# Landsat Segmentation Using Semi-Supervised Learning

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*Machine learning; semi-supervised classification; computer vision;*

## introduction

Landsat Image semi-supervised classification is one of the computer vision's subarea, which aims to separate an image into regions in order to make it's analysis and comprehension easier. Its application benefits several areas of knowledge, such as geology and geography. Therefore, the development of effective methods of classification is very important.

## Objectives

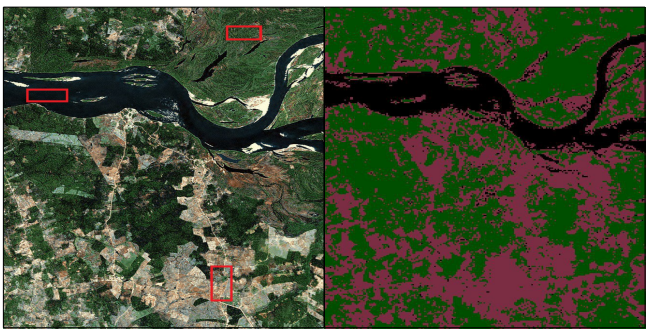
The main goal of this project was to apply semi-supervised learning in the task of Landsat image classification. Specifically, the competition and cooperation algorithm[1], which was tested and extended for the realization of the proposed theme.

## Material and Methods

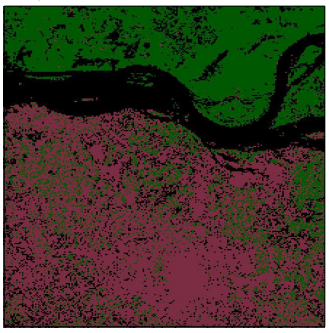
For the realization of this project studies about the concepts of image classification and segmentation, image attribute extracting and how to work with multispectral images were required.
Once mastered these themes, the original graph based algorithm was applied to the Landsat classification. In these tests was verified that the algorithm can be used in the proposed task.
According to the main goal, a specific version of the algorithm was created and implemented, replacing the graph structure by the image pixel's coordinates.

## Results and Discussion

Once implemented the original algorithm and it's extension for images, tests on Landsat images were made, for both RGB and multispectral images.



**(a)** **(b)**



**(c)**

**Figure 1.** 4 band Multispectral image classified by the two implementations of the algorithm. Separated in water(black),crops(pink) and forest(green). (a) original image with samples outlined in red, (b) image classified by the original algorithm (c) image classified by the modified algorithm.

As shown in figure 1, the classification could be done with certain error rate, also, the modified version was less accurate, that happened in all tested multispectral images, in RGB images the accuracy of the two versions was equivalent.

## Conclusions

The competition and cooperation algorithm has proved itself capable of classify Landsat images, with visible error rate, and being enhanced, could be a good option for this task.

## Acknowledgements

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[1]Breve, F., Zhao, L., Quiles, M., Pedrycz, W., & Liu, J. (2012). Particle competition and cooperation in networks for semi-supervised learning. Knowledge and Data Engineering,IEEE Transactions on,24(9), 1686–1698.

[2]Duda, R. O., Hart, P. E., & Stork, D. G. (2000). Pattern Classification (2nd Edition). Wiley-Interscience.

[3]Shapiro, L. G. & Stockman, G. C. (2001). Computer Vision. New Jersey: Prentice-Hall.