TTF
T. Il we solve Subset Sum in polytime, then P=NP
F. Every problem in the class P can be reduced to
Vertex Cover.
2) Longet Parti:
Inpit: G=(V,E), g=N) Otipot: a publication > G
The longest Park is MP-hard Lecture it is a
conorditation of:
IS
Clique (Rodraila)
8.12 (2006 edition)
K-spanning tree.
Input: G=(V,E); KEN.
Ottpet: T, subgrouph of B. T is a spanning tree and
deg (v) & k
TST 1), VS icin NP
Step 1): K-Spanning Tree is in NY. Given G=(V, E); KEM and S, candidate sol.
. 5 spans G: Run Explace (v) in S, check that all vertices are marked visited.
Charles HIEV: deg (v) & k by
. Shas "small" day: JrEV: day (V) & K by check
S is cycle-free: Run DFS, chick for back-edge
Step 2)
Rudrata Path -> K-Spanning Tree
$G=(V_jE)$ \longrightarrow $G'=G$ j $k=2$.
(=) Il S is a w.l. of Rubiata, Hen S is also
asol. of 2-Spanning Tree for G.
(We can recover the got of Rubrich in
polytime time.
8.14 Clique + I.S.
Inpt: $C = (V, E)$; $g \in W$
Other: $(S_1, S_2): S_1 \subseteq V: S_1 = S_2 = 9$
Others: $(2^{1/2})$: $(2^{1/2})$
C is a chique in G.
S, is a clique in G. S, is an IS in G.
S, is a clique in G. Szic an IS in G.
S, is a chique in G. Si is an IS in G. Step 1 Clique + IS is in NP. h= M
S, is a clique in G. Si is an IS in G. Step 1 Clique + TS is in NP. h= N/ Otack 18,1=9 O(n)
S, is a clique in G. Si is an IS in G. Step 1 Clique + TS is in NP. h= N/ Check 15/1=9 O(n) Check 15/2=9 O(n)
S, is a clique in G. Signer TS in G. Step 1 Clique TS is in NP. held Check 18,1=9 O(n) Check 182=9 O(n) Huves: (uv) EE O(n2)
S, is a clique in G. Step 1 Clique + TS is in NP. h= IVI Ouck 18,1=9 O(n) Check 1821=9 O(n) Hu,v ES, : (nv) E E O(n²) Hu,v ESz: (nv) & E O(n²)
S, is a clique in G. Si is an IS in G. Step 1 Clique t IS is in NP. held Ouch 15,1=9 O(n) Check 1521=9 O(n) Hu,v ES; (uv) EE O(n²) Step 2:
S, is a clique in G. Si is an IS in G. Step I Clique + TS is in NP. h= V Ouck Si = 9 O(n) Ouck Si = 9 O(n) Ouck Si = 9 O(n) Hu,v \in Si, : (nv) \in \in O(n^2) Hu,v \in Si, : (nv) \in \in O(n^2) Step 2: Clique \rightarrow Clique + IS
S, is a clique in G. Six on IS in G. Step 1 Clique + IS is in NP. h= IVI Ouck 18,1=9 O(n) · Check 182=9 O(n) · Hu,v ES, : (uv) E E O(n²) · Hu,v ES; : (uv) & E O(n²) Step 2: Clique -> Clique + IS G=(V,E); g -> G'=GUH g=9
S, is a clique in G. Sign of TS in G. Step 1 Clique + TS is in NP. held Ouch 15,1 = 9 O(n) Ouch 15,1 = 9 O(n) Hu,v ES; (uv) E E O(n2) Step 2: Clique -> Clique + TS G=(V,E); 9 -> G'=GUH G=9 Where H=(V, EH); 1VH=9
S, is a clique in G. Six on IS in G. Step 1 Clique + IS is in NP. h= IVI Ouck 18,1=9 O(n) · Check 182=9 O(n) · Hu,v ES, : (uv) E E O(n²) · Hu,v ES; : (uv) & E O(n²) Step 2: Clique -> Clique + IS G=(V,E); g -> G'=GUH g=9
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S, is a clique in G. Sign of TS in G. Step 1 Clique + TS is in NP. held Ouch 15,1 = 9 O(n) Ouch 15,1 = 9 O(n) Hu,v ES; (uv) E E O(n2) Step 2: Clique -> Clique + TS G=(V,E); 9 -> G'=GUH G=9 Where H=(V, EH); 1VH=9
S, is a clique in G. Step 1 Clique + TS is in NP. h= V Ouck S_1 = g O(n) · Check S_2 = g O(n) · Hn, v \in S_2: (mv) \in E O(n^2) Step 2: Clique \rightarrow Clique + TS G=(V,E); g \rightarrow G'=GUH G=9 Where H=(V,OEH); V_H = g E_H = Ø F= Ø
S, is a clique in G. So is an IS in G. Step 1 Clique + IS is in NP. he V Ouck S_1 = 9 O(n) Check S_2 = 9 O(n) Hn,v \in S_2: (uv) \in E O(n^2) Step 2: Clique \rightarrow Clique + IS G=(V,E); 9 \rightarrow G=GUH G=Y Where H=(V,EH); V_H = 9 EH= Ø Notice: H = O(V)
S, is a clique in G. So is an IS in G. Step 1 Clique + IS is in NP. he V Ouck S_1 = 9 O(n) Check S_2 = 9 O(n) Hn,v \in S_2: (uv) \in E O(n^2) Step 2: Clique \rightarrow Clique + IS G=(V,E); 9 \rightarrow G=GUH G=Y Where H=(V,EH); V_H = 9 EH= Ø Notice: H = O(V)
S, is a chique in G. Si is an IS in G. Step 1 Chique its is in NP. held Ouck 15,1 = 9 O(n) Augues 15 = 9 O(n) Augues 2: Chique -> Chique + IS G=(V,E); g harmon G'=GUH g=g Where H=(N,EH); NH = 9 EH= Ø Notice: 1H1=O(N) Is a sol for Chique + IS!!!
