Rayscape, miss nothing. See everything

DISCOVER THE SMART AI ASSISTANT

\1 Executive Summary

Intro: Who we are?

Founded in 2019, Rayscape is making healthcare smarter with the help of artificial intelligence. Our company consists of a multidisciplinary team that has skills in machine learning, radiology, business development and regulatory affairs.

Real-world use cases have always been our focus: we have built Rayscape as close to radiologists as possible, their feedback being ingrained into our product. This allows us to provide a solution that is helpful in clinical, everyday scenarios – which is what medical professionals want.

Our Mission

The **number of medical images worldwide keeps raising** on a year-to-year basis, while the number of doctors that have to analyze them, **the number of radiologists, is plateauing**. Thus, more pressure is applied on existing doctors, which must deal with an ever-increasing number of images.

In these circumstances, human error, caused by stress or tiredness, can influence results and thus the quality of healthcare services.

Our vision is to empower doctors to reduce errors and keep up diagnostic speed throughout the working day, by assisting them in their diagnosis process. Our Artificial Intelligence algorithms act as a trusted assistant that can alleviate some of the hurdles that radiology presents.

The Whitepaper

We set off to present the key concepts about our solutions and the main science behind them.

Our portfolio is comprised of two products: the chest x-ray analysis assistant and the chest Computed Tomography (CT) analysis assistant.

Chest radiographs are the most performed medical image.

A versatile scan, they are used both for disease screening and monitoring. Often, chest x-rays represent the start of a patient's journey — which makes it that more important to get their analysis right.

Due to only being able to present two-dimensional information, as well as being performed en-masse, it can be very easy for doctors to miss subtle pathologies. The benefit of prioritizing them in order of the case's severity is also large.

With Rayscape we provide the most comprehensive chest x-ray analysis tool on the market, touching on both use-cases and more.

Chest CT is crucial in many diseases' diagnosis, but it is essential to oncological cases.

Since our focus for the CT product is the oncological diagnosis, it is designed around lung nodule detection.

Rayscape can assist radiologists with automated measurements of nodule diameter and volume, removing mundane tasks from the doctors' workflow. Along with this, we understand how time-consuming it is to comparatively analyze the CT scans of recurring patients — therefore we have developed our AI to perform such comparisons automatically.

Using Rayscape on chest CT scans allows medical professionals to focus on the tasks that matter, while automating the laborious parts that drain energy and do not fully make use of their know-how and time.

More details at **rayscape.ai**.
Ask for a free demo at **contact@rayscape.ai**

\2 Products

\\ CHEST X-RAY AI

Our chest x-ray analysis product has the ability to bring any issue to light.

By automatically distinguishing between normal X-rays and those with anomalies, Rayscape enhances patient care by providing doctors with a quick way to triage and prioritize each case.

The most comprehensive tool on the market, Rayscape's chest product provides radiologists with a complex analysis tool that:

- Detects 148 findings on chest x-rays and groups them into 17 different classes of pathologies
- Localizes the pathology groups on the x-ray
- Generates additional images with subtraction and suppression of the bone tissue
- Automatically calculates the cardio-thoracic index
- Identifies SARS-CoV-2 virus-related pathologies and assigns a specific score to each radiograph
- Prioritizes patients according to the identified pathologies

Easy prioritizing, time-saving and diagnostic quality boosting are all benefits of our AI.

We've monitored our tool in practice, by tracking physicians' activities in multiple centres where Rayscape was used daily. We have observed the following:

- Easily triaging patients has saved pneumothorax and acute edema patients complications and even lives
- On average, doctors spend 20% less time analysing chest x-rays when using Rayscape's system
- Doctors are more sensitive to detail when using our tool, the overall True positive rate of a radiologist working together with Rayscape is 74%, a significant improvement from the 70% score, when working alone.

Rayscape's performance on the 17 classes of pathologies is summarised below (validation performed on 10,000 patients not seen before by the algorithms):

Lung Opacity	92.0	Hilar/Mediastinal Disease	87.7
Atelectasis	94.5	Interstitial Disease	81.5
Cardiomegaly	95.7	Lung Lesion	89.4
Consolidation	94.6	Pleural Effusion	96.9
Edema	94.7	Pneumothorax	97.4
Diaphragmatic Dysfunction	85.4	Cifo-Scoliosis	82.0
Emphysema	88.1	Support Devices	99.1
Fracture	90.2	Tuberculosis	98.1
Pleural Other	89.7		

Table 0.1 Area Under the Receiver Operating Characteristic (AUROC) scores of each pathology class

We believe these items are must-haves in a modern healthcare institution, as they contribute to a better healthcare system overall and thus to people's wellbeing.

