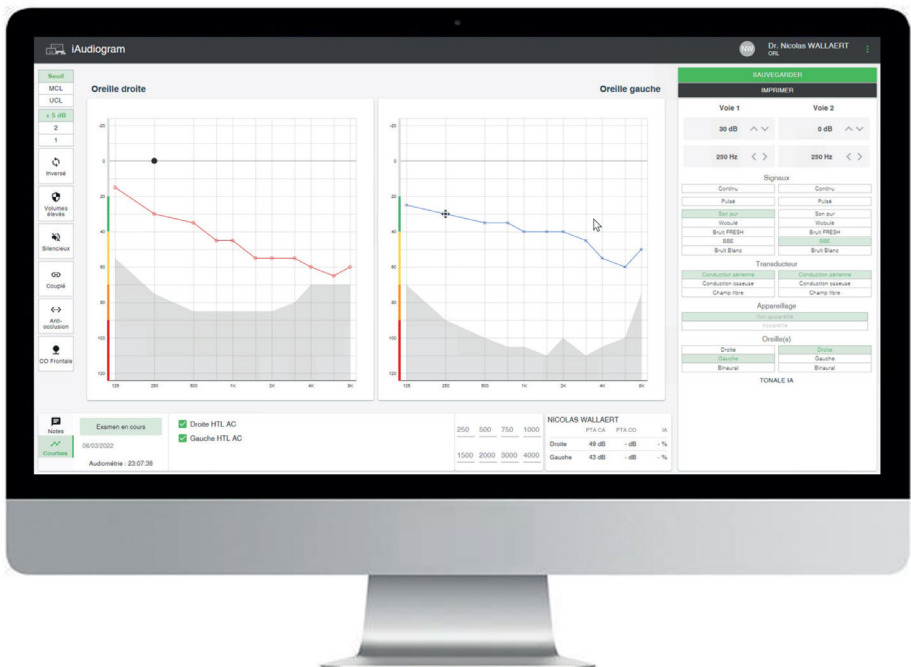# iAudiogram

Automated Audiometry Platform using Artificial Intelligence

Saves time.

Precise & Robust.

Cost-effective

Developed by practitioners, for practitioners.

Our unique expertise

1 in 2 people has never tested their hearing.

Today, the demand for hearing care remains largely unaddressed.

To address this major public health issue, iAudiogram automatically performs auditory functional explorations using Artificial Intelligence, **saving precious medical time for all hearing specialists** : ENT doctors and audiologists.

iAudiogram

Automatise auditory functional explorations.

Guarantees precision and reliability of audiometric results.

Provides an efficient and time-saving solution for hearing professionals.

Offers quality hearing care access in a timely manner to everyone, everywhere.

The team

Nicolas WALLAERT (PhD, Aud. M.Sc, Ing)
Founder & President

MSc Audiology
Audioprothésiste DE
PhD Ecole Normale Supérieure, Paris (PSL)
Acoustic Engineer

Antoine PERRY (ENG)
Technical Director

Full Stack Engineer

Nihaad PARAOUTY (PhD, Ing)
Scientific Director - Clinical Studies and Clinical Support

PhD Ecole Normale Supérieure, Paris (PSL)
& University of Cambridge
Post-doc New York University & Inserm

Hadrien JEAN (PhD, Ing)
Director of Innovation

PhD Ecole Normale Supérieure, Paris (PSL)
Teacher & author

Lamisse ZEGHOUDA (Eng)
Quality and Regulatory Affairs Manager

Engineer
MSc biotechnology & molecular pathology

Eric WALLAERT
Commercial & Marketing Director

ESSEC
International expertise

Artificial Intelligence at the service of clinical audiology (IA)

Artificial Intelligence offers new perspectives in the field of clinical Audiology.

