Elective MS course: SPECTRAL CLUSTERING

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TOPICS:

- Introducing graph based matrices for the solution of quadratic placement problems.
- Laplacian and modularity spectra of some notable simple graphs and that of edge- and vertex-weighted graphs.
- Estimating minimal and maximal multiway cuts with the spectra of the above matrices; finding near optimal cuts with metric clustering of the representatives assigned to the vertices by means of the eigenvectors (k-means algorithm and its weighted versions).
- The methods are generalized to rectangular arrays of nonnegative entries, e.g., to microarrays, via SVD.
- Theory of Reproducing Kernel Hilbert-spaces, application to image segmentation (see the Figure below).
- Revealing the underlying block-structure in large, noisy networks; perturbation theorems. Testable graph parameters.
- Random graph models, stochastic block models, parameter estimation with the EM algorithm.

Requirements: see on the homepage https://www.math.bme.hu/∼marib/speclus
Book: Bolla, M., Spectral Clustering and Biclustering. Learning Large Graphs and Contingency Tables. Wiley, 2013.

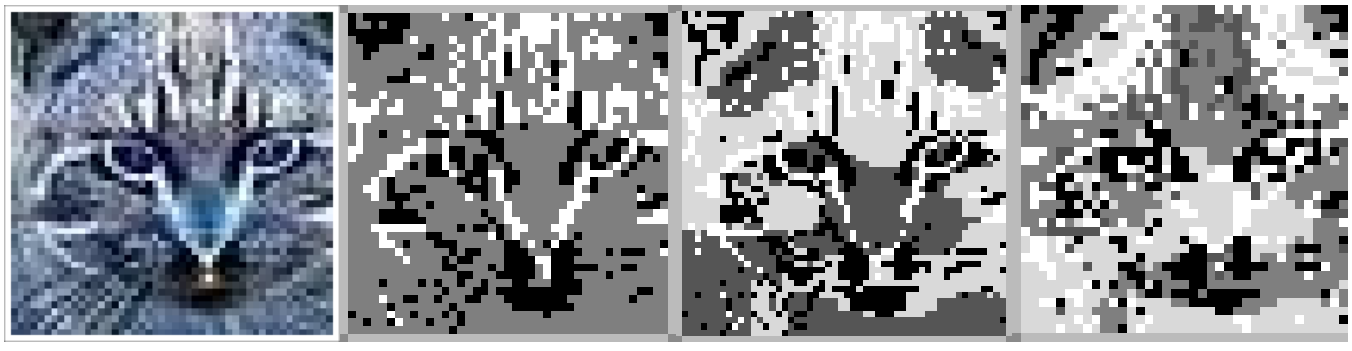

Figure 1: The original picture and the pixels colored with 3, 4, and 5 different colors according to their cluster memberships (made by László Nagy).