REVOLUTIONARY AUTOMATIC DETECTION OF OSTEOPOROSIS

Artificial Intelligence in the service of Medicine

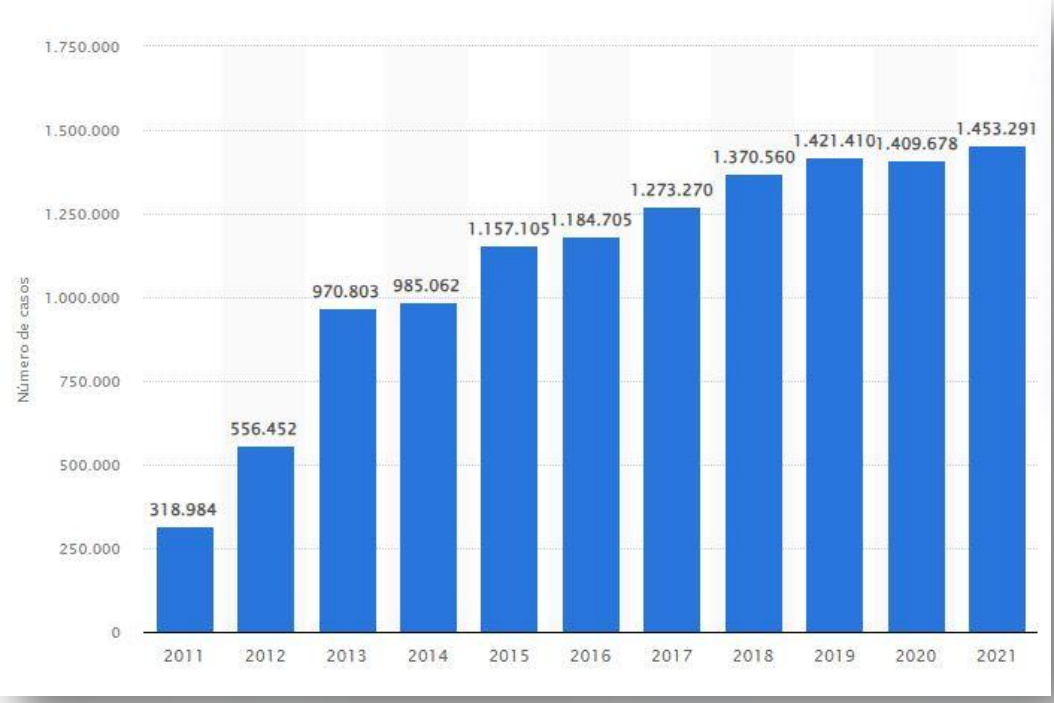
TRANSMURAL
BIOTECH

WHAT IS quantusOS?

quantusOS is a non-invasive, fast and easy-to-use test for the automatic detection of osteoporosis.

From a hip X-ray in AP (anteroposterior) view, being valid the whole hip view (two femurs) or half hip (one femur), it is able to detect the risk of osteoporosis. Its technology is based on the quantitative analysis of femur texture.

Number of cases of osteoporosis registered in Spain from 2011 to 2021.



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This study was carried out thanks to the collaboration of the Hospital Universitario Ramón y Cajal in Madrid, Spain. The images were acquired by radiologists following the image acquisition protocol approved by the hospital's ethics committee.

Our expertise is focused on developing innovative medical technologies, based on image analysis and processing, to provide healthcare professionals with additional information that current technologies cannot provide and substantially improve the quality of service they can offer to the patient.

DEVELOPING TOMORROW'S MEDICAL TECHNOLOGIES TODAY

A REVOLUTIONARY SOLUTION FOR RESOURCE OPTIMIZATION

quantusOS classifies images into different classes according to the risk of osteoporosis. quantusOS has been designed as a tool to assist clinicians, which can be used at different points in clinical practice.

