

RESEARCH AND DEVELOPMENT OF FEDERATED AI TECHNOLOGY FOR THE CREATION OF SOVEREIGN BIOBANK DATA NETWORKS

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The project will be implemented through a consortium collaboration with the following partners:

- E-GROUP ICT SOFTWARE Private Limited Company
- Semmelweis University
- Budapest University of Technology and Economics

Grant amount (HUF): 641,916,982 HUF

Total project cost (HUF): 896,557,415 HUF

Project start date: 06/01/2025

Planned physical completion date: 05/31/2027

DETAILED PROJECT SUMMARY

The exponential growth of data holds enormous potential, particularly for research and AI-driven innovation in industries such as personalized medicine. A significant amount of genomic and related health data is accumulating in biobanks; however, due to fragmentation, these data can only be utilized in a limited way. Integrated access to such data is of strategic importance, yet traditional approaches are not viable due to this fragmentation and the sensitive nature of personal data.

In personalized medicine, health data complemented with genomic information plays a critical role in understanding disease progression, predicting risk, forming the basis for public health strategies, and identifying targets for drug development.

The goal of the project is the research and development of the FedXGen module, part of the FedX platform, based on federated learning. A toolkit will be developed to support the analysis of genomic and phenotypic data, incorporating AI-based functionalities and patented underlying technologies. The system will enable federated learning-based analytical and virtual data access services, allowing for unified analysis of sovereign biomedical data stored in a distributed manner—strictly without access to actual personal data by anyone outside the managing institution of the biobank, thus complying with current and future security and data protection regulations.



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To achieve this goal, the consortium—E-GROUP ICT SOFTWARE Zrt., Semmelweis University, and Budapest University of Technology and Economics—cannot use existing centralized or cloud-based data integration solutions due to concerns related to personal data protection, data movement, and associated costs.

The novelty of the FedXGen platform lies in its capability to not only conduct federated analysis of real-world data (RWD) but also perform complex genomic analyses, including the use of polygenic risk models and cutting-edge transformer foundation models.

Another aim of the project is to establish a demonstration-scale national biobank research and analysis network using the system—called the National Federated Biobank Data Network (NEFAB). This network will initially connect 2 institutions (Semmelweis University and University of Szeged), potentially encompassing data from multiple biobanks and enabling federated access and analysis of genomic and phenotypic data from thousands of patients. The project will establish interoperability among siloed institutional databases and enable their joint analysis. Through FedXGen's federated capabilities, precision data management functionalities will be developed.

These services will be created in continuous collaboration with state and market stakeholders supporting the project, taking into account legal frameworks and market demands. The objective is to transform FedXGen into a commercially mature platform at the international level—capable of forming self-sustaining and profitable data networks for data owners, both in research and financial terms.

The international deliverables of the project will support the realization of personalized medicine research and drug development strategies, significantly reducing costs and time requirements, while increasing the efficiency and success rate of research. The NEFAB data network built on the FedXGen federated personalized medicine platform will lay the foundation for a national federated data network, which—by integrating with the national healthcare system—could position Hungary as a leading country internationally in the implementation of precision medicine.