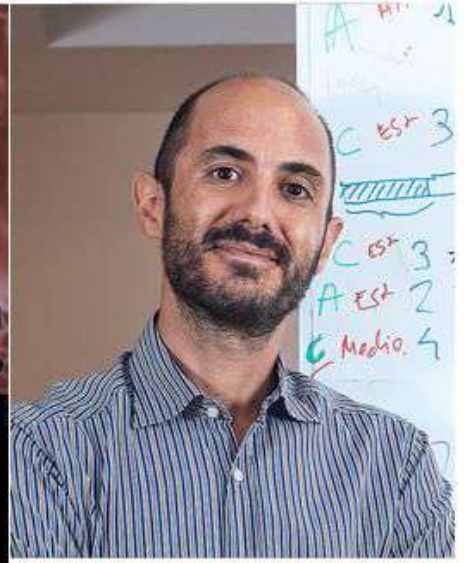
Retos de la Inteligencia Artificial ante el COVID-19 (Charla Online)

Con Andrés Torrubia



ALUMNI UPV

Miércoles

1

abril 2020

Sobre mi

- Teleco UPV (1997)
- #1 Competición conducción autónoma Alibaba
- #2 Competición predicción propiedades moleculares CHAMP

- Divulgación:

@antor

¿Qué es la IA?

→ Aprendizaje automático (*machine learning*)

→ Aprendizaje profundo (*deep learning*)

IA para la detección de brotes (i)

EL PAÍS

TECNOLOGÍA

CORONAVIRUS DE WUHAN »

Un sistema de inteligencia artificial fue el primero en alertar del coronavirus de Wuhan

El algoritmo pronosticó correctamente que el virus saltaría de la región china a Bangkok, Seúl, Taipei y Tokio en los días posteriores a su aparición

Una mujer hace la compra con mascarilla este martes en un supermercado de Pekín. KEVIN FRAYER(GETTY IMAGES)

M. VICTORIA S. NADAL

Madrid · 28 ENE 2020 - 20:25 CET

bluedot

About Us Our Products Education Careers Get in Touch

BlueDot's outbreak risk software safeguards lives by mitigating exposure to infectious diseases that threaten human health, security, and prosperity.

We empower governments, health care providers, and businesses worldwide.

Our Leadership on COVID-19

1st

BlueDot was among the first in the world to identify the emerging risk from COVID-19 in Hubei province and notify our clients via our Insights platform, validating our capabilities as a global early warning system for infectious disease.

BlueDot published the first scientific paper on COVID-19, accurately predicting its global spread using our proprietary models

BlueDot disseminated bespoke, near-real-time insights to clients including governments, hospitals and airlines, revealing COVID-19's movements. Our intelligence is based on over 40 pathogen-specific datasets reflecting disease mobility and outbreak potential.

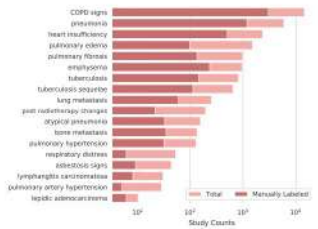
BlueDot delivers regular reporting to answer the most pressing questions, including which countries reported local cases, how severely cities outside of China were affected, and which cities risked transmitting COVID-19 despite having no official cases.

IA para la detección de brotes (ii)

IA para predicción de diagnóstico (i)

https://github.com/BIMCV-CSUSP/BIMCV-COVID-19

PADCHEST: A LARGE CHEST X-RAY IMAGE DATASET WITH MULTI-LABEL ANNOTATED REPORTS



BIMCV
Medical Imaging Databank of the Valencia Region

GENERALITAT VALENCIANA

Fundació per al Foment de la Investigació Sanitària i Biomèdica de la Comunitat Valenciana

