Helmholtz Imaging Annual Conference 2024



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Quantification of human skin biomarkers for disease characterization by optoacoustic mesoscopy with machine learning

Tuesday 14 May 2024 10:00 (15 minutes)

Non-invasive quantification of the anatomical features of human skin can lead to improved identification of vascular and other features associated with a number of diseases. Ultra-wideband raster-scan optoacoustic mesoscopy (RSOM) is a novel modality that has demonstrated unprecedented ability to visualize epidermal and dermal features in vivo. This ability can be used to prognose dermatological diseases and monitor treatment responses in a non-invasive manner based on quantified skin anatomical and microvasculature features. However, automatic and quantitative analysis of three-dimensional RSOM datasets remain a challenge. To address this challenge, we have developed a deep learning-based framework, termed Deep Learning RSOM Analysis Pipeline (DeepRAP), to analyze and quantify morphological skin features recorded by RSOM and extract imaging biomarkers for disease characterization. DeepRAP uses a two-layer segmentation strategy based on a convolutional neural network with a transfer learning approach. This strategy enabled automatic recognition of the skin layers according to their morphological structure and subsequent segmentation of the dermal microvasculature with an accuracy equivalent to human assessment. The combination of RSOM and DeepRAP analysis presents an attractive solution to image and quantify morphology and functional changes in the skin, with the potential to improve diagnostic and prognostic applications for skin and circulatory pathologies.

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 Session Classification:
 Thematic Session: Image Analysis - part I

Track Classification: Image Analysis (focus on representation learning and foundation models): Thematic focus: Image Analysis