FGAI4H-R-037-A01

Cambridge, 21-24 March 2023

Source:	Vector Radiocompany, Research & Production Corporation «National Telemedicine Agency», PHTHISISBIOMED LLC	
Title:	Att.1 - Presentation - Cloud service of artificial medical intelligence for automated processing of digital chest radiographs to detect tuberculosis, oncology and coronavirus	
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Abstract:	This PPT contains a presentation on Cloud service of artificial medical intelligence for automated processing of digital chest radiographs to detect tuberculosis, oncology and coronavirus.	

CLOUD SERVICE OF ARTIFICAL MEDICAL INTELLIGENCE FOR AUTOMATED PROCESSING OF DIGITAL CHEST RADIOGRAPHS TO DETECT TUBERCULOSIS, ONCOLOGY AND CORONAVIRUS

Victor Klassen

Mikhail Natenzon

Yuriy Gogoberidze

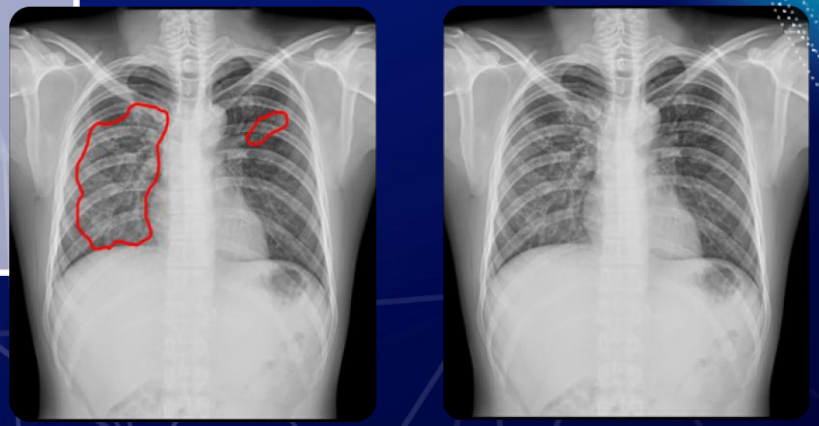
Prosvirkin Iliya

AUTOMATED ANALYSIS PROGRAM CHEST X-RAY/FLUOROGRAMS (CXR/FLG)

AI

Artificial Medical Intelligence (AMI)

This is a Medical decision support system. Allows you to automate the process of primary viewing of the CXR / FLG and identify alarming images (with suspected pathology).



ANALYSIS OF CHEST X-RAY / FLUOROGRAM (CXR / FLG)

Russian Federation

~80 million

fluorographic studies
was held in 2020

TARGETS AND GOALS

- Improving the quality of CXR/FLG analysis without destroying the existing research screening system
- Seamless integration of AMI into information systems of medical organizations
- Ensuring detection and identification of a wide range of pathological features

Putin and Chuchalin

PROJECT TEAM

Alexander Chuchalin
Doctor of Medical Sciences,
Academician

Ilya Prosvirkin
Ph.D., IT director
JSC "RK "Vector"

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Software Engineer,
data analyst

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Marianna Kudrina
Director of "PhthizisBioMed" LLC

Mikhail Natenson
Ph.D., academician,
founder and chairman of the
board of directors
"National Telemedicine Agency"

Sobyanin on the use of artificial intelligence to combat covid-19

PhtithisisBioMed is the leader of the experiment

Fighting the COVID-19 pandemic

To create a modern system to combat tuberculosis and COVID-19 epidemics, the Government of Russia organized an Experiment on the use of innovative technologies in the field of computer vision for the analysis of medical images and further application in the health care system of the city of Moscow.

The PhthisisBioMed service participates in the Experiment and, based on the results of 2020 and 2021, is recognized as a leader among other fluorogram processing programs.

Interaction with reference center

Reference-Center

Moscow Radiology "Scientific and Practical Clinical Center for Diagnostics and Telemedicine Technologies of the Moscow Health Department"

High-tech non-commodity exports to Asia, Africa, Latin America and Oceania in accordance with the recommendations of the UN, WHO and ITU (needs assessment)

BRICS countries:		African countries:		CIS countries:	
China	17,000 pcs.	Morocco	3,000 pcs.	Uzbekistan	1,500 pcs.
India	15,000 pcs.	Algeria	2,500 pcs.	Armenia	500 pcs.
Brazil	10,000 pcs.	Ghana	1,500 pcs.	Kyrgyzstan	500 pcs.

Market. Export

Morocco

Mohammed VI University of Medical Sciences Casablanca

India

Sanjay Gandhi Postgraduate Institute of Medical Sciences, Raebareli Road, Lucknow-226 014

Brazil

Rede Universitaria de Telemedicinal"

China

Shanghai Advanced Research Institute, Chinese Academy of Sciences

South Africa

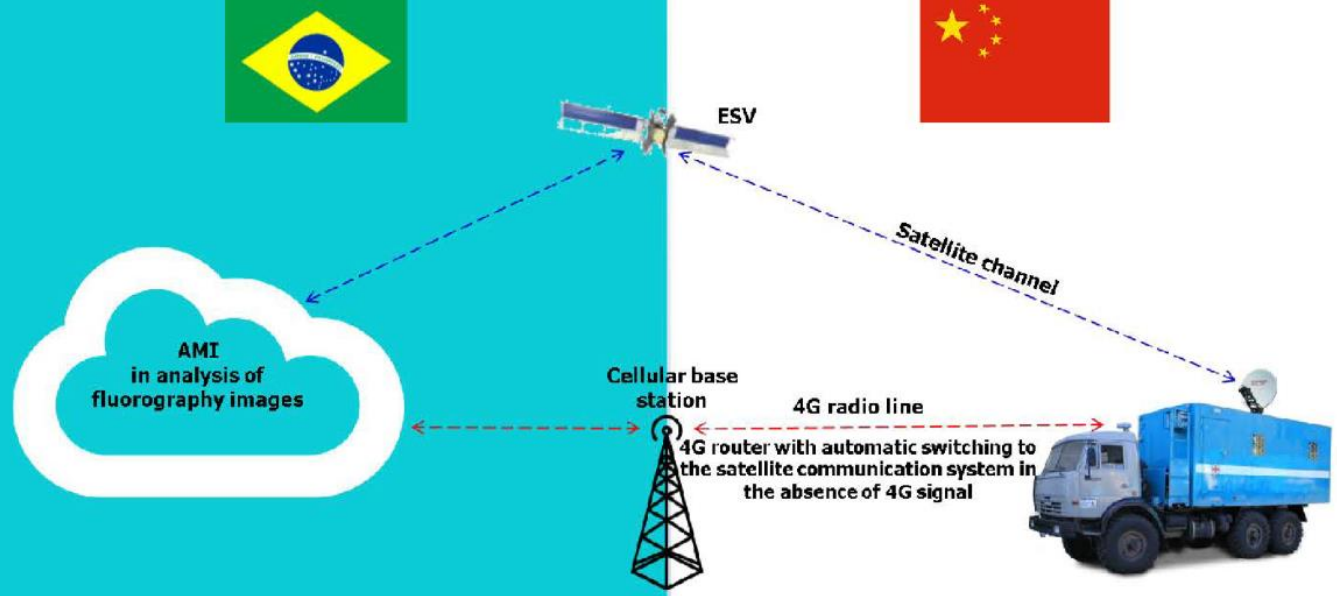
Khuphuka Kings Intemational/Khuphuka Kings Airways / NAFCOC Dшban Metropolitan

Iraq

BRICS, African countries, Turkey and Iran

Egypt, Kenya, Ghana, Ethiopia, Nigeria, Congo and Morocco

Countries of the Middle East and Africa



Sobre o complexo de telemedicina móvel

O complexo telemédico móvel de fluoroscopia (CTMM) "KAMA" proporciona pesquisas automatizadas por fluoroscopia (elemento base do projeto; possíveis opções incluem mamografia, cardiografia e outras) necessárias para o rastreamento da saúde da população em grande escala, primeiramente para os habitantes rurais e de regiões de difícil acesso, no decorrer de dispensarização e exames preventivos.

O CTMM "KAMA", graças ao conjunto de software e hardware pré-instalado nele e ao nosso know-how – o programa de análise automatizada de imagens fluoroscópicas (patente de invenção n.º 2684181), fornece uma melhoria de qualidade na análise de imagens fluoroscópicas graças à redução do fator erro humano e à redução do tempo de análise de imagens com qualidade constante

关于遠程醫療用移動式X射線熒光攝影儀

KAMA移動式X射線熒光攝影儀可進行自動化X射線熒光分析是醫療儀器的主要功能；還可進行乳房造影、心動描記術等），能夠在臨床檢查和預防檢查中對居民健康進行高效的大規模疫病普查，尤其是居住在鄉村和交通不易到達區的居民。

得益于預裝的软硬件配置及我們的技術訣竅，即可以對X射線熒光攝影圖像自動進行分析的應用程序（專利號：2684181），KAMA型移動式X射線熒光攝影儀可以確保X射線熒光攝影圖像的分析質量得到提升，因為該儀器能在保持恆定質量的條件下減少人為過失因素和攝影圖像的分析時間。

On the Mobile Telemedicine Complex

The KAMA Mobile Telemedicine Fluorography Complex (MTFC) allows automated fluorography studies (basic project element, possible options: mammography, cardiography, and others) necessary for effective mass screening of the health of people including those who live mainly in rural and hard-to-reach areas during periodic health and preventive examinations.

Due to its pre-installed hardware and software complex and our know-how, software for automated analysis of fluorographic images (Patent for Invention No. 2684181), the KAMA MTFC provides improved quality of analysis of fluorograms by reducing the human error factor and reducing the time required for image analysis with constant quality.

About the future of artificial intelligence in medicine

Telecommunication module MTMC "KAMA-F-AMI"

AES

Satellite channel

Base station
cell station

Radio link 4G

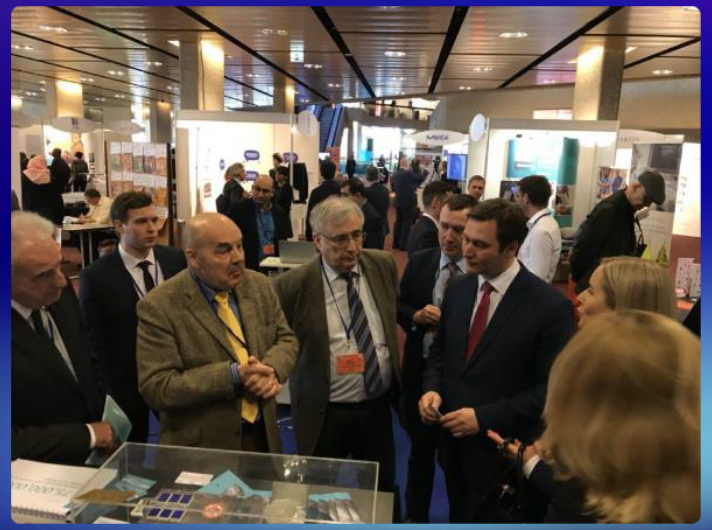
4G router
with function
automatic
switching to
satellite
communication
in the absence
4G signal

AMI
analysis of digital
radiographs
chest organs
cells/fluorograms

Russian Diagnostic Summit 2022 in Moscow

International forum Kazan Digital Week-2022

Sobyanin on the use of artificial intelligence to combat covid-19



Japan Russia eHealth Workshop 2018 Tokyo

BRICS Biotechnology and Biomedicine Innovation Collaboration Conference

Intellectual property

ФЕДЕРАЛЬНАЯ СЛУЖБА ПО НАДЗОРУ В СФЕРЕ ЗДРАВООХРАНЕНИЯ
(РОСЗДРАВНАДЗОР)

РЕГИСТРАЦИОННОЕ УДОСТОВЕРЕНИЕ НА МЕДИЦИНСКОЕ ИЗДЕЛИЕ

от 31 мая 2022 года № РЗН 2022/17406

На медицинское изделие
Программа автоматизированного анализа цифровых рентгенограмм органов грудной клетки/флюорограмм по ТУ 62.01.29-001-96876180-2019

Настоящее регистрационное удостоверение выдано
Общество с ограниченной ответственностью "ФтизисБиоМед" (ООО "ФБМ"), Россия, 422980, Республика Татарстан, г. Чистополь, ул. К. Маркса, д. 135

Производитель
Общество с ограниченной ответственностью "ФтизисБиоМед" (ООО "ФБМ"), Россия, 422980, Республика Татарстан, г. Чистополь, ул. К. Маркса, д. 135

Место производства медицинского изделия
ООО "ФБМ", Россия, 422980, Республика Татарстан, г. Чистополь, ул. К. Маркса, д. 135, ком. 311, 316

Номер регистрационного досье **№ РД-38673/90943 от 12.01.2021**

Класс потенциального риска применения медицинского изделия **3**

Код Общероссийского классификатора продукции по видам экономической деятельности **58.29.32.000**

Настоящее регистрационное удостоверение имеет приложение на 1 листе

приказом Росздравнадзора от 31 мая 2022 года № 4779
допущено к обращению на территории Российской Федерации.