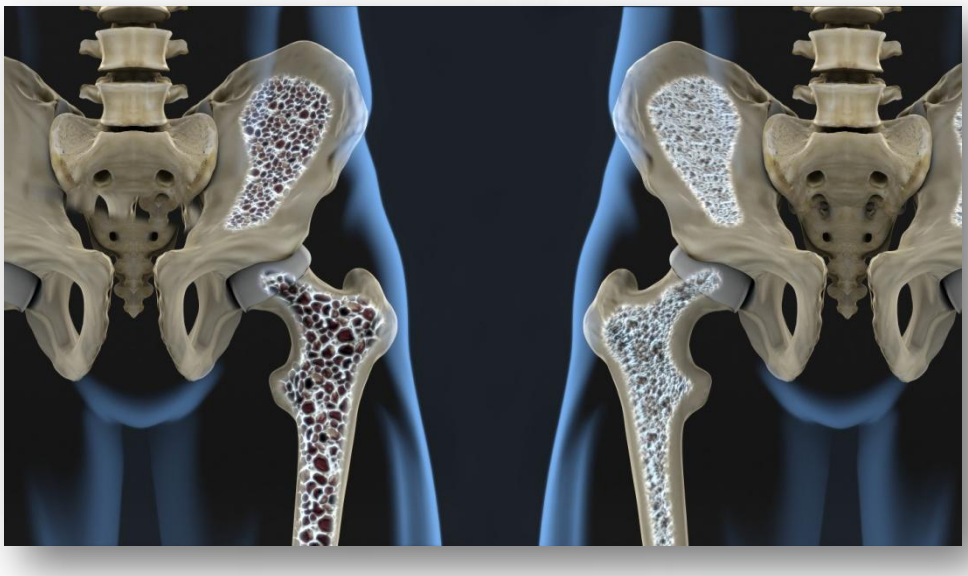
A good example would be to use it as a densitometry reduction tool or as an incidental screening tool to detect osteoporosis in non-risk patients who have an X-ray performed for other reasons.

ANALYSIS AND CLASSIFICATION OF OSTEOPOROSIS

Preliminary tasks, such as dividing images into single femurs, excluding femurs with prostheses, and cropping the images from the top of the femur, were performed to improve the training of the prediction algorithm.

Division into two femurs

To obtain images with individual femurs, an automatic process was implemented using a Deep Learning algorithm. This algorithm classified the images as "one-sided" or "two-sided" of the pelvis, based on the presence of one or both sides.

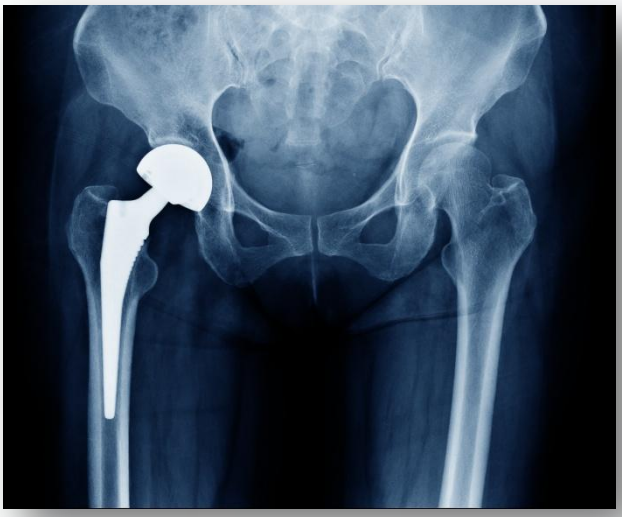


Images classified as "two-sided" were vertically divided into two separate images (right side and left side). This approach transformed the entire database into images of a single femur, facilitating model training and accuracy.

ANALYSIS AND CLASSIFICATION OF OSTEOPOROSIS

Prosthesis detection

In order to avoid confusion in the osteoporosis prediction algorithm, an additional Deep Learning algorithm was employed. This algorithm automatically classified femurs as "prosthetic" or "no prosthesis" and was applied to all images in the dataset. Femurs classified with prostheses were automatically discarded from the database.



