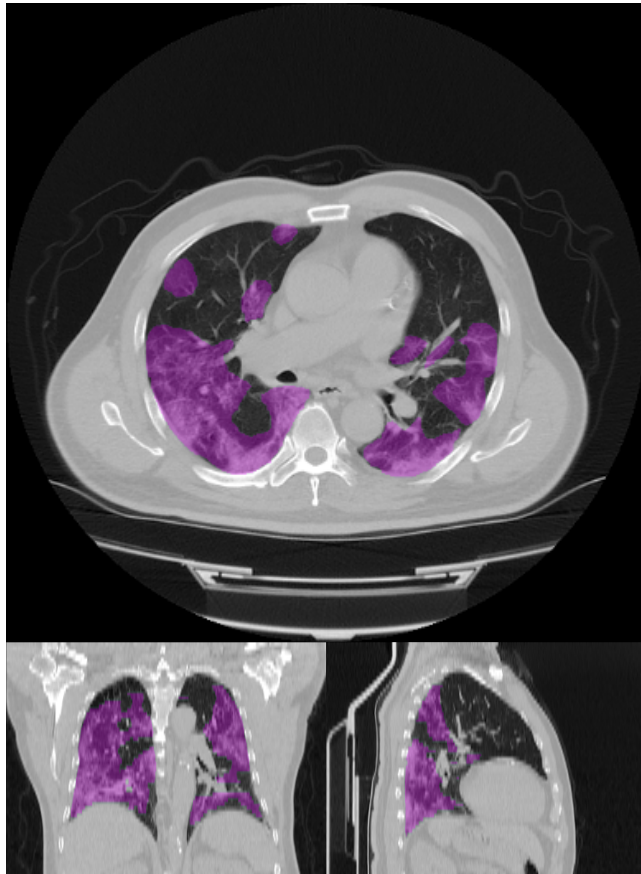
- AI-based
- RESTful API
- Solid original dataset

The screenshot shows a web interface with a CT scan of a chest. The scan is annotated with red and blue regions, indicating detected lesions. At the bottom of the interface, there are three buttons labeled 'Cancers', 'Diagnoses', and 'Symptoms'.

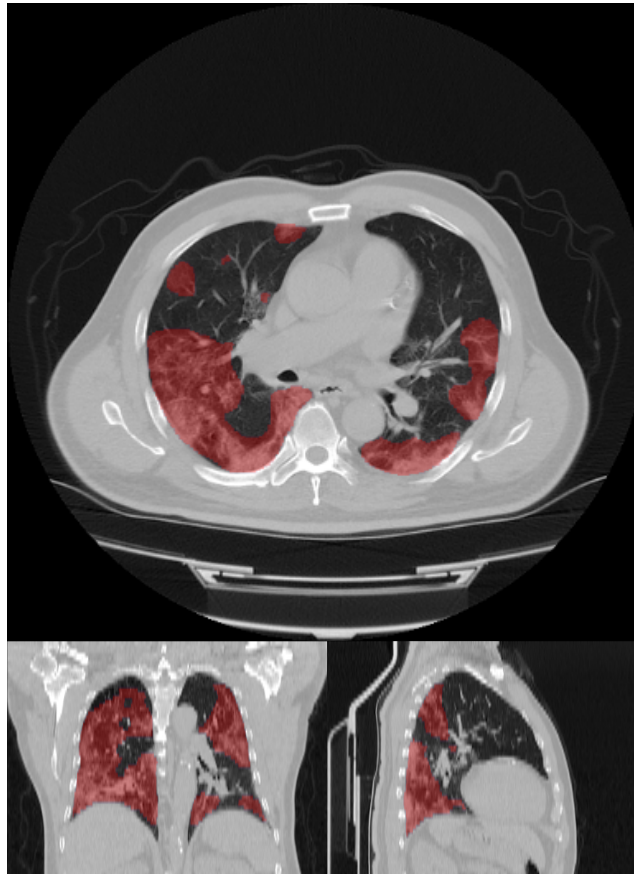
Amazon: <https://tbportals.niaid.nih.gov/>

COVID Lesion Grand Challenges: We are in Top-10 (finally No 6)

