Sokratis Makrogiannis, PhD

Professor

Delaware State University

IHER Research Project, 2024-2025 “Machine Learning-based Imaging Biomarkers for Metabolic and Age- related Diseases”

RESEARCH AREAS

- Biomedical image analysis at macro and nano scales
- AI-assisted disease diagnostics
- Clinical application to studies of age-related and metabolic diseases

SCIENTIFIC ACHIEVEMENTS

- Techniques for automated delineation of individual muscle groups in the thigh using 3D MRI
- AI-based diagnosis and decision interpretation for osteoporosis and osteopenia in radiographs
- Automated cell segmentation and tracking in time- lapse microscopy

FUNDING

RCMI Funding: NIH/NIMHD U54MD015959

Other funding obtained with RCMI support:

- 2234869, NSF/CISE, “Microrobotics?enabled differentiation control loops for cyber physical organoid formation”
- SC3GM113754, NIH/NIGMS, “Image Analysis and Machine Learning Methods for Biomarkers of Age- related and Metabolic Diseases”

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SCIENTIFIC ADVANCE

Deep network and multi-atlas segmentation fusion for delineation of thigh muscle groups in three-dimensional water–fat separated MRI Published in Journal of Medical Imaging,Volume 5, September 2024 PMID: 39234425

This work aims to develop a method for automated segmentation of thigh muscle groups in three-dimensional (3D) thigh magnetic resonance images (MRI). Thigh muscle groups lie anatomically adjacent to each other, rendering their manual delineation a challenging and time-consuming task. The proposed technique employs image and label fusion of multi- atlas segmentation (MAS) with 3D deep learning model-based segmentation. It leverages the generalizability of MAS and the representation power of deep networks for accurate segmentation of individual muscle groups, which is critical for accurate assessment of their volume and fat content. We evaluated the performance of the proposed framework and baseline methods on MRIs of 15 healthy subjects by threefold cross-validation and further tested it on four patients. The experimental results indicated that fusion of anatomical mappings from multiple MAS techniques produces accurate muscle group segmentation. Additional fusion of MAS with deep network segmentation, further improves muscle delineation. The proposed approach can enable accurate and timely measurement of muscle structure and composition on large scale clinical studies, and lead to better understanding of body composition changes in metabolic and age-related diseases.

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