Femur trimming

A Deep Learning algorithm was used to automatically segment the region of interest (ROI), delineating the top of the femurs. This process allowed each femur to be trimmed into a square around the automatic delineations, facilitating data preparation for the osteoporosis prediction algorithm.

ANALYSIS AND CLASSIFICATION OF OSTEOPOROSIS

Osteoporosis prediction

To predict osteoporosis, a Deep Learning algorithm was trained and evaluated using all cropped images along with their associated results. Training was performed on 80% of the dataset, and testing was performed on the remaining 20% to evaluate classification performance.

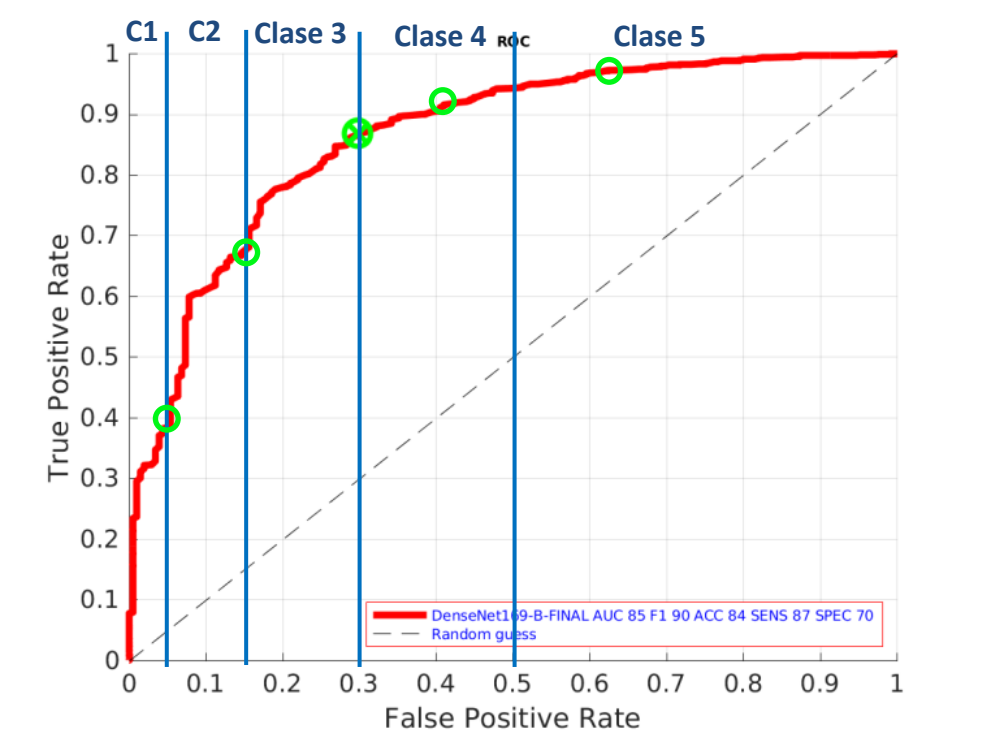
In addition, the possibility of creating a model that is applied with high sensitivity or high specificity criteria as needed, with the objective of maximizing the detection of positives or negatives, respectively, was highlighted.

Reliability of quantusOS per class

	AUC	F1 - Score	ACC	SENS	SPEC	PPV	NPV
Class 1 (>95% SPEC)	86.6	55.1	47.0	38.4	95.1	97.8	21.7
Class 2 (>85% SPEC)		79.2	70.0	67.2	85.4	96.2	31.8
Class 3 (>70% SPEC)		90.4	84.3	86.9	70.2	94.2	49.0
Class 4 (>85% SENS)		92.1	86.7	92.2	57.6	92.3	55.9
Class 5 (>95% SENS)		93.3	88.2	97.3	37.6	89.7	71.3

*Specificity: probability that the test identifies as non-diseased those who are not ill.*Sensitivity: probability that the test identifies as diseased those who are in fact diseased.*PPV and NPV: Positive Predictive Value and Negative Predictive Value.

