

K-Cores

Introduction to Network Science

Carlos Castillo

Topic 21

Sources

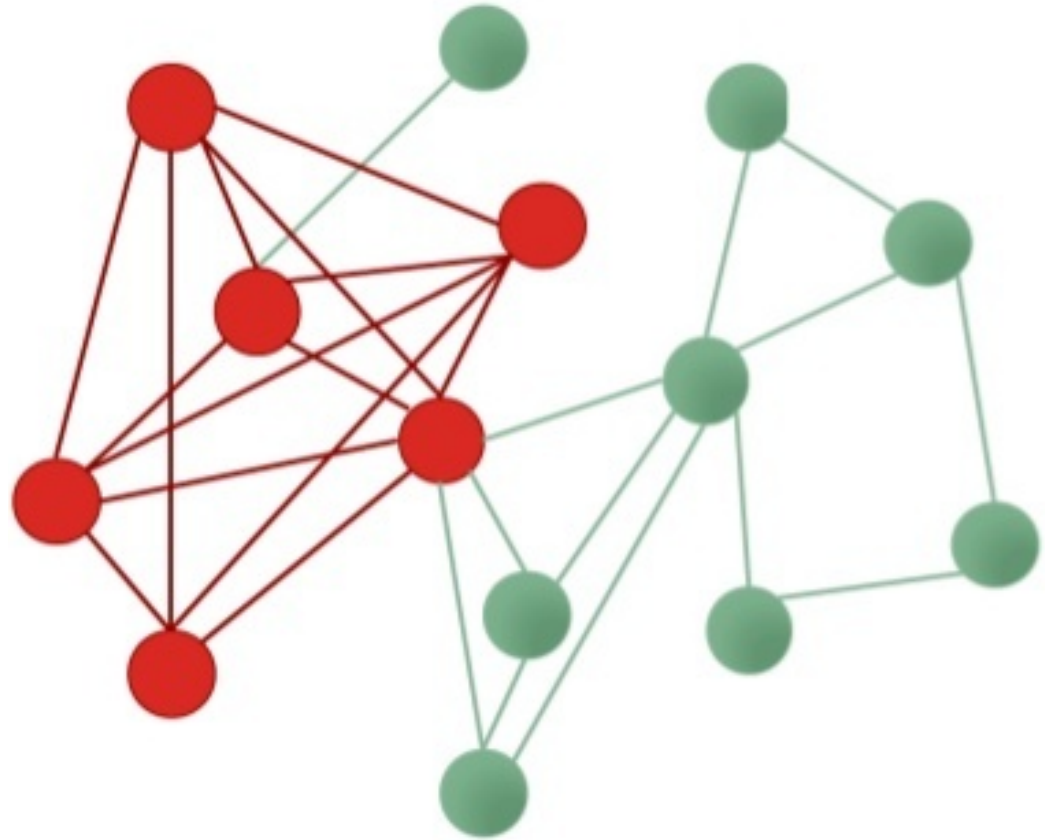
- Barabási 2016 Chapter 9
- [Networks, Crowds, and Markets](#) Ch 3
- C. Castillo (2017) [Dense Sub-Graphs](#)
- Tutorial by A. Beutel, L. Akoglu, C. Faloutsos [[Link](#)]
- Frieze, Gionis, Tsourakakis: “Algorithmic techniques for modeling and mining large graphs (AMAZING)” [[Tutorial](#)]
- A survey of algorithms for dense sub-graph discovery [[link](#)]