\\ LUNG CT AI

Detect and track lung nodules by using a smart AI assistant.

Our product equips you with an extra brain that enhances your ability to analyse. It provides you with important information and higher precision so you can achieve faster results.

Rayscape helps identify high-risk patients and notifies physicians by detecting possibly malignant nodules during regular check-ups. Our product enables seamless process optimization, from preventive monitoring to early detection, emergency care, and much more:

- Identifies lung nodules with a diameter between 3-30 mm
- Highlights the presence of nodules on each slice and displays their location
- Automatically measures the diameter and volume of the identified nodules
- Compares lung nodules characteristics between different investigations and generates a report with nodules evolution
- Classifies the nodules as malignant/benign and assigns a set of attributes including texture, calcification, edge, and subtlety to each nodule

- Identifies lesions caused by SARS-CoV2 infection and quantify them volumetrically
- Displays the degree of damage to the lungs following SARSCoV2 infection

Increased accuracy and a significant timesaving for doctors working with our Lung CT Tool

We have analyzed doctors working with Rayscape's Lung CT system in different settings: oncology hospitals, private clinics, and emergency units. We have realized that:

- The time saved by Rayscape is significant, with specialists spending, on average, 30% less time on the CT scan when assisted by our algorithm
- The boost to performance is significant: a doctor that works alone has, on average, 82% sensitivity at detecting lung nodules – if assisted by Rayscape, this is increased up to 88%.

With early detection and quick action, patients can have better outcomes – this is what Rayscape's tool offers to people all over the world.

\3 Evidence

Randomised Clinical Trial NCT05282056: Evidence of a cognitive bias in the quantification of COVID-19 with CT: an artificial intelligence randomised clinical trial

Bogdan A. Bercean, Andreea Birhala, Paula G. Ardelean, Ioana Barbulescu, Marius M. Benta, Cristina D. Rasadean, Dan Costachescu, Cristian Avramescu, Andrei Tenescu, Stefan Iarca, Alexandru S. Buburuzan, Marius Marcu, Florin Birsasteanu

A preliminary survey and retrospective analysis on CT revealed that radiologists, on average, overestimate the percentage of COVID-19 lung involvement by 10.23 ± 4.65% and 15.8 ± 6.6%, respectively. In a subsequent randomised trial, **Rayscape's AI support reduced the absolute overestimation error (P < 0.001) from 9.5% ± 6.6 (95% CI) to 1.0% ± 5.2 (95% CI).** The AI's objectivity was shown to be a valuable complement in **mitigating the radiologist's subjectivity, reducing the overestimation tenfold.**
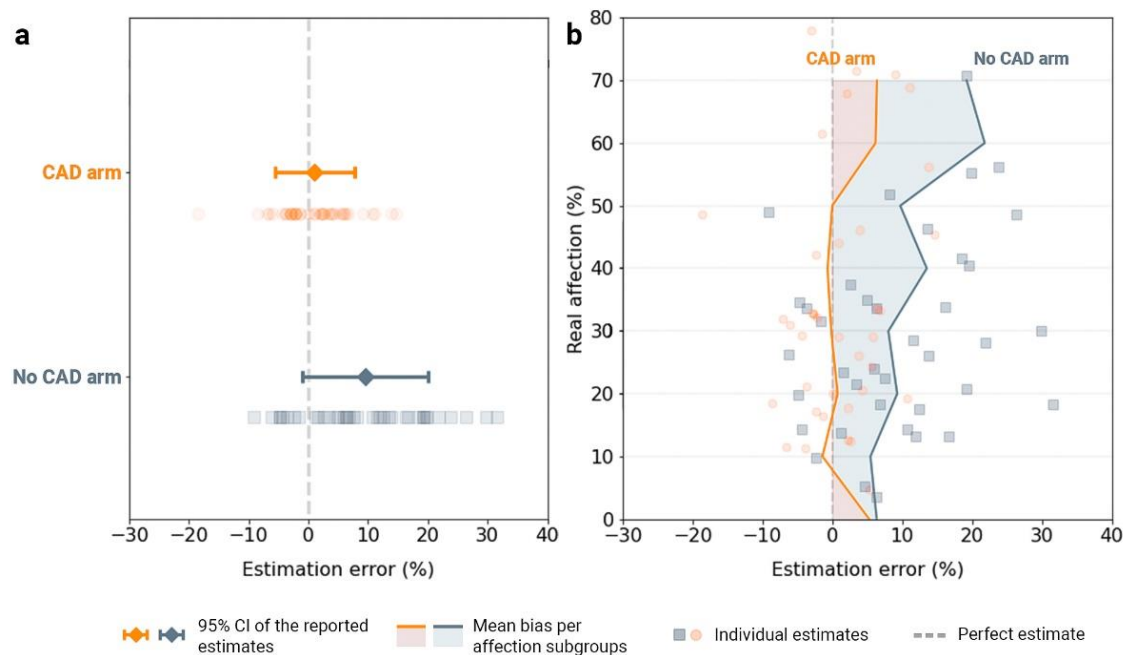
Figure 2 Estimation error of in COVID-19 lung involvement on CT studies with and without Rayscape AI support