AUC ROC curve for osteoporosis detection



HOW TO USE quantusOS?

Using quantusOS is easy, it only requires 3 steps:

Step 1: Acquire an X-ray.

quantusOS requires a radiograph in DICOM format. There is a simple guide available within the application that shows how to perform the image acquisition.

Step 2: Use the quantusOS medical application to analyze the image. This application allows you to send the image to be analyzed to the system.

Step 3: Get the result of the application in a few minutes.

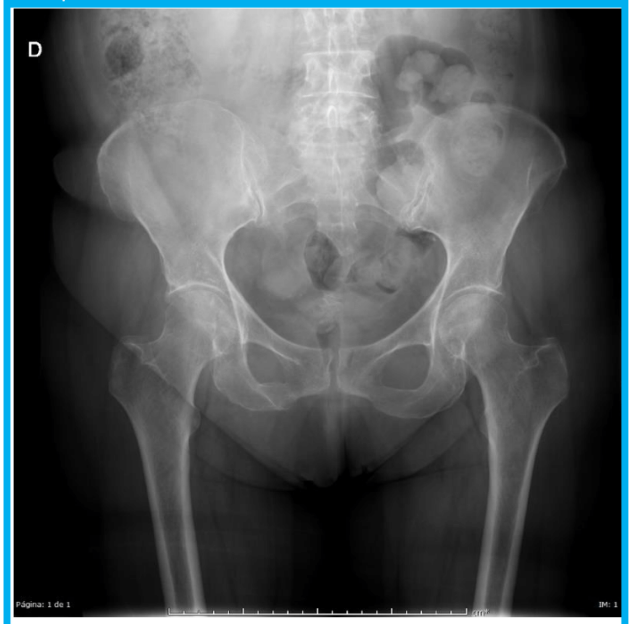
Test Osteoporosis

quantus OS BETA

Patient & Provider Information

PATIENT NAME:	PATIENT NAME:
PATIENT ID:	REFERRER/ORDER CLINICIAN:
QUANTUSOS ID:	REPORTA DATE:

Sample information



US ACQUISITION DATE: (dd/mm/yyyy) **03/11/2023**

REQUEST DATE: (dd/mm/yyyy hh:mm) **03/11/2023 17:42**

Sample information

quantusOS ID:

TRANS-1

RIGHT FEMUR RISK CLASS: 5

LEFT FEMUR RISK CLASS: 4

PATIENT FEMUR RISK CLASS: 5

TEST DESCRIPTION: Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis vel elementum nisl. Proin nec eleifend erat, vel egestas libero. Maecenas pharetra accumsan massa, ut pretium orci pellentesque eget. Praesent ut metus metus. Praesent sit amet dui et lectus fermentum venenatis ac sed nisi. Aliquam sit amet laoreet nibh. Vestibulum euismod nisl ac neque dictum venenatis.

quantusOS™: Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis vel elementum nisl. Proin nec eleifend erat, vel egestas libero. Maecenas pharetra accumsan massa, ut pretium orci pellentesque eget. Praesent ut metus metus. Praesent sit amet dui et lectus fermentum venenatis ac sed nisi.

Authorized signer/s

TRANSMURAL BIOTECH

Technical responsible:
Transmural Biotech S.L.

AN INNOVATIVE MEDICAL SOLUTION

- **Unrestricted 24-hour access:** Through an internet connection it is possible to use quantusOS and review the results at any time and from anywhere.
- **No installation required:** no downloading of any software.
- **Great compatibility:** quantusOS is compatible with most web browsers as well as devices used in medical practice.

quantusOS OFFERS HIGH VALUE FOR MONEY

- **NO initial investment in infrastructure required!**
- **Pay-as-you-go: Pay only for each analysis you order!**
- **Bring more value to your practice and increase your profits!**

www.quantusOS.org

Precise

Effective

Fast

If you want to try it, Contact us!

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