07 - Images as Graphs

Images can be represented as graphs, enabling powerful graph algorithms for segmentation and analysis. Each pixel (or superpixel) becomes a node; edges connect similar neighbors.

Graph cuts: Partition the graph to separate foreground from background. Minimize a cut that balances edge weights and region consistency.

Spectral clustering: Uses eigenvectors of the graph Laplacian to find natural clusters. Reveals structure that k-means might miss.

Superpixels and Efficiency

Superpixels group pixels into small, roughly uniform regions (typically 100-1000 per image). They reduce the graph size dramatically.

Instead of millions of pixel nodes, you have thousands of superpixel nodes. This makes spectral clustering and other algorithms much faster while preserving important boundaries.

Applications: image segmentation, object detection, and medical imaging.