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A COMPUTER-AIDED SYSTEM FOR DIFFERENTIAL DIAGNOSIS OF LUNG DISEASES

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ОНКОЦЕНТР

Given:

- Lung cancer (LC) is the most common malignancy tumor in all countries

- Lung cancer is the main reason of mortality from malignancy tumors

- Computed tomography (CT) is a gold standard of LC diagnostic, so CT images are optimal base for creating of intellectual diagnostic systems.

Goal:

- To develop an approach to improve AI algorithms which is close to "doctor's logic"

Relevance: concepts
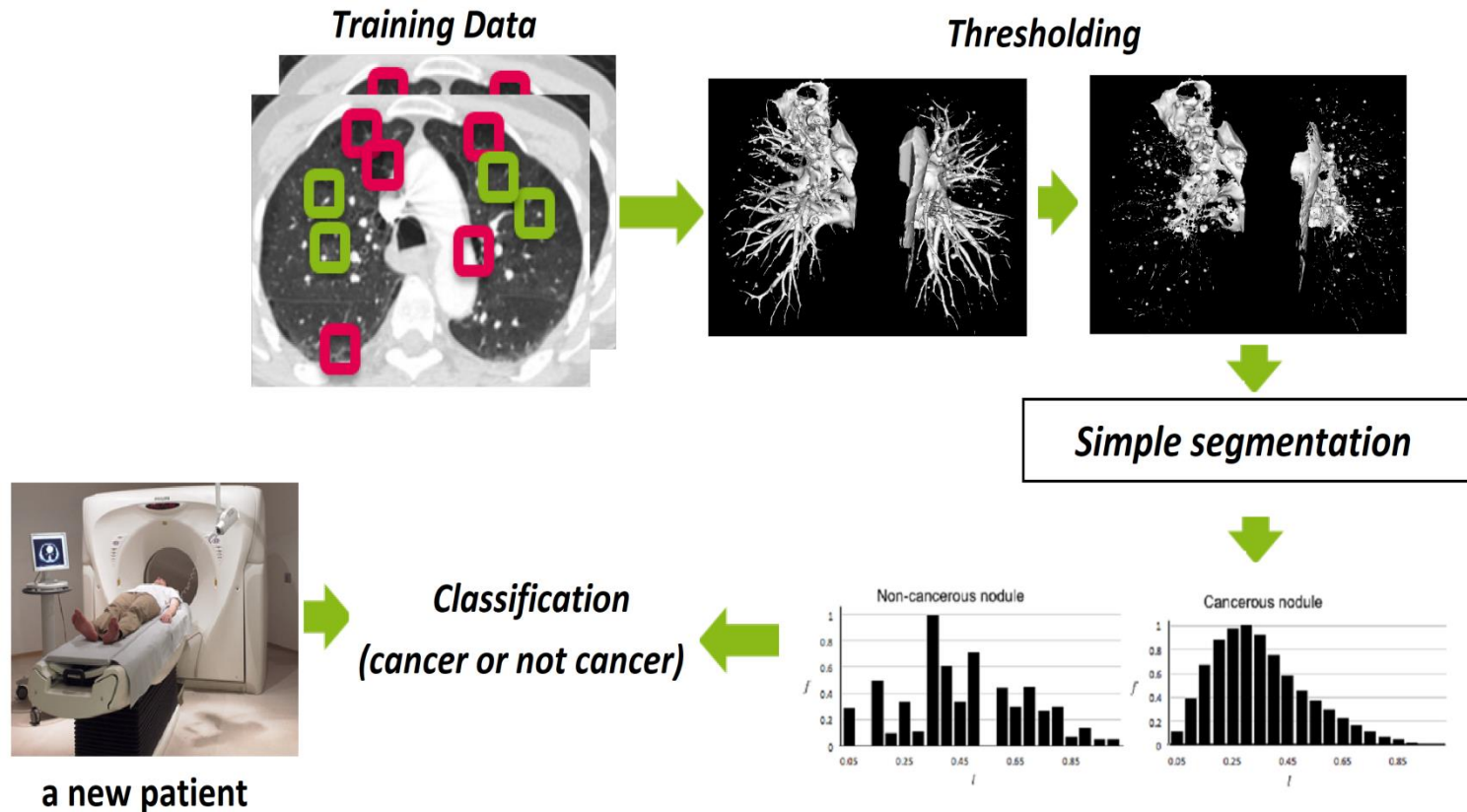
Data processing simplifying:

- 1.   Nodule doesn`t adjacent closely to vessels and other anatomical structures;
- 2.   Nodule locates at the center of the chest and significantly associates with large blood vessels;
- 3.   Nodule has sub pleural location;
- 4.   Nodule associates with a small part of pleura.

