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Chapter 1 : A Brief Summary of Independent Set in Graph Theory | Dive Into A Data Deluge

In graph theory, an independent set, stable set or anticlique is a set of vertices in a graph, no two of which are blog.quintoapp.com is, it is a set S of vertices such that for every two vertices in S, there is no edge connecting the two.

In fact, sufficiently large graphs with no large cliques have large independent sets, a theme that is explored in Ramsey theory. A set is independent if and only if its complement is a vertex cover. A vertex coloring of a graph G corresponds to a partition of its vertex set into independent subsets. Maximal independent set[edit] Main article: Maximal independent set An independent set that is not the subset of another independent set is called maximal. Such sets are dominating sets. The number of maximal independent sets in n-vertex cycle graphs is given by the Perrin numbers , and the number of maximal independent sets in n-vertex path graphs is given by the Padovan sequence. Finding independent sets[edit] Further information: Clique problem In computer science , several computational problems related to independent sets have been studied. In the maximum independent set problem, the input is an undirected graph, and the output is a maximum independent set in the graph. If there are multiple maximum independent sets, only one need be output. This problem is sometimes referred to as "vertex packing". In the maximum-weight independent set problem, the input is an undirected graph with weights on its vertices and the output is an independent set with maximum total weight. The maximum independent set problem is the special case in which all weights are one. In the maximal independent set listing problem, the input is an undirected graph, and the output is a list of all its maximal independent sets. The maximum independent set problem may be solved using as a subroutine an algorithm for the maximal independent set listing problem, because the maximum independent set must be included among all the maximal independent sets. In the independent set decision problem, the input is an undirected graph and a number k, and the output is a Boolean value: The first three of these problems are all important in practical applications; the independent set decision problem is not, but is necessary in order to apply the theory of NP-completeness to problems related to independent sets. Maximum independent sets and maximum cliques[edit] The independent set problem and the clique problem are complementary: Therefore, many computational results may be applied equally well to either problem. For example, the results related to the clique problem have the following corollaries: The independent set decision problem is NP-complete , and hence it is not believed that there is an efficient algorithm for solving it. The maximum independent set problem is NP-hard and it is also hard to approximate. Despite the close relationship between maximum cliques and maximum independent sets in arbitrary graphs, the independent set and clique problems may be very different when restricted to special classes of graphs. For instance, for sparse graphs graphs in which the number of edges is at most a constant times the number of vertices in any subgraph , the maximum clique has bounded size and may be found exactly in linear time; [6] however, for the same classes of graphs, or even for the more restricted class of bounded degree graphs, finding the maximum independent set is MAXSNP-complete , implying that, for some constant c depending on the degree it is NP-hard to find an approximate solution that comes within a factor of c of the optimum. Now it can be solved in time O 1. When restricted to graphs with maximum degree 3, it can be solved in time O 1. For many classes of graphs, a maximum weight independent set may be found in polynomial time. Famous examples are claw-free graphs , [10] P5-free graphs [11] and perfect graphs. Another important tool are clique separators as described by Tarjan. Therefore, minimum vertex covers can be found using a bipartite matching algorithm. In fact, Max Independent Set in general is Poly-APX-complete , meaning it is as hard as any problem that can be approximated to a polynomial factor. Interval scheduling An interval graph is a graph in which the nodes are 1-dimensional intervals e. An independent set in an interval graph is just a set of non-overlapping intervals. The problem of finding maximum independent sets in interval graphs has been studied, for example, in the context of job scheduling: This problem can be solved exactly in polynomial time using earliest deadline first scheduling. Independent sets in geometric intersection graphs[edit] Main article: Maximum disjoint set A geometric intersection graph is a graph in which the nodes are geometric shapes and there is an edge between two shapes iff they intersect. An independent set in a geometric intersection graph is just a set of disjoint non-overlapping shapes. The problem of finding maximum independent sets in geometric intersection graphs has been studied, for example, in the context of Automatic label placement: Finding a maximum independent set in intersection graphs is still NP-complete, but it is easier to approximate than the general maximum independent set problem. Finding maximal independent sets[edit] The problem of finding a maximal independent set can be solved in polynomial time by a trivial greedy algorithm. Software for searching maximum independent set[edit] Name.

