HW11 out due Tue after break = last HW
NO GPS due Mon after break
Might be short GPS after break
CAS for next semester
After break: Conflict Fam for final exam Fri Dec 8-8am
No HW parties this Sat or next Sat or Dec 7 <

My office hours Wed 4->5 => 3-4 and after

X is NP-hard iff solving X in poly time => P=NP
iff there is a poly time reduction from 3SAT to X
or MaxIndSet
or vertexCover
or MaxClique

KiZeiten

If there is a poly time reduction from 3SAT to X

\[
\text{VertexCover} \quad \text{G:} \quad \text{H:}
\]

VertexCover(G, 2) = True
VertexCover(G, 1) = False
We are trying to establish a correspondence between vertex covers $S$ in $G$ and Hamiltonian cycles $C$ in $H$.

**G**

- vertex
- edge
- $v \in S$
- $uv \; s.t. \; u \in S$
- $uv \; s.t. \; u \notin S$
- $\# \text{vertices in } S$

**H**

- vertex path
- edge gadget
- $C$ uses $u$'s vertex path
- $C$ enters both ends of $uv$'s edge gadget
- $C$ enters $uv$'s gadget at $u$'s end, crosses over to $u$'s end, crosses back and leaves from $u$'s end
- $\# \text{vertex paths traversed by } C$

$=$ $\# \text{ covered vertices}$
If ham cycle in $H$ uses $u$'s vertex gadget, mark $v$'s edge gadget.

If ham cycle touches every edge gadget, every gadget has at least one marked vertex.
(a \lor b \lor c) \land (b \lor \bar{c} \lor \bar{d}) \land (\bar{a} \lor c \lor d) \land (a \lor \bar{b} \lor \bar{d})