Abstract

MICCAI - International Workshop on Machine Learning in Medical Imaging (MLMI)

Title: Machine Learning in Medical Image Analysis

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While a large majority of medical images are still analyzed visually and qualitatively, the ever-growing amounts of medical image data that accompany routine diagnostic and treatment procedures increase the need for and acceptance of computerized approaches to medical image analysis by physicians. Development of fully automated quantitative approaches is highly desirable to achieve objective results free of inter- and intra-observer variability that is typical for expert analyses as well as for human-controlled computer-assisted techniques. Despite of substantial progress in the field, the number of fully automated and robust approaches that would be ready for broad deployment in physicians' offices is still very limited. The broad and problem-adaptable knowledge of the diseases, human anatomy, associated pathology, specifics of individual imaging modalities, etc. is one of the strongest points of the human analysts. Currently, this vast a priori knowledge and associated decision making are difficult to properly incorporate in computerized systems. Clearly, machine learning approaches will play a critical role in the future of automated medical image analysis.

Almost all current medical image analysis techniques rely on a number of parameters that are set experimentally by human designers. This somewhat ad-hoc approach needs to be changed to include formal parameter optimization methods leading to parameter estimation from human-expert analyzed examples. The keynote presentation will focus on approaches to derive information from databases of expert-analyzed problem-specific examples. We will concentrate on approaches allowing to learn shape and image properties of objects and organs, mainly leading to a higher performance of medical image segmentation techniques in 3D and 4D. Methods for cross-modality use of learned information will be discussed. The talk will be accompanied by sample applications in automated segmentations of cartilage MR, retinal OCT, and cardiovascular images.