CT IMAGE ANALYTICS FOR COVID-19

Alibaba Cloud

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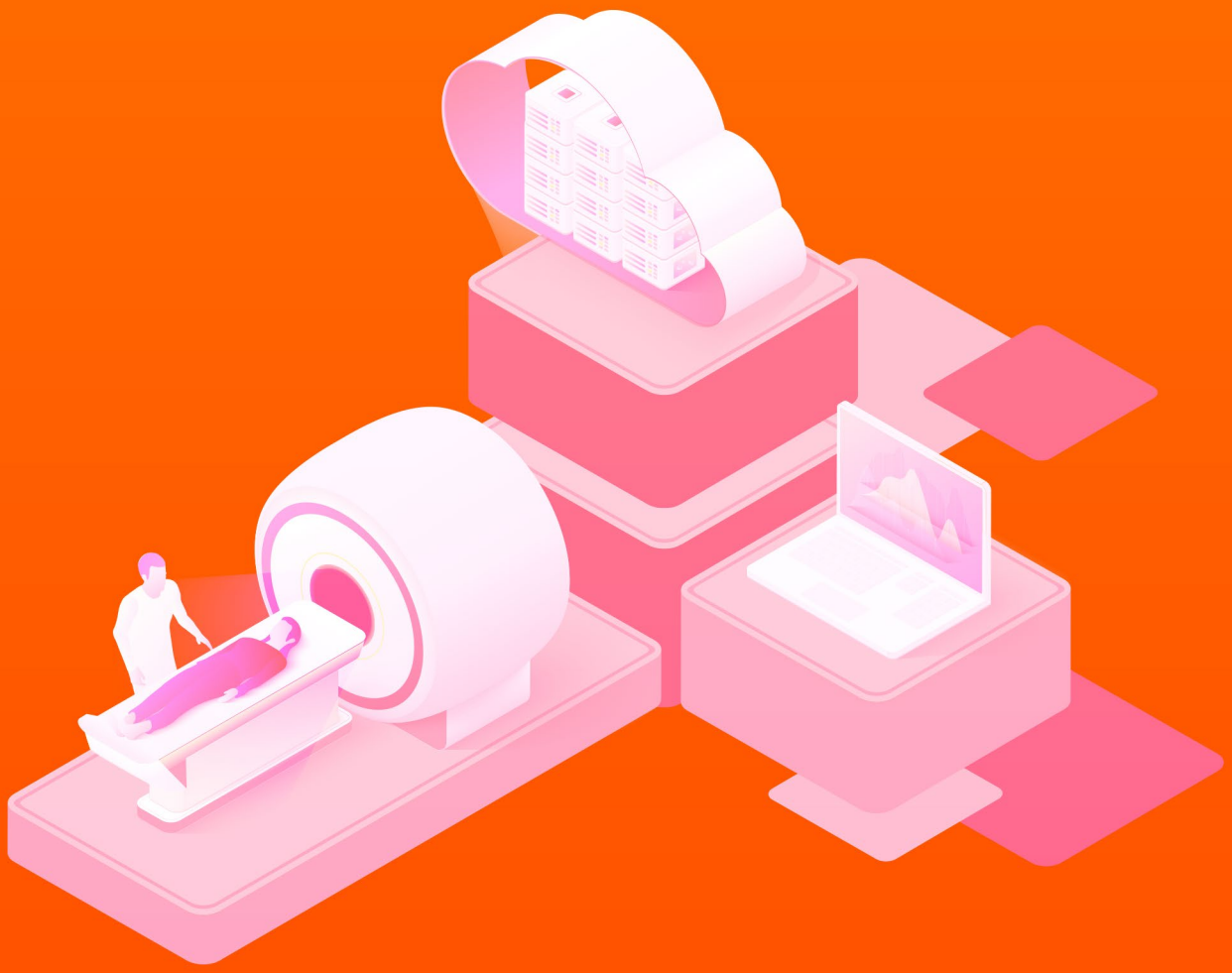

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INTRODUCTION

At Alibaba Cloud, we are responding to the Coronavirus Disease 2019 (COVID-19) by making our powerful cloud-based computational platforms and resources available to researchers worldwide. In doing so, we hope to support these crucial research efforts, helping experts around the world solve the difficulties and public welfare challenges caused by the spread of COVID-19.

