
UNIVERSITÀ
POLITECNICA
DELLE MARCHE

# Artificial Intelligence applied to Collagen Imaging data in physiologic, pathologic and tissue-engineered conditions

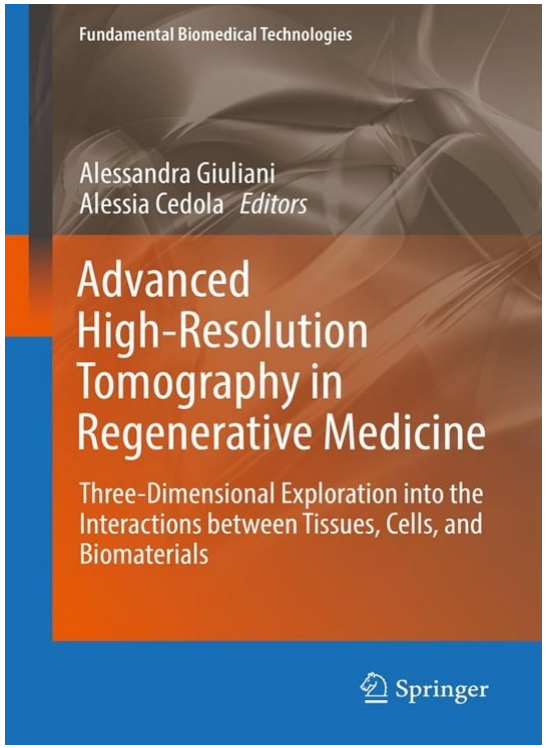
**Prof. Alessandra Giuliani**

UNIVERSITÀ POLITECNICA DELLE MARCHE

## Supervisor: Prof. Alessandra Giuliani
## Research Group Description

**Prof. Alessandra Giuliani**, PhD; Associate Professor in Applied Physics, https://orcid.org/0000-0003-4177-7441
(Publication List , H-index = 21)

Head of the Applied Physics Group, Dept-DiSCO
Università Politecnica delle Marche.




**Applied Physics Group (SSD FIS/07) in the Medical Area- Dept. DiSCO**

The research lines of the group focus on tissue physiopathology, biomaterials, tissue engineering and regenerative medicine. The aim of the research is to study, using advanced physical techniques based on synchrotron radiation, the structural changes of different types of biological tissue when affected by specific pathologies (advanced diagnostics), in conditioned environmental conditions (such as micro- or macro-gravity), or to verify the outcome of a treatment, often performed with innovative tissue engineering techniques. We are approaching this study also with the support of digital platforms suitable for the application of artificial intelligence to image processing.

UNIVERSITÀ POLITECNICA DELLE MARCHE

## Supervisor: Prof. Alessandra Giuliani

## Research Group Description: the Research Group

### Available experimental and data analysis techniques

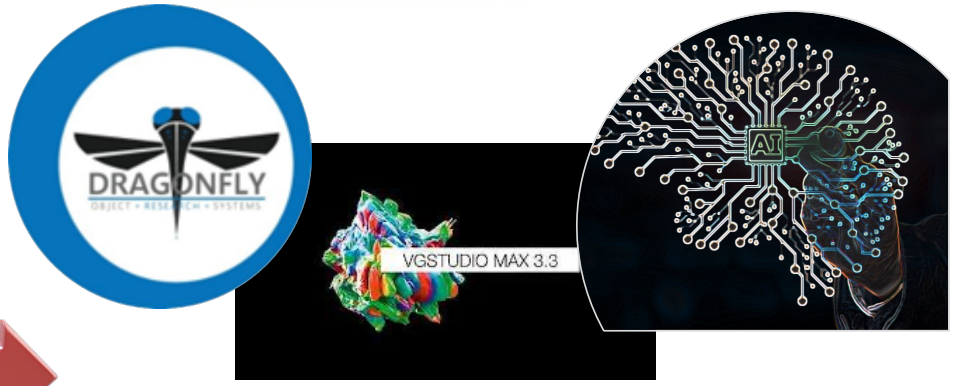
Access to Synchrotron imaging beamlines at European Large Scale Facilities