Ground-truth



Automatic detection



Computerized Cancer Diagnosis: Free secured web Service

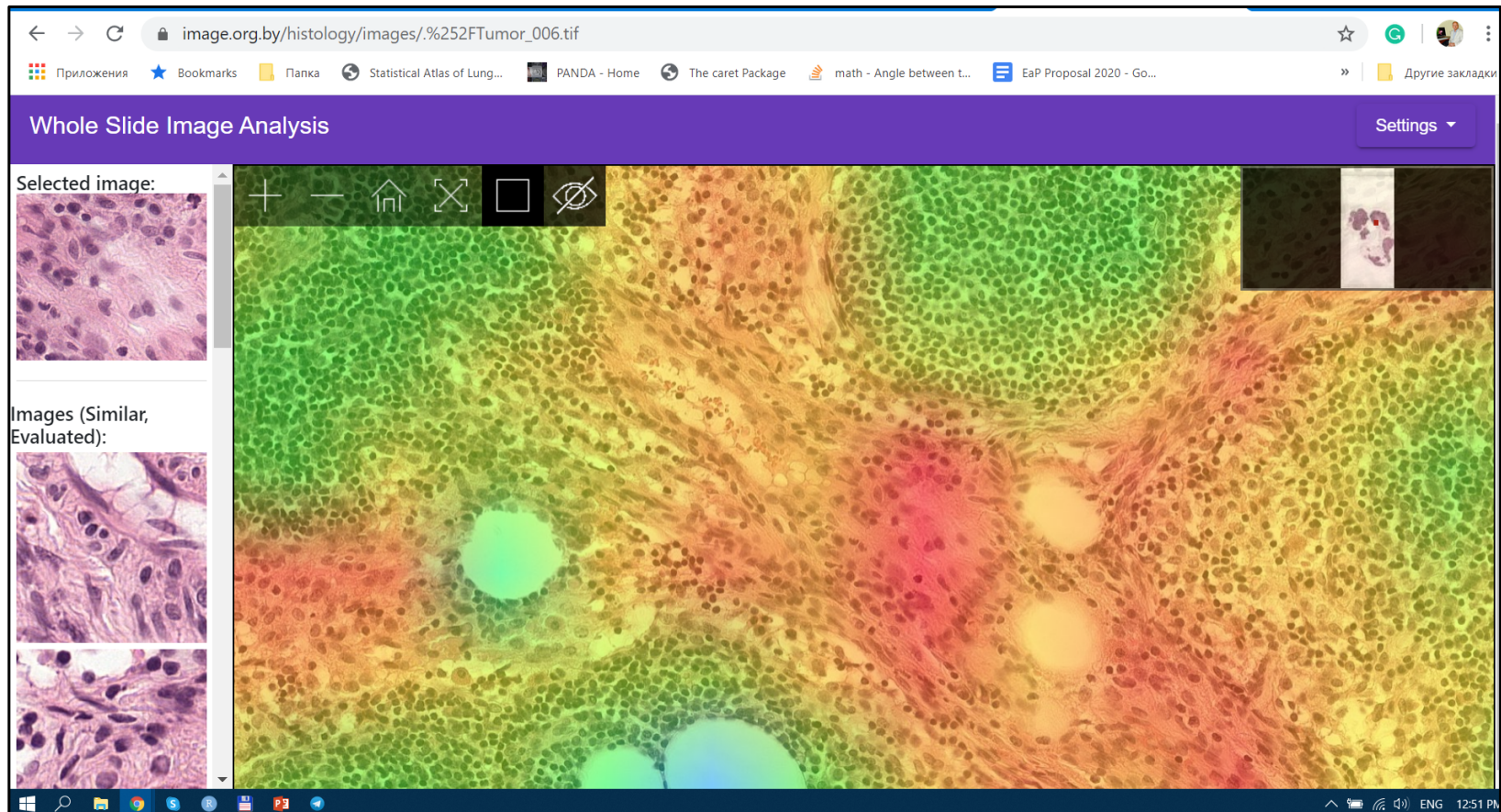


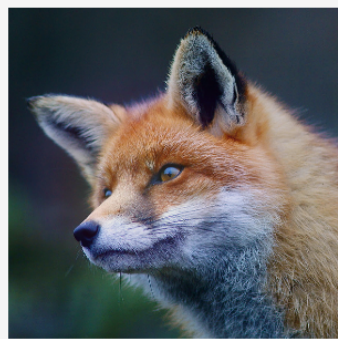
image.org.by

Adversarial Attacks: The Dark Side of AI and Deep Learning ?