Руководитель Федеральной службы по надзору в сфере здравоохранения **А.В. Самойлова**

0066949

РОССИЙСКАЯ ФЕДЕРАЦИЯ

ПАТЕНТ

НА ИЗОБРЕТЕНИЕ

№ 2684181

СПОСОБ АВТОМАТИЗИРОВАННОГО АНАЛИЗА ЦИФРОВЫХ ФЛЮОРОГРАФИЧЕСКИХ СНИМКОВ

Патентообладатель: ***Общество с ограниченной ответственностью "ФтизисБиоМед" (RU)***

Авторы: ***Андрианов Николай Григорьевич (RU), Классен Виктор Иванович (RU), Мальцев Антон Владимирович (RU), Сафин Артем Альбертович (RU)***

Заявка № **2018110728**
Приоритет изобретения **27 марта 2018 г.**
Дата государственной регистрации в Государственном реестре изобретений Российской Федерации **04 апреля 2019 г.**
Срок действия исключительного права на изобретение истекает **27 марта 2038 г.**

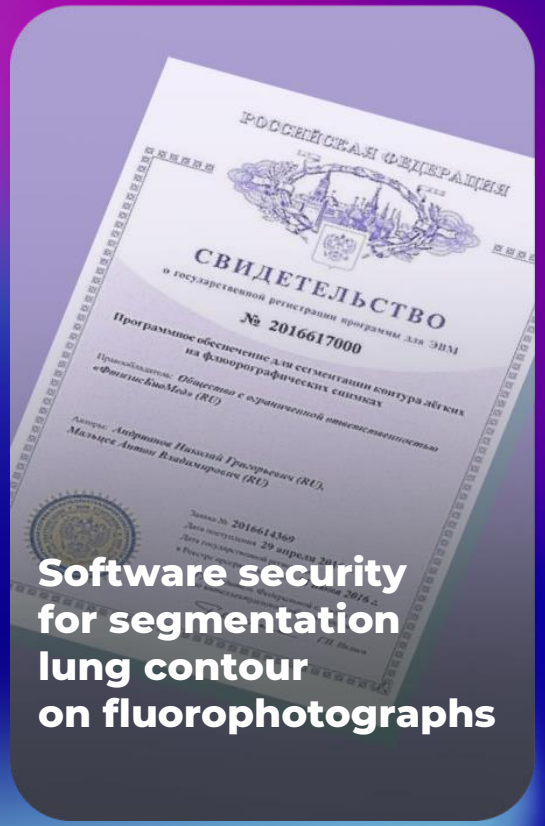
Руководитель Федеральной службы по интеллектуальной собственности *Г.П. Ивлиев*

Intellectual property

Program for manual pathology markings on fluorographic pictures

Program automated analysis fluorographic images (version 2)

Program automated analysis fluorographic images



Software security for segmentation lung contour on fluorophotographs

Clinical trials. Performed by Radiology of Moscow

In accordance with the permission of the Roszdravnadzor of Russia, he conducted the "SPCC Diagnostics and Telemedicine of the Moscow Health Department" (Radiology of Moscow). A data set consisting of chest x-ray images and fluorograms was used. The protocol of calibration testing of the AI service No. 19 of 06/02/2020 was used. The protocol of calibration testing of the AI service (change of versioning of the AI service) No. 6 dated February 4, 2022 was used.

The values of the main accuracy metrics for the PhthisysBioMed AI service, by CXR/FLG modalities, as of February 4, 2022, are:

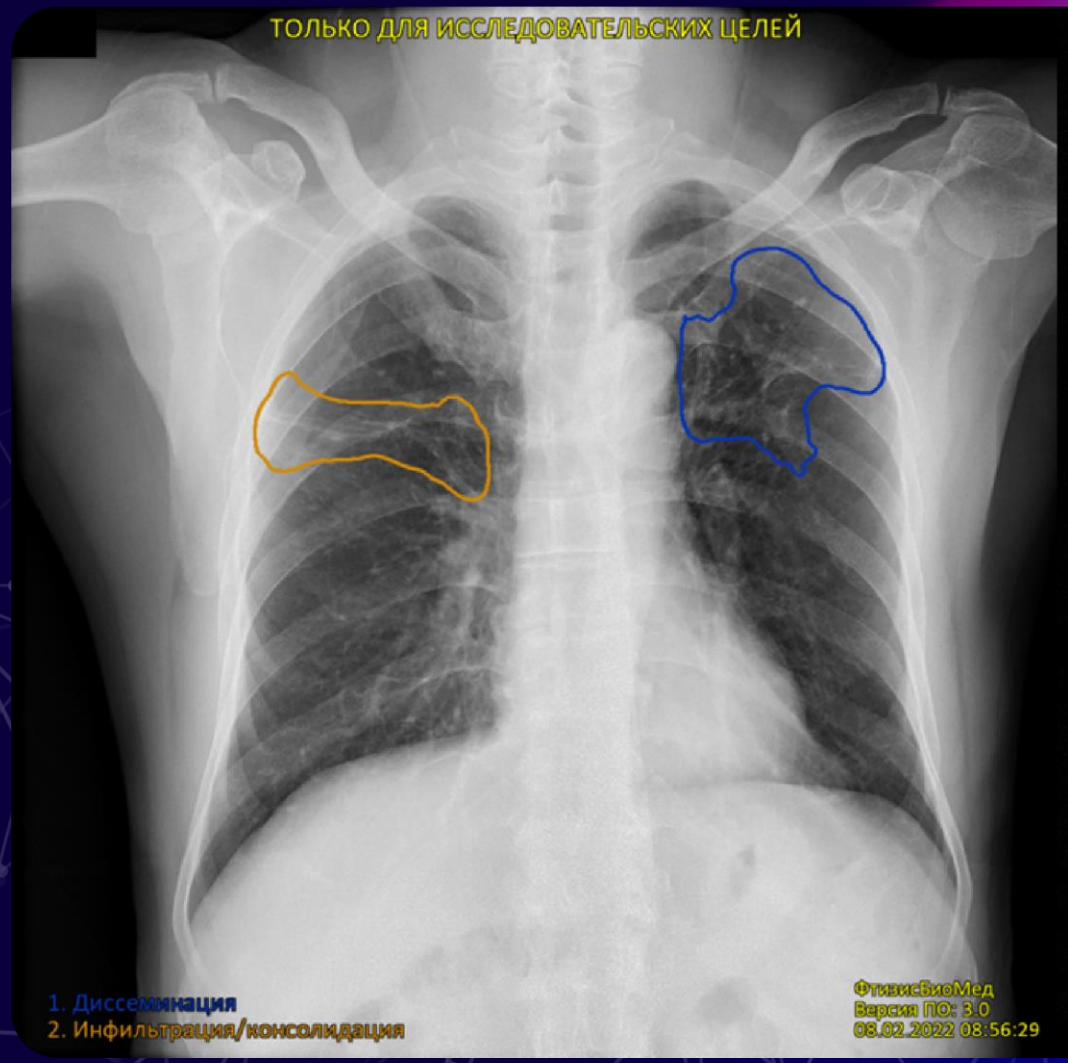
- 0,965 - AUC
- 0,92 - sensitivity
- 0,94 - specificity
- 0,93 - accuracy
- 10 sec. - specific time analysis

Web service. Analysis of CXR/FLG images Online

At present, a web service for the analysis of digital CXR/FLG images has been launched.

It is available at ftizisbiomed.ru and is adapted for mobile devices.

The result of the service PhthisisBioMed



Статус Частично - Проверка обращена

Модальность	ФЛГ
Область исследования	CHEST
Идентификатор исследования	1.871.3.1859213745.54904.1770 1983172798.2474477225.1
Дата и время формирования заключения ИИ-Сервисом	05.02.2022 15:46
Предупреждение	Только для исследовательских целей
Предупреждение	Заключение получено при поддержке алгоритма искусственного интеллекта
Наименование сервиса	FBM
Версия сервиса	3.0
Назначение сервиса	Сервис определяет наличие патологических изменений
Технические данные	Количество изображений: 1
Данные по качеству серий	Обработана 1 серия

Описание

Область целевого исследуемого органа: органы грудной клетки (лёгкие)
Проекция: прямая передняя

Заключение

Вероятность наличия патологических изменений: 0.72
Выявленные патологические области:
1. Диссеминация
2. Инфильтрация/консолидация
Количество выявленных патологических изменений: 2

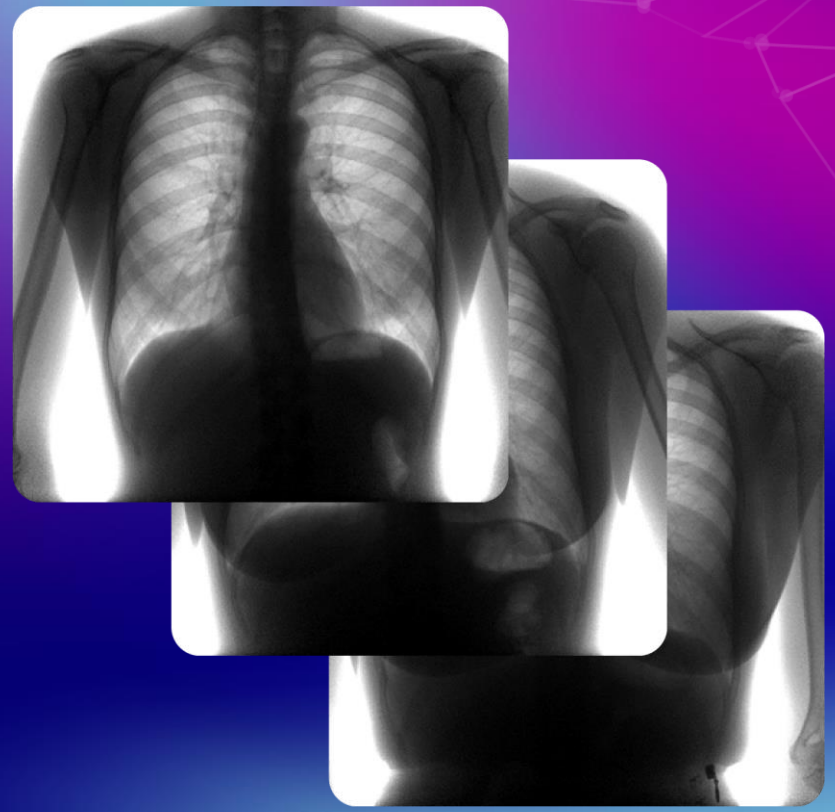
Руководство пользователя

ФтизисБиоМед - автоматическая система, выявляющая области предполагаемых патологических признаков на ре
исследованию.
Области локализуются цветными контурами на изображении. Каждому цвету контура соответствует одно из заклю
одному патологическому признаку, одному из двух возможных патологических признаков или о том, что класс па
Перечень заключений по каждому выявленному контуру приведен в левом нижнем углу дополнительной серии.
Диагностируемые патологические признаки:
-Плевральный выпот
-Пневмоторакс
-Ателектаз
-Очаг затемнения
-Инфильтрация/консолидация
-Диссеминация
-Полость
-Кальцинат/кальцинированная тень
-Нарушение целостности кортикального слоя.
-Инородное тело/ЭКС