In response to this global pandemic, we have released our CT Image Analytics for COVID-19 technology as part of our wider Fight Coronavirus [COVID-19] Program.

A Computed Tomography (CT or CAT) scan creates detailed images of the inside of the body. These scans are used to diagnose and monitor a broad range of conditions, including damage to lungs and other pulmonary disorders.

In this article, we explain how our CT Image Analytics for COVID-19 technology can help provide medical teams with quick, quantitative CT image analysis, avoiding errors caused by fatigue and allowing adjustments to be made to treatment plans.

THE CT CHALLENGE

As COVID-19 spreads exponentially, CT imaging departments are under significant pressure to optimize their performance levels and understand the virus's intricacies. But the number of suspected cases is growing at an often-exponential rate around the world and clinicians are struggling to keep pace with demand.

A CT machine typically produces 300 to 400 chest images per patient per scan and it takes between five and 15 minutes for a doctor to analyze this information. A patient with COVID-19 also receives multiple scans with, on average, more than 2,000 CT images during the entire hospitalization process.

Manually reading and comparing this imaging data for every patient requires a huge amount of effort in optimal conditions. When teams are nearing capacity, however, the individuals assessing these scans are often fatigued and operating under excessive workloads; human error could easily become an issue.

Such analysis also requires specialist knowledge, but we are dealing with a sudden and new viral outbreak. It's simply not feasible to train every single medical practitioner out there on how to detect the virus.

Under the current CT analysis system, there is an inherent need to expedite the analysis process and guarantee the precision of the techniques used.

INTRODUCING CT IMAGE ANALYTICS

When precision and pace are required, CT Image Analytics for COVID-19 can help, significantly improving the testing accuracy and detection efficiency rates.

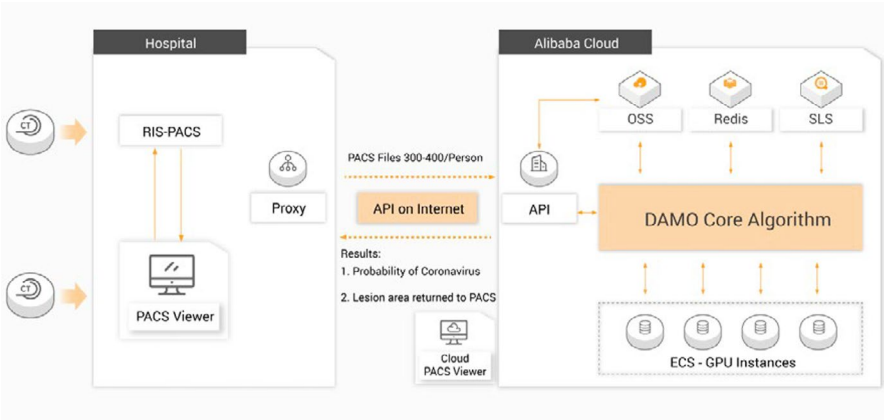
Our CT Image Analytics for COVID-19 technology can assist in identifying characteristics of coronavirus pneumonia in CT scans with about 96% accuracy. It is 60 times faster than human detection methods, taking less than four seconds to run each test and transmit the data.

More than 160 public institutions in China are currently using this technology. As of March 14, 2020, the system has already analyzed more than 240,000 CT image volumes (around 13,000 per day on average).

This technology relies on cutting-edge deep learning algorithms, which have been trained using 5,000 cases to understand the differences between COVID-19 pneumonia, common pneumonia, and other conditions. This advanced technology can also estimate the proportion of pulmonary lesions for those affected by COVID-19.

HOW IT WORKS

The CT Image Analysis for COVID-19 technology benefits from a powerful combination of scalable cloud-based services and accurate deep learning algorithms.



AI-Assisted diagnosis process of COVID-19

The AI system identifies the virus through computed tomography scans of the chest. The algorithm has been trained with data and CT scans from more than 5,000 confirmed coronavirus cases so far and taps into deep learning to study patterns of infection.