S, is a clique in G. So is an IS in G. Step 1 Clique of S is in NP. held Ouch 15:1=8 O(n) Augue ES; (un) & E O(n2) Step 2: Clique -> Clique of IS Clique -> Clique of IS While 9 Where H=(V, EH); WH = 9 EH = Ø Notice: 1H1 = O(1V1) Is a sol for Clique t IS!!! Clique + IS Clique t IS!!! Clique (S, S) of Clique t IS then
Step 1 Clique + TS is in NP. h= V Step 2: Clique + TS Silver a Clique S in G, then (S, H) is a sol for Clique + TS!!! Clique + TS Silver (S, Sz) of Clique + TS, then Silver (S, Sz) of Clique + TS, then Silver (S, Sz) of Clique + TS Vertices from H are isolated!
S, is a chique in G. Si is an IS in G. Step 1 Chique its is in NP. held Ouck 15,1 = 9 O(n) Augues 15 = 9 O(n) Augues 2: Chique -> Chique + IS G=(V,E); g harmon G'=GUH g=g Where H=(N,EH); NH = 9 EH= Ø Notice: 1H1=O(N) Is a sol for Chique + IS!!!
Step 1 Clique ITS is in NP. held Step 1 Clique ITS is in NP. held Ouch 16,1=9 Cha Augues, (M) & E O(n2) Augues, (M) & E O(n2) Step 2: Clique -> Clique ITS G=(VE); g has G=GUH g=g Where H=(V, EH); VH =g EH=Ø Notice: H =O(N) is a sol for Clique ITS, then so a sol for Clique ITS, then Sign (Siss) of Clique ITS, then Sign a Clique in G because all voluces for H are isolated! Who recome a Clique in linear time.
Step 1 Clique + TS is in NP. h= V Step 2: Clique + TS Silver a Clique S in G, then (S, H) is a sol for Clique + TS!!! Clique + TS Silver (S, Sz) of Clique + TS, then Silver (S, Sz) of Clique + TS, then Silver (S, Sz) of Clique + TS Vertices from H are isolated!
Step 1 Clique ITS is in NP. held Step 1 Clique ITS is in NP. held Ouch 16,1=9 Cha Augues, (M) & E O(n2) Augues, (M) & E O(n2) Step 2: Clique -> Clique ITS G=(VE); g has G=GUH g=g Where H=(V, EH); VH =g EH=Ø Notice: H =O(N) is a sol for Clique ITS, then so a sol for Clique ITS, then Sign (Siss) of Clique ITS, then Sign a Clique in G because all voluces for H are isolated! Who recome a Clique in linear time.
Step 1 Clique ITS is in NP. held Step 1 Clique ITS is in NP. held Ouch 16,1=9 Cha Augues, (M) & E O(n2) Augues, (M) & E O(n2) Step 2: Clique -> Clique ITS G=(VE); g has G=GUH g=g Where H=(V, EH); VH =g EH=Ø Notice: H =O(N) is a sol for Clique ITS, then so a sol for Clique ITS, then Sign (Siss) of Clique ITS, then Sign a Clique in G because all voluces for H are isolated! Who recome a Clique in linear time.
Step 1 Clique ITS is in NP. held Step 1 Clique ITS is in NP. held Ouch 16,1=9 Cha Augues, (M) & E O(n2) Augues, (M) & E O(n2) Step 2: Clique -> Clique ITS G=(VE); g has G=GUH g=g Where H=(V, EH); VH =g EH=Ø Notice: H =O(N) is a sol for Clique ITS, then so a sol for Clique ITS, then Sign (Siss) of Clique ITS, then Sign a Clique in G because all voluces for H are isolated! Who recome a Clique in linear time.
Step I Clique ITS is in NP. held Ouch 151=9 O(n) Step 2: Clique -> Clique + IS Clique -> Clique + IS Ouch -> Clique S in G then (S, H) Is a sol for Clique + IS!!! Ouch -> Clique in G because oil Vertices for H are isolated! Outhorse for H are isolated! IS -> Clique + IS
Step! Clique ItS is in NP. h= V Step! Clique ItS is in NP. h= V . Clock S_1 = 9 (N) . Clock S_2 = 9 (N) . Howe S_2 : (W) & E (N) Step 2: Clique Clique + IS G=(V,E); 9 Clique + IS Where H=(V,OEH); V = 9 EH = Ø Notice: H = O(V) Sown a Clique S in G, then (S,H) is a sol for Clique + IS; then Solven (S_1,S_2) of Clique + IS, then volved for H are while! (b) We recome a Clique in linear time. IS Clique + IS IS Clique +
Step I Clique ITS is in NP. held Ouch 151=9 O(n) Step 2: Clique -> Clique + IS Clique -> Clique + IS Ouch -> Clique S in G then (S, H) Is a sol for Clique + IS!!! Ouch -> Clique in G because oil Vertices for H are isolated! Outhorse for H are isolated! IS -> Clique + IS