Several years of Research & Development, accompanied by academic, scientific and medical collaborations have led to the creation of a unique clinical solution: the iAudiogram.

iAudiogram optimizes patient care management : by freeing up key medical time through the automation of audiometric tests, iAudiogram allows hearing specialists to concentrate solely on patients.

4 International patents filed

Winner of the i-Nov competition, organized by the French government & BPI France

8 clinical validation studies

Scientific collaborations with renowned clinicians and researchers

Scientific Committee

Composed essentially of Doctors, University Professors and Researchers, they are leaders in their fields.

Prof. Benoit GODEY
PU-PH, MD, PhD, ENT, Head of the ENT department @ CHU de Rennes

Dr. Laurent SEIDERMANN
MD, ENT President of ENT syndicate in France @ SNORL

Prof. Florence ROSSANT
PhD, PU Signal processing @ ISEP

Dr. Diane LAZARD
MD, PhD ENT & auditory scientist @ Institut de l'Audition

Prof. Ilaria RENNA
PhD, PU in AI and human/robot interaction @ ISEP

Collaborations and funding

Our scientific collaborations include many institutional partners, both in the medical field and in auditory research.

Our scientific committee, as well as all our institutional partners have allowed us, in total independence, to develop and offer you the iAudiogram solution.

Patient care management with iAudiogram

Installation in booth — **2**

Consultation with the hearing specialist — **4**

1 — Appointment scheduling

3 — Hearing assessment by **iAudiogram**

Screenshot of **iAudiogram**

iAudiogram solution
with AudioPod

The future of professional audiometry

All the clinical and diagnostic audiometry tests of a traditional audiometer automated for the 1st time in the world by Artificial Intelligence, scientifically and clinically validated, in a compact, computerized, and easy to use equipment.

The AudioPod can be used both in person and remotely through tele-audiometry.

classe IIa CE

iAudiogram features

Pure tone audiometry

Air and bone conduction with automated masking. Automated pure tone audiometry by AI.

Speech audiometry in silence

SRT/SDT (Words, Sentences, and Logatomes) with masking. Automated speech audiometry by AI.

Speech audiometry in noise

SRT/SDT (Words, Sentences, and Logatomes). Automated speech audiometry by AI.

Automated reports

Automated reports by AI, customizable and exportable

Audiological history

General, otological, surgical and medical history.

ISO and ANSI compliant

Clinical and scientific validation.

Tele-supervision

Automated AI procedures supervised by our audiometric experts.
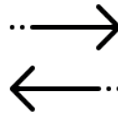
Tele-expertise

Collaborate more easily with your colleagues and referrers.

Telemedicine

remote audiometric assessment to be more accessible to your patients.

Investigation of supraliminal disorders

Comfort and Discomfort Thresholds.

Weber test

Determine the type of hearing-loss.

Video-otoscopy

Can be used for tele-expertise, AI validation of audiometry feasibility

And many more!

Pure Tone Audiometry

The Reference for functional auditory exploration

Manual tests require a hearing professional with limited medical time and offer only a discrete frequency estimate.

Automatic tests enable a continuous frequency estimate, but lack precision (use of predictable or recurrent stimuli). Also, time consuming and incompatible with clinical use.

Benefits of **iAudiogram** :
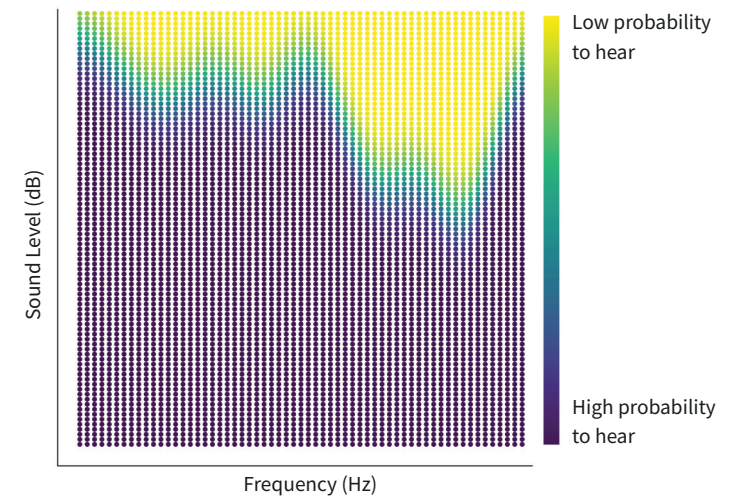Complete, accurate and repeatable assessments
Fully automatised
Efficient and time saving
Compatible with clinical use

