Articulation Point a vertex in an undirected graph iff removal disconnects the graph

Diameter the largest shortest path between the nodes of a graph

Directed acyclic graph (**DAG**) finite directed graph with no directed cycles.

Simple a graph without multiple edges or self loops

Path sequence of alternating vetches and edges.

Cycle path that starts and end at the same vertex.

Completed Graph undirected graph, every pair of vertices is connected by an edge

Clique a complete subgraph

Bipartiteness vertices can be divided into two disjoint and independent sets

Connected graph has all pairs of vertices connected by at least one path (undirected). contains a directed path from *u* to *v* or a directed path from *v* to *u* for every pair of vertices *u, v* (directed)

Connected component is a connected subgraph of a unconnected graph.

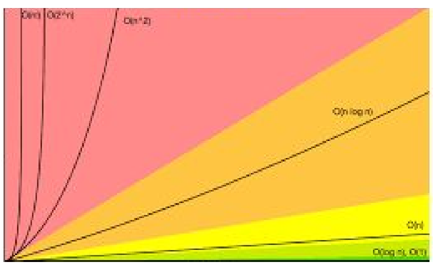
Strong component is maximal strongly connected subgraphs

Strongly connected (Disconnected, simply strong): a directed graph where e(u,v) and e(u,v) exist for all vertices pairs

Weakly connected: a directed graph that would be connected if turned into an undirected graph.

Minimum Spanning Tree subset of edges of a weighted directed graph that connects all vertices, without any cycles and with the minimum total weight

Tree undirected graph in which any two vertices are connected by exactly one path

<table>
<tr>
<td>
</td>
<td>$O(1)$
$O(log\ n)$
$O(\sqrt{n})$

$O(n)$
$O(n\ log\ n)$

$O(n^2)$
$O(2^n)$
$O(n!)$</td>
<td>Is directed graph is strongly connected
Finding connected/strongly connected components
Test bipartiteness
Depth first search (DFS)
Breadth first search (BFS)
Topological ordering in a directed graph
Is an undirected graph is connected
$\lim_{n\to\infty} f(n)/g(n) \neq \infty \quad \Rightarrow \quad f = O(g)$</td>
</tr>
</table>

<table>
<tr><th>Algorithm</th><th>Running time</th><th>Algorithm</th><th>Running time</th><td rowspan="4">prove that (n − 1)! is the worst-case number of topological orderings of a DAG with n nodes.
Induction Step: for n-1, is O((n-2)!)
Then: prove with Tree (remove one, the rest is in (n-2)!, add back anywhere and it’s (n-1)*(n-2)!)</td></tr>
<tr><td>Gale Shapley</td><td>$O(n^2)$</td><td>MST Prim</td><td>$O(e\ log\ v)$ * $O(v^2)$ **</td></tr>
<tr><td>DFS, BFS</td><td>$O(v+e)$ * $O(v^2)$ **</td><td>MST</td><td>$O(e\ log\ v)$ or $O(e\ log\ e)$</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
</table>

*adjacency list | **adjacency matrix

<table>
<tr><td>Gale Shapley</td><td>Intervals</td></tr>
<tr><td>function stableMatching {
  All m ∈ M and w ∈ W to free
  while ∃ free m, m has a w to propose to {
    w = first woman on m’s list he has not yet proposed
    if w is free
      (m, w) become engaged
    else some pair (m', w) already exists
      if w prefers m to m'
        m' becomes free
        (m, w) become engaged
      else
        (m', w) remain engaged }}</td><td>R set of intervals in S not considered yet
A set of selected intervals
  set R = S and A={}
  while R 6={} {
    choose an interval i in R where f(i) is smallest
    add interval i to A
    delete intervals from R incompatible with i (*)}</td></tr>
</table>

Sources: http://bigocheatsheet.com/ and class notes