Preliminarily, a survey of 40 radiologists, measured the physicians' predisposition to overestimate COVID-19 severity on simulated lung CTs. The following retrospective analysis measured the degree of overestimation on 109 patients from two sites: Pius Brinzeu County Emergency Hospital Timișoara, Romania (HOSP-TM) and ExMed Medical Network, Romania (EXMED). A subsequent prospective randomised clinical trial studied the AI's capacity of reducing the bias over 86 COVID-19 patients that

Subgroup	Patients		Estimation error (95% CI)	P
Overall	109 (100.0%)		15.83 (4.34, 27.32)	< 0.001
Sex				
M	51 (46.8%)		15.41 (4.58, 26.24)	< 0.001
F	58 (53.2%)		16.2 (4.07, 28.32)	< 0.001
Age				
25-67 yrs	55 (50.5%)		13.89 (3.36, 24.43)	< 0.001
67-93 yrs	54 (49.5%)		17.8 (5.63, 29.97)	< 0.001
Severity				
0-24%	55 (50.5%)		12.94 (3.64, 22.24)	< 0.001
50-74%	25 (22.9%)		17.05 (5.58, 28.51)	< 0.001
25-49%	29 (26.6%)		20.25 (6.41, 34.1)	< 0.001

Figure 1 Subgroup analysis of mean estimation error between Rayscape AI support and non-AI support arms on COVID-19 confirmed CT studies

performed a CT investigation between February-March 2022. The patients were automatically split into AI assistance and no AI assistance arms. The primary outcome was the mean error of reported lung involvement.

Observational Clinical Study: Clinical validation of an artificial intelligence model for lung x-ray analysis

A one-group pretest–posttest design study comprising a cohort of 5233 CXRs of over 3000 patients, assessed the Radiologists' sensitivity, specificity, and F1 score, with and without using artificial intelligence in clinical settings. The three main endpoints of the study were concluded as follows: **Radiologists showed evidence of superior sensitivity, non-inferior sensitivity and superior F1 score when using Rayscape.** The average overall difference in F1 was +3.08 (95% CI: -.012, +7.4
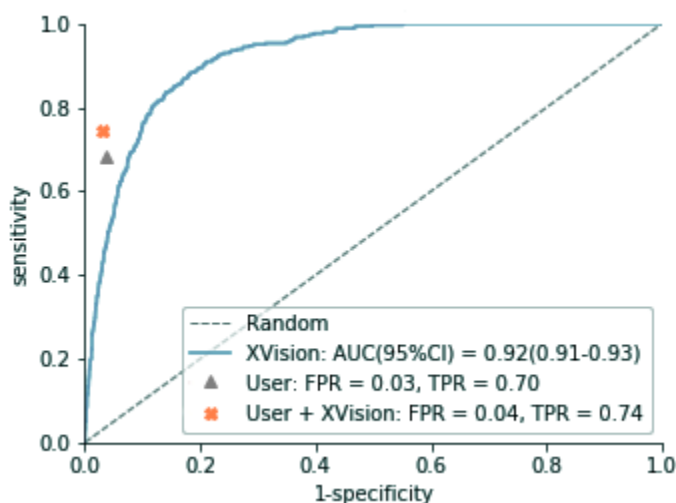

Figure 3 Mean AUROC analysis for 17 pathologies over a cohort of 3000 patients with radiological studies

The study was conducted prospectively between March 2020 and August 2020 at Pius Brinzeu County Emergency Hospital Timișoara, Romania. The sampling was done consecutively with minimum age exclusion criteria of 16 years old. The patients and physicians were blinded to the study's final objectives.