Pathology localizer

List of pathological signs, detected by the AI service:

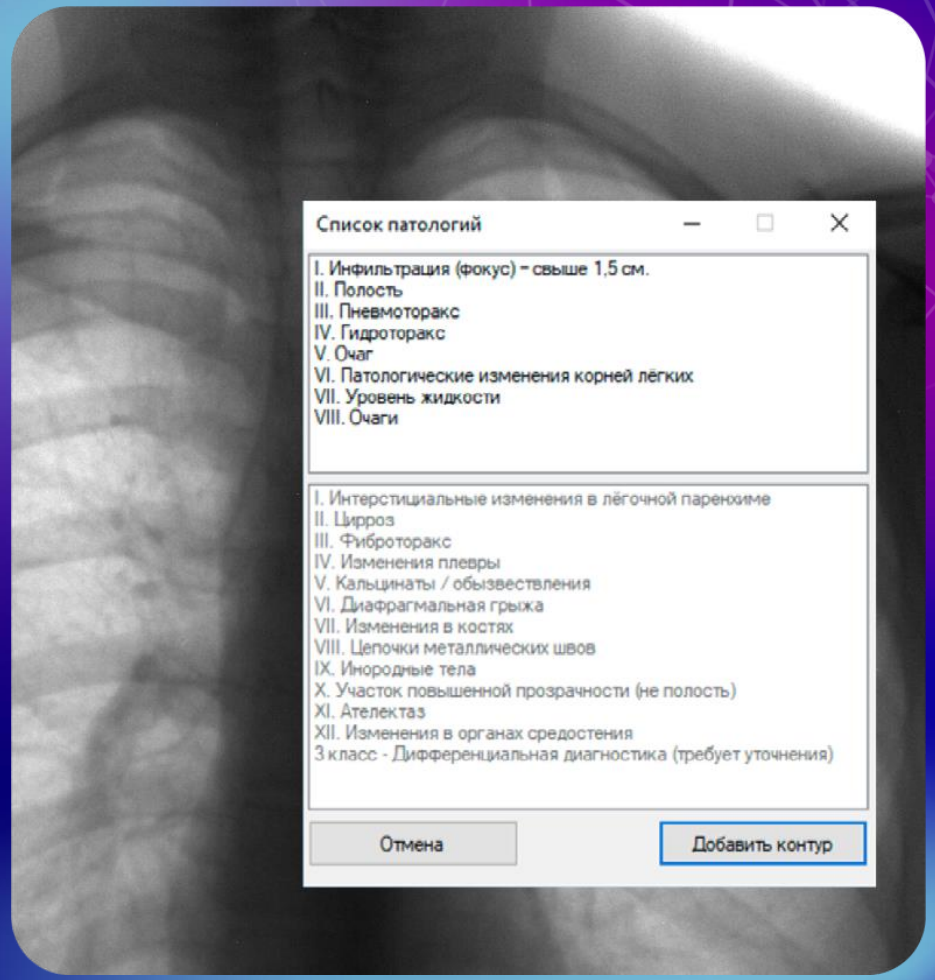
- infiltration;
- with partial and total shading;
- hydrothorax (liquid level);
- with partial and total shading;
- cirrhosis;
- fibrothorax;
- atelectasis;
- with partial and total shading;
- hearth;
- cavity;
- pneumothorax;
- dissemination;
- pleura changes;
- calcifications;
- changes in the bones.



Pathology classifier

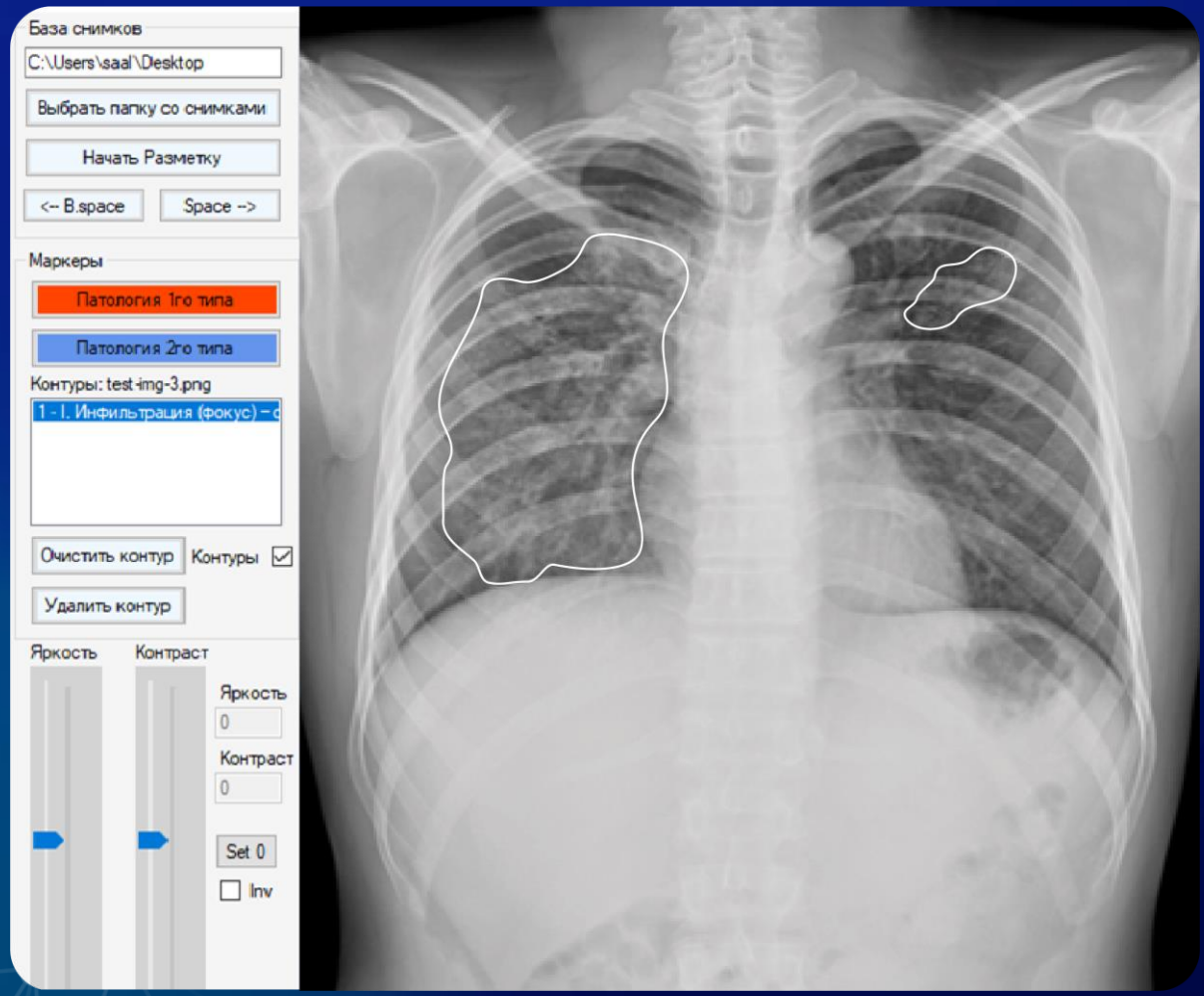
List of pathological signs, classified by the AI service:

- pleural effusion;
- pneumothorax;
- atelectasis;
- center of blackout;
- infiltration/consolidation;
- dissemination;
- cavity;
- calcification/calcification shadow;
- violation of the whole cortical layer.

