

# Quantitative Biomedical Image Analysis: From Macro to Nano

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27 gennaio 2020 ore 15.00 aula multimediale

## Abstract

Continuous progress achieved in biomedical imaging technology in the past decades has led to considerable improvement in the structural and functional understanding of healthy and pathological organisms, but also increased the need for automated tools to analyze and interpret the growing amount of biomedical data acquired. In an attempt to answer this need, we carry out collaborative research efforts aimed at the adaptation and development of novel technologies for the analysis of biomedical images. Accordingly, this talk will summarize our ongoing research efforts focused on two imaging modalities: 1) magnetic resonance imaging, and 2) microscopy. In the first part of the talk we will explore automated analysis of brain MR images for neurological disorders and searching large repositories for comparison of multiple patients. Then in the second part we will present our approach for the analysis of dendritic spines from two-photon laser scanning microscopy. In the final part we will introduce our recent research focus on the analysis of cell motility and wound healing from phase-contrast microscopy as well as a recent collaboration with the Photonics Lab of Rome Tre University and CMMIP of Politehnica University of Bucharest for analyzing and quantifying bacterial pathogens from multiple microscopy modalities. We will conclude the talk by some open problems and future directions.

## Biography

*Devrim Ünay received the B.S. degree in electrical and electronics engineering and the M.S. degree in biomedical engineering from Boğaziçi University, Turkey, and the Ph.D. degree in applied sciences from the Faculté Polytechnique de Mons, Belgium. He was a Senior Scientist and a Marie Curie Fellow with the Video Processing and Analysis Group, Philips Research Eindhoven, The Netherlands, a Visiting Researcher with the VPA Laboratory, Faculty of Engineering and Natural Sciences, Sabanci University, Istanbul, Turkey, and a Faculty Member with Biomedical Engineering Department, Faculty of Engineering and Natural Sciences, Bahcesehir University, Istanbul. He served as the Head of the Biomedical Engineering Department, İzmir University of Economics, Turkey. He is currently a Faculty Member at the Electrical-Electronics Engineering Department of Izmir Democracy University, Turkey. His research interests include biomedical image analysis, computer vision and pattern recognition, content-based information retrieval, machine/deep learning, and machine vision and quality inspection. He has been the PI of 4 national and 1 international projects. He has published 2 books, 4 book chapters, 19 journal papers, several conference proceedings, and holds 2 US patents. He has actively participated*

*in the organizations of ICPR2010 and MICCAI 2016 conferences, and co-organized several special sessions in national and international conferences. He is currently serving as an Associate Member of the [IEEE Signal Processing Society](#), [Bio Imaging and Signal Processing Technical Committee \(BISP TC\)](#) for the term 2019-2021.*

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