

Graphs in Machine Learning

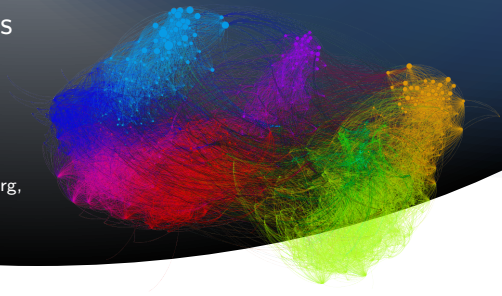
Spectral Clustering: Examples

Understanding and Applications

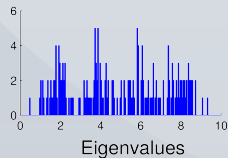
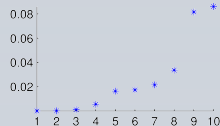
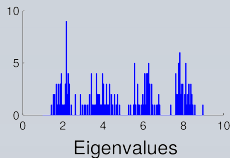
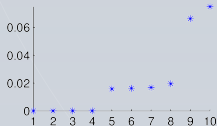
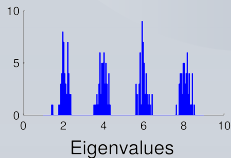
Michal Valko

Inria & ENS Paris-Saclay, MVA

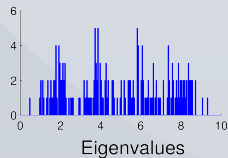
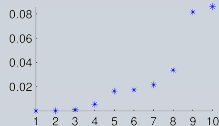
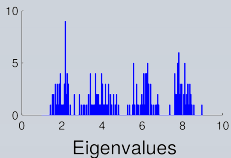
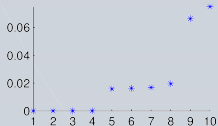
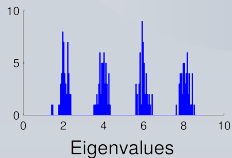
Partially based on material by: Ulrike von Luxburg,
Bernhard Schölkopf, John C. D. Miller, Doyle & Schnell, Daniel Spielman



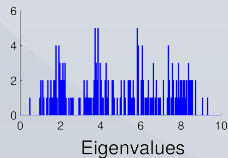
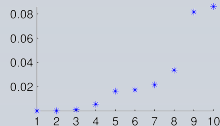
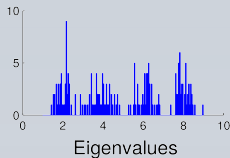
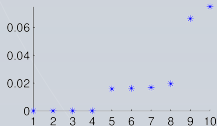
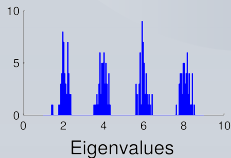
Spectral Clustering: 1D Example



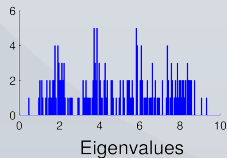
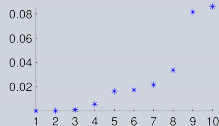
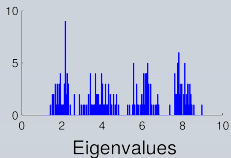
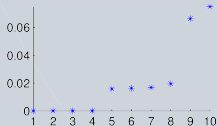
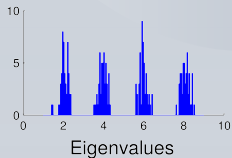
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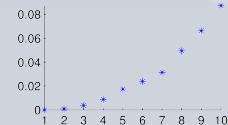
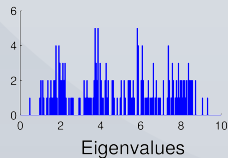
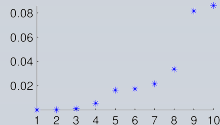
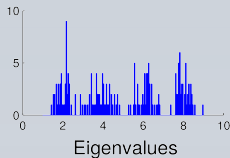
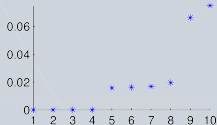
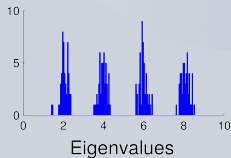


Spectral Clustering: 1D Example



Spectral Clustering: 1D Example

Elbow rule/EigenGap heuristic for number of clusters



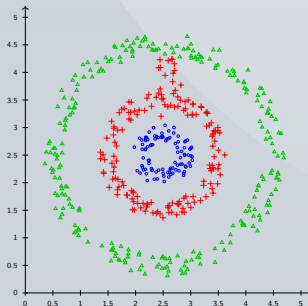
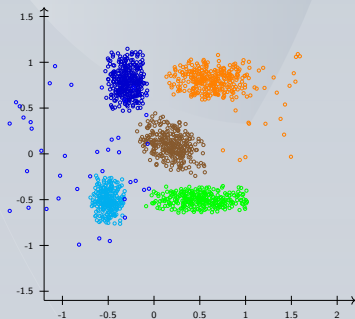
Source: von Luxburg (2007)

