Artificial-intelligence assisted spectral unmixing for illuminated manuscripts

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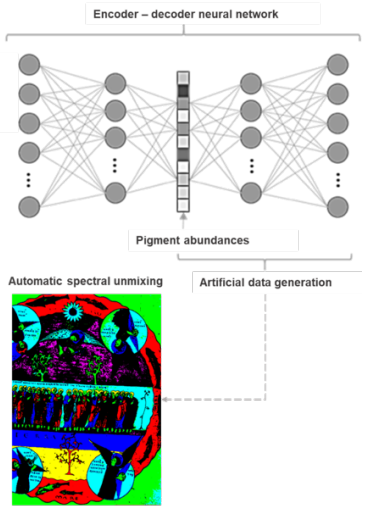
Starting date	before end of 2024
Duration	1 year
Gross monthly salary	2936 €
Application deadline	June 30, 2024

Project description

The goal of this project is to use machine learning (ML) algorithms to model how the reflectance spectra of complex mixtures of colored materials from historical artworks, specifically illuminations and/or decorated letters from ancient manuscripts, depend on their chemical composition. Covering a wide range of energy from visible (VIS) to mid-infrared (mid-IR) coupled with X-ray fluorescence spectroscopy (XRF), a spectral database of reference inorganic and organic materials will be built. Subsequently, a supervised ML algorithm will be trained on the database, and the obtained ML model will be capable of simultaneously predicting the composition of the colored layer and the abundance of materials present in the mixture. Next, we will use the trained ML model to generate a greater variety of artificial reflectance spectra, thus expanding the existing data set. A second ML model will then be trained on the expanded data set to understand how the reflectance spectrum correlates with the composition of the pictorial mixture. This second model will be applied to the analysis of historical manuscripts. ***The candidate is expected to develop an approach that will offer an efficient and general method for onsite determination of the composition of historical illuminations based on their spectral response.***

Skills required

- ***Python programming***
- ***Knowledge in machine learning algorithms (most specifically encoder-decoder NN and transfer learning would be appreciated)***
- *Expertise in reflectance and X-ray fluorescence imaging spectroscopies (optional)*
- *Experience with multi-spectral dataset analyses (optional)*



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