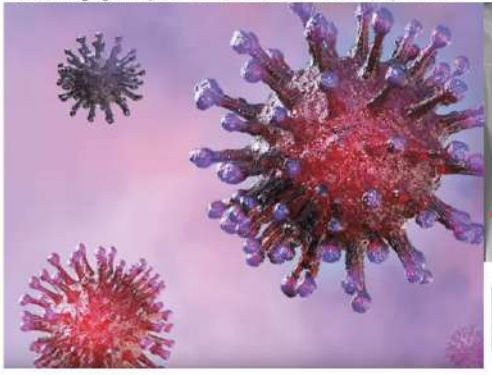
UNIÓN EUROPEA

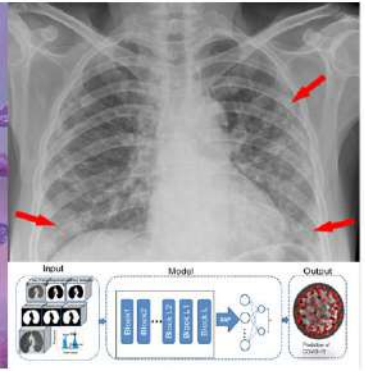
BIMCV-COVID-19

FYI, the content on BIMCV COVID-19 github space is subject to daily updates. Note: please do not claim diagnostic performance of a model without a clinical study! This is not a kaggle competition dataset.

Following common strategies and initiatives emerged from the scientific community at international level, a series of actions are being carried out within the Valencia Region Image Bank (BIMCV) that combines data from the PadChest dataset with future datasets based on COVID-19 pathology to provide the open scientific community with data of clinical-scientific value that helps early detection of COVID-19.

Medical Imaging Example of COVID-19 Rx from medRxiv preprint doi





https://github.com/auriml/Rx-thorax-automatic-captioning/blob/master/image_prediction/Predict_Pleural_Effusion.ipynb

IA para predicción de diagnóstico (ii)

Israel desarrollará App para diagnosticar síntomas del COVID-19

El Ministerio de Defensa de Israel comenzará a probar una App de muestreo de voz para diagnosticar los síntomas del nuevo coronavirus, utilizando inteligencia artificial para identificar la "huella vocal única" de los portadores del virus.

Un equipo de la Dirección de Investigación y Desarrollo de Defensa (DDR&D) del ministerio llevará a cabo la prueba con la empresa emergente Vocalis Health, con sede en Tel Aviv, el desarrollador de una plataforma para teléfonos inteligentes que utiliza biomarcadores vocales y grandes datos para analizar la salud de la población.

VocalisHealth

IA para predicción de diagnóstico (iii)

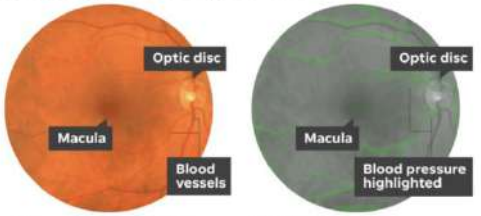
Article | Published: 19 February 2018

Prediction of cardiovascular risk factors from retinal fundus photographs via deep learning

Ryan Poplin, Avinash V. Varadarajan, Katy Blumer, Yun Liu, Michael V. McConnell, Greg S. Corrado, Lily Peng ✉ & Dale R. Webster

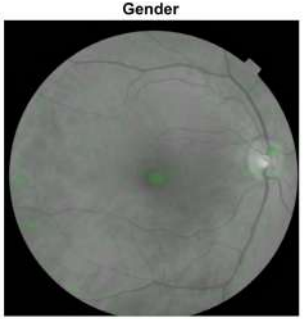
Nature Biomedical Engineering **2**, 158–164(2018) | Cite this article

Google AI can predict heart problems by taking pictures of your eye



- Image of the back of the eye showing the macula (dark spot in the middle), optic disc (bright spot at the right), and blood vessels.
- Retinal image in gray, researchers can focus on blood vessels to determine the health risks associates with a patient's blood pressure.
- Images showed that each cardiovascular risk factor prediction uses a distinct pattern, such as blood vessels for blood pressure and optic disc for other predictions.

