Deep Learning Infrared Spectro-Imaging

Summary:

This project aims at investigating potentials of deep learning (DL) in the field of Infrared (IR) spectro-imaging data analysis for diagnostic.

A IR data is a 2D spatial slice + 1D spectral data that images the response of infrared beam attenuation through thin samples deposited on a microscope slice. According to the type of human tissue, the spectral information is going to differ. Thus an analysis of the 1D spectral data in each point of the 2D image helps at determining some characteristics about the sample. Standard classification methods, such as principal component analysis, are able to distinguish quickly the organ original tissue (brain, kidney, ...) but are not quite interesting for diagnosis.

Conversely, technics based on spectral decomposition by fitting of series / models ofcharacteristic bands are able to distinguish thin spectral differences (healthy / cancerous tissues)and they can also provide quantitative information (glucose / lipids concentrations for example). Unfortunately, such latter methods require a computation time which is not in agreement with routine application (several hundreds of sample analysis per day in a pathology laboratory for instance).

Thus, the objective of this project is to investigate DL capabilities for analyzing IR spectral data and define DL based approach(es) / method(s) that could overcome limitations of standard classification while reaching a better computation time than quantitate - and time consuming - techniques.