

Improving cancer diagnosis and prediction with AI and big data

A multimodal AI-based toolbox and an interoperable health imaging repository for the empowerment of imaging analysis related to the diagnosis, prediction and follow-up of cancer

The increase in the amount and availability of health data, especially medical imaging in cancer cases, combined with the emergence of new technological tools based on Artificial Intelligence (AI) and Machine Learning (ML) offer unprecedented opportunities for improving the accuracy of cancer detection, prediction and follow-up, thus allowing clinical care decisions that are better informed. INCISIVE is a 42-month project that aims at

exploring the potential of novel AI tools for enhancing current imaging solutions for cancer cases. INCISIVE addresses challenges related to the detection of patterns in large volumes of cancer imaging data, thus increasing the interpretability of complex imaging data and supporting more effective decision-making for Healthcare Providers. It also addresses challenges related to data labelling and annotation, as well as availability and sharing of imaging data so that it can be used for training and validating AI tools for improved imaging methods.

The project targets **two main results:**

01

An **AI-based toolbox** consisting of novel AI models, combined with a set of predictive, descriptive and prescriptive analytics, enabling the multi-modal exploration of the available data sources; this includes a Machine Learning (ML-) based automatic annotation system to produce data for the training of algorithms in AI research.

02

An **Interoperable pan-European federated repository of health images** that allows the donation and sharing of data in compliance with legal, ethical, privacy and security requirements, for AI-related training and experimentation; the repository will rely on federated data storage and will operate on a Federated Learning basis, abiding to the highest data privacy and security standards. It will also offer High Performance Computing-as-a-service, where necessary, thereby allowing for cost-effective performance of computationally intensive processing without the need for maintaining expensive equipment.

The project solutions will be piloted on four types of cancer



Lung Cancer

Accurate detection of malignant, non-small-cell lung cancer (NSCLC) lesions, with a possible extension of the diagnostic capabilities of the models to solitary lung nodules in the prospective pilots.



Breast Cancer

Inference of histopathological information, such as Gleason score, through non-invasive mpMRI imaging screenings to revolutionize the clinical workflow and allow for optimization of treatment selection.



Colorectal Cancer

Risk stratification of patients, prediction of metastasis risk and prediction of the patient's response to treatment to positively impact the colorectal cancer clinical workflow.



Prostate Cancer

Low-cost non-invasive diagnostic solution to facilitate reliable and affordable periodic screening, and increase the survival rate through accurate early diagnosis.

The INCISIVE consortium, coordinated by Maggioli SpA, is implemented by 26 organizations from 9 different countries (blue dots): Italy, Spain, Finland, Greece, Cyprus, Serbia, Belgium, United Kingdom, Luxembourg.

The pilot activities will be carried out in 5 sites in Greece, Italy, Spain, Cyprus and Serbia (red outlined dots).



INCISIVE aspires to enable more accurate and better informed decisions by improving the sensitivity and specificity of cancer imaging methods, even lower cost methods, increasing their accuracy in cancer diagnosis, prediction, evolution and relapse.

The main expected research outputs from INCISIVE's are



The INCISIVE **AI-driven models enhancing image processing and data analysis** focusing on improving sensitivity and specificity in diagnosis and statistical assessment of cancer.



The INCISIVE **pan-European repository of health images** that will enable the secure access and sharing of data and ultimately allow the large-scale adoption of such solutions in cancer diagnosis and follow-up.



The INCISIVE **platform which through its Federated Learning and HPC-as-a-service approaches**, will provide secure cost-effective performance of computationally intensive processing, without the need for maintaining expensive.



The INCISIVE **user services and reporting tools in the form of intuitive and highly interactive visualizations**, addressing the needs of stakeholders visualizing the AI analysis results along with corresponding reasoning, thus, better supporting the accurate detection, prediction and follow-up of cancer and allowing decisions that are better informed.



The INCISIVE **de-identification mechanism** aiming to enable ethical sharing and processing of medical data.



A pool of **scientific publications** in highly ranked conferences and high impact journals.

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The consortium brings together expertise in:

ARTIFICIAL INTELLIGENCE, MEDICAL IMAGE PROCESSING DATA ANALYTICS, SECURITY (Institute of Communication & Computer Systems, Center for Research and Technology Hellas, Aristotle University of Thessaloniki, Fundació TIC Salut Social, Squaredev, University of Helsinki, University of Novisad, Centro Regionale ICT SCRL, Visaris D.O.O.), **COMPLEX ICT SYSTEMS** (Maggioli SpA, Telesto IOT Solutions LTD, European Dynamics Luxembourg SA, Innosystems LTD), **HIGH PERFORMANCE COMPUTING** (Barcelona Supercomputing Center), **CANCER CLINICAL RESEARCH AND PRACTICE** (Fundació Clínic per la Recerca Biomèdica, Linac-Pet Scan Opco LTD, University of Rome Tor Vergata, University of Naples Federico II, Hellenic Cancer Society, Cyprus Association of Cancer Patients and Friends, University of Athens, Kingston University, Cyprus University of Technology), **LEGAL AND ETHICAL ISSUES** (Time.Lex), **INNOVATION AND BUSINESS PLANNING** (White Research, Medtronic Iberica SA).

For more information you can check the official website of the project: <http://www.incisive-project.eu> or contact the project's Communication Office: contact@incisive-project.eu Twitter: @IncisiveEU LinkedIn: <https://www.linkedin.com/groups/9022935/>



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