BRACCO FELLOWSHIPS
EDUCATION IN RESEARCH
ENROLMENT FORM

Name of Institution Department of Radiology, School of Medicine, University of Crete

City and Country of Institution Heraklion, Crete

RESEARCH GROUP

The Medical Imaging Research Group is based as the University of Crete and the University Hospital of Heraklion and focuses on the use of artificial intelligence and radiomics for the study of musculoskeletal and oncological disease. The group has extensively published on the use of radiomics and deep learning for the diagnosis of bone marrow disease. The group has received funding from ESSR (Young Researcher's Grant 2022) and has active funding from the European Union. Its members have extensive experience in the integration of biological omics (metabolomics, proteomics) with radiomics and on the use of deep learning methods (convolutional neural networks and generative adversarial networks) for the study of disease states. The leaders of the group have actively participated in the development of international guidelines for the use of artificial intelligence for medical imaging (2024 Update of CLAIM guidelines and the METRICS guidelines). The team closely collaborates on AI projects with the Institute of Computer Science of the Foundation for Research and Technology (FORTH).

TITLE OF PROPOSED RESEARCH PROJECT
Quantification of iron deposition to the bone marrow and parenchymal organs with the use of deep learning and MR imaging

OBJECTIVES

Iron deposition to the bone marrow and parenchymal organs (primarily the liver) is an important consequence in patients with chronic kidney disease undergoing hemodialysis, leading to organ failure. This can be identified with the use of state-of-the-art quantitative MR sequences which allow whole-organ evaluation in contrast to traditional biopsy which samples only a random, limited part of the organ. Deep learning techniques can be used for the prediction of iron content using traditional MR sequences without the need for the addition of specialised MR sequences in the scanning protocol. This can lead to the reduction of scanning time but it can also importantly enable opportunistic screening of iron overload using in any conventional abdominal MRI, prompting for further treatment. Specific objectives include:

- To train deep learning algorithms with the use of novel MRI sequences for the quantification of iron in parenchymal organs and the bone marrow, in patients with chronic kidney disease and beta-thalassemia. <u>MRI examinations already exist in the database of the department and will be retrospectively collected by the fellow to curate a dataset suitable for AI applications.</u>
- To test the results of the developed algorithms in real cases from the University Hospital of Heraklion
- To collaborate with members of the group for the clinical deployment of the algorithm

APPLICANT'S DUTIES
- To collect retrospective data for algorithm training and testing
- To assist in the clinical assessment of the diagnostic capacity of the developed algorithms
- To collaborate with members of the group for the selection of the appropriate algorithms and the deployment of the developed models

APPLICANT'S BENEFITS
- Participation on scientific outcomes of the project i.e. presentations to congresses or <u>publications of papers</u>
- The applicant will familiarise with the process of dataset curation for AI algorithm training and testing
- Guidance on the use of python for AI applications will be offered by members of the group, however, **<u>coding skills won't be necessary for the conduction of the project</u>**
- Participation and exposure to algorithm evaluation and clinical deployment
- Ultimately the applicant will have the chance to familiarise with the pipeline of AI research, from algorithm training to clinical deployment for evaluation purposes
- Within the premises of the project the applicant will be exposed to state-of-the-art MRI techniques for the quantification of iron for a series of diseases

- Project Leader: Michail Klontzas, MD, PhD, Assistant Professor of Radiology
- Members:
    - Apostolos Karantanas, MD, PhD, Professor of Radiology
    - Thomas Maris, PhD, Professor of Medical Physics