Developed by Alibaba Group's research and innovation institute DAMO Academy, a DAMO (Discovery, Adventure, Momentum and Outlook) core algorithm sits at the heart of the CT Image Analytics for COVID-19 technology. This effectively achieves two things: one is to track treatment responses in confirmed cases, and the other is to provide diagnoses for suspected cases.

The algorithm learns the differences between COVID-19 pneumonia, common pneumonia, and other situations. The technology can then predict the probability of COVID-19 pneumonia and common pneumonia based on the input CT images. This CT Image Analysis technology can also output the lesion masks and affected lung volume ratio, helping doctors to effectively measure the development or treatment of COVID-19 patients.

The technology has made several breakthroughs. Speaking in a statement, DAMO's AI-algorithm expert Xu Minfeng explained:[1] "Technically speaking, our continuous refinements have resulted in major improvements in diagnostic precision and speed. With the help of deep learning, our system can also fill in the gaps and provide additional diagnostic precision when there are not enough CT scans available."

Thanks to the cloud-based technology it relies on, CT Image Analytics for COVID-19 is highly scalable, high-speed, and seamlessly exchanges image and case data across different medical systems.

This results in an improved response time, which is important when working as part of a global community to lessen the impact of COVID-19.

Our API connects these cloud-based technologies and the DAMO algorithm, linking the Alibaba Cloud technologies to the hospital's PACS (Picture Archiving and Communication Systems).

CT Image Analytics for COVID-19 is easy to deploy. Using one of two methods medical institutions can:

1. Deploy the CT image analysis algorithms, relying on their existing local cloud imaging applications to store, view and share CT scan images. This installation takes three working days to set up.
2. Deploy a cloud PACS, which provides a complete cloud imaging solution. This installation takes 10 working days to set up.

Once deployed, medical professionals can benefit from a rapid and highly accurate analysis tool, helping them understand the nuances of this disease for every case, avoid errors and keep pace with the pandemic.

Disclaimer: The technology is not intended to, by itself and without the exercise of professional judgment and clinical evaluation, diagnose any medical condition or disease or conclusively indicate the absence of any disease, including COVID-19 and the technology is not a substitute for diagnosis and treatment by a certified medical professional. The technology has not been thoroughly tested, and are not guaranteed in any way to be accurate, useful, sufficient, satisfactory, available, or otherwise fit for any purpose. To the maximum extent permissible under applicable law, the Solution is provided "AS IS," "WITH ALL FAULTS," and without any warranties or service guarantees.

NOTE

The accuracy is calculated using the model trained on about 5000 samples, and is tested based on a sample size of 660 tests with a 1:1:1 ratio of cases of COVID-19 pneumonia, common pneumonia, and other conditions.

IN SUMMARY

The outbreak of COVID-19 is a serious and complex issue. At Alibaba Cloud, we are working with a range of organizations and institutions affected by the epidemic to help minimize its impact. We are also committed to helping the world's researchers through these unprecedented, challenging times.

Our CT Imaging Analytics for COVID-19 technology can assist in identifying the characteristics of coronavirus pneumonia in CT scans with approximately 96% accuracy, where the entire test only takes between three to four seconds.

This technology is one of many available under the Fight Coronavirus [COVID-19] Program, which is intended to support public research institutions worldwide for the research analysis and prevention of COVID-19. You can submit the summary and description of your research project to wanqing.hwq@alibaba-inc.com.

All submissions will be reviewed for technical feasibility, and eligible applicants will be contacted for more details and the next steps of the process. Once the submission is successful, the applicant will get a specific coupon quota according to the project, which is valid for 3 months. The coupon can be used for all Alibaba cloud products, including HPC, ECS, and GPU, excluding marketplace products and 3rd party products.

REFERENCES

1. https://www.alibabacloud.com/blog/595979

ABOUT

Established in September 2009, Alibaba Cloud is the cloud computing arm of Alibaba Group and develops highly scalable platforms for cloud computing and data management.

It provides a comprehensive suite of cloud computing services available from www.alibabacloud.com to support participants of Alibaba Group's online and mobile commerce ecosystem, including sellers and other third-party customers and businesses.

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