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Chapter 2 : independent set - Wikidata

Let 'G' = (V, E) be a graph. A subset L of E is called an independent line set of 'G' if no two edges in L are adjacent. Such a set is called an independent line set. An independent line set is said to be the maximal independent line set of a graph 'G' if no other edge of 'G' can be.

If all n-vertex graphs in a family of graphs have O n edges, and if every subgraph of a graph in the family also belongs to the family, then each graph in the family can have at most O n maximal cliques, all of which have size O 1. Interval graphs and chordal graphs also have at most n maximal cliques, even though they are not always sparse graphs. The number of maximal independent sets in n-vertex cycle graphs is given by the Perrin numbers , and the number of maximal independent sets in n-vertex path graphs is given by the Padovan sequence. Initialize I to an empty set. While V is not empty: The runtime is O m since in the worst case as we have to check all edges. O m is obviously the best possible runtime for a serial algorithm. But a parallel algorithm can solve the problem much faster. For every edge in E, if both its endpoints are in the random set S, then remove from S the endpoint whose degree is lower i. Break ties arbitrarily, e. Add the set S to I. Remove from V the set S and all the neighbours of nodes in S. For each node v, divide its neighbours to lower neighbours whose degree is lower than the degree of v and higher neighbours whose degree is higher than the degree of v , breaking ties as in the algorithm. Call an edge bad if both its endpoints are bad; otherwise the edge is good. Build a directed version of G by directing each edge to the node with the higher degree breaking ties arbitrarily. So for every bad node, the number of out-going edges is more than 2 times the number of in-coming edges. So every bad edge, that enters a node v, can be matched to a distinct set of two edges that exit the node v. Hence the total number of edges is at least 2 times the number of bad edges. For every good node u, the probability that a neighbour of u is selected to S is at least a certain positive constant. This probability is at most the probability that a higher-neighbour of u is selected to S. Hence, for every good node u, the probability that a neighbour of u is selected to S and remains in S is a certain positive constant. Hence, the probability that u is removed, in each step, is at least a positive constant. Hence, for every good edge e, the probability that e is removed, in each step, is at least a positive constant. So the number of good edges drops by at least a constant factor each step. Since at least half the edges are good, the total number of edges also drops by a constant factor each step. Hence, the number of steps is O log m , where m is the number of edges. This is bounded by O.

Chapter 3 : Graph Theory Independent Sets

An independent vertex set of a graph G is a subset of the vertices such that no two vertices in the subset represent an edge of G. The figure above shows independent vertex sets consisting of two subsets for a number of.

Chapter 4 : Category:Independent set (graph theory) - Wikimedia Commons

Graph Basics Let G be a undirected graph. G=(V,E), where V is a set of vertices and E is a set of edges. Every edge e in E consists of two vertices in V of G. It is said to connect, join, or link the two vertices (or end points).

Chapter 5 : Independent sets â€” Sage Reference Manual v Graph Theory

Independent Vertex Set Let 'G' = V,E be a graph. A subset of 'V' is called an independent set of 'G' if no two vertices in 'S' are adjacent.

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In graph theory, an independent set or stable set is a set of vertices in a graph, no two of which are blog.quintoapp.com

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is, it is a set I of vertices such that for every two vertices in I, there is.

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An independent set in a graph is set of vertices such that there are no edges between them. A maximal independent set is an independent set which cannot be extended.

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Classes and methodsÂ¶ class blog.quintoapp.comndentSetsÂ¶. Bases: object The set of independent sets of a graph. For more information on independent sets, see Wikipedia article Independent_set_(graph_theory).

Chapter 9 : graph theory - Maximal Independent Set - Computer Science Stack Exchange

In graph theory, a maximal independent set (MIS) or maximal stable set is an independent set that is not a subset of any other independent set. In other words, there is no vertex outside the independent set that may join it because it is maximal with respect to the independent set property.