Source: Baig, Edward C. "Google Hopes AI Can Predict Heart Disease by Looking at Retinas." *USA Today*, Gannett Satellite Information Network, 19 Feb. 2018, www.usatoday.com/story/tech/2018/02/19/google-ai-can-predict-heart-disease-looking-pictures-retina/344547002/.



Actual: Female
Predicted: Female

IA para descongestión 112, información (PLN)

Carina - 1millionbot.com

¿Tienes preguntas sobre el COVID-19?

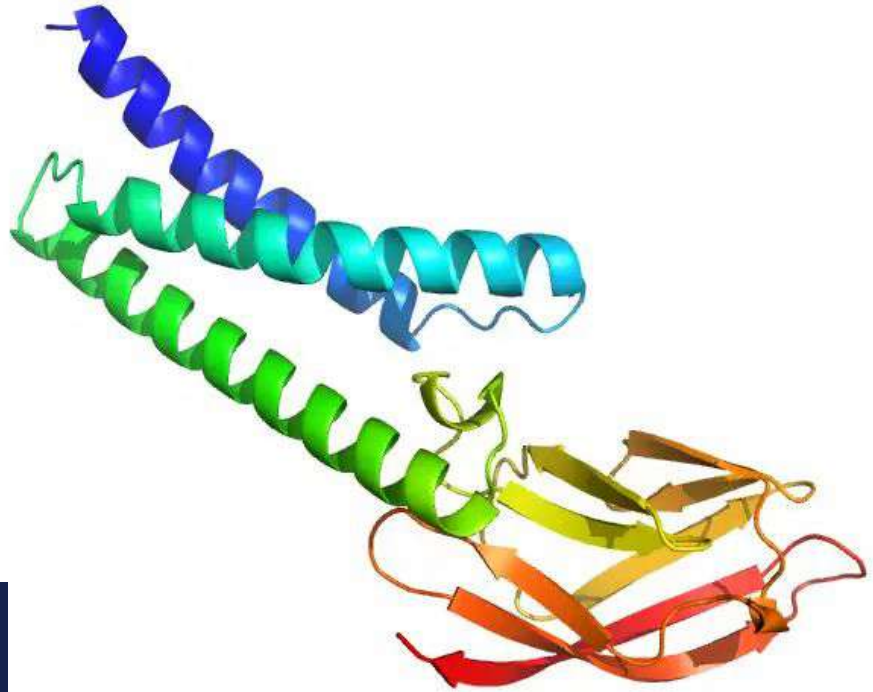
Pregúntale a Carina. Resuelve 9 de cada 10 dudas.

- ¿Qué debo hacer si tengo síntomas?
- ¿Cuántas personas contagiadas hay?
- ¿Cuántas personas se han curado?
- ¿Qué tengo que hacer si vivo con una persona contagiada?
- ¿Cuándo estará disponible una vacuna?
- ¡Y muchas cosas más!

Cesión gratuita a las instituciones públicas

IA para tratamiento (i)

Computational predictions of protein structures associated with COVID-19



Alphafold Open Source

This package provides an implementation of the contact prediction network, associated model weights and CASP13 dataset as published in Nature.

IA para tratamiento (ii)

AI for the repurposing of approved or investigational drugs against COVID-19

Konstantin Avchaciov, Olga Burmistrova, and Peter O. Fedichev*
GERO PTE. LTD., 60 Paya Lebar Road #05-40B Paya Lebar Square, Singapore 409051

The coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has spread globally since 2019 and reached the pandemic level in 2020. We utilized a deep neural network to search for host-target acting antivirals among experimental and approved drugs with potential activity against coronavirus-born diseases. To achieve the goal we searched for gene expression signatures of molecular perturbations most closely resembling the effects of the COBP2 gene knockout since COBP2 is required for replication of a genetically similar virus SARS-CoV. The majority of the top-scoring molecules were already suggested for repurposing as broad-spectrum antivirals. One of the approved drugs from the list, nitazoxanide, has recently demonstrated activity against SARS-CoV-2. We, therefore, urge prompt experimental characterization of the other predictions and highlight the potential of modern AI/ML technologies for prompt identification of human-trial ready therapeutics against the world's most urgent medical needs. We encourage academic and industrial collaborations to validate the results of this research and further develop the most successful compounds.