Kostis W.J., Reeves A.P., et all 2003
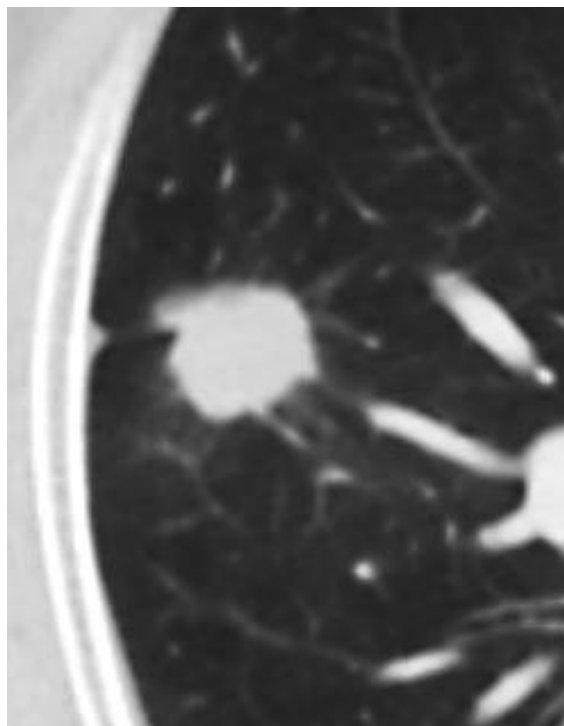
Clinical and radyological:

- 1. Central
  - endobronchial
  - peribronchial
  - nodular peribronchial
- 2. Peripheral
  - nodal (invasive)
  - lepidic
  - cancer of apex (Pancoast)
- 3. Mediastinal

Lung nodules detection
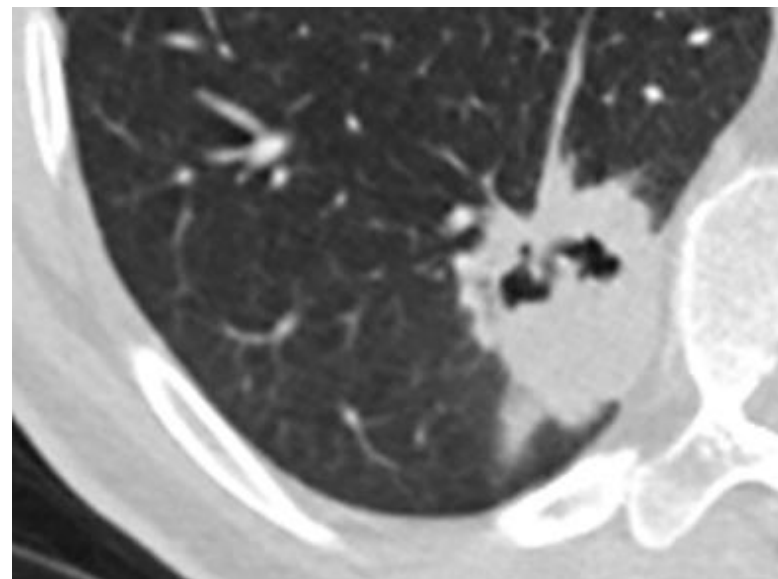# by segmentation and NEOchord method

Training Data

Thresholding

Simple segmentation

Non-cancerous nodule

Cancerous nodule

Classification
(cancer or not cancer)

a new patient

Patent application № 2018118626

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ОНКОЦЕНТР

Relevance: variety of structure

Adenocarcinoma

Squamous cell carcinoma

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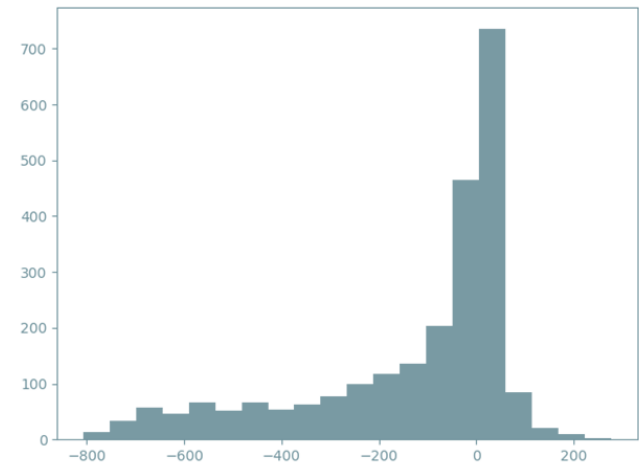
ОНКОЦЕНТР