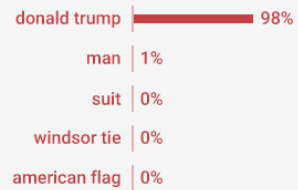
Forcing CNN to a Wrong Decision



Original Image



Adversarial Altered Image



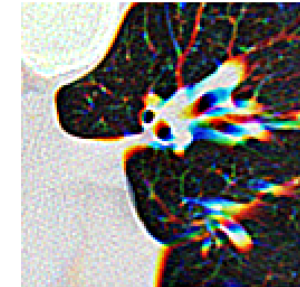
Original Image



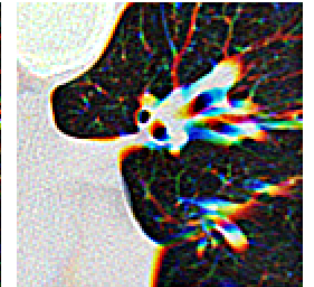
Malicious version



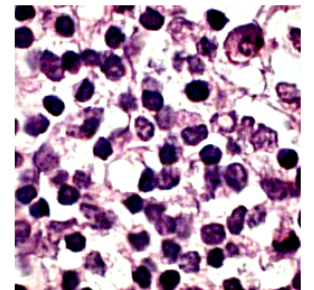
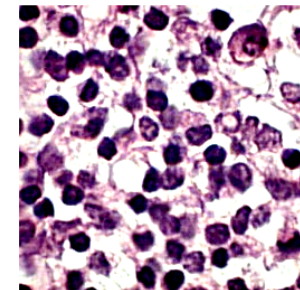
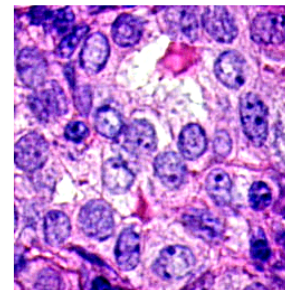
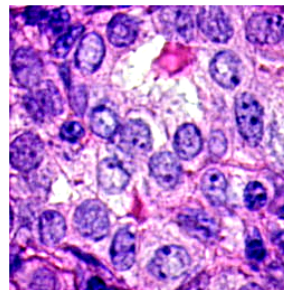
Original Image



Malicious version



Healthy lung recognized as pathology



Breast Cancer recognized as Norm and *vice versa*

Security of Personal Data: Generation of plausible artificial images

- Generative Adversarial Networks (GANs)
- Trained on ~500k X-ray images and 600k of histopathology images
- Image plausibility control
- Unlimited number of images for free
- Additional benefits for MSc and PhD students

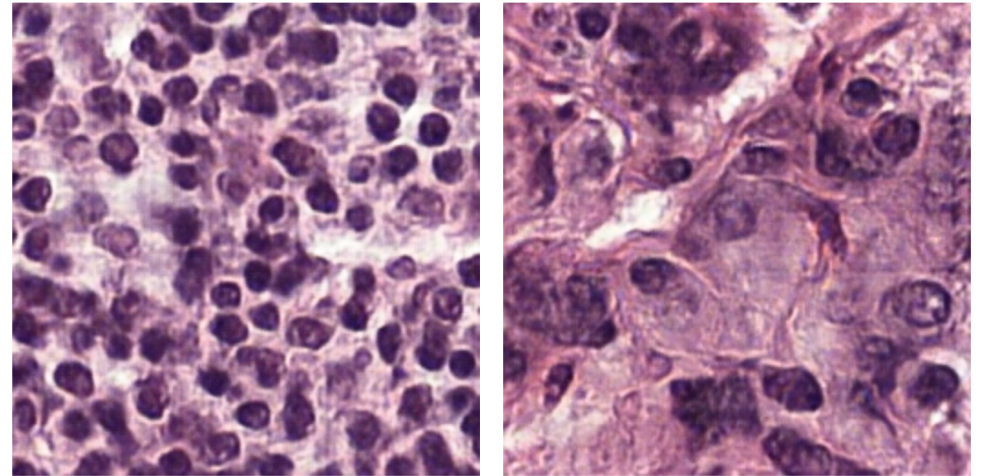
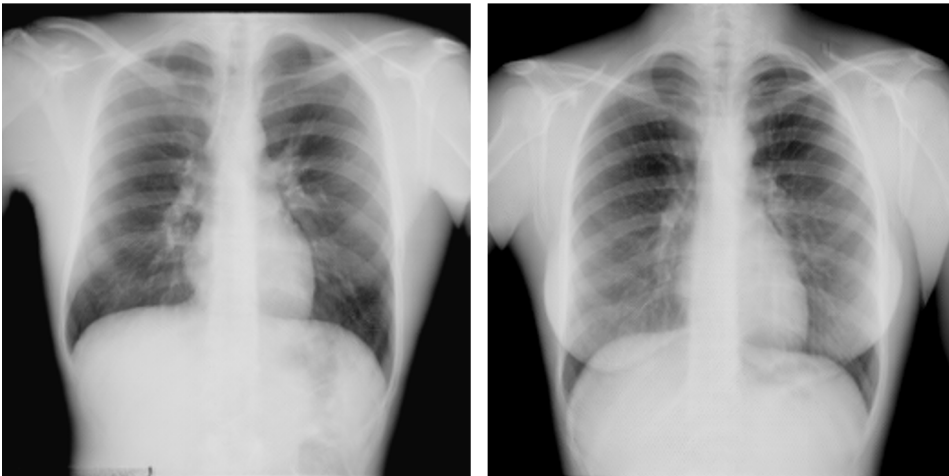


image.org.by/iFactory

No more Legal, Ethical, and Technical problems

Thank you!