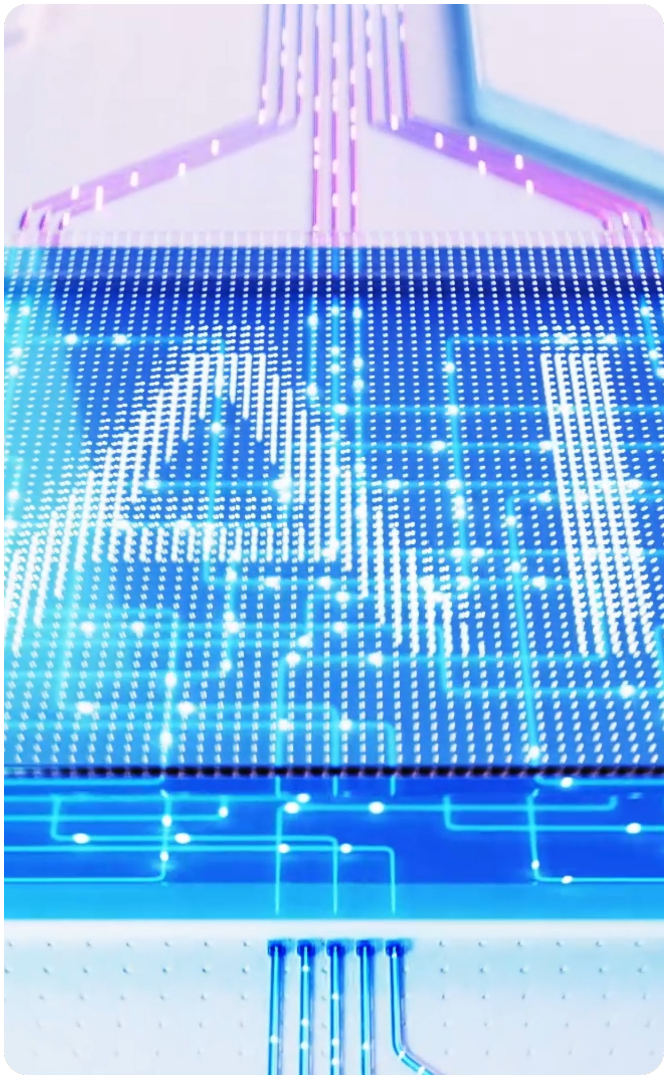
OPTIMA Artificial Intelligence (AI) Explainer

Overview

The OPTIMA project is a collaborative initiative aiming to improve cancer care through the integration of Artificial Intelligence (AI) technologies. It focuses on personalised treatments and innovative therapies, with an emphasis on strengthening shared decision-making between clinicians and patients.



Objectives

Clinical Decision Support: Develop a computer-interpretable guideline-based decision support platform, helping doctors make evidence-based treatment decisions.

AI Knowledge Generation: Utilise AI and advanced analytics on real-world data to generate new knowledge and insights, leading to enhanced cancer care strategies.

OPTIMA is funded through the IMI2 Joint Undertaking and is listed under grant agreement No. 101034347. IMI2 receives support from the European Union's Horizon 2020 research and innovation programme and the European Federation of Pharmaceutical Industries and Associations (EFPIA). IMI supports collaborative research projects and builds networks of industrial and academic experts in order to boost pharmaceutical innovation in Europe.

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Applications of AI in Cancer Care

The OPTIMA project explores various applications of AI, including:

Imaging: AI has revolutionised image analysis in developing imaging biomarkers to enhance and support decision making in diagnostic and treatment response and optimisation processes.

Electronic Health Records (EHR) data: AI has demonstrated its value in the analysis of EHR data, which is one of the major data modalities to trace and better understand cancer clinical history.

Natural Language Processing (NLP): NLP is used to analyse Observational Medical Outcomes Partnership (OMOP) EHRs and evaluate the adherence to clinical guidelines.

Several tasks can be addressed with AI on the aforementioned data, such as:

Classification: Classification involves a model that aims to predict the correct label of a given input data, such as performing pattern recognition to improve early diagnosis or identify subgroups of patients with different disease characteristics.

Regression: Regression refers to the process of extracting measurable characteristics from un-structured data, for example calculating the Gleason score from medical images.

Clustering: Clustering involves identifying similarity within groups in data, such as grouping individuals based on their genetic risk and screening results.

Prediction: Prediction involves forecasting various aspects of patient care, such as determining the appropriate treatment sequence or combination, predicting disease incidence, and estimating survival rates.

Multimodality: Multimodality refers to the combi-nation and integration of various data sources, including medical imaging, omics data, EHRs, OMOP data, and more.

Causal inference: Causal inference is the process of identifying cause-and-effect relationships in data. In the context of the OPTIMA project, it can be used for therapy management and assessing the quality of life of patients to understand how treatments impact their well-being.

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Data and Privacy Considerations

OPTIMA places significant emphasis on data privacy and ethical compliance. Patients' personal data is treated with the utmost confidentiality, and all activities adhere to legal regulations and ethical guidelines to ensure patient privacy and data protection.

Ethical and Legal Aspects

OPTIMA prioritises ethical considerations, ensuring the compliant and ethical treatment of patient data within the project. Efforts are made to address AI model explainability and potential biases, emphasising transparency and fairness in AI-driven decision-making.

Digitised Workflows and Federated Learning

To operationalise AI in clinical settings, the OPTIMA project aims to digitise workflows by incorporating computer-interpretable guidelines and research questions. Federated learning allows AI models to be collectively trained across multiple sites without sharing raw data, preserving data privacy and statistical bias reduction.

Limitations of AI in Healthcare

AI systems can learn and understand the form of data but cannot attach semantic meaning to it. While they can identify patterns, they lack the ability to comprehend underlying concepts. This limitation implies that AI can detect specific medical data associated with certain conditions (e.g., identifying cancer in medical images) but cannot fully understand the medical concepts behind the data (e.g., the significance of cancer in the context of a patient's overall health).

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