



Cordelia - application for automatic evaluation of ECG recordings using machine learning and artificial intelligence methods

The CeZIS research group formed by employees of the Košice IT company VSL Software, a. s. and the Faculty of Science at Pavol Jozef Šafárik University in Košice developed a solution for automatic evaluation of ECG recordings using machine learning and artificial intelligence methods, and successfully participated in the PhysioNet/CinC Challenge 2021 competition.

[PhysioNet](#) is an international research platform for the comprehensive analysis of physiological signals, founded in 1999 under the auspices of the National Institutes of Health in Washington and managed by members of the [MIT Laboratory for Computational Physiology](#) in Cambridge. In addition to the collection of datasets and programming libraries, it provides the opportunity to participate in an annual prestigious competition associated with the [Computing in Cardiology conference](#). Since 2000, the researchers have been investigating the current issues and challenges in the analysis of physiological signals.

The CeZIS research group successfully participated in this competition entitled [PhysioNet/Computing in Cardiology Challenge 2021](#). The aim was to identify cardiac abnormalities on 12-lead, 6-lead, 4-lead, 3-lead and 2-lead ECG recordings, whereby the simultaneous presence of multiple abnormalities can be classified on a single ECG recording. In the competition, data from multiple countries on three continents, obtained in demographically diverse populations, were provided. A total of 68 academic or corporate/commercial teams submitted a total of 1056 solutions during the multiple phases of the competition.

After the official round, in which the CeZIS team placed fifth, the organizers provided the opportunity to submit one additional solution. After the final evaluation of [all submitted solutions](#) (Chapter 4, Tables 7, 8, and 9), the CeZIS team achieved the best results for all ECG lead configurations and surpassed the results of the team that won the official round and also participated in the additional phase of the competition.

Based on the solution for PhysioNet/CinC Challenge 2021, the CeZIS team created the Cordelia application for detection of more than twenty types of ECG findings or abnormalities. [A publicly available prototype](#) of the application allows users to analyze your own ECG recordings or to view the sample ECG recordings with various anomalies.

In future, the application can serve as:

- Support prevention and early diagnosis of heart disease during preventive examinations at general practitioners.
- A medical aid in teaching medical and science students.
- A tool for preliminary and rapid diagnosis using wearable devices without the presence of a cardiologist.



The solution is the result of machine learning using the architecture of group models of artificial neural networks from more than 120,000 ECG records.

In future activities, the team aims to collaborate with manufacturers of ECG devices and smart wearables. An important aspect for the development and improvement of the solution is the availability of additional ECG recordings datasets, which will enable the application and testing of novel semi-supervised and self-supervised learning methods in the field of artificial intelligence.

If interested in various forms of collaboration, you can contact the members of the research team at cordelia@vsl.sk.

Cordelia screen

cordelia



cordelia@vsl.sk

High Quality ECG Diagnostics

Trained on more than 120,000 ECG recordings
Opinions of several specialists
Thousands of hours of learning
Automatic diagnostics in seconds

UPLOAD YOUR ECG

DEMO

Part of the main Cordelia application screen for an example of evaluating a 12-lead ECG recording at a sampling frequency of 500 Hz

Identifikácia pacienta: Ukážka 19, Žena, 30 - 39 rokov Vyhovujúce EKG

▼ EKG nález

Frekvencia srdca (f/min): 78 Nepravideľný rytmus

Komorová extrasystola

99.95%

Sínusový rytmus

99.88%

Ukázať ďalšie nálezy

Zobraziť všetko 100%

