# CareNexus: Integrated solutions for Healthcare Communication

## Alexandru Ioan BULZAN

Department of Computer Science, Faculty of Mathematics and Computer Science, West University of Timişoara, Vasile Pârvan Blvd., no. 4, 300223 Timişoara, Romania.
E-mail: alexandru.bulzan01@e-uvt.ro

\* Author to whom correspondence should be addressed;

## Abstract

Through the digitization process, we aim to improve and streamline communication between healthcare professionals, patients and clinics. Currently, many existing solutions do not provide secure data transfer, interoperability and predictive analytics, leading to inefficiencies in the healthcare system. With the aim of improving data security, accessibility and offering personalized facilities to patients, an integrated digital communication platform called CareNexus was developed. The platform stands out by implementing health risk prediction (HRP) models, advanced authentication and Big Data analytics. A secure authentication based on multiple factors and the use of encryption algorithms, an interface based on different user roles and a prediction system based on model training had been implemented. To estimate the risk of developing heart problems or diabetes, we use Random Forest and Extreme Gradient Boosting models that analyze patients' medical history and demographics. The prototype was tested with healthcare professionals and with the help of volunteer patients from clinics, to simulate the interactions within the application in order to assess the safety, efficiency and last but not least, the user experience. Thanks to the CareNexus app, users from clinics had the opportunity to have secure access to their medical records in real time, had the possibility to perform streamlined planning and the app contributed to better patient engagement. Personalized assessments of different risks were successfully provided through HRP models, so patients were able to be guided towards preventive healthcare measures. The integration of this system ensured optimization of response times and administrative workflow. Results reinforce the need for data-driven and patient-oriented solutions. CareNexus is a digital platform that effectively improves security, accessibility and predictive healthcare, demonstrating for modern healthcare ecosystems a potential for large-scale deployment. Subsequently, future system enhancement studies of the platform will focus on extensive validation under current regulations in order to maximize impact.

**Keywords:** Healthcare Communication; Random Forest; Big Data; Patient Engagement; Secure Authentication.

*Appl Med Inform 47(Suppl. S1) May/2025*

S83