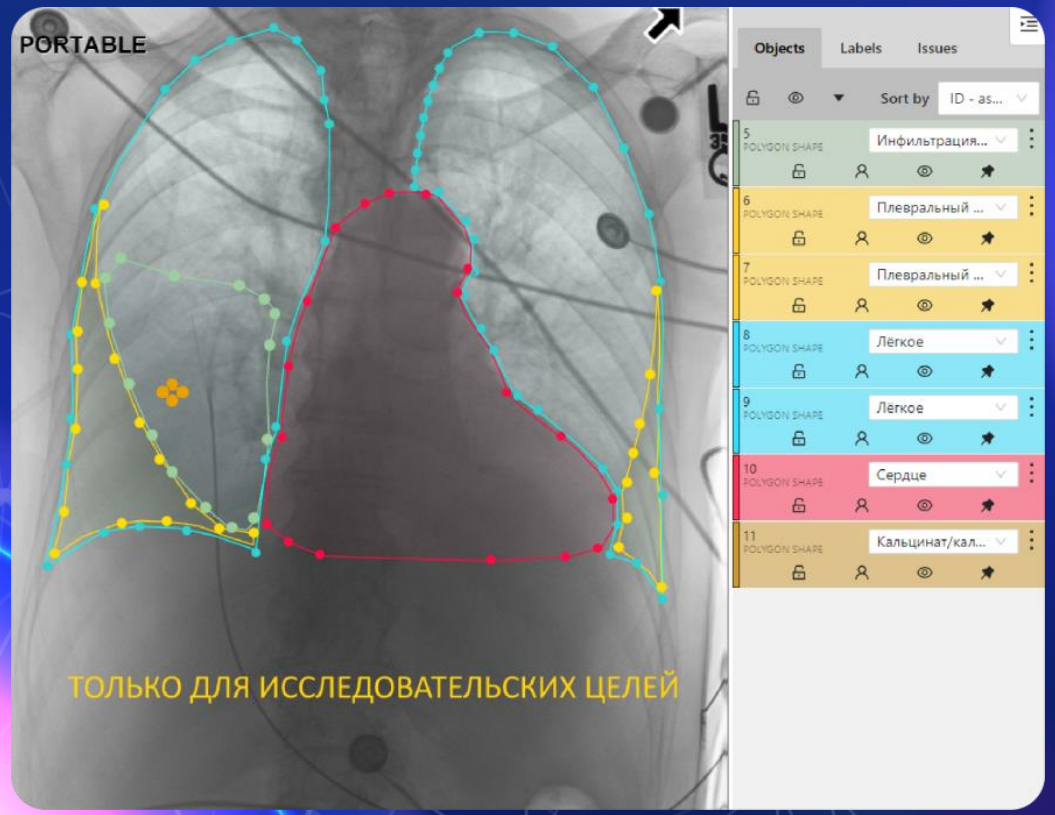


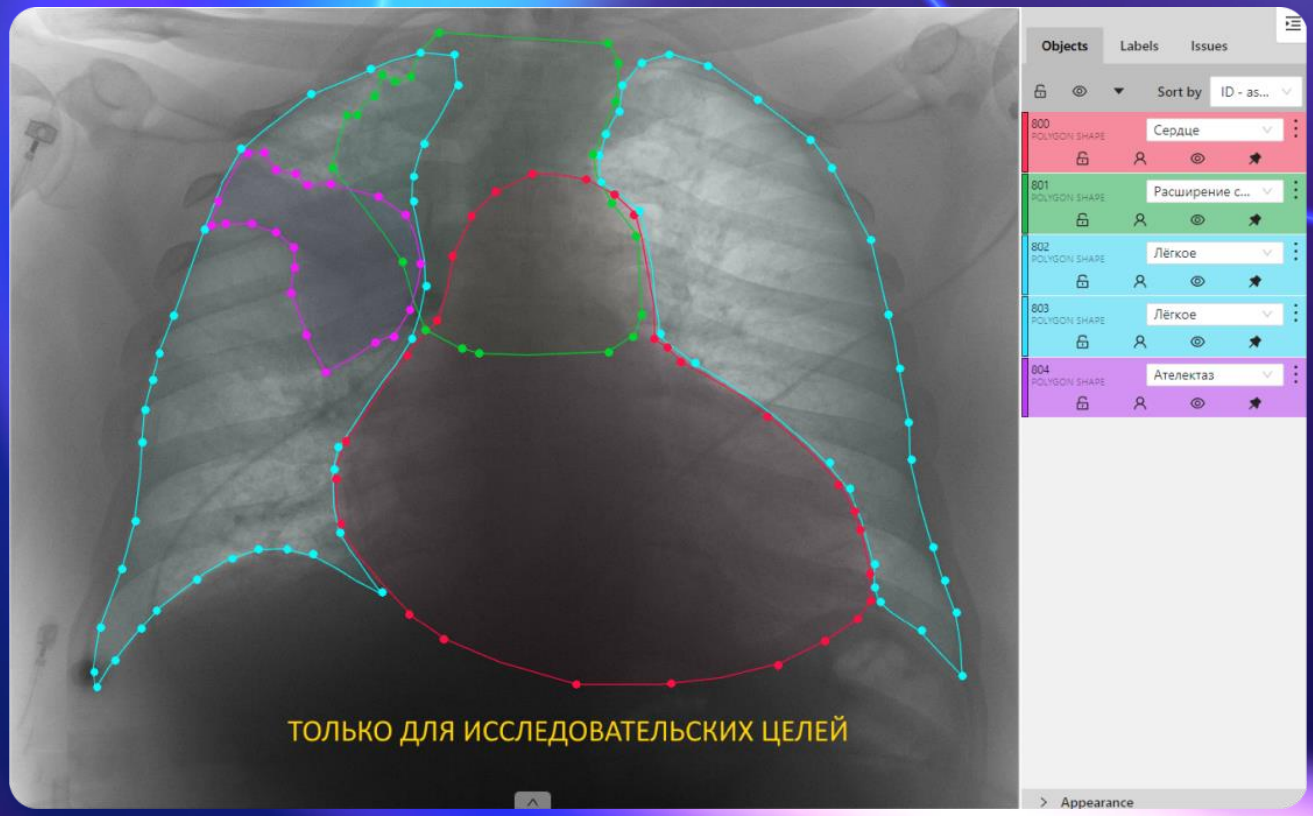
DataSet

A methodology for verification and marking of digital fluorographic images was developed, as well as the necessary tools were created.

