

Graphs for image processing, analysis, vision and pattern recognition

Aims of the course : introduce image processing methods based on graphs for low-level applications like segmentation and higher level applications like pattern recognition

- What is a graph? Which kind of graphs do you know for image processing?

- What is a Region Adjacency Graph? Do you know how to define the Voronoï diagram and Delaunay triangulation from a set of points?

- Which algorithms from graph theory have you already seen?

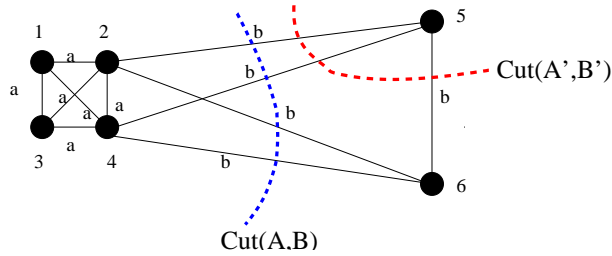
- Here is a toy image :



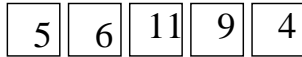
Propose a segmentation method of this image based on the minimum spanning tree.

Propose a segmentation method based on a minimum cut.

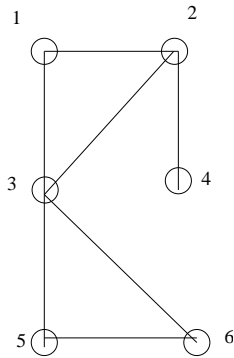
- Here is a toy image. Compute the cost of the cuts and normalized cuts.



• Doing a binary classification can be done by computing a min-cut. What is the graph to build for the following toy image - line and the energy : $U(x|y) = \sum_s (y_s - \mu_{x_s})^2 + \beta \sum_{(s,t)} \Delta(x_s, x_t)$ (y_s is the grey-level of pixel s , x_s is the class 0 or 1, β a penalization constant). $\mu_0 = 5$ and $\mu_1 = 10$.



• The decision tree allows to compute the maximal cliques of a graph. What is the decision tree for the following graph :



• To find sub-graph isomorphisms, an association graph can be computed. Determine the one associated to the two following graphs :

