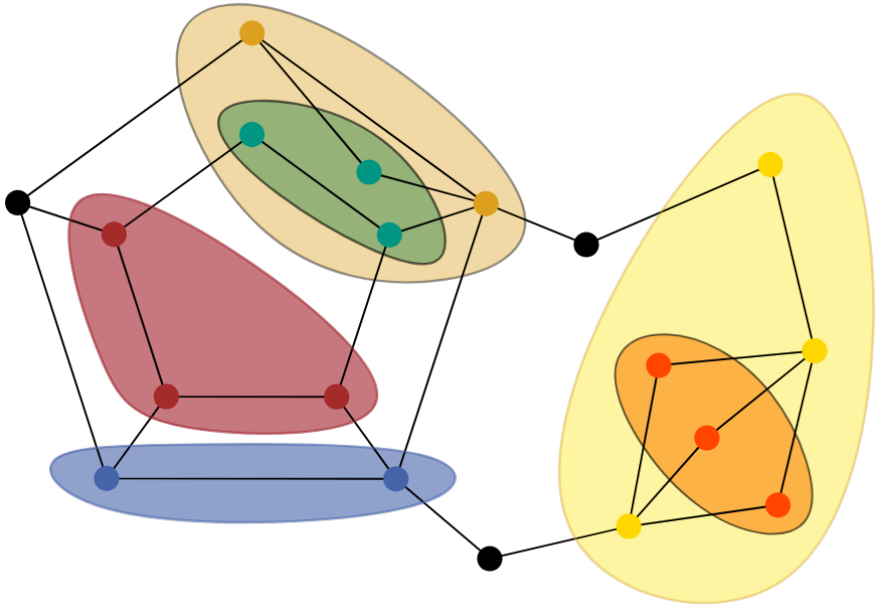
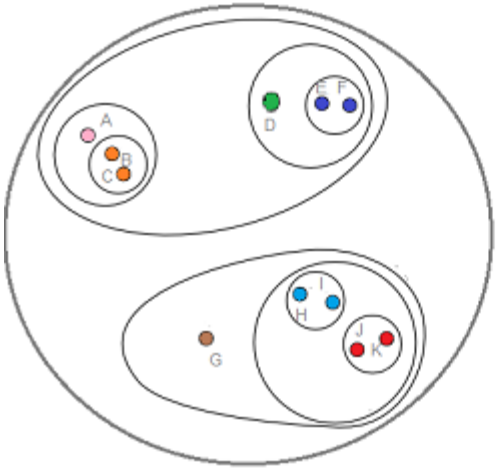


