PRESS RELEASE

From Data to Diagnosis

How AI Is Shaping the Next Generation of Respiratory Medicine

In a world where healthcare systems are under pressure, can Artificial Intelligence help doctors make faster and smarter decisions and save more lives. The EU-funded research project AI4Lungs is working on precisely that. The Fraunhofer Institute for Industrial Mathematics ITWM is working with international partners to develop digital tools, methods, and models for the optimal selection of clinical treatment pathways for lung patients, with the aim of providing resource-efficient and medically optimized care.

Lung disease can conceal a wide variety of conditions, from cancer to rare lung diseases. Early and accurate diagnosis is crucial for successful and targeted treatment. In everyday clinical practice, however, it is very challenging to carry out complex examinations and plan individually tailored therapies. Diagnostic and therapeutic steps go hand in hand, and new decisions about the direction of treatment must be made repeatedly during the course of treatment.

The goal of the AI4Lungs project is to develop AI tools that support physicians in the diagnosis and treatment of complex lung diseases. To this end, 18 partners from across Europe – including hospitals, researchers, legal experts, and technicians – are working together to build a smarter, more personalized healthcare system.

Real Patient Data as the Basis for AI-Supported Therapy Recommendations

To this end, AI4Lungs collects more than 2,500 real patient records, which are securely provided by our clinical partners. These data are used to train AI models. A platform with an AI-supported digital twin system simulates various patient scenarios and prepares customized treatment proposals based on the real data.

Decision Support System for Physicians

The »AI4Lungs« project enables sound diagnostics through the use of various examination methods, including medical imaging, digital stethoscopy, liquid biopsies, and molecular pathology procedures. The multimodal data obtained in this way is

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analyzed using advanced AI technologies such as ensemble learning, entropy-based learning methods, computational linguistics, and deep learning.

Based on the analysis results, a clinical decision support system helps treating physicians work with patients to determine the best individual treatment path. This involves the use of multi-criteria and sequential decision-making methods, knowledge-based systems, and explainable and ethical AI approaches.

»Our contribution to the project is to develop this decision support system and integrate it seamlessly into AI-supported data analysis,« explains Dr. Jonas Flechsig, who is responsible for the project at Fraunhofer ITWM. »Together with our project partners, we have already made significant progress this year. We have introduced the digital twin platform and can ensure that we comply with the new EU AI regulations.«

A Responsible and Respectful Approach to Data Collection

The collection of medical data raises questions regarding data protection, fairness, and legal responsibility. Legal and ethics partners Timelex and Deloitte ensure that the platform is built responsibly and in compliance with regulations, including a new EU AI law.

»It is crucial that the design and implementation of AI tools are aligned with the future requirements of the AI Act from the outset. This proactive approach not only supports the potential for future commercialization of project results, but also facilitates responsible testing under real-world conditions,« says Marta Wilińska, legal expert at Timelex.

»By following strict digital ethics principles when integrating AI tools into clinical workflows, doctors retain full decision-making power while being able to use AI for resource-intensive tasks such as diagnosis and treatment planning. This human-in-the-loop approach improves treatment outcomes and promotes sustainable healthcare systems,« says Marcel Rebbert, digital ethics expert at Deloitte.

Shaping the Future Together, Not Alone!

Project partner Future Needs is actively involved in synergy projects that aim to change the future of healthcare. The goal of creating synergies between projects includes the exchange of knowledge, the possibility of data exchange in compliance with data protection regulations, and joint participation in events and webinars.

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»Building synergies with other EU projects that share a common mission is critical to accelerating progress. By working together, we grow faster and increase our collective impact. We are currently planning a joint meeting with all AI4Lungs synergy project coordinators to explore opportunities for lasting change in healthcare,« says Emma Tsai, Head of Dissemination at Future Needs.

About AI4Lungs

The AI4Lungs project was officially launched on January 1, 2024 and will run for 3.5 years. The project is funded by the European Union under the »Horizon Europe« program (grant agreement no. 101080756) with 6.9 million euros. It focuses on computational models for new patient stratification strategies (RIA) under the two-stage call HORIZON-HLTH-2022-TOOL-12-01. The consortium consists of 18 partners from 10 countries working together to develop AI-powered solutions to improve lung health.

Further information is available online at:
Optimal Treatment Paths for Lung Diseases - Fraunhofer ITWM

Group photo taken at the »AI4Lungs« project meeting held in Kaiserslautern from February 25 to 26, 2025. © Fraunhofer ITWM

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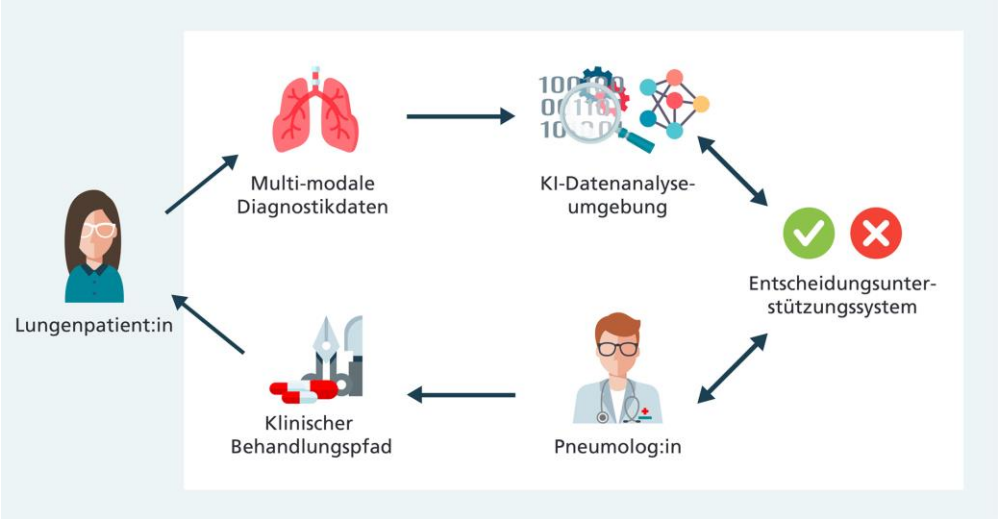

Concept of the project »AI4Lungs« © Fraunhofer ITWM

About the Fraunhofer Institute for Industrial Engineering ITWM

The **Fraunhofer Institute for Industrial Mathematics ITWM** in Kaiserslautern is one of the largest research institutes for applied mathematics worldwide. We see our mission as further developing mathematics as a key technology and providing innovative impetus. Our focus is on implementing mathematical methods and technology in application projects and further developing them in research projects. Close cooperation with partners from industry ensures that our work is highly practical.

The integral components of our work are consulting, implementation, and support in the application of high-performance computing technology and the provision of customized software solutions. Our diverse expertise addresses a broad spectrum of customers in the automotive, mechanical engineering, chemical, energy, and financial industries. These customers also benefit from our excellent network, for example in the Simulation and Software-Based Innovation Competence Center.

About the Fraunhofer Society

The **Fraunhofer Society**, based in Germany, is the world's leading organization for application-oriented research. With its focus on future-oriented key technologies and the exploitation of results in industry and business, it plays a central role in the innovation process. As a guide and source of inspiration for innovative developments and scientific excellence, it helps shape our society and our future. Founded in 1949, the organization currently operates 75 institutes and research facilities in Germany. Approximately 30,800 employees, most of whom have a background in natural sciences or engineering, generate an annual research volume of around €3.0 billion. Of this, €2.6 billion is attributable to contract research.

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