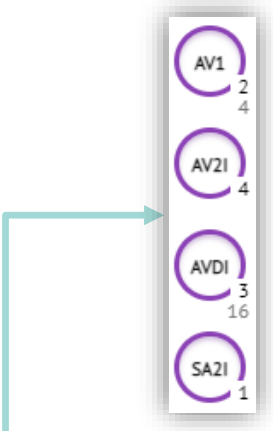
CardioAI®

ECG annotation and interpretation software

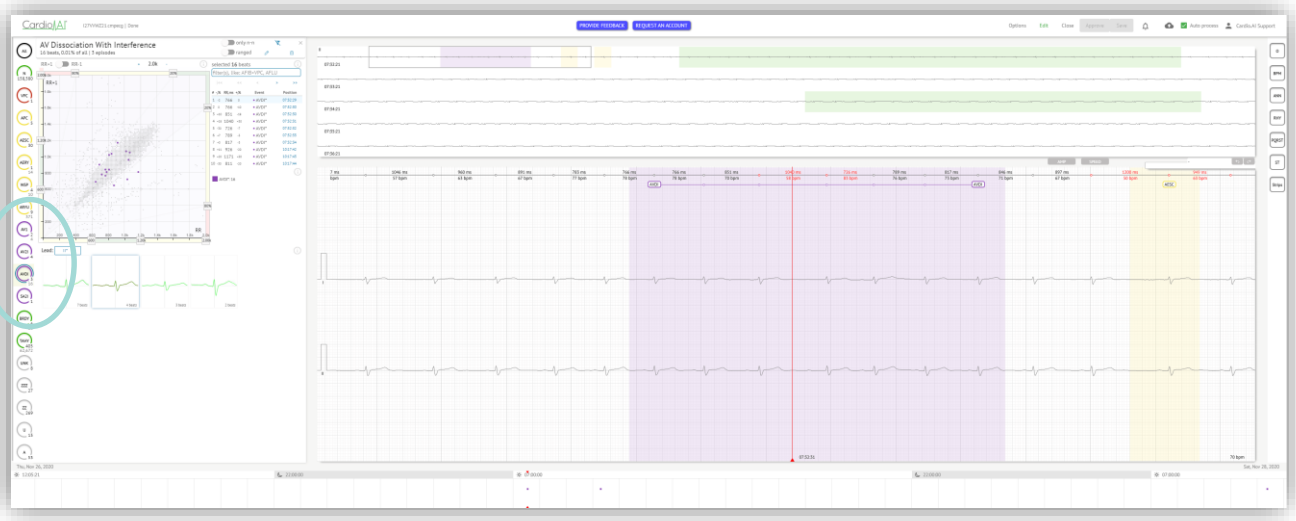
Why Cardio.AI

It is widely accepted that long-term ECG diagnostics with the highest possible quality is hard to achieve, especially considering the current economical constraints. There are multiple factors that affect this quality, and the most prominent are:

- software that is used to clean up the record;
- technician's training level;
- time constraints.



Altogether these factors serve as the downward multiplicators, reducing the chances to spot this single episode we might be looking for, affecting the efficiency of early detection and prevention. Multiple sources suggests the accuracy of the manual long-term ECG processing stays as low as 70%-75%.*



Pic.1. Only three episodes of AV-DISSOCIATION were detected which might be tricky to spot by using plain conventional Holter software.

* https://jamanetwork.com/journals/jamainternalmedicine/article-abstract/2771093

How we solve the problem

Cardio.AI solves this problem by introducing the AI pre-processing pipeline as the first step before the technician even attends the record. This mostly eliminates the human factor, improving the ability to spot arrhythmia or conduction issues. This particular AI separates sinus beats from everything else with very high accuracy, more than 95% in presence of the noise.

Technician's work transforms from manual processing (which is error-prone, see Pic.2) into validation processing in a much more relaxed setting as the AI already proposed interpretation (Pic.3). Technician needs only to validate and occasionally reclassify the strips.

Pic.2. Unannotated signal.

Pic.3. Automated annotation by Cardio.AI.

AI-assisted processing

That way we propose the best of both worlds - an entirely automatic pipeline but under full human control, allowing for occasional human intervention. AI's classification ability serves as the quality bottom line, supporting diagnostic companies with high-quality output.