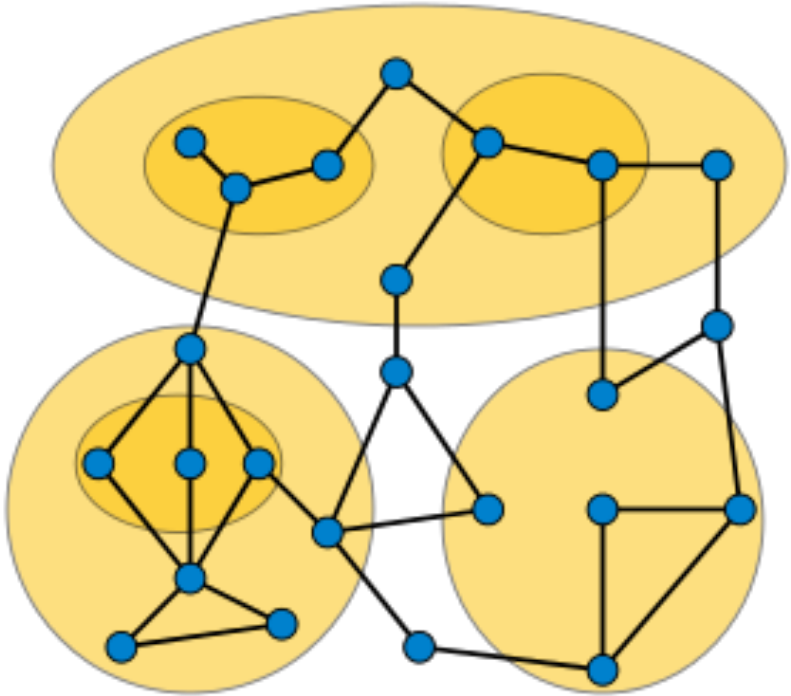
Clustered Planarity

Hierarchical Clustering



Clustered Graph

A clustered graph is a graph with a hierarchical clustering on its vertices



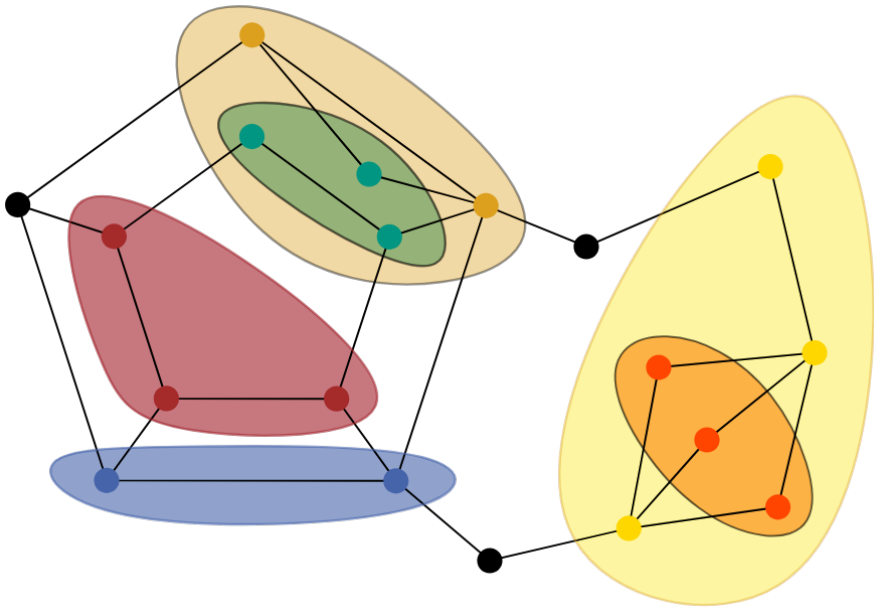
Clustered Planarity

A clustered graph is clustered planar if we can draw the graph in the plane, and each clusters a a closed curves surrounding exactly the vertices which that cluster contains, such that:

1) No edges cross

1) No cluster boundaries cross

1) A given edge and a given cluster boundary intersect at at most one point



Question:

Is there a polynomial time algorithm to determine if a clustered graph is clustered planar?

Answer:

Nobody knows

New Question:

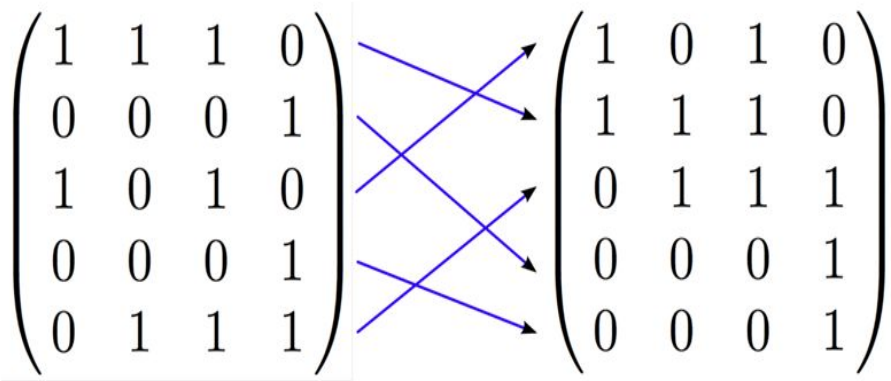
Is there a polynomial time algorithm to determine the minimum number of clusters that can be deleted from a clustered graph to make it clustered planar?

Answer:

Probably not
(its NP-Complete)

Consecutive Ones Property

A matrix is said to have the consecutive ones property if its rows can be reordered such that in every column, all ones appear consecutively



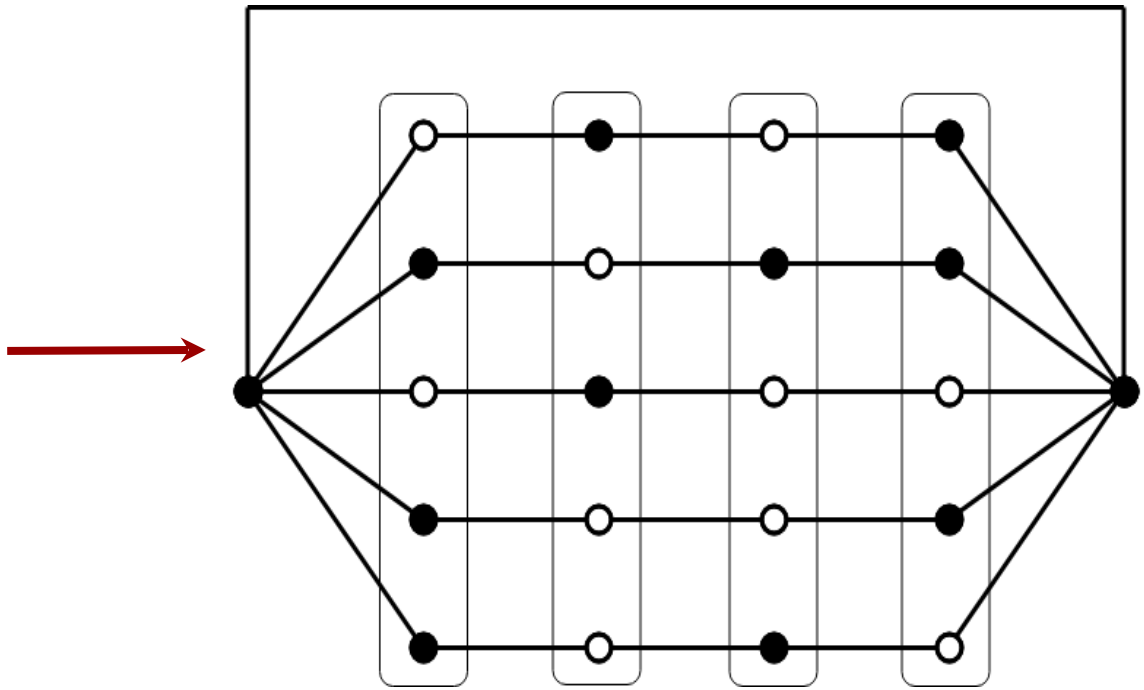
Consecutive Ones Submatrix Problem

Given a matrix M and an integer k, can we delete k columns from M such that the resulting matrix has the consecutive ones property?

NP-COMPLETE!

Reduction:

$$\begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix}$$



Mapping solutions of c-planarity to C1P Submatrix

$$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 1 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix}$$