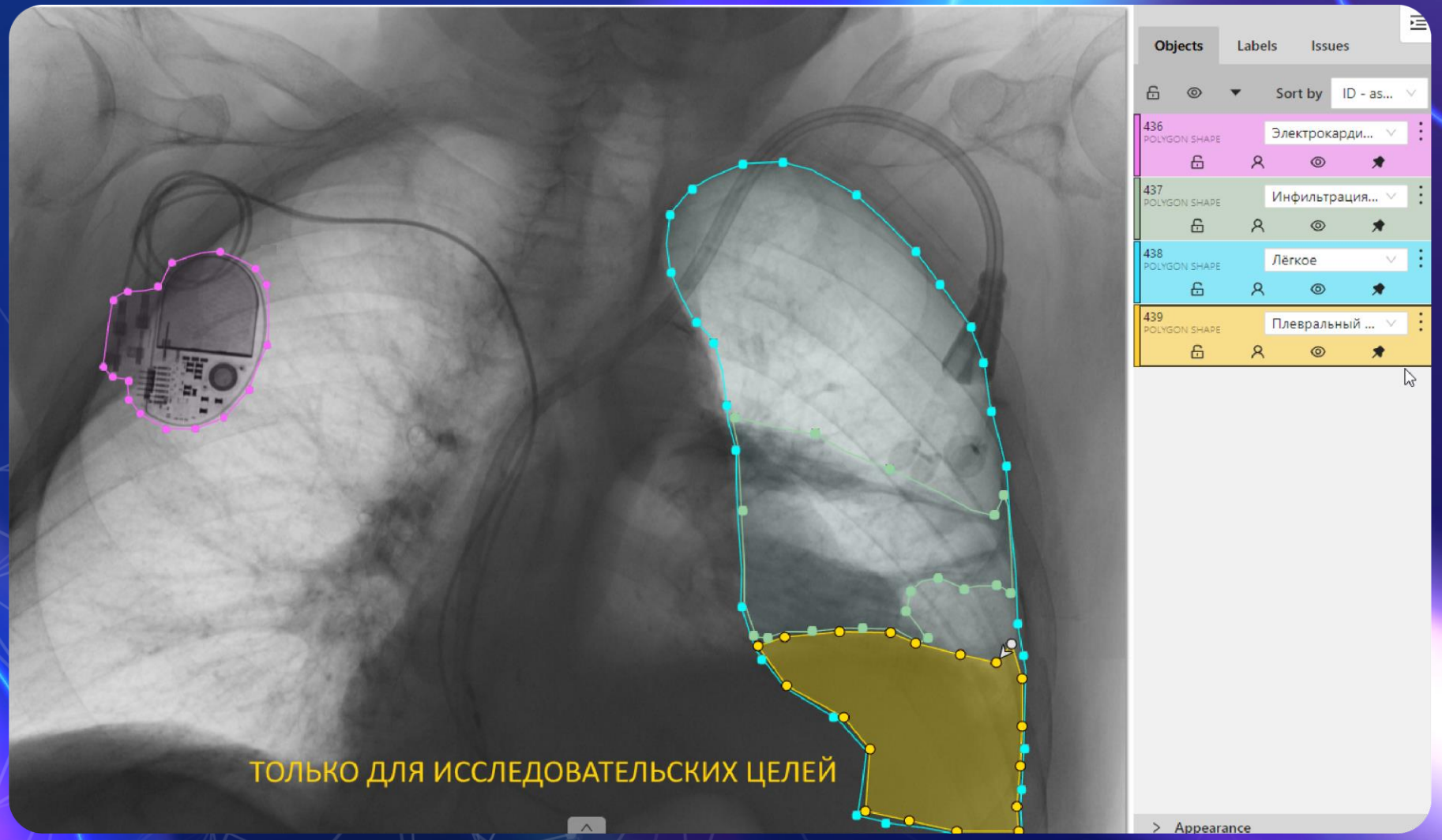


DataSet tool

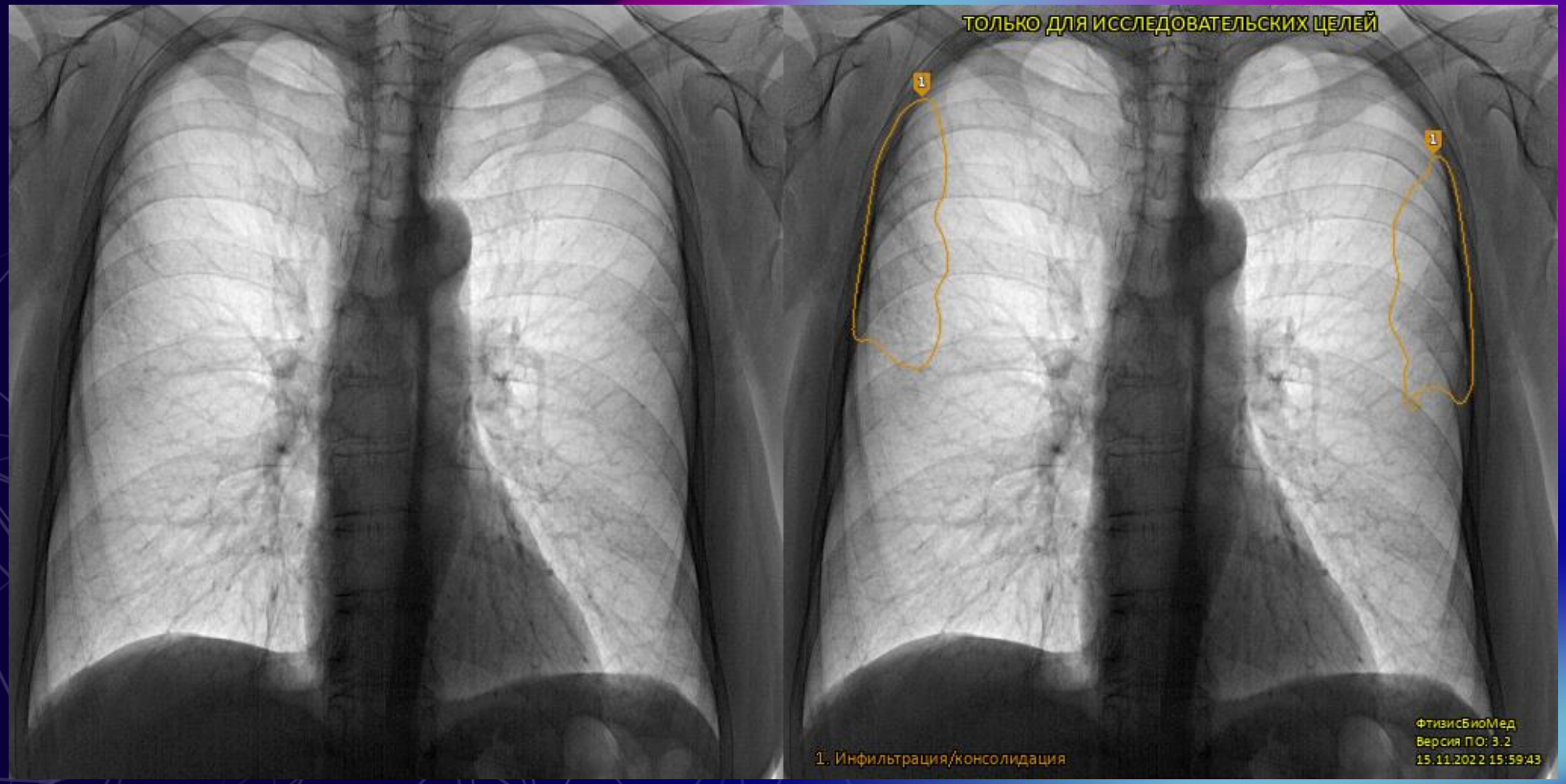




Marking of foreign bodies



Examples of the work of the PhthisisBioMed service



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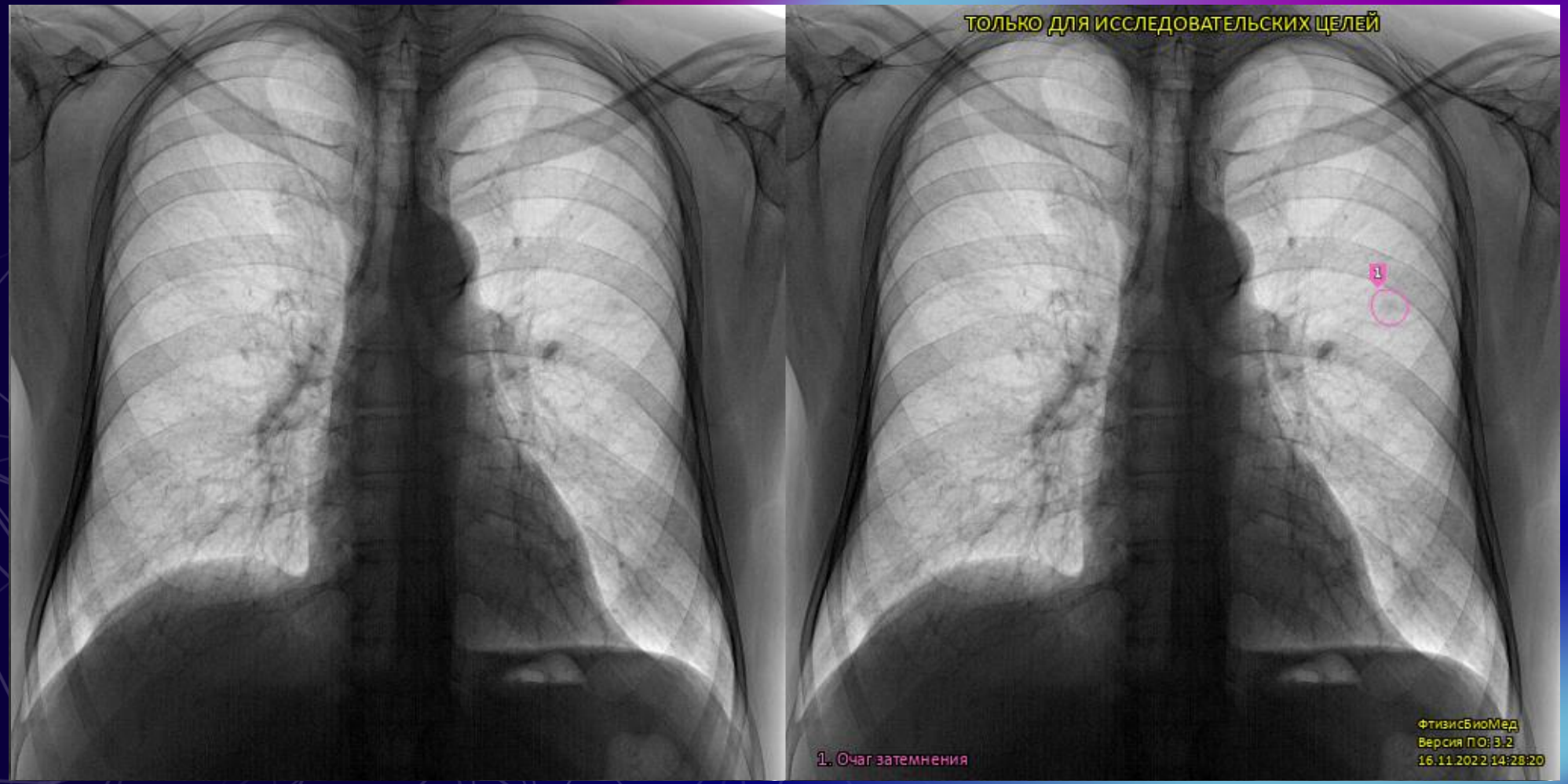

Examples of the work of the PhthisisBioMed service

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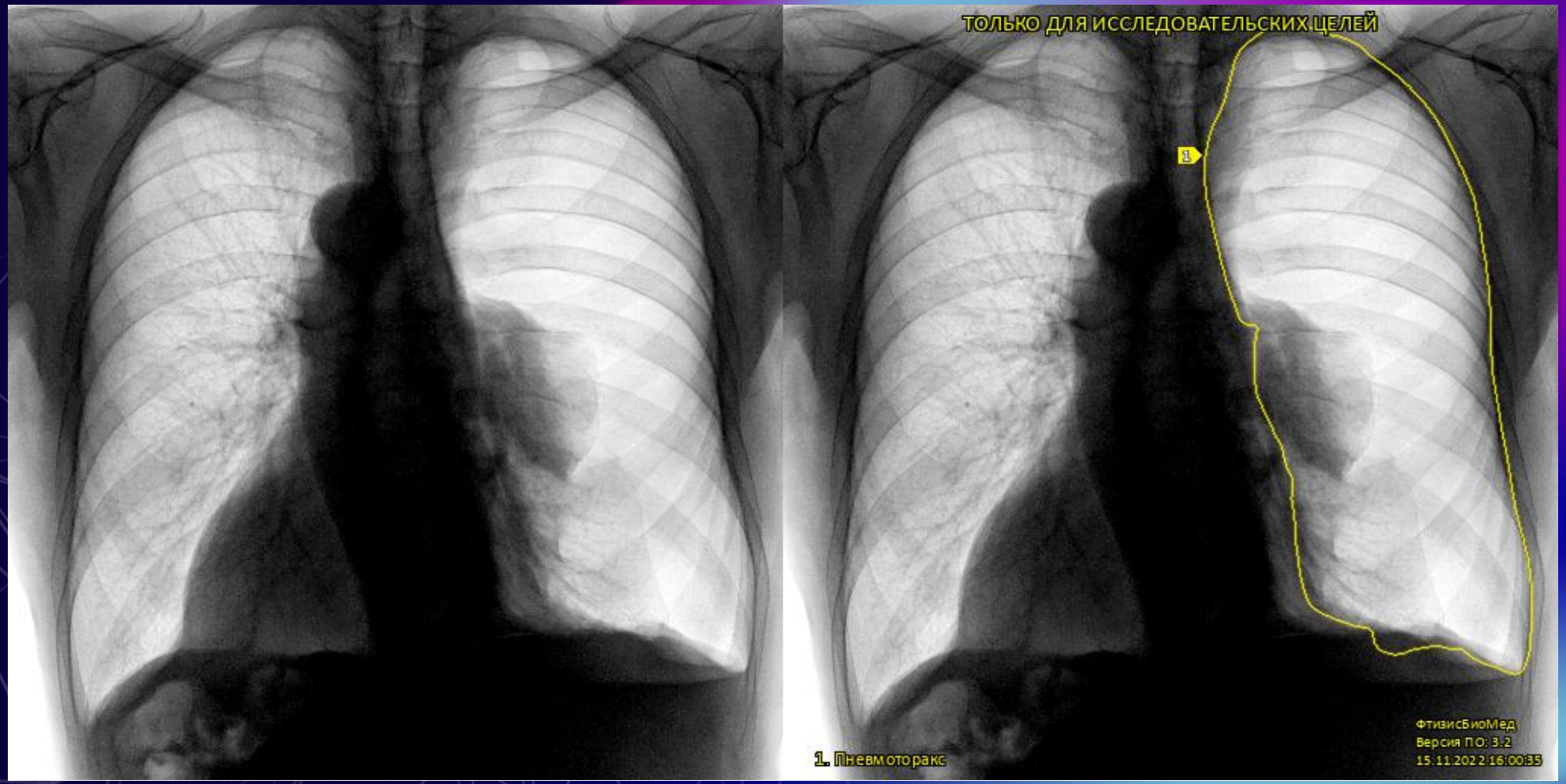
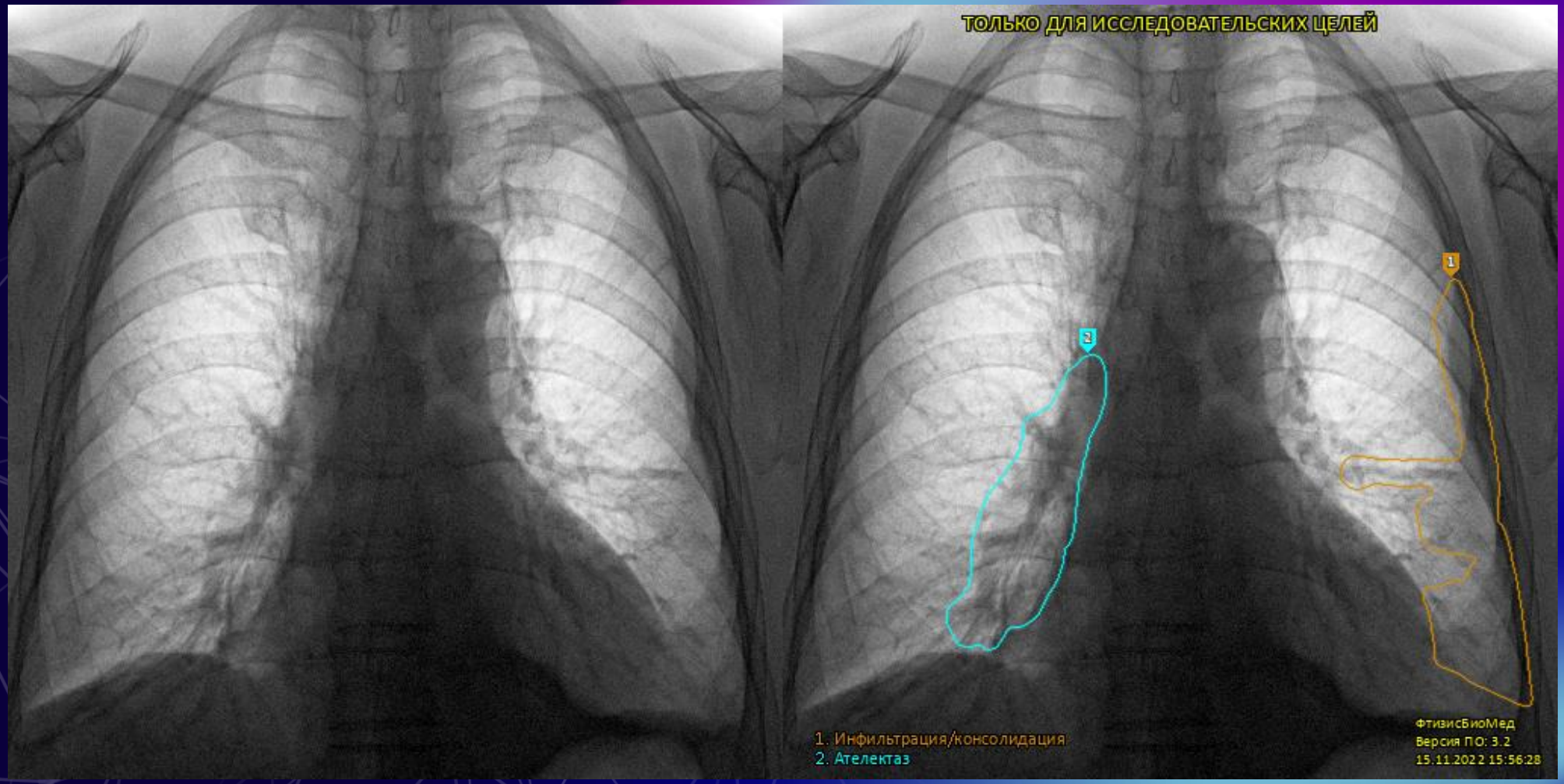
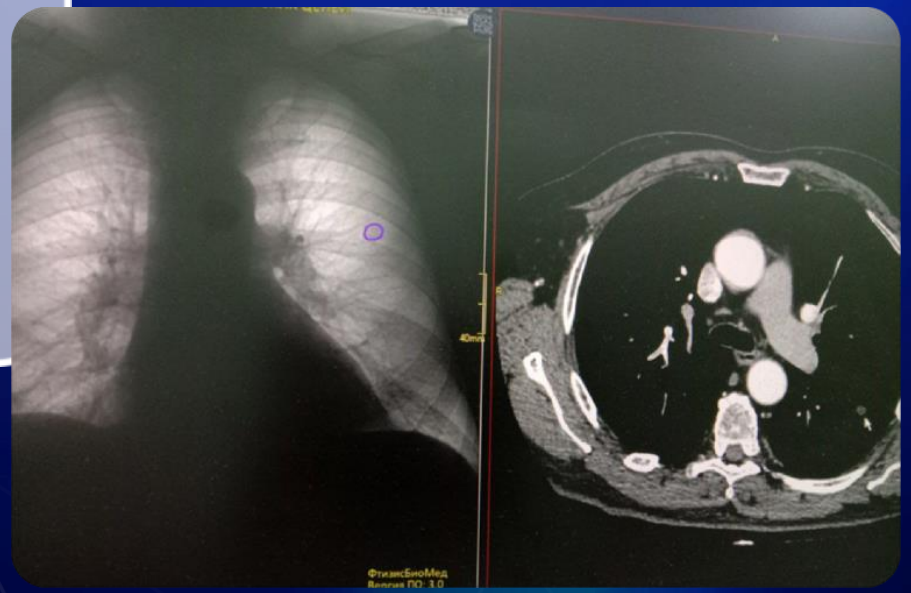