Pure Tone Audiometry with Artificial Intelligence

Through our Machine Learning algorithms, iAudiogram automatically performs your patient's pure tone audiometry by estimating the probability of hearing a series of intensity and frequency combinations.

Following an initialization phase, our Artificial Intelligence models test your patient with targeted intensities and frequencies to converge as quickly as possible to a precise estimation of thresholds to the nearest dB.

Test time ≈ 10 minutes. Its entire automation enables you to focus on what matters most: your patients.

Comparison of a manual audiometry to iAudiogram

Perfect agreement between thresholds obtained manually & automatically using iAudiogram
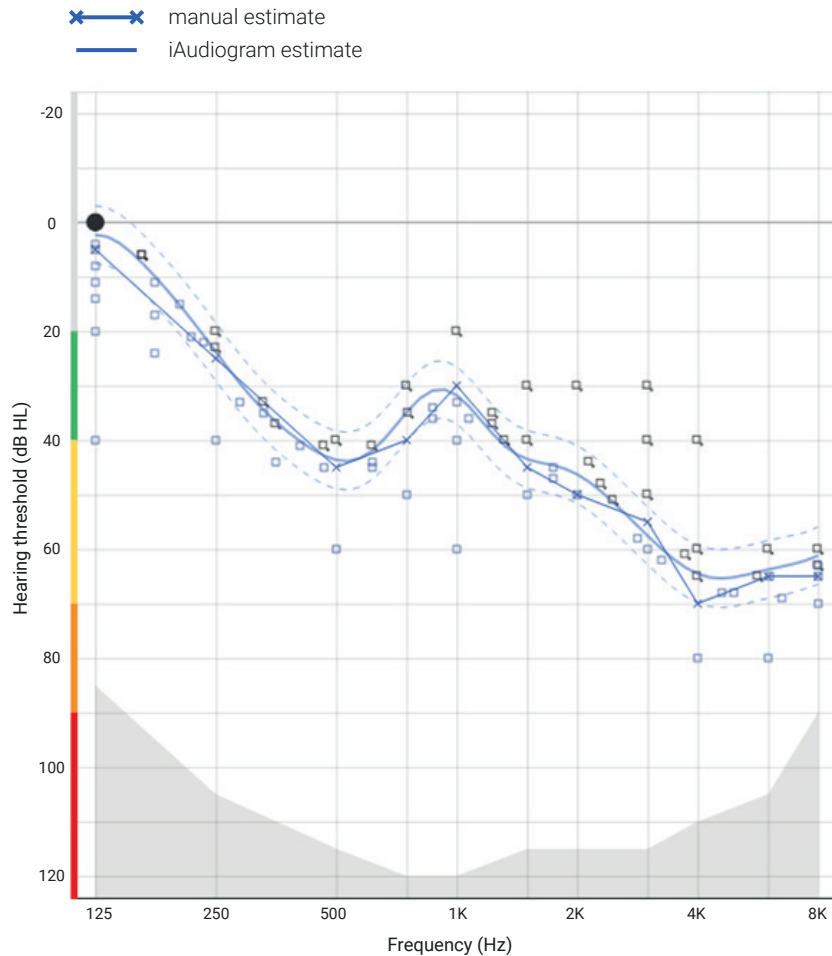
Screenshot of **iAudiogram**