Extension of the feature vector by histograms of density
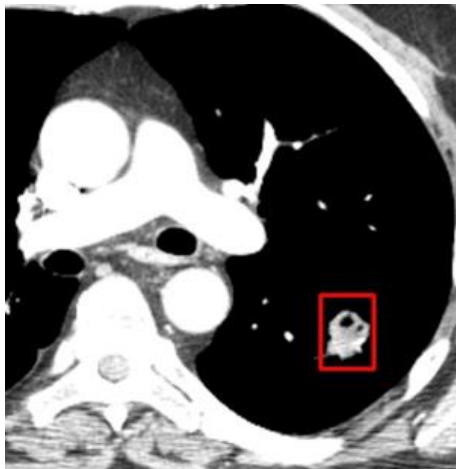
Squamous cell cancer
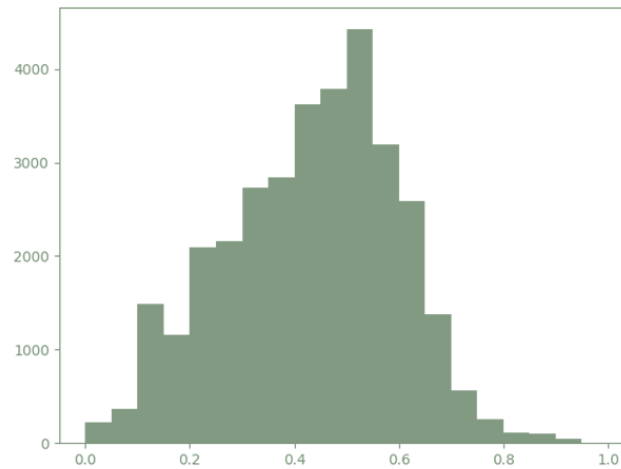
Histogram of chords

Histogram of density

Results:

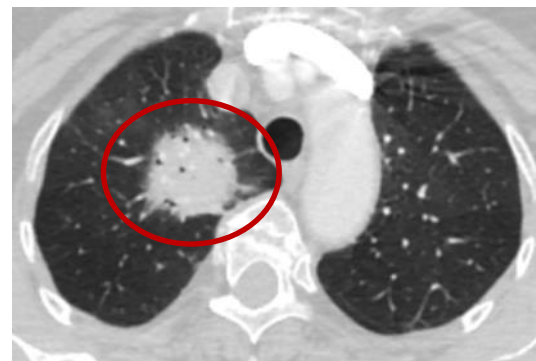| Sensitivity	Specificity	Accuracy
93%	97%	95%

Learning: public datasets LIDC, LUNA16

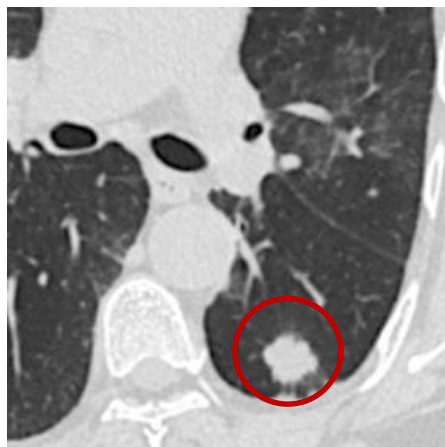**Testing:** LIDC, LUNA16, dataset of Oncocentre
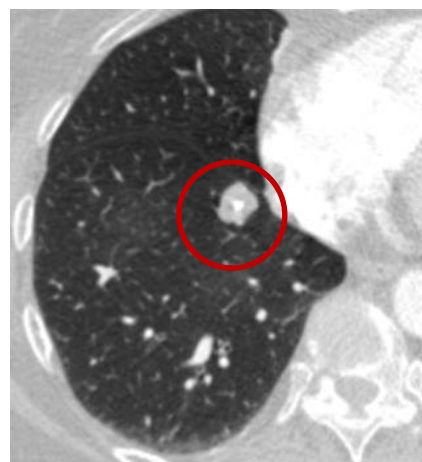
Relevance: cancer "masks"