X-ray high resolution detector granted to ELETTRA Synchrotron


Elettra Sincrotrone Trieste

Benchtop microtomographic system

Dedicated HW and Data Storage




Digital Platforms for Data Analysis and Artificial Intelligence

UNIVERSITÀ POLITECNICA DELLE MARCHE

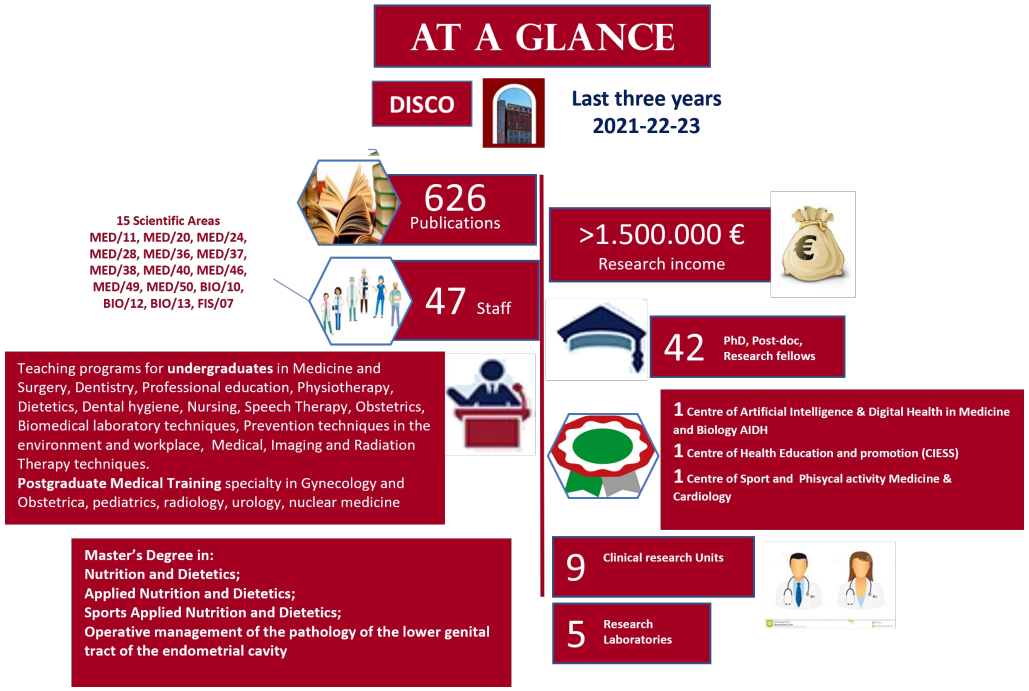
# The Department of Odontostomatologic and Specialized Clinical Sciences

## Director: Prof. Andrea Giovagnoni

The **Department of Odontostomatologic and Specialized Clinical Sciences** is the scientific and educational organizational structure of the UNIVPM University established in 2008, devoted to the promotion of scientific research, education and the dissemination of scientific research results in the community.

Its main objectives are to plan, organize and regularly evaluate the quality of research activity carried out in the scientific fields and disciplines under its competence; to plan, organize and manage the first-level and master's courses of the Faculty of Medicine; and, finally, to provide cultural and educational activities and contribute to training and orientation activities based on the needs of students in cooperation with the Medical Association.

https://www.disco.univpm.it/



UNIVERSITÀ POLITECNICA DELLE MARCHE

**Supervisor:** **Prof. Alessandra Giuliani**

**Project Idea:** **Artificial Intelligence applied to Collagen Imaging data in physiologic, pathologic and tissue-engineered conditions**

**Mechanical stimuli are regulators of the extracellular matrix (ECM) activity**, with special reference to collagen bundles: sustained mechanical stimulation may lead to modifications of the collagen composition, amount and distribution. These interactions can determine pathophysiological processes, including **developmental defects, fibrosis, inflammatory diseases, tumor growth and metastasis**. Thus, **maintaining or restoring tissue tension, by modulating external forces,** is key to the success and regulation of tissue remodeling/repair and wound healing.


**Two main objectives**:

(1) the **identification of three-dimensional morphometric parameters** deriving from the tomographic image analysis of pathological (fibrotic or cancerous) and regenerated collagen-based tissues, through **segmentations guided by artificial intelligence** followed by **data mining;**

(2) to **reconstruct volume forces** and **contact forces acting locally** in these contexts.