

Advanced Algorithms

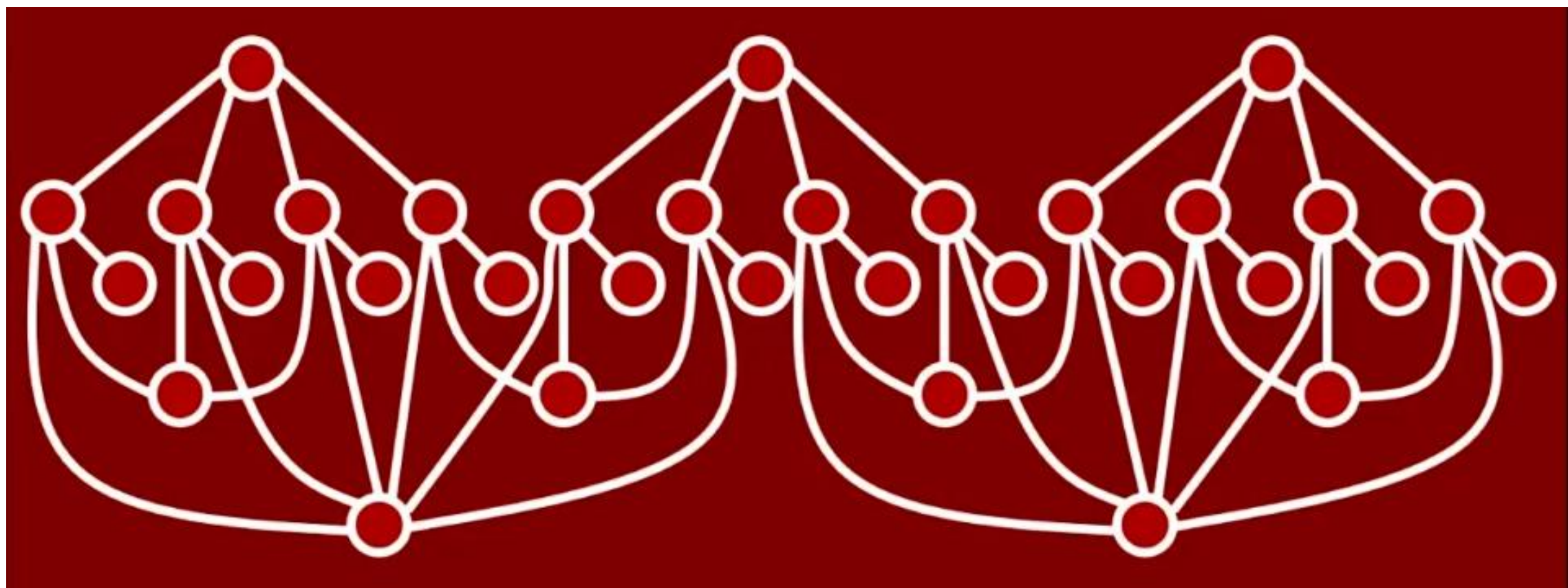
October 23, 2025

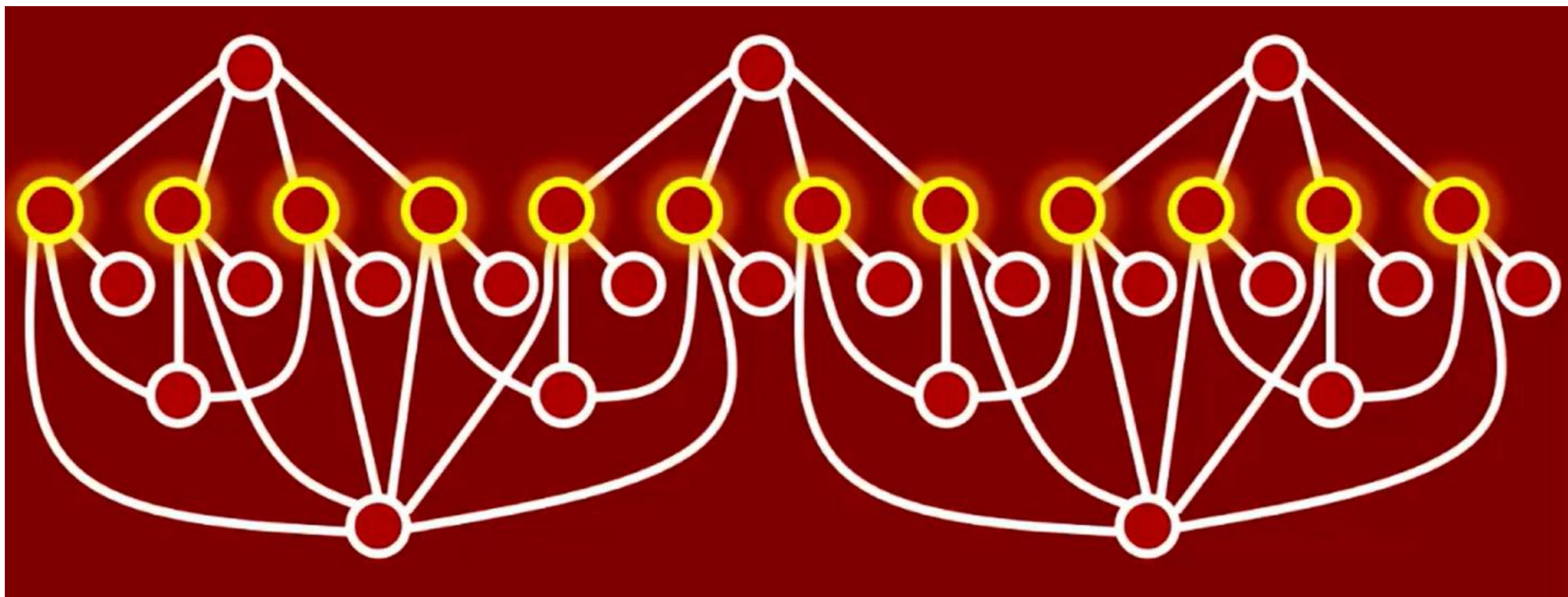
Greedy Vertex Cover

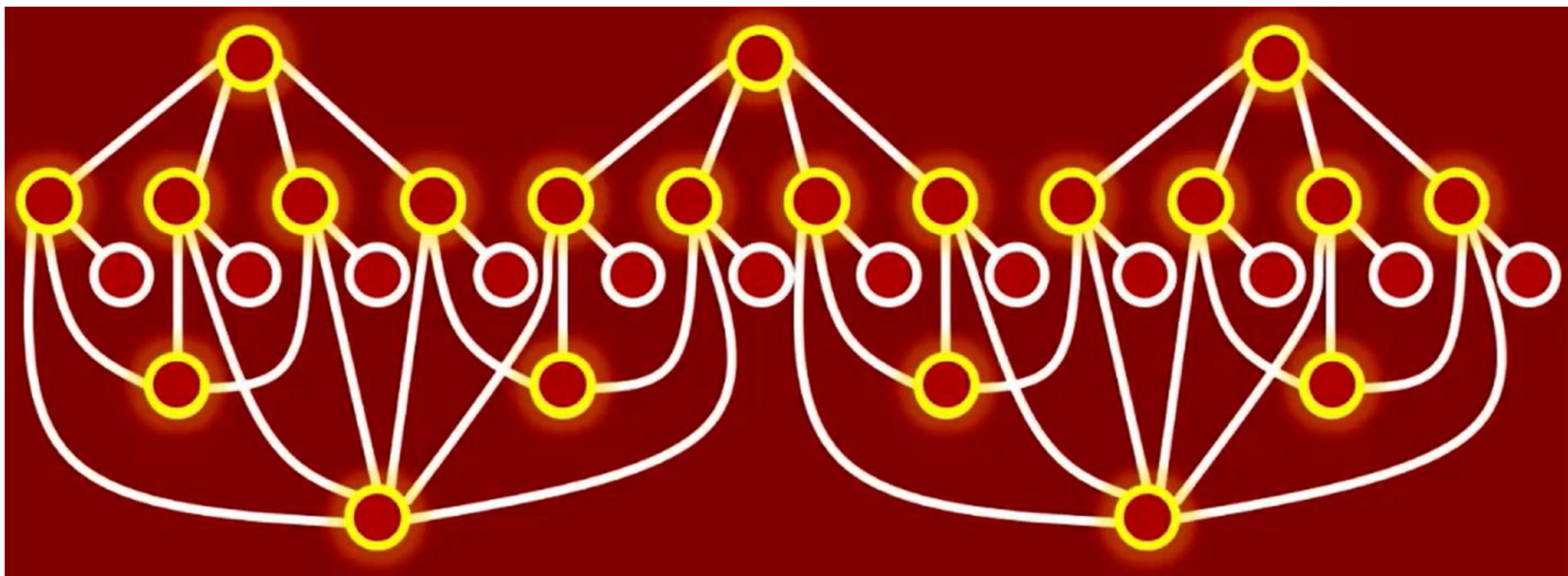
- Initialize $S = \emptyset$
- **While** not all edges covered by S :
 - Let v be the vertex covering the most number of uncovered edges
 - Update $S = S \cup v$.
- Return S

This is not a C -approximation for any constant C

But it is an $O(\log n)$ -approximation, we will see this later when we study Set Cover







Gavril's algorithm

- Initialize $S = \emptyset$
- **While** not all edges covered by S :
 - Let $\{u, v\}$ be some uncovered edge
 - Update $S = S \cup \{u\} \cup \{v\}$. ?
- Return S

Gavril's algorithm

- Initialize $S = \emptyset$
- **While** not all edges covered by S :
 - Let $\{u, v\}$ be some uncovered edge
 - Update $S = S \cup \{u\} \cup \{v\}$. !
- Return S

This is a 2-approximation for Vertex Cover