

Relationship Between VERTEX COVER and INDEPENDENT SET:

The relationship between vertex covers and independent sets is complementary. A vertex cover is a set of vertices that covers all edges in a graph (at least one endpoint of each edge is in the cover), while an independent set is a set of vertices with no edges between them. In a graph, if X is a vertex cover, then the set of vertices not in X is an independent set, and vice versa.

Relationship Between INDEPENDENT SET and CLIQUE:

The relationship between independent sets and cliques is also complementary. An independent set is a set of non-adjacent vertices (no edges between them), while a clique is a set of mutually adjacent vertices (an edge between every pair of vertices). In a graph, if X is an independent set, then the set of vertices not in X is a clique, and vice versa.

Relationship Between VERTEX COVER and CLIQUE:

The relationship between cliques and vertex covers in a graph is complementary as well, but in a slightly different way than the relationship between independent sets and cliques. A clique in a graph is a set of vertices where every pair of vertices in the set is adjacent, meaning there is an edge between every pair of vertices in the clique. A vertex cover in a graph is a set of vertices such that every edge in the graph has at least one endpoint in the vertex cover.

The complementary relationship can be described as follows:

- If you have a clique in a graph, then the set of vertices not in the clique forms a vertex cover. This is because, in a clique, there are edges between all pairs of vertices, so every edge in the graph has at least one endpoint in the complement of the clique
- If you have a vertex cover in a graph, then the set of vertices not in the vertex cover forms an independent set, where no two vertices in the set are adjacent. This is because if you have a vertex cover that covers all edges, the complement of that cover must not have edges between its vertices, creating an independent set

Summary

Vertex covers and **independent sets** have a complementary relationship, and **independent sets** and **cliques** also have a complementary relationship

Cliques and **vertex covers** have a complementary relationship in terms of graph theory:

- A **clique** corresponds to a set of mutually adjacent vertices
- A **vertex cover** corresponds to a set of vertices that cover all edges in the graph