

# List of NP-Complete Problems

1. Clique: Graph  $G = (V, E)$ , positive integer  $k \leq |V| = n$ .

Q: Does there exist a clique of size  $k$  or more in  $G$ ?

2. Sum of subsets: Given set of integers  $\{a_1, \dots, a_n\}$ , integer  $C$ .  
(Set Partition)

Q: Is there a subset of the integers whose sum is  $C$ ?

3. Hamilton Cycle: Given  $G = (V, E)$ , does there exist a Hamilton Cycle (a cycle contains every vertex) of  $G$ ?

4. Independent set: Graph  $G = (V, E)$ , positive integer  $k \leq |V| = n$ .

Q: Does there exist an independent set of size  $k$  or more in  $G$ ?

IS:  $V' \subseteq V$ , s.t., for any  $u, v \in V'$ ,  
 $(u, v) \notin E$ .

5. TSP: Given a weighted graph  $G=(V,E)$ , does there exist a Hamilton cycle whose total edge weights is at most  $k$ ?

6. Vertex Cover: Given graph  $G=(V,E)$ , integer  $k \leq |V|$ .

Q: Is there a vertex cover of size  $k$  or less for  $G$ ; i.e., a subset  $V' \subseteq V$  with  $|V'| \leq k$  s.t. for each edge  $(u,v) \in E$ , at least one of  $u$  and  $v$  is in  $V'$ ?

7. Dominating set: Given graph  $G=(V,E)$ , integer  $k \leq |V|$ .

Q: Is there a dominating set  $V'$  of size  $\leq k$  s.t. for every vertex  $u \in V - V'$  there is a  $v \in V'$  s.t.  $(u,v) \in E$ ?