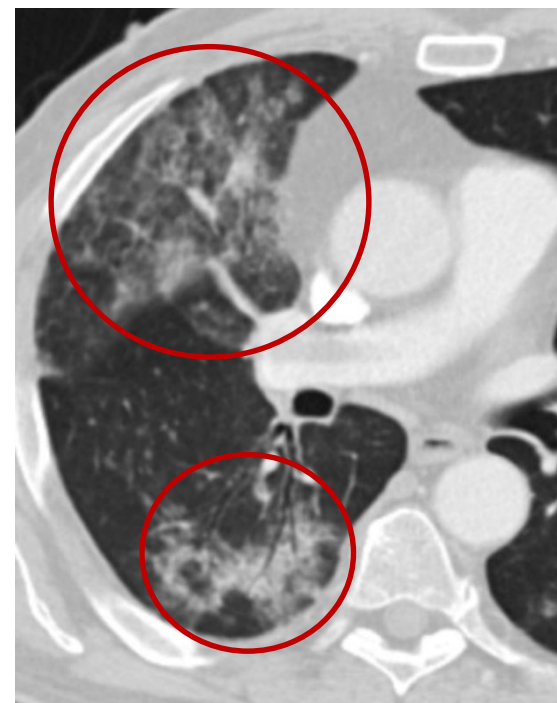Tuberculosis

Lymphoma

Metastasis of breast cancer

Hamartoma
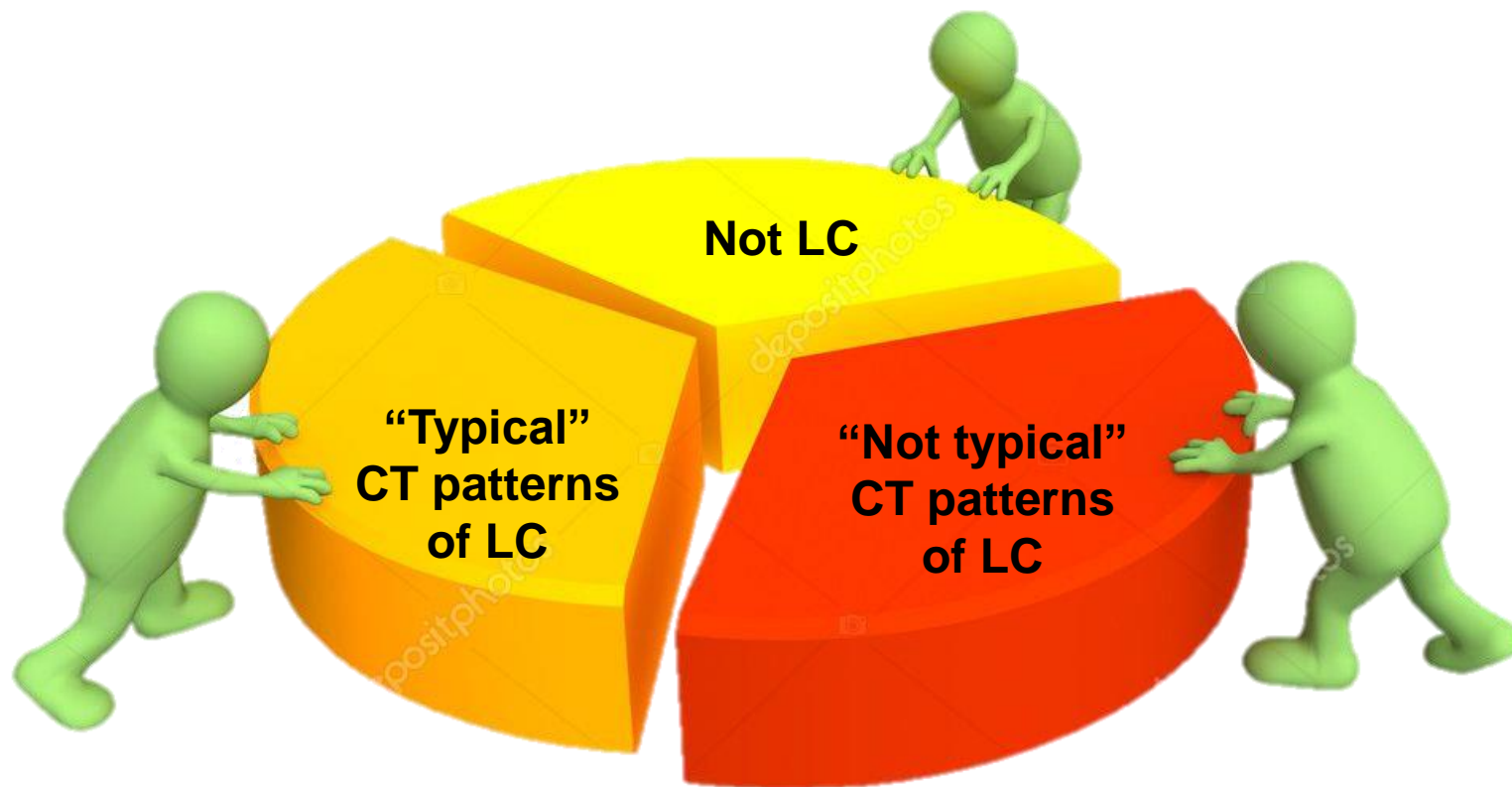
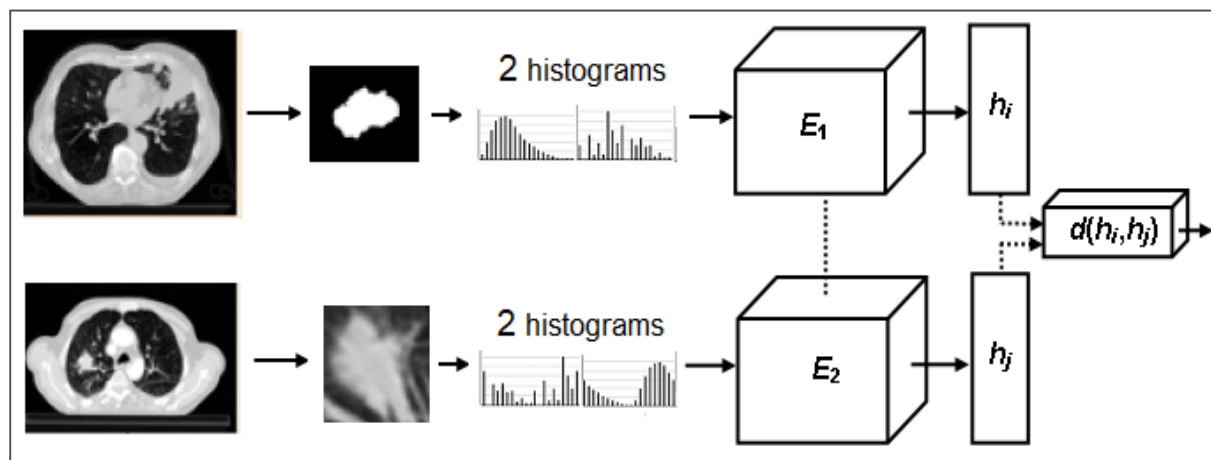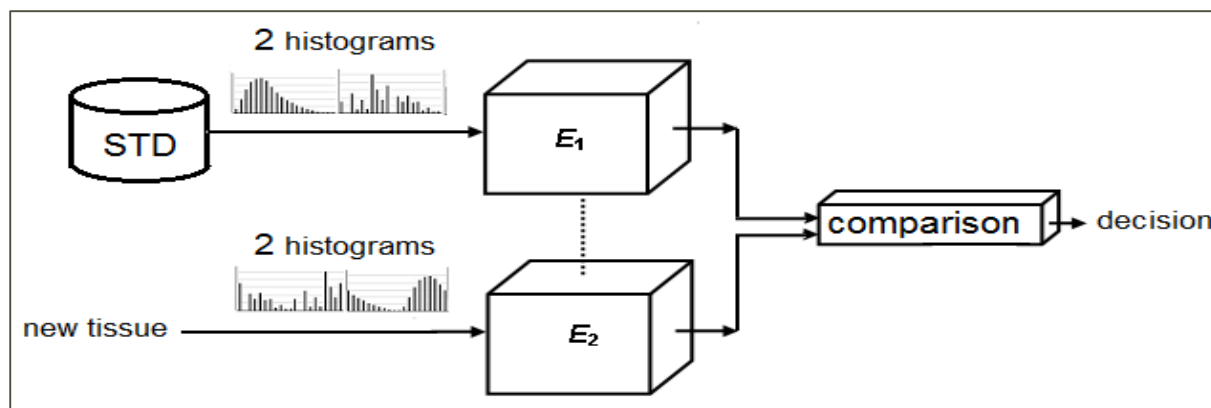# Relevance: cancer "masks"

Cancer

Cancer

Cancer

Split of dataset

Siamese neural network for differential diagnosis

Conclusions:

- AI system for differential diagnosis of LC should consider variety of biological behavior of the tumor
- The main difficulty of the C-A system for LC diagnosis is insufficient quantity of "non-cancers"

Thank you for your attention!