Spectral Clustering: Understanding

Compactness vs. **Connectivity**

Spectral Clustering: Understanding

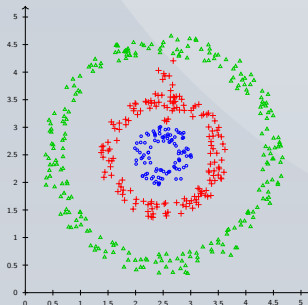
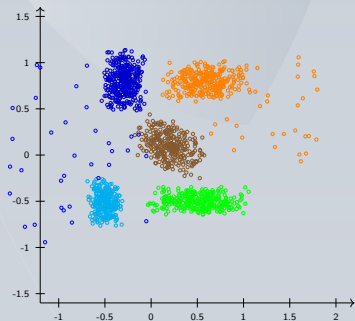
Compactness vs. Connectivity



Source: von Luxburg (2007)

Spectral Clustering: Understanding

Compactness vs. Connectivity

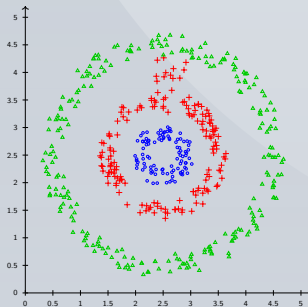
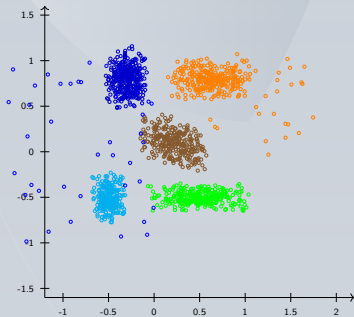


Source: von Luxburg (2007)

For which kind of data we can use one vs. the other?

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Compactness vs. Connectivity

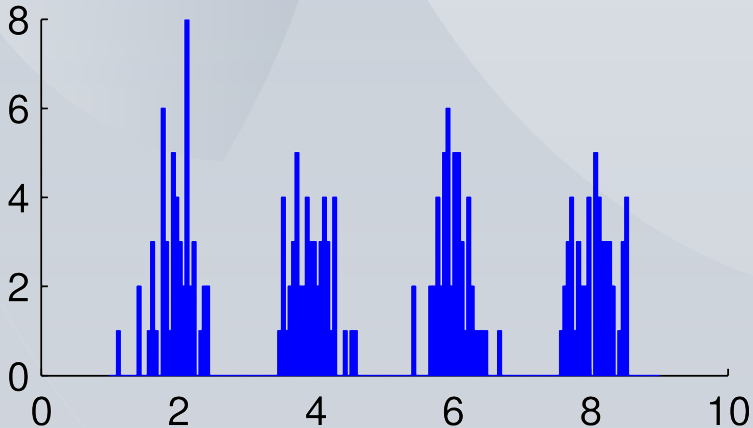


Source: von Luxburg (2007)

For which kind of data we can use one vs. the other?

Any disadvantages of spectral clustering?

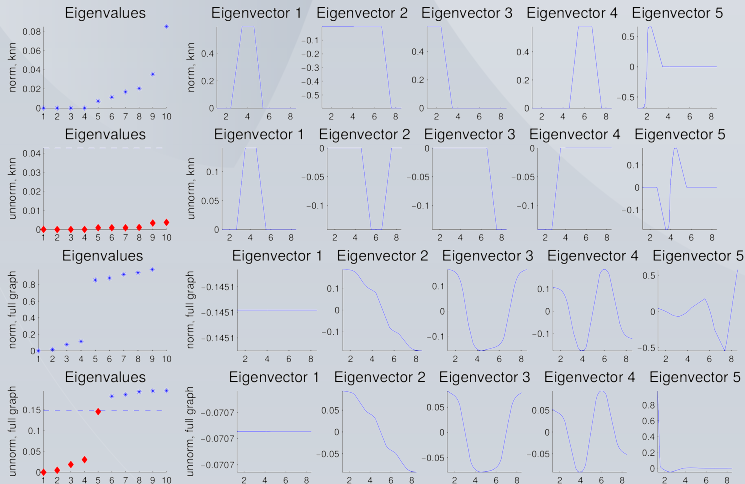
Spectral Clustering: 1D Example - Histogram



Source: von Luxburg (2007) –

http://www.informatik.uni-hamburg.de/ML/contents/people/luxburg/publications/Luxburg07_tutorial.pdf

Spectral Clustering: 1D Example - Eigenvectors



Source: von Luxburg (2007)

Spectral Clustering: Bibliography

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- Things can go wrong with the relaxation: **Spielman & Teng (2007)** – Spectral partitioning works: Planar graphs and finite element meshes
Linear Algebra and Its Applications, 421:284–305



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`https://misovalko.github.io/mva-ml-graphs.html`