Examples of the work of the PhthisisBioMed service

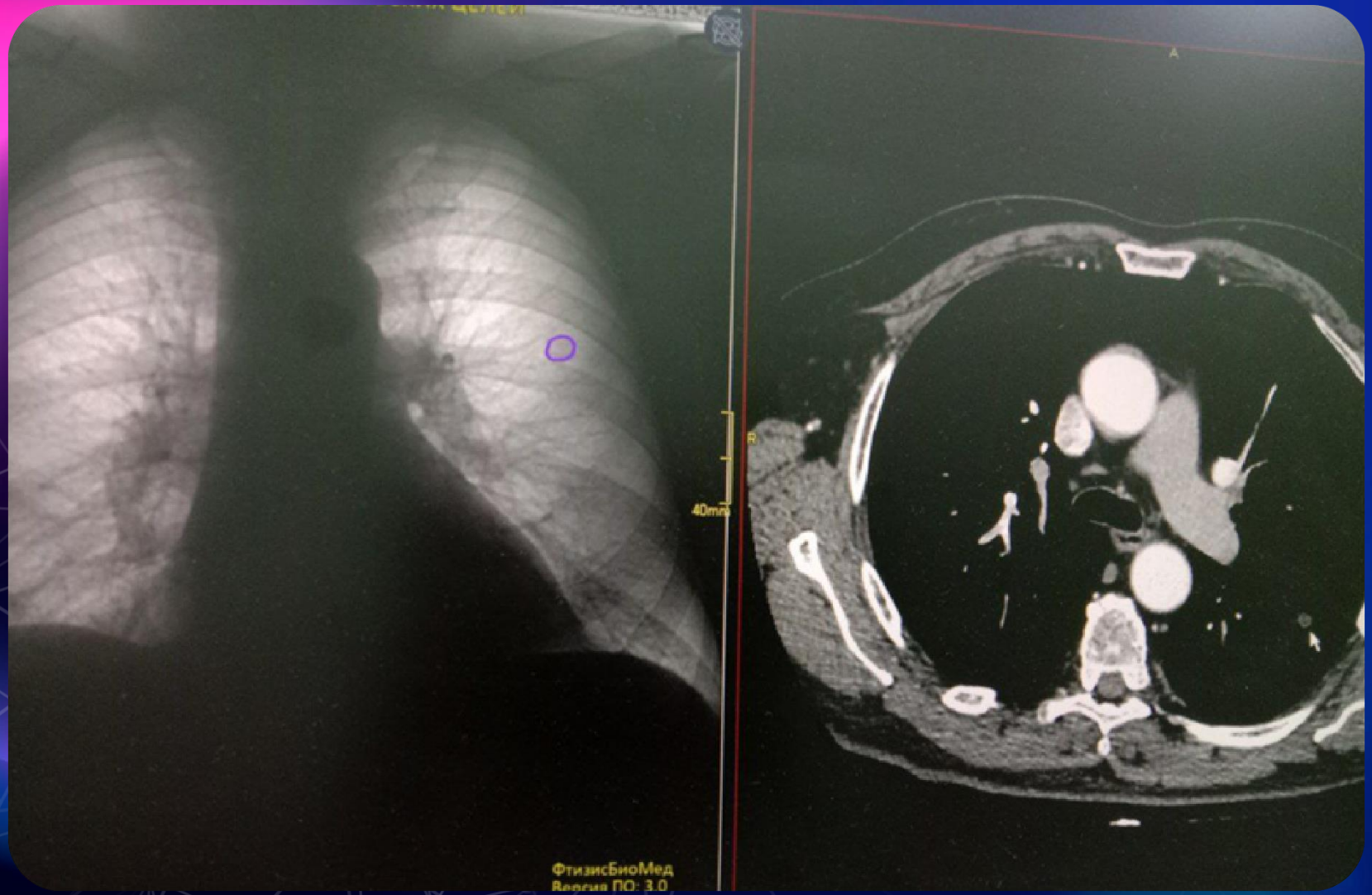


DOCTOR`S REVIEWS OF PHTHISISBIOMED

On prophylactic fluorography, AI PhthisisBioMed reveals a rounded neoplasm 8 mm in D or a tuberculous focus. Further examination in the form of CT with intravenous contrasting clarifies: the absence of tuberculosis, excludes the malignancy of the formation and gives the most likely answer: a benign congenital lesion - lung hamartoma (lack of contrasting formation on CT - it does not have a pathological tumor vascular supply network).



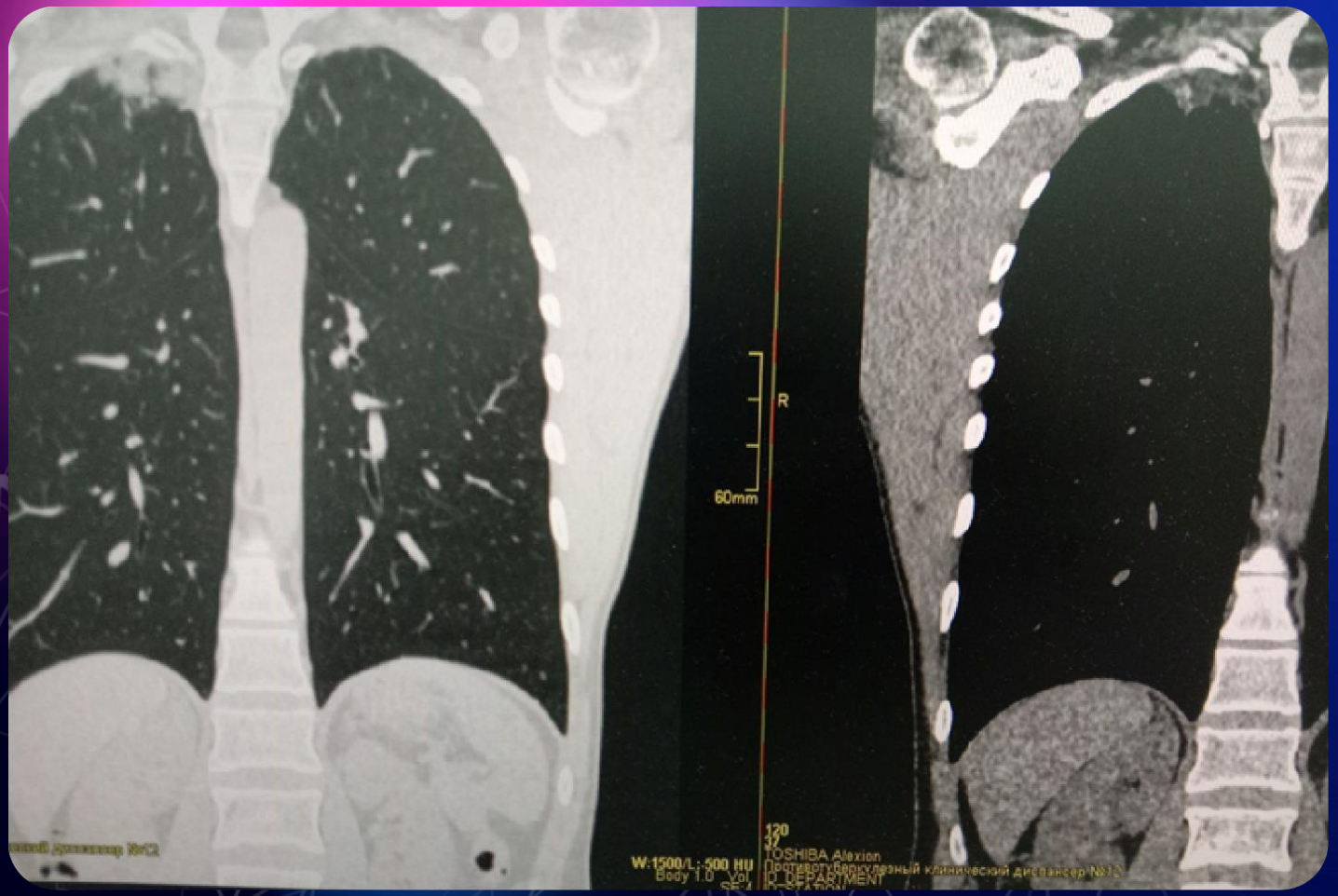
DOCTOR`S REVIEWS OF PHTHISISBIOMED

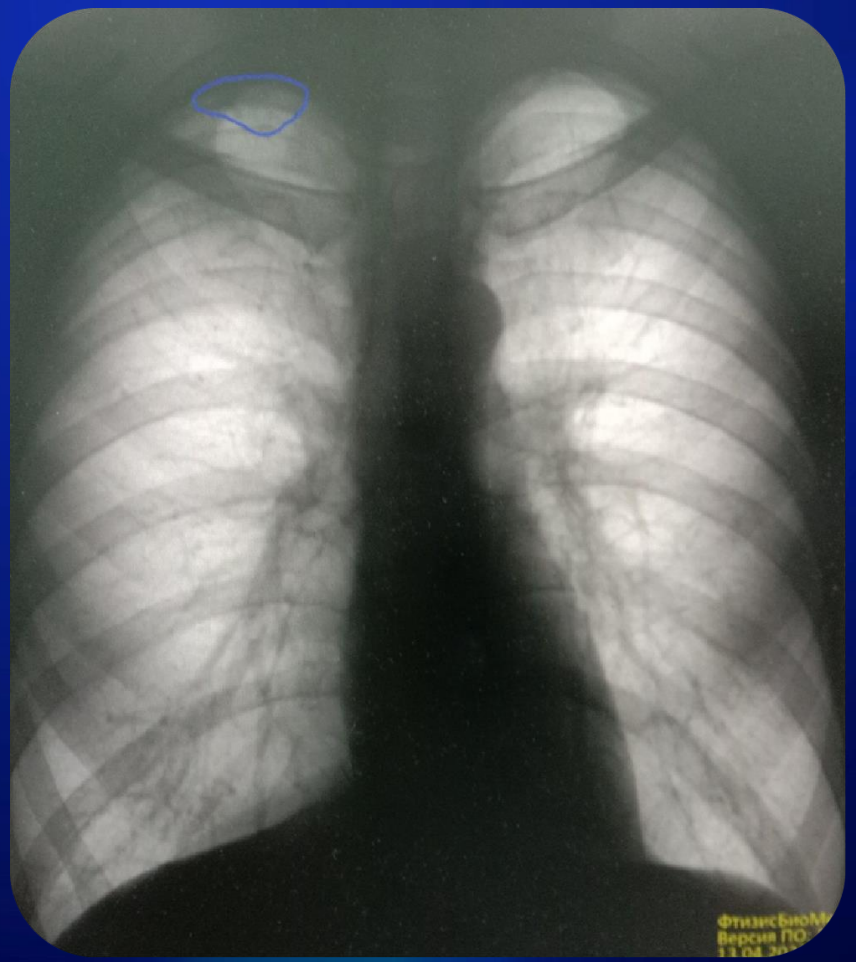


DOCTOR`S REVIEWS OF PHTHISISBIOMED

AI PhthisisBioMed reveals significant residual changes after tuberculosis. Further examination on CT confirms the presence of changes and excludes the activity of the infection. It is already becoming difficult for a specialist to compete with AI in this case, although this is rather an exception for fluorography. The protein intelligence in fluorography is still ahead of the silicone one.