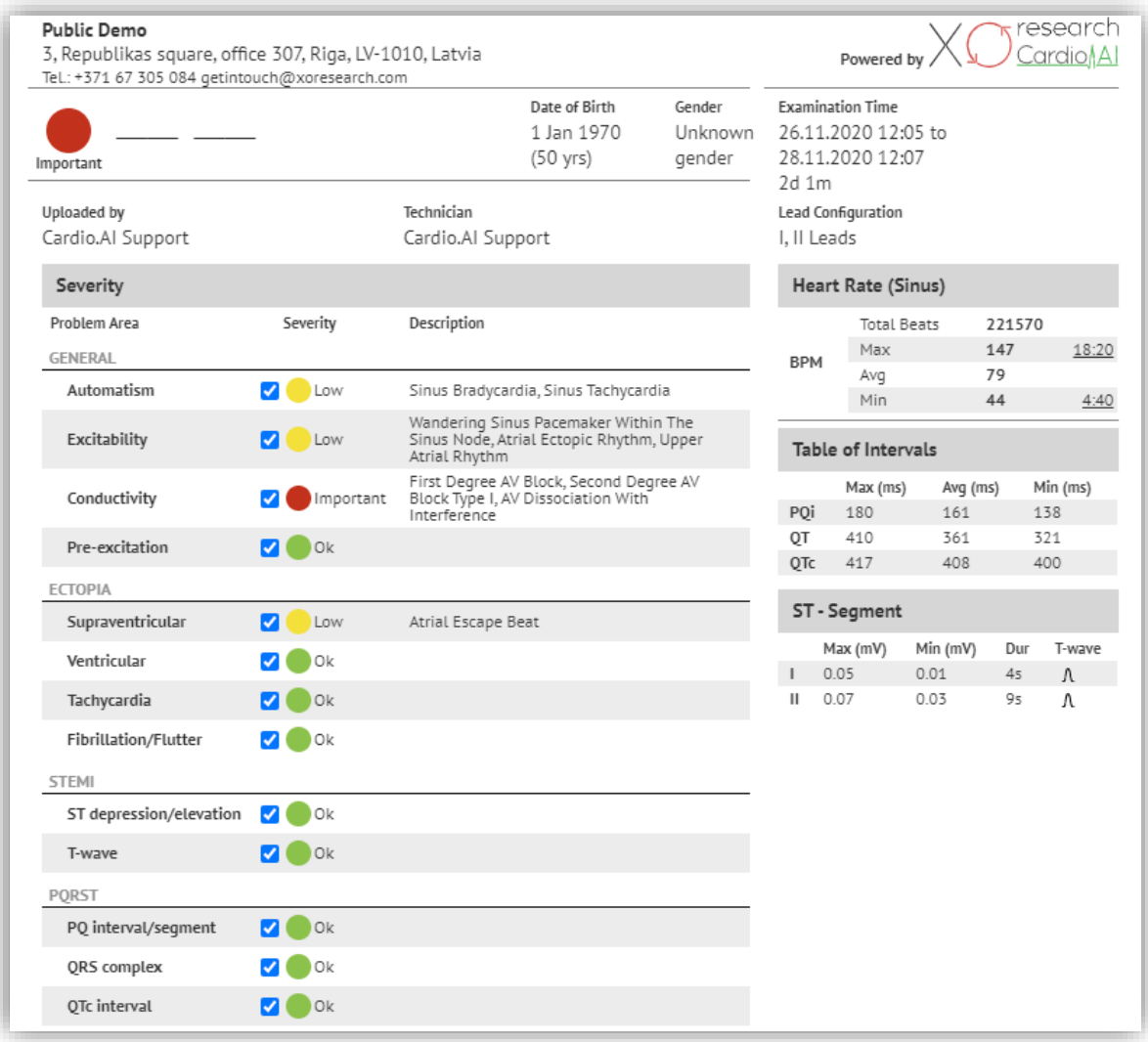
To make things even more interesting, Cardio.AI already understands almost any possible arrhythmia or conduction issue, and the team constantly working towards reaching the full coverage, to include even rare arrhythmias, essentially a superhuman state on the ECG interpretation. The process of improving the AI is conceptually very simple, the team just adds the strips on which AI performs poorly to the training pipeline, eventually converging the quality to be above 90% (compared to human's average 74%) on any particular arrhythmia class, with some classes, like Atrial Fibrillation or Ventricular ectopic rhythms, to be above 98%.

Pic.4. Seeing is believing – all the findings at your fingertips.

Reporting

For physicians and attending clinicians all the above transforms into high-quality reports that frequently contains the references to the strips that would be otherwise hard or even impossible to spot with conventional Holter processing pipelines. This includes things like singular Type I AV-blocks, rhythm migration, nodal rhythm, etc.

The software resides completely in the cloud and is accessible from a number of supported web-browsers. This leads to another strong point – the ability for doctors to access the evidence online, from anywhere. Report becomes clickable for all the statistics and strips, leading to the signal in context. This allows for any exploration depth, a game-changer in some cases, particularly for patients with multiple arrhythmia types. It opens the internals of the record to the attending clinician, helping to build the trust between the doctor and a diagnostic center.



Public Demo
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Important _____ _____

Date of Birth: 1 Jan 1970 (50 yrs)
Gender: Unknown gender

Examination Time: 26.11.2020 12:05 to 28.11.2020 12:07 2d 1m

Uploaded by: Cardio.AI Support
Technician: Cardio.AI Support
Lead Configuration: I, II Leads

Severity

Problem Area	Severity	Description
GENERAL		
Automatism	Low	Sinus Bradycardia, Sinus Tachycardia
Excitability	Low	Wandering Sinus Pacemaker Within The Sinus Node, Atrial Ectopic Rhythm, Upper Atrial Rhythm
Conductivity	Important	First Degree AV Block, Second Degree AV Block Type I, AV Dissociation With Interference
Pre-excitation	Ok	
ECTOPIA		
Supraventricular	Low	Atrial Escape Beat
Ventricular	Ok	
Tachycardia	Ok	
Fibrillation/Flutter	Ok	
STEMI		
ST depression/elevation	Ok	
T-wave	Ok	
PQRST		
PQ interval/segment	Ok	
QRS complex	Ok	
QTc interval	Ok	

Heart Rate (Sinus)

BPM	Total Beats	221570	
	Max	147	18:20
	Avg	79	
	Min	44	4:40

Table of Intervals

	Max (ms)	Avg (ms)	Min (ms)
PQi	180	161	138
QT	410	361	321
QTc	417	408	400

ST - Segment

	Max (mV)	Min (mV)	Dur	T-wave
I	0.05	0.01	4s	∧
II	0.07	0.03	9s	∧

Pic.5. Decision-supporting reports.