UNIVERSITÄT
BERN

Bern, 15.04.2021

Bern Data Science Day 2021 - April 23

Interpretability-Driven Sample Selection Using Self Supervised Learning For Disease Classification And Segmentation

Mauricio Reyes
MIA group, ARTORG, University of Bern
mauricio.reyes@med.unibe.ch

Abstract

In supervised learning for medical image analysis, sample selection methodologies are fundamental to attain optimum system performance promptly and with minimal expert interactions (e.g. label querying in an active learning setup). In this paper we propose a novel sample selection methodology based on deep features leveraging information contained in interpretability saliency maps. In the absence of ground truth labels for informative samples, we use a novel self supervised learning based approach for training a classifier that learns to identify the most informative sample in a given batch of images. We demonstrate the benefits of the proposed approach, termed Interpretability-Driven Sample Selection (IDEAL), in an active learning setup aimed at lung disease classification and histopathology image segmentation. We analyze three different approaches to determine sample informativeness from interpretability saliency maps: (i) an observational model stemming from findings on previous uncertainty-based sample selection approaches, (ii) a radiomics-based model, and (iii) a novel data-driven self-supervised approach. We compare IDEAL to other baselines using the publicly available NIH chest X-ray dataset for lung disease classification, and a public histopathology segmentation dataset (GLaS), demonstrating the potential of using interpretability information for sample selection in active learning systems. Results show our proposed self supervised approach outperforms other approaches in selecting informative samples leading to state of the art performance with fewer samples.