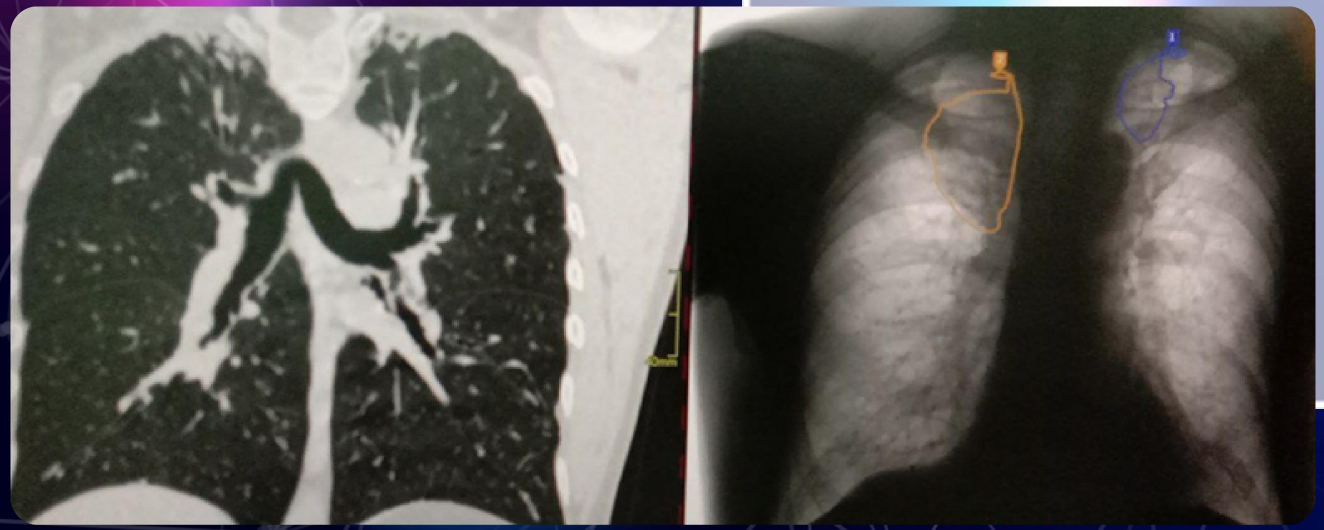
DOCTOR`S REVIEWS OF PHTHISISBIOMED



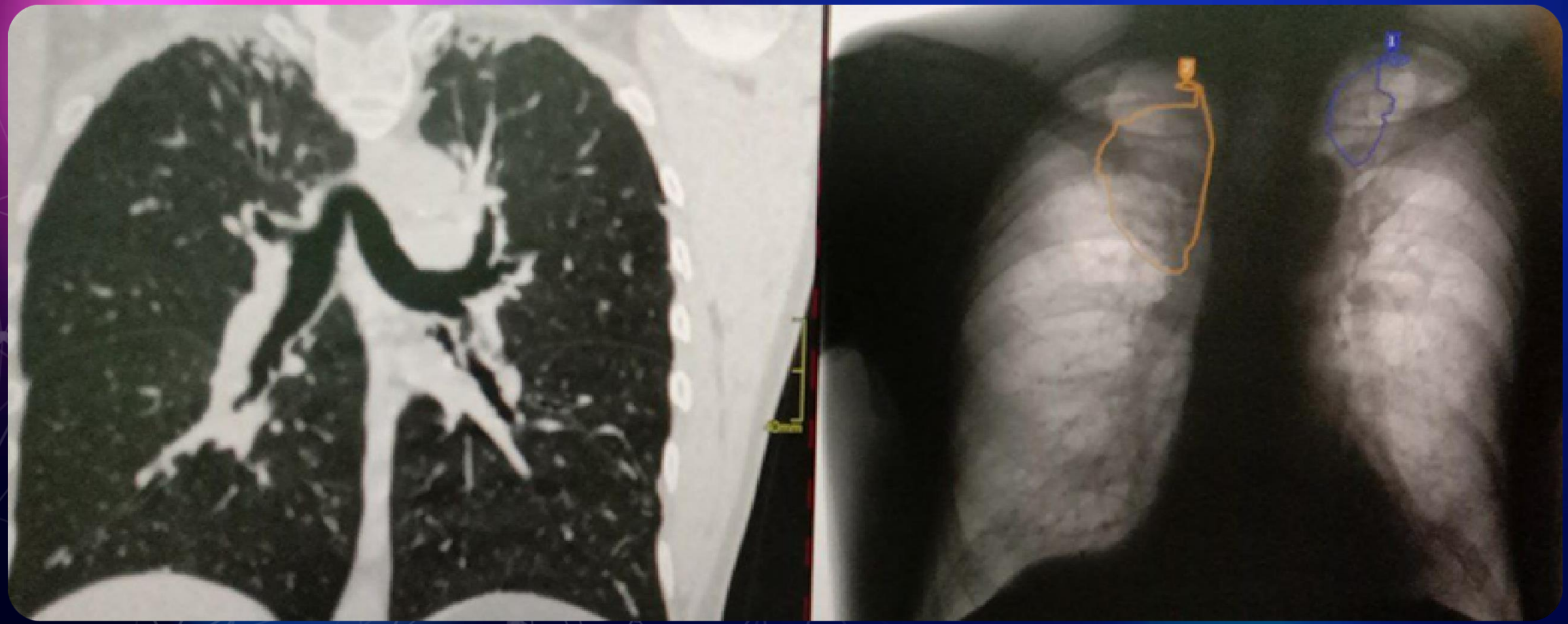


DOCTOR`S REVIEWS OF PHTHISISBIOMED

AI PhthisisBioMed on fluorography marks changes in the tops of both lungs. To exclude active tuberculosis, we turn to the fluoro-archive: the lack of dynamics. On CT, there were previously massive pleuroapical layers on both sides. There is no active tuberculosis.