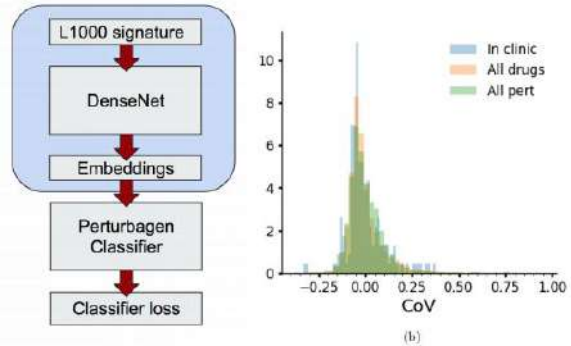


TABLE I: The top-scoring drugs according to the predicted antiviral effect.

Molecule	CoV-Score	MoA	Status	Direct evidence	Indirect evidence
Top LINCS L1000					
Brefeldin A		Arf inhibitor	N/A	$EC_{50} = 21.4\mu M$ (SARS-CoV) [12]	Herpes simplex, Newcastle disease, papillomavirus and polyomavirus [13]
Approved drugs					
Niclosamide	0.57	N/A	Approved for the treatment of tapeworm infections	$EC_{50} = 3.12\mu M$ (SARS-CoV) [14]	Rhinoviruses (HRV), influenza virus, Chikungunya virus, Zika virus [15]
Nitazoxanide	0.35	N/A	Approved antiprotozoan, currently is in clinical trials for influenza (Phase 3), rotavirus or norovirus (Phase 2), Hepatitis B and C, HIV	$EC_{50} = 2\mu M$ (MERS-CoV) [16], $EC_{50} = 2.12\mu M$ (SARS-CoV-2) [8]	Influenza $EC_{50} = 0.2 - 1.5\mu M$, syncytial virus, parainfluenza, rotavirus, norovirus, hepatitis B, hepatitis C, dengue, yellow fever, Japanese encephalitis virus and HIV [17]
Afatinib	0.34	EGFR	Approved for the treatment of non-small cell lung carcinoma	Drugs with the same MoA were effective in in vivo models of SARS-Cov	N/A
Ixazomib	0.33	Proteasome inhibitor	Approved for the treatment of multiple myeloma	Another inhibitor with the same MoA suppressed replication of SARS-Cov at $EC_{50} < 1\mu M$	Another inhibitor with the same MoA suppressed replication of influenza A virus at $EC50 < 1\mu M$
5 more drugs	0.29 – 0.34	Known MoA	2 approved, 3 withdrawn	N/A	Some active against Polyomaviruses
Reserpine	0.29	Vesicular monoamine transporters antagonist	Natural compound. Used as an antihypertensive (in combination). Was used as an antidepressant and to treat dyskinesia in Huntington's disease	$EC_{50} = 3.4\mu M$ (SARS-CoV) [18]	N/A
Investigational drugs					
Obatoclax	0.33	Mcl-1 (Bcl-2 family) inhibitor, senolytic	Phase 2 clinical trials for leukemia, lymphoma, myelofibrosis, and mastocytosis	N/A	Was effective in vitro against Influenza A and Zika viruses ($EC_{50} < 0.1\mu M$)
NVP-AUY922	0.23	Hsp90 inhibitor	Phase 2 clinical trials, oncology	N/A	Was effective in vitro against Influenza A and Measles ($EC_{50} < 0.1\mu M$)
7 more drugs	0.20 – 0.38	Known MoA	Phase 1/2	N/A	2 some active against Influenza and Dengue