Advantages of iAudiogram Pure Tone Audiometry

+ Efficient
Fully automated procedure
Medical time needed reduced to 0

+ Accurate and repeatable
Audiometric thresholds measured with 1 dB precision
Unparalleled accuracy and repeatability
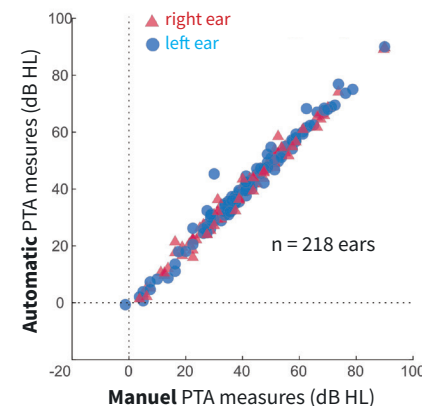Solution for non-cooperative patients

+ Complete hearing assessment
Continuous frequency threshold measures
Estimation of uncertainties associated with thresholds
Extension of assessment, include high frequencies

+ Reliability of results
Sensitivity of threshold measurements = 98.9%
Specificity of the measurements = 96%.

WALLAERT N., Perry A., Jean H., Paraouty N., Godey B. Under submission (2022)

Excellent repeatability = -0.3 dB HL ± 3.6 test/retest comparison using iAudiogram

Manual pure-tone average = Automatic pure-tone average, shared variance ≈ 98%

Speech Audiometry

Central screening element in clinical practice

Manual tests require a hearing professional with limited medical time but offer complete information: open lists, phonetic confusion analysis.
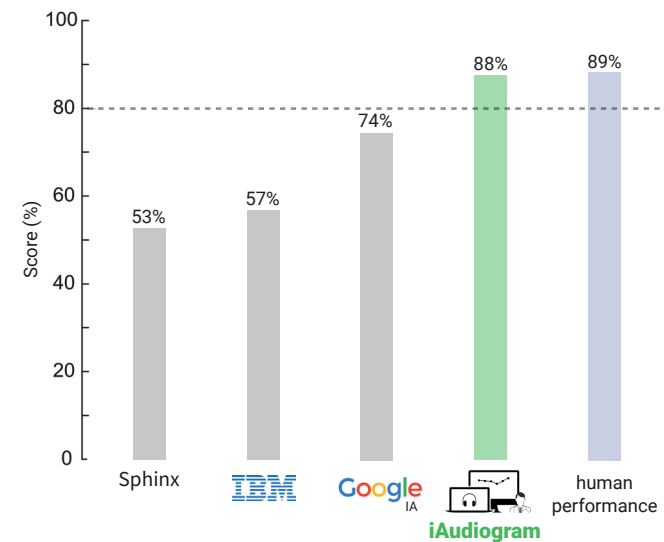
Automatic tests are incompatible in clinical settings. Efficiency gain at the expense of diagnostic quality. Lack of accuracy: closed lists, adaptive procedures.

Benefits of **iAudiogram** :
Complete, accurate and repeatable assessments
Fully automatised
Efficient and time saving
Compatible with clinical use

Speech Audiometry with Artificial Intelligence

iAudiogram offers the automation of your speech audiometry tests in silence and in noise.

Through our Machine Learning algorithms, iAudiogram automatically detects if a patient repeats the words correctly, **as a practitioner would do during a consultation**.

Following a development phase of speech recognition algorithms at the phonemic and global (word) levels, we used deep neural networks to train our models with **over 100,000 audio recordings, manually labeled by experts**.

Validation clinique :
WALLAERT N., Jean H., Perry A., Paraouty N., Godey B,. Article in prep. (2022)

Our models of speech recognition
First automated speech audiometry in the world

1.

None of the current speech recognition algorithms provide phonemic recognition.

2.

In global scoring of patient audio recordings, **iAudiogram is superior** to reference algorithms.