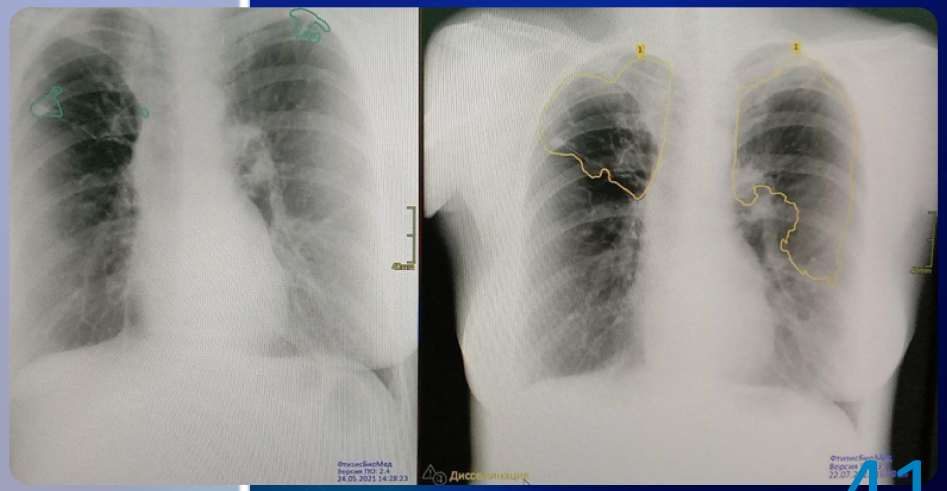


DOCTOR`S REVIEWS OF PHTHISISBIOMED

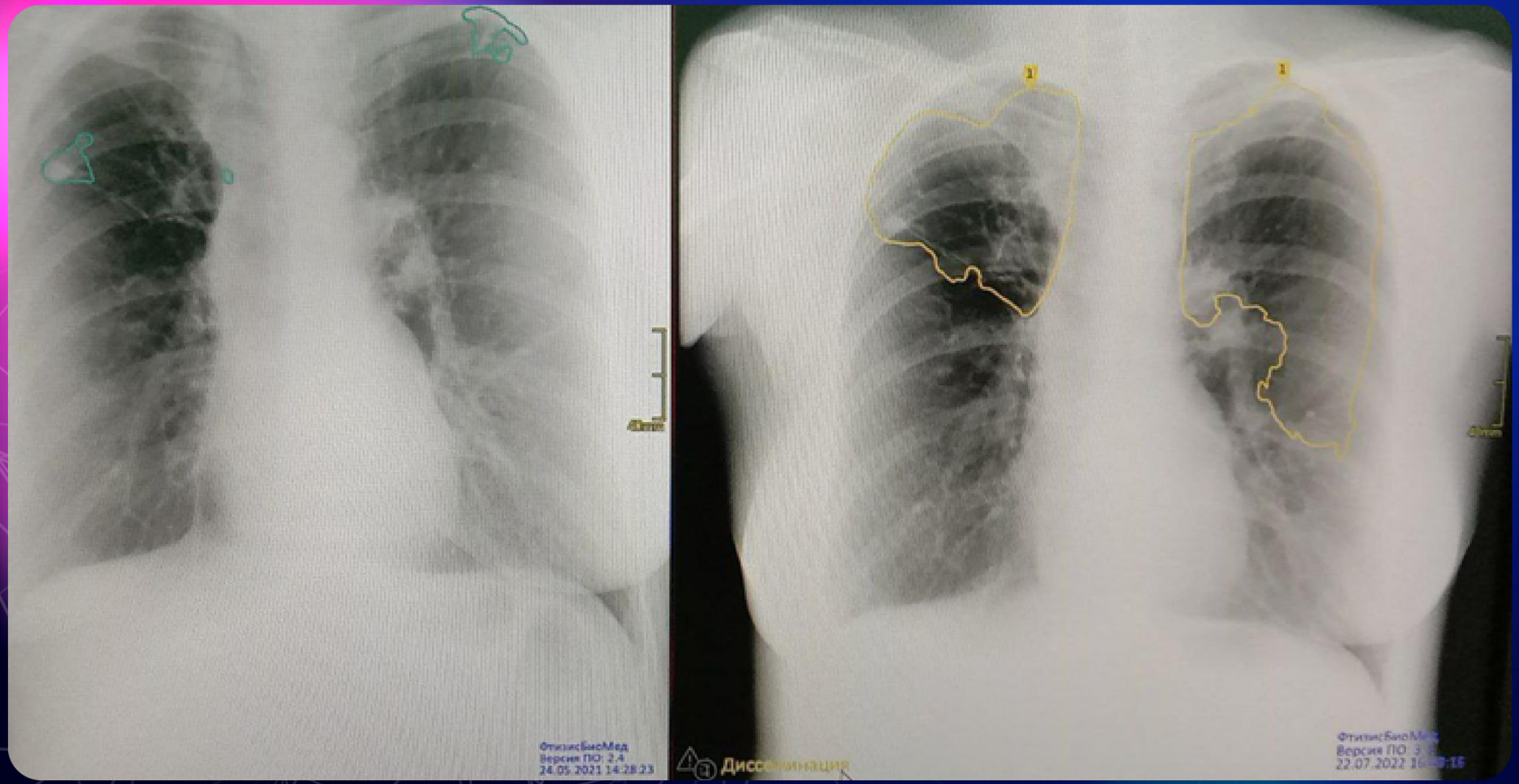


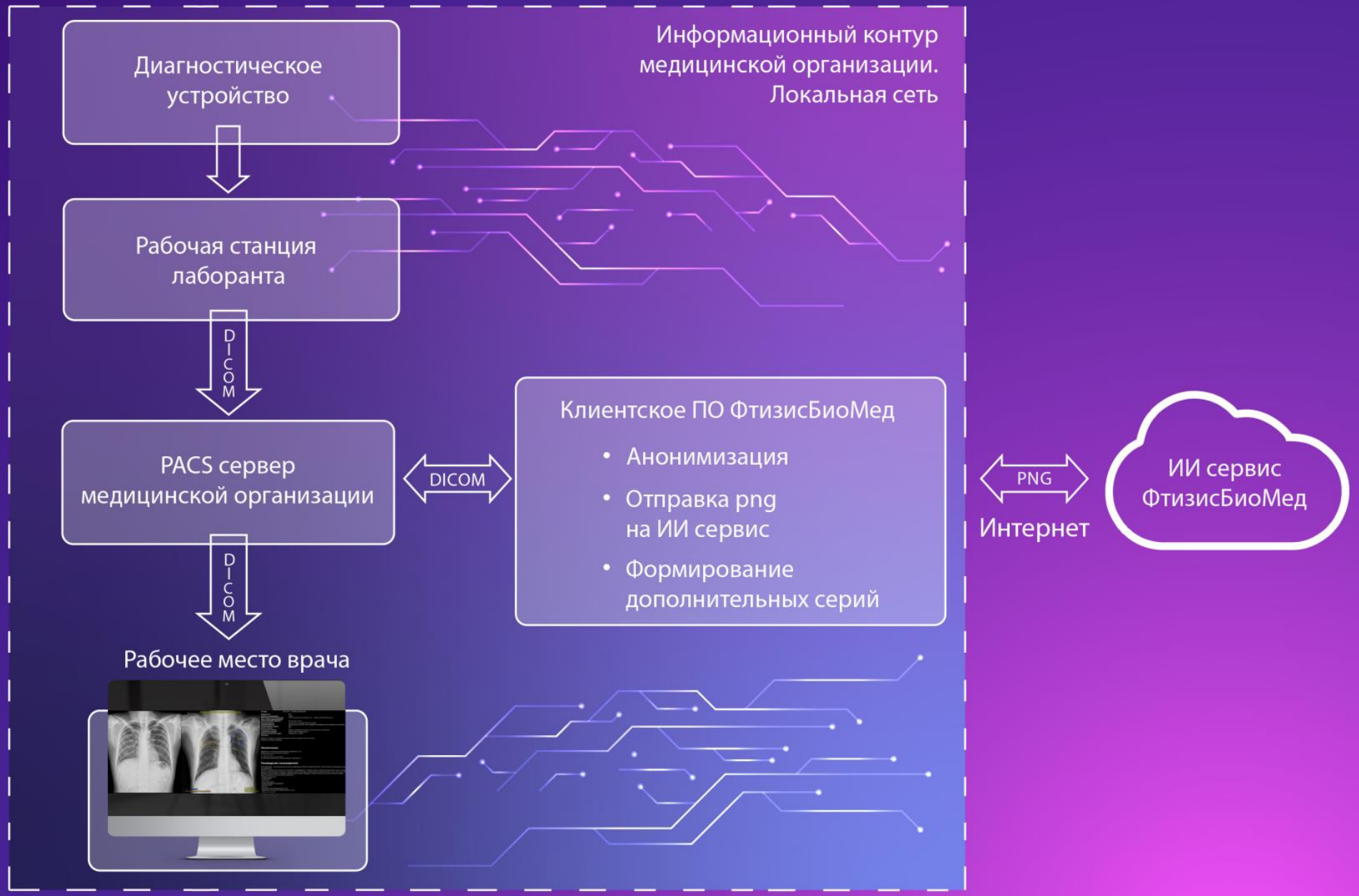
DOCTOR`S REVIEWS OF PHTHISISBIOMED

Evolution of the PhthisisBioMed AI algorithm on lung fluorography from left to right from 2021 to 2022 from the detection of individual small areas of radiological symptoms (focal shadows in tuberculosis) to a comprehensive assessment of a large image area: individual shadow radiological symptoms of focal shadowing are analytically combined into a clinical and radiological syndrome of pulmonary dissemination in tuberculosis (with the output at the bottom of the right image of the name of the clinical and radiological syndrome: dissemination).



DOCTOR`S REVIEWS OF PHTHISISBIOMED




Информационный контур медицинской организации. Локальная сеть
Диагностическое устройство
Рабочая станция лаборанта
DICOM
PACS сервер медицинской организации
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Анонимизация
Отправка png на ИИ сервис
Формирование дополнительных серий
PNG
Интернет
ИИ сервис ФтизисБиоМед

Achievement

GOLDEN MERCURY 2020

The Golden Mercury National Award is an annual competition for small enterprises and exporting enterprises.

IT-STARS 2021

The award is a recognition of the merits of companies and personalities working in the IT field for achievements in the development and implementation of innovations and the implementation of IT projects.

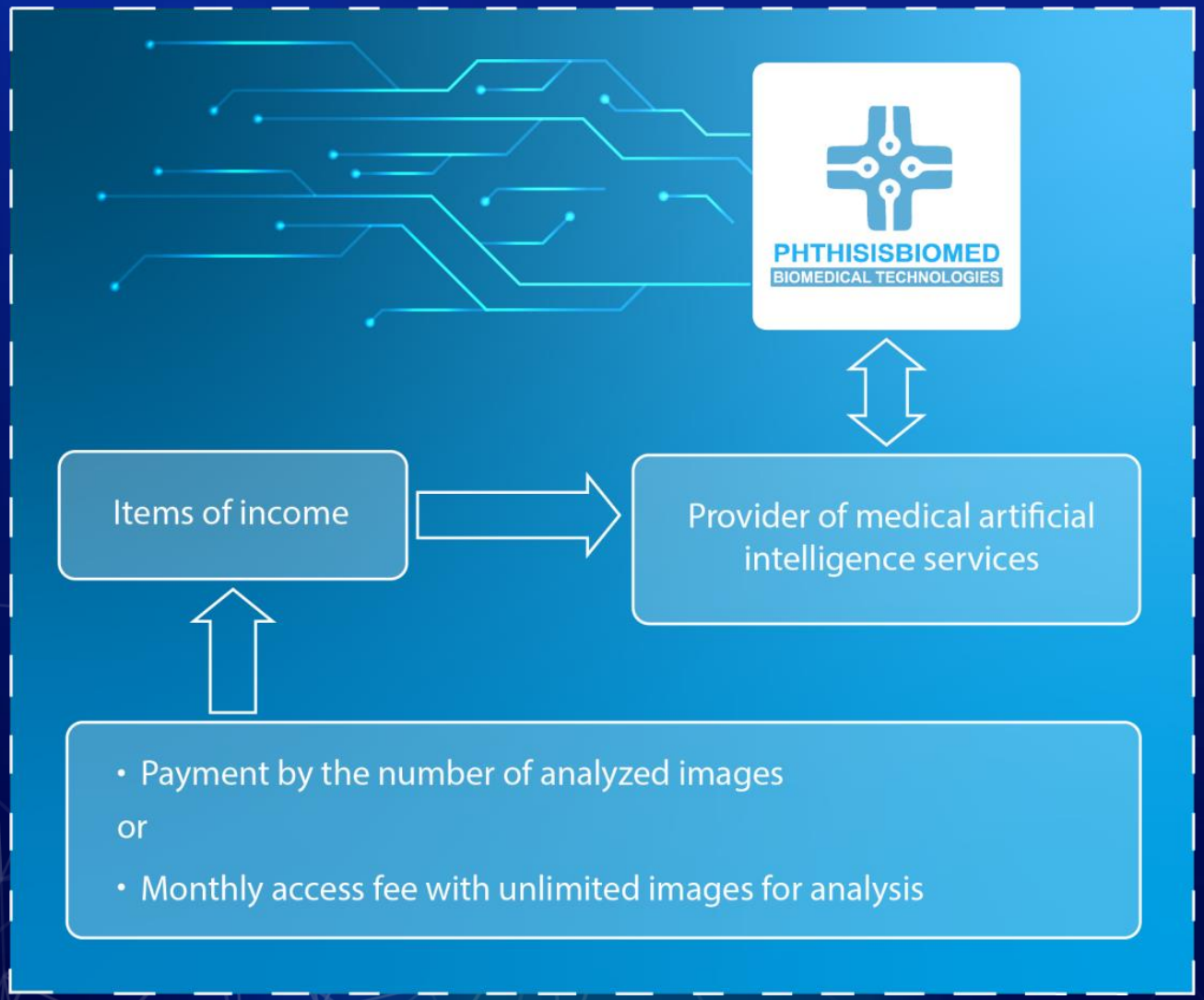
Product

Cloud service for a doctor and radiologist based on medical AI, which allows you to detect pathologies on a fluorogram / radiograph in seconds

Consumption model

System User	Specialist in X-ray diagnostics	
Consumer of the result	Doctor - Specialist in X-ray Diagnostics Organizer of Health Care	
Beneficiaries		
	Specialized state medical institutions	Reduction of costs by reducing the number of diagnostic errors and reducing by 10 times the cost of treatment for early diagnosis of the disease
	Private medical institutions	
	Manufacturers of fluoro-graphic equipment	Increasing competitiveness and the number of treated patients
	Insurance companies	Increase in sales of equipment with AI
Payer	State Medical institutions	Reduction of costs for the treatment of neglected diseases

A business model for a medical artificial intelligence service provider



A business model for a medical artificial intelligence service provider

PHTHISISBIOMED
BIOMEDICAL TECHNOLOGIES

- Provides an interface for the doctor to download the images.
- Analyzes the uploaded source image.
- Gives the doctor an image with marks of probable areas and types of pathologies.

Items of income

- Payment by the number of analyzed images.

or

- Monthly access fee with unlimited images for analysis.

Partners

Kazan Federal
UNIVERSITY

BIGDATA

РАДИОКОМПАНИЯ
ВЕКТОР
СПУТНИКОВЫЕ ТЕЛЕКОММУНИКАЦИИ БУДУЩЕГО

Contacts

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