



PhD in BIOINGEGNERIA / BIOENGINEERING - 38th cycle

PARTENARIATO PNRR Research Field: IMPROVING LUNG CANCER RISK PREDICTION WITH ARTIFICIAL INTELLIGENCE

Monthly net income of PhDscholarship (max 36 months)

€ 1325.0

In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity

Motivation and objectives of the research in this field

Lung cancer is still one of the major causes of cancer related death worldwide. Due to its asymptomatic occurrence, early detection through screening programs based on Low-dose Computerized Tomography (LDCT) is the gold standard which resulted in lung cancer mortality reduction higher than 20% according to multiple trials. However, multiple aspects limit the implementation of prevention programs, including (i) radiologists' reading procedures which are time consuming and operator dependent, (ii) the consistent amount of false positive cases to be analysed through invasive procedures and, therefore, (iii) an overload for the health system. Computer Assisted Diagnosis (CAD) systems represent a possible solution to support the clinical practice and to guarantee high risk patients monitoring also in health emergency conditions. In particular, artificial intelligence (AI) has demonstrated its potential in providing accurate CAD systems to handle pulmonary nodules, though its reliability still needs to be increased to change the current standards of care.

This project research is in the framework
 ?ANTHEM: AdvANced Technologies for Human-centrEd Medicine?
 Codice PNC0000003 CUP B53C22006720001
 PIANO NAZIONALE COMPLEMENTARE (PNC) ?
 Decreto Direttoriale n. 931 del 6 giugno 2022 ?
 ?AVVISO PER LA CONCESSIONE DI FINANZIAMENTI



	DESTINATI AD INIZIATIVE DI RICERCA PER TECNOLOGIE E PERCORSI INNOVATIVI IN AMBITO SANITARIO E ASSISTENZIALE? da finanziare nell'ambito del PNC
Methods and techniques that will be developed and used to carry out the research	The main activity of the project will therefore consist in developing AI models able to manage lung cancer screening, including lesions detection and future appearance prediction in terms of malignancy and growth rate, thus establishing a CAD system to be used in the clinical practice for lung cancer risk prediction. Methods for Explainable AI (XAI) will be also exploited to explain and interpret the causal relationship between input features and outcome of an AI model, thus making the clinical decision based on CAD systems more interpretable. Open data available on the Cancer Image Archive (https://www.cancerimagingarchive.net/) will be primarily exploited to allow for universal reproduction of the results.
Educational objectives	During the PhD project the candidate will have to attend educational courses provided by the PhD school of Bioengineering and Politecnico di Milano. Participation to national and international conferences is also foreseen.
Job opportunities	After the PhD, different job opportunities will be available as Post-Doc or Research Scientist in national or international institutions. Careers in medical image processing are recently evolving in many enterprise organizations, including job opportunities such as data scientists, big data engineers and machine learning engineers. Also, possible collaborations with clinical institutions specialized in lung cancer screening can be established.
Composition of the research group	1 Full Professors 1 Associated Professors 0 Assistant Professors 3 PhD Students
Name of the research directors	PROF. CHIARA PAGANELLI - PROF GUIDO BARONI

Contacts
Prof. Chiara Paganelli, Politecnico di Milano



Chiara.paganelli@polimi.it

Prof. Guido Baroni, Politecnico di Milano

Guido.baroni@polimi.it

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	662.5 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

The PhD student will be involved in educational activities along with teaching assistantship covering topics of advanced image processing, image feature extraction, machine learning and others mathematical modelling for tumor detection, characterization and prediction. A shared desk and computer will be given to the student at the CartCasLab for the time needed to carry out the research.

The research group will be composed by 1 full professor, 1 assistant professor of Politecnico di Milano, along with other PhD students involved in collateral projects. Collaboration with physicists of Università di Milano Bicocca (Milano, Italy) and CERN (Geneve, Switzerland) is also foreseen for the implementation and validation of XAI models. Medical doctors and physicists of collaborating clinical institutions will also cooperate in the project.

This project research is in the framework

“ANTHEM: AdvANced Technologies for Human-centrEd Medicine”

Codice PNC0000003 CUP B53C22006720001

PIANO NAZIONALE COMPLEMENTARE (PNC) – Decreto Direttoriale n. 931 del 6giugno 2022 –

“AVVISO PER LA CONCESSIONE DI FINANZIAMENTI DESTINATI AD INIZIATIVE DI RICERCA PER TECNOLOGIE E PERCORSI INNOVATIVI IN AMBITO SANITARIO E ASSISTENZIALE”

da finanziare nell’ambito del PNC