3.

iAudiogram performance is equivalent to human performance, i.e. the maximum level: 88.6%). Indeed, ratings performed manually by two expert practitioners diverge by 11.4% (human variability, uncertain diction, …).

Advantages of iAudiogram Speech Audiometry

+ Efficient
Fully automated procedure
Medical time needed reduced to 0

+ Accurate and repeatable
Accuracy and repeatability identical to clinical standards

+ Complete hearing assessment
Open list
Phonetic confusion analysis

+ Reliability of results
90.8% of phonemes correctly identified

iAudiogram performance comparable to human performance:
In global scoring < 1% difference
In phonemic scoring < 5% difference

+ Test optimization
Continuous speech intelligibility measures
Full psychometric curve

Tele-audiology

Address patients' priorities to solve a global public health issue

The performance of an automated audiometric examination by Artificial Intelligence may sometimes require the supervision of patients to monitor the proper completion of the test (comprehension of guidelines, resolution of technical problems, ...).

Artificial Intelligence at the service of Clinical Audiology :
An effective tool to address a major public health issue

1. Compensate for ENT under-demography
and medical deserts,

2. Optimize access to hearing specialists,

3. Reinforce prevention and screening, ...

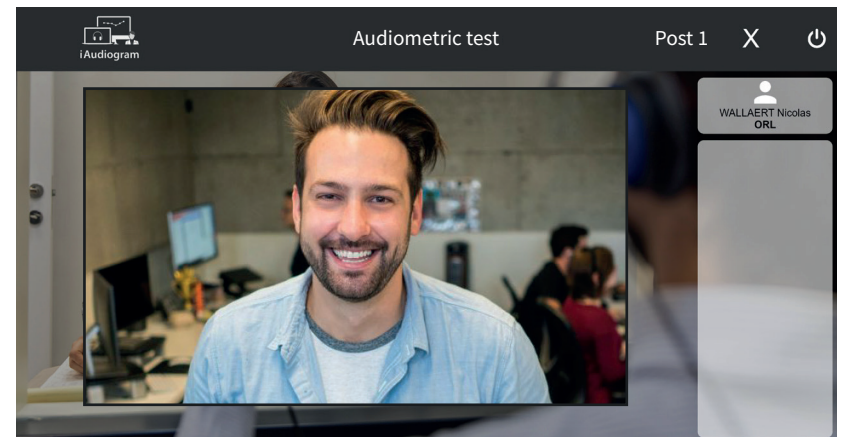**Tele-medicine**
Be closer to your patients.
The iAudiogram platform allows you to perform a complete otological assessment by videoconference, while controlling a remote AudioPod (ENT tele-consultation, tele-audiometry, post-operation control, tele-prescription, ...).

Tele-expertise
collaborate more efficiently
with your colleagues.
iAudiogram can be used as a tele-expertise platform to allow you to exchange more easily with your colleagues and prescribers.

Screenshot of the tele-medicine platform

Our offer

Time save

One audiometry =
0 minutes from the
practitioner

Complete functional explorations

Tone and speech
audiometry (in silence/
noise), evaluation of
prosthetic benefits (hearing
aids and implants)

Certified equipment, guaranteed

Calibrated and maintained by
our care

Security and confidentiality

Your data are saved within your premises,
or on a secured and encrypted cloud in
France if you prefer

Cost-effectiveness

Efficiency gain allows you to
increase your activity and cater for
a higher number of patients.

No hidden costs

Installation, AudioPod,
annual calibration and
support are free

2-months trial period free of charge

**No commitment
No subscription**

You can stop using
iAudiogram at any time

Our services are billed to you on a fee-for-service basis :
number of audiometries performed by Artificial Intelligence.

To know your **benefits and the cost of iAudiogram**, we invite
you to perform a **personalized simulation** on our website :
www.iaudiogram.com

iAudiogram – Company My Medical Assistant SAS

5 bis Cours Anatole France

51100 Reims

www.iaudiogram.com

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