El futuro post-covid19

Telemedicine is essential amid the covid-19 crisis and after it

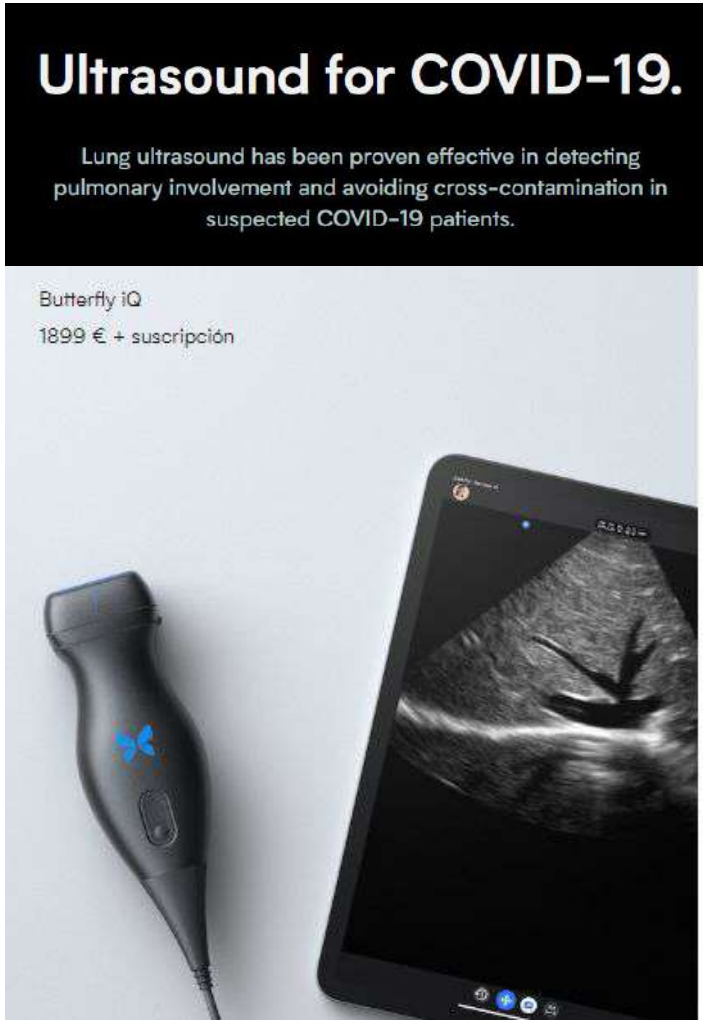
Online health care helps patients and medical workers —and will be a legacy of combating the novel coronavirus, says Eric Topol of Scripps Research

Mar 31st 2020

Online health care helps patients and medical workers—and will be a legacy of combating the novel coronavirus, says Eric Topol of Scripps Research

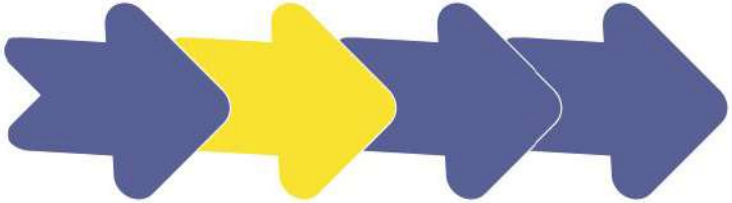
This is a by-invitation contribution to the series "The world after covid-19". More articles are at Economist.com/openfuture

FOR MILLENNIA the laying-on of hands represented the essence of the doctor-patient relationship: taking the pulse, tapping on and listening to the chest, feeling lumps—the human touch of the carer. But the covid-19 pandemic is accelerating the transition to a new model of remotely delivered health care that embraces the benefits of digital and data technologies. It is not a solution to the current crisis, but it will be one of its lasting consequences.



Impacto económico

Adopción de la IA



01 **IA en Internet**
Empresas de Internet explotando datos de sus usuarios

02 **IA en los Negocios**
Negocios tradicionales buscando productividad

03 **IA Perceptual**
Dispositivos con sensores nos hacen la vida más fácil

04 **IA Autónoma**
Sistemas se mueven e interaccionan en el entorno haciendo tareas humanas