Sometimes, at the center these graphs may have an interesting dense sub-graph



Remember: densest sub-graph

Sub-graph
having the
maximum
density

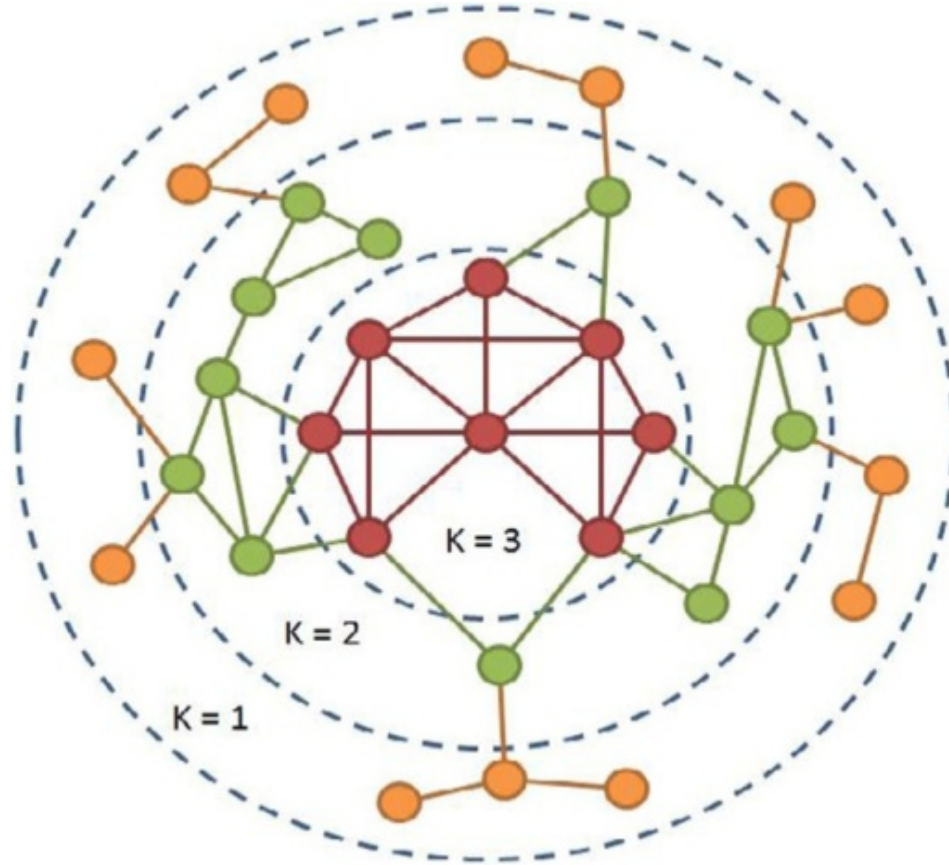


k-core decomposition
is a method to decompose
a graph into *layers*

k-core decomposition

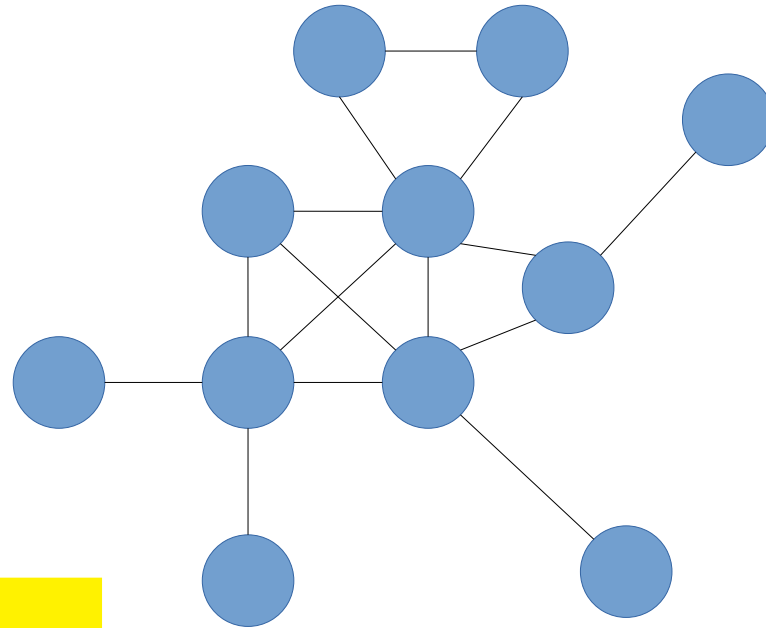
- Remove all nodes having degree 1
 - Those are in the 1-core
- Remove all nodes having degree 2 *in the remaining graph*
 - Those nodes are in the 2-core
- Remove all nodes having degree 3 *in the remaining graph*
 - Those nodes are in the 3-core
- Etc.

