

When Math Saves Lives: Ma.Me.Mo.Bi.A. Project Involved in the Diagnosis of Aneurysms, Diabetes, and Alzheimer's Disease

An interdisciplinary team of researchers demonstrates that fundamental equations and artificial intelligence can work together to detect medical anomalies

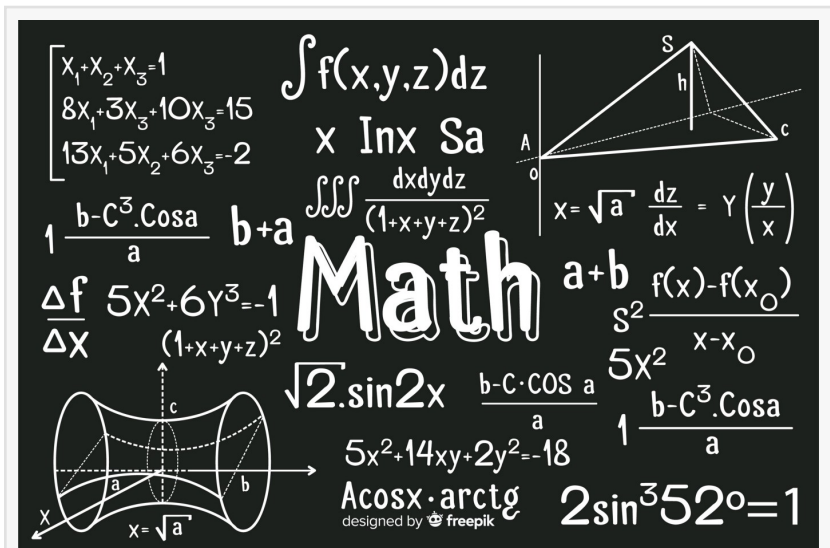
SIBIU, TRANSYLVANIA, ROMANIA, June 30, 2026 /EINPresswire.com/ -- An interdisciplinary team of researchers demonstrates that fundamental equations and artificial intelligence can work together to detect complex medical anomalies directly from CT, MRI, or OCTA images, without losing data control and interpretability.

Behind every accurate medical diagnosis lies a massive amount of technology, but a new scientific frontier promises to bring precision to an unprecedented level. The European project Ma.Me.Mo.Bi.A. (Mathematical Methods and Models for Biomedical Applications), carried out under financing contract no.

760076/23.05.2023, has successfully created an innovative bridge between

the pure theory of mathematical approximation and everyday clinical medicine.

Coordinated by Prof. Dr. Gianluca Vinti and executively managed by Prof. Dr. Ana-Maria Acu, the project brings together an elite team of mathematicians, computer scientists, and artificial intelligence specialists. Their goal? To transform raw medical imaging into intelligent support



Mathematics can save lives, researchers say



Project supported by PNRR



tools for physicians.

Three Medical Fronts, a Single Weapon: Intelligent Algorithms

Mathematical validation did not just remain on paper. Through strategic collaborations with institutions such as the Polissano Clinic Sibiu and the Sibiu County Clinical Emergency Hospital, the algorithms were tested directly on real cases. The research focused on three major directions with a critical impact on public health:

1. Detecting Aortic Aneurysms Without Contrast Agents

Early identification of abdominal aortic aneurysms (AAA) is vital. The team developed an almost fully automated procedure capable of clearing CT images of calcium plaques and perfectly segmenting blood vessels. The innovation lies in combining modern neural networks (U-Net type) with mathematical operators called Sampling Kantorovich. The result delivers a performance comparable to the most advanced deep learning techniques, but with a huge advantage: the mathematical model remains transparent and controllable at every stage, eliminating the "black box" errors typical of AI.

2. Early Diagnosis for Diabetic Patients

By analyzing OCTA (Optical Coherence Tomography Angiography) retinal images, the project introduced advanced methods for background noise reduction and the reconstruction of the blood vessel network. The algorithms successfully measure vascular connectivity and differentiate with high accuracy between the eyes of healthy individuals and those of diabetic patients, providing crucial support to ophthalmologists.

3. Volumetric Monitoring in Alzheimer's Disease

Applied to brain magnetic resonance imaging (MRI), Ma.Me.Mo.Bi.A. enabled automated segmentation and volume measurement for white matter, gray matter, and cerebrospinal fluid. These biomarkers are essential in evaluating structural degradations associated with Alzheimer's and other neurodegenerative diseases.

Global Recognition and Impact on the Scientific Community

"The project demonstrates that modern mathematical methods from approximation theory can be transformed into efficient tools for processing biomedical images."

These high-level results have already been published in prestigious international journals such as the Journal of Mathematical Analysis and Applications and Mathematical Methods in the Applied Sciences. Furthermore, Sibiu became an international hub for applied mathematics by hosting the ICATA 2024 conference (International Conference on Approximation Theory and its Applications), an event that consolidated academic ties with research centers in Italy and Germany.

In addition to the direct technological benefit brought to medicine, the project fulfilled an essential mentorship mission by actively involving PhD students and postdoctoral researchers in software development and advanced research. Through the success of Ma.Me.Mo.Bi.A., the "Lucian Blaga" University of Sibiu reaffirms its position on the map of European research, proving that the future of medicine is calculated, step by step, through mathematics.

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