The EMERALD Project

Objectives:

1. Development of an eXplainable AI (XAI) driven model for nuclear diagnosis.
2. Integration into a contextually relevant Medical Decision Support System (MDSS).
3. Implement a high-quality, interoperable repository of heterogeneous medical data, consolidating information from multiple sources along with expert knowledge.

Approach:

1. Handle complexity using the dynamic and adaptable computational capabilities of **Fuzzy Cognitive Maps**.
2. Integrate Advanced **Deep Learning techniques into eXplainable AI**.
3. Replicate human cognition to **enhance interpretability and explainability** in medical decision-making.

Find out more...

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EMERALD AI

EMERALD Project

Contact

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Fuzzy Cognitive Explainable Analytics for Translating Model Complexity in Nuclear Medical Diagnosis

Project Number: 3656

https://emerald.uth.gr

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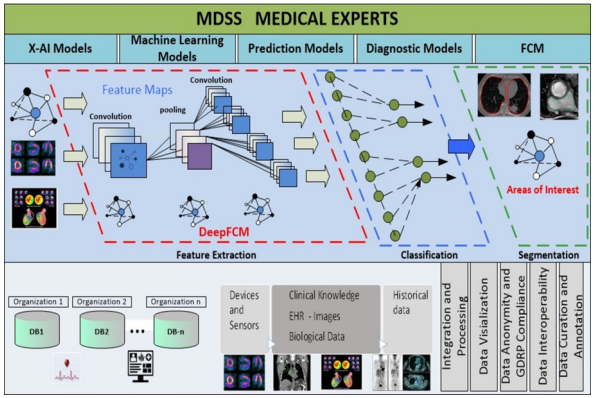
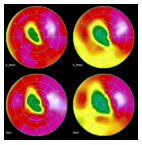
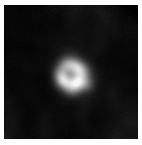
Motivation and Concept

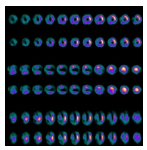
Medical data is vast and complex, making it challenging for human doctors to process and analyze effectively. **Artificial Intelligence (AI)** can rapidly manage large and heterogeneous datasets, helping healthcare professionals make more accurate and timely diagnoses. However, AI models are notoriously 'black-box' in nature, making them difficult to understand and trust.

EMERALD claims to mitigate these challenges developing of an **eXplainable AI (XAI)** driven model and integrating it into a contextually relevant **Medical Decision Support System** (MDSS).









The Project

EMERALD is an ambitious **36-month project** that brings together a team of 13 highly skilled researchers and academic collaborators from both the medical **industry and academia**. The consortium boasts significant expertise in **cutting-edge technologies**, which will be leveraged to achieve the project's goals.

The EMERALD architecture embodies a powerful vision with two distinct layers.

A. A cutting-edge data and knowledge aggregation layer that is fully equipped to handle diverse and complex data from multiple sources, easily and efficienctly

B. An explainable AI analytics and intelligence layer to effectively analyze medical data and provide actionable solutions for enhancing CAD and NSCLC prognostic, diagnostic, and therapeutic capabilities.

Expected Outcomes / Impacts

- Cutting-edge theoretical models will be implemented to efficiently **handle data and knowledge provided by experts**. These models will integrate kernel functions and functional weighted connections among FCM concepts, resulting in highly **accurate and interpretable decisions** with excellent performance metrics.
- Physicians will benefit from **in-depth and user-friendly explanations**, which will be delivered through graphical and textual means. Our approach places a strong emphasis on promoting **transparency** and fostering an **understanding of the analysis**.
- The envisioned cutting-edge MDSS is the **future of nuclear medicine diagnosis**. With its unmatched accuracy, transparency, and explainability, it offers healthcare professionals a reliable tool that can help them provide the best possible care to their patients.

Pubic Material

The developed tools are accessible through the **GitHub** platform:

pyXAI-ML Library	pyXAI-NuclearMed	DeepFCM

https://github.com/ACTA-Lab-University-of-Thessaly

ΕΛΙΔΕΚ Ελληνικό Ίδρυμα Έρευνας & Καινοτομίας

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