Example



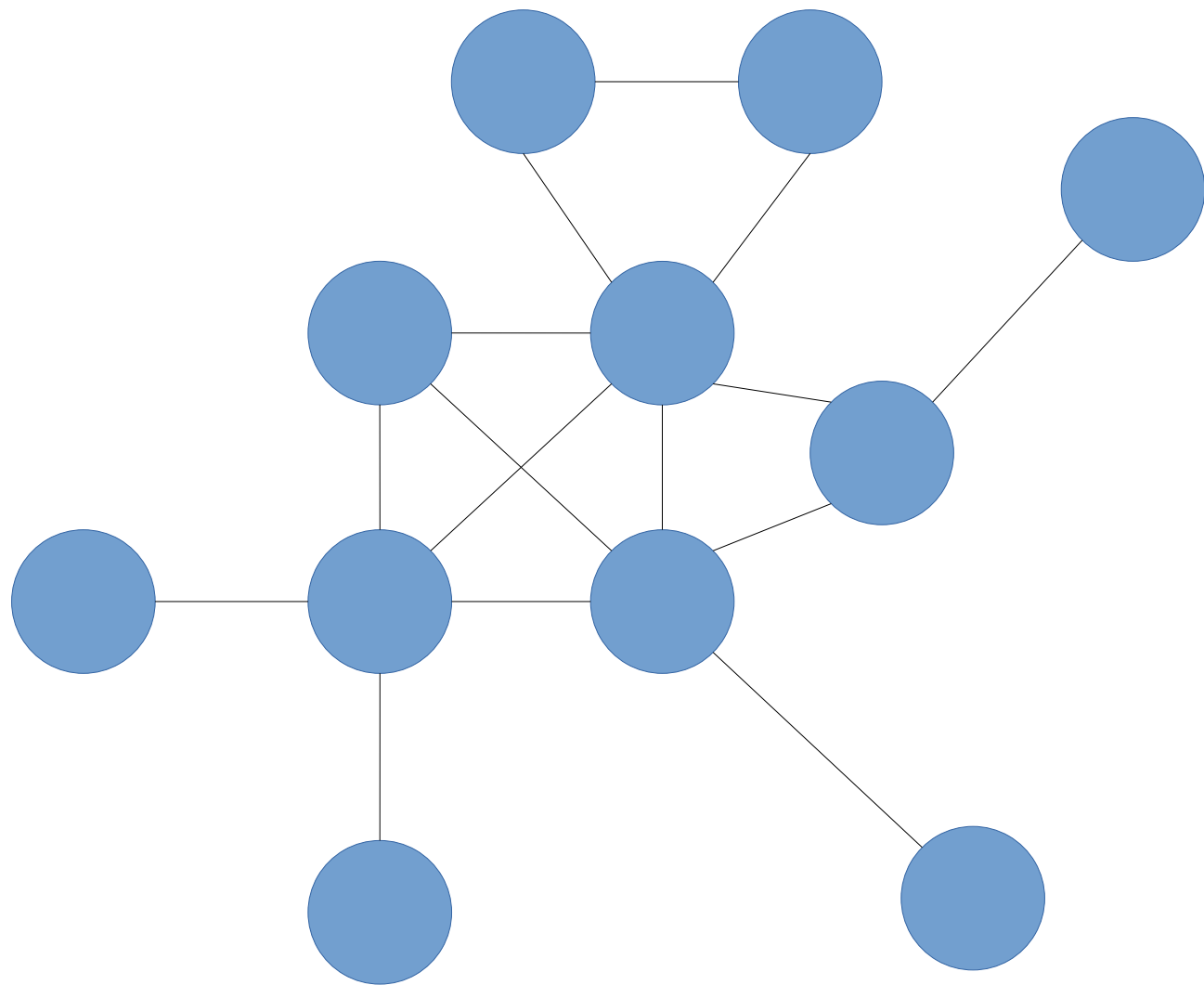
Exercise

For each node in the graph, indicate the max k-core to which it belongs



Draw in Nearpod Draw-it
<https://nearpod.com/student/>
Code to be given during class

<http://www.cpt.univ-mrs.fr/~barrat/NHM.pdf>



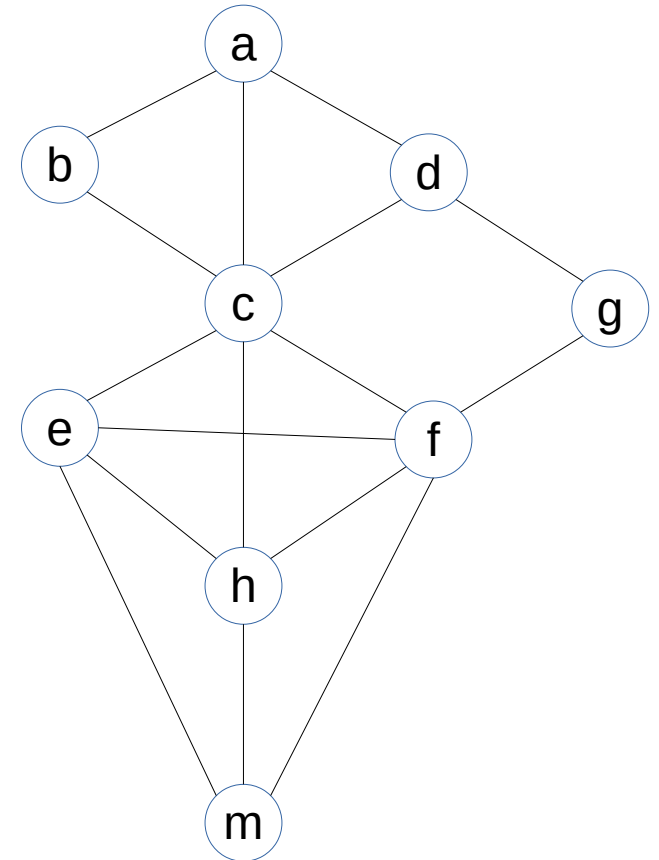
Summary

Things to remember

- What is the k -core decomposition
- How to compute it on a graph

Practice on your own

Find the 3-core of this graph



Solution by Vivekanand Khyade (start at 01:23)
<https://youtu.be/8sNZ5d8eNC8?t=83>