The standard of reference labels for each CXR was set by a panel of three radiologists who annotated each image both independently and collaboratively for conflict resolution when needed. The statistical analysis was double-checked by an independent collaborator.

Reader Study: Time efficiency analysis of thoracic x-ray diagnosis with artificial intelligence support

Octavian Andronic, Bogdan Bercean, Marius Benta, Cristian Avramescu, Andrei Tenescu, Gianina Ardelean, Ioana Micurescu, Dan Costachescu, Florin Birsasteanu

100 x-ray studies were examined by four radiologists with and without Rayscape diagnostic support with a minimum 1-month washout period in between readings. **The results concluded that AI support led to a decrease of 19.4% in mean reading time (95% CI: 25.4, 13.2, P<0.01). At the same time, the radiologists' mean sensitivity increased by +6.1% (95% CI: +2.0, +7.0).**
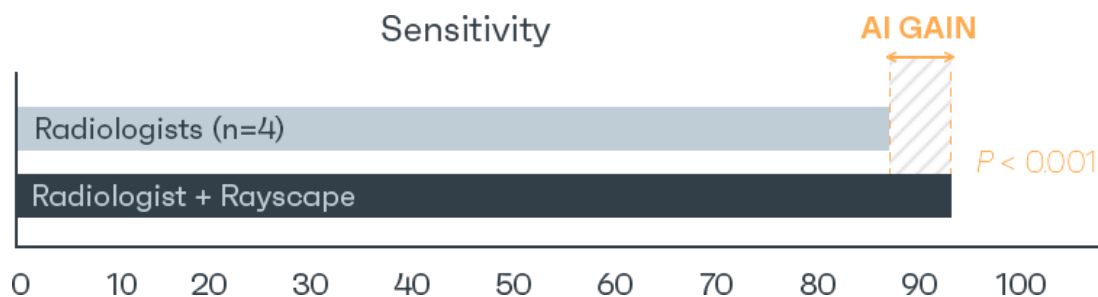

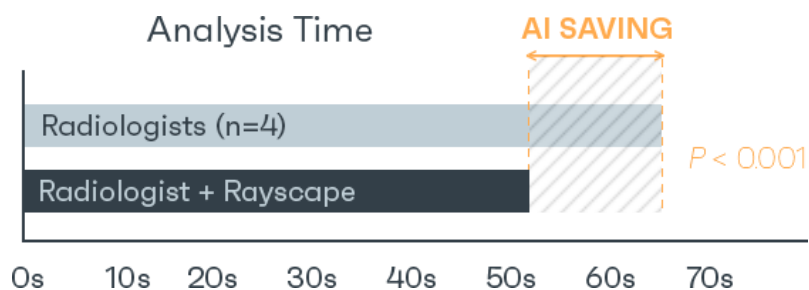*Figure 4 Mean sensitivity measurements of radiologists analysing tuberculosis patients*

Figure 5 Mean analysis time for radiologists diagnosing tuberculosis

Reader Study: Evaluation of an AI system for pneumothorax diagnostic support on thoracic radiographs

Mihnea-Ionuț Nicoară, Marius-Mihail Benţa, Bogdan Bercean, Daniel-Sebastian Vrânceanu, Andra-Patricia David, Felicia Stoica, Florin Bîrsăşteanu

A case-control diagnostic study on 300 patients independently evaluated Rayscape's ability to detect pneumothorax on thoracic x-rays. Five radiologists quantified the AI-generated reports, which led to a measured AUROC score of 95.83 (95% CI: 88.7, 100.0), sensitivity of 96.4 (95% CI: 80.7, 99.2) and specificity of 100 (95% CI: 97.9, 100.0).

\4 Contact us

Get in touch to find out more about us or
schedule a demo: **contact@rayscape.com**

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