Report 1 -14/01/2023 (U Pavithra[222SP030])

Title: Nonlinear Hyper Spectral Images Unmixing

Objective: Representation of mixed pixels in Hyper Spectral Image (HIS) as a set of pure materials (end members) weighted by respective abundances.

Introduction: In hyper spectral unmixing, the model used prevalently is the linear mixing model, and a large variety of techniques based on this model has been proposed to decompose end members and their abundances in hyper spectral imagery [1] [2].

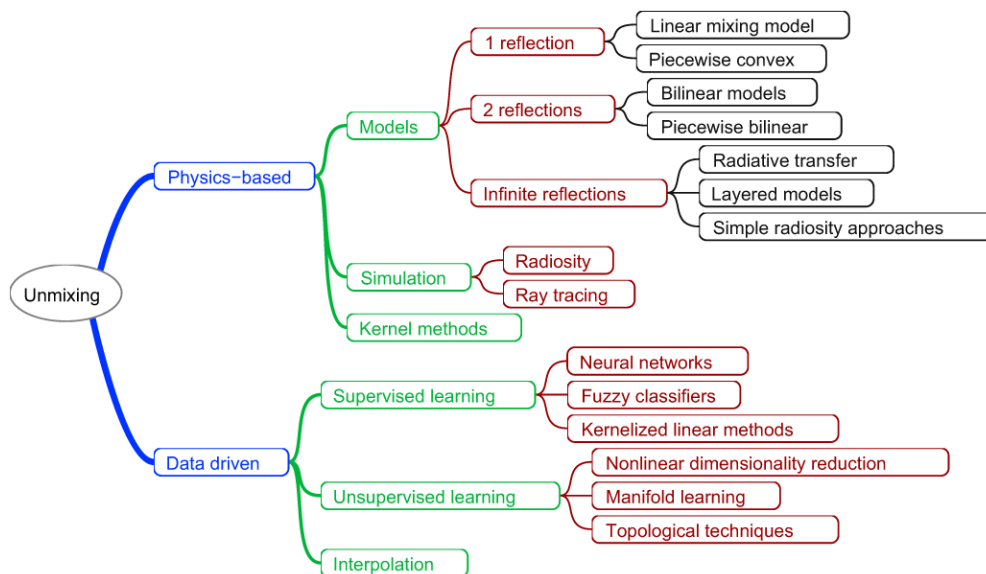Various techniques available for unmixing are represented in Fig1.

Fig1: Taxonomic tree of the different unmixing techniques [1]

Problem Statement: Nonlinear spectral mixing effects represent a real-world scenarios, such as planetary remote sensing, intimate mineral mixtures, vegetation canopies, or urban scenes more accurately [1].

Applications: Hyperspectral Unmixing techniques have been widely used for a variety of applications, such as mineral mapping and land-cover change detection.

Datasets which can be used:

1. Japser Ridge
2. Samson
3. Urban
4. Cuprite [5]

References:

1. R. Heylen, M. Parente and P. Gader, "A Review of Nonlinear Hyperspectral Unmixing Methods," in IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, vol. 7, no. 6, pp. 1844-1868, June 2014, doi: 10.1109/JSTARS.2014.2320576.

2. N. Keshava and J. F. Mustard, "Spectral unmixing," in IEEE Signal Processing Magazine, vol. 19, no. 1, pp. 44-57, Jan. 2002, doi: 10.1109/79.974727.

3. Mohamad Jouni, Mauro Dalla Mura, Lucas Drumetz, Pierre Comon. Multifeature Hyperspectral Unmixing Based on Tensor Decomposition. 2022. hal-03480890v4

4. Linear Unmixing : https://www.youtube.com/watch?v=BsuBybh8-io

5. http://lesun.weebly.com/hyperspectral-data-set.html

Work to be done in coming weeks:

1. Literature Review of Nonlinear methods

2. To read and represent the datasets that are in .mat format to matrix in python (matplotlib).