

FeedBack set in digraphs

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$$VC \propto FVS \propto FES$$

Feedback Vertex Set in Digraphs

FVS es NP

$VC \propto FVS$

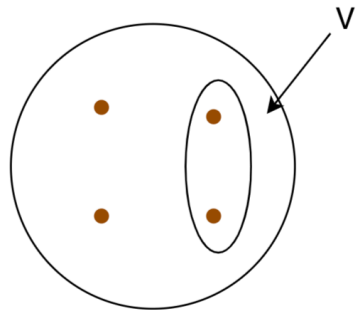
Vertex Cover
Problem



Si asumimos que VC es
NPC

Feedback Vertex Set in Digraphs

1) Sea $D(V,E)$ y $K \in \mathbb{N}$,
Queremos encontrar un $V' \subseteq V$
tal que $|V'| \leq K$ y
 $D \setminus V'$ sea acíclica



Feedback Vertex Set in Digraphs

$H(V, F)$ si $G(V, E)$ es gráfica

$$F = \{a \rightarrow b, b \rightarrow a \mid a - b \text{ en } E\}$$
$$= \{(a, b), (b, a) \mid (a, b) \in E\}$$

Feedback Vertex Set in Digraphs

$H = \overset{\leftrightarrow}{G}$, si $V' \subseteq V$ es FVS de H
 $\Rightarrow \forall e = \{a, b\} \in E \Rightarrow a \in V' \text{ ó } b \in V'$

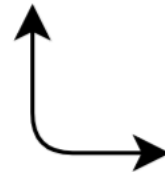
Feedback Vertex Set in Digraphs

Input:

$f: \text{Gráficas} \rightarrow \text{Digráficas}$

$$G \rightarrow f(G) = \overset{\longleftrightarrow}{G}$$

$$G(V, E) \rightarrow H(V, F)$$


$$F = \overset{\longleftrightarrow}{E}$$

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- Si $k \in \mathbb{N}$ y queremos resolver para
 $D \stackrel{\leftrightarrow}{=} G$, FVS para k , i.e. ¿Existe $V' \subseteq V$
 $\stackrel{\leftrightarrow}{\quad}$
tal que $G \setminus V'$ sea acíclica y $|V'| \leq k$?

Feedback Vertex Set in Digraphs

Como $\forall e=(a,b) \in F$

$\Rightarrow (a,b,a)$ es un ciclo en D , $\forall (a,b) \in F$

\Rightarrow Si V' es solución de FVS, para D y K

$\Rightarrow \forall (a,b) \in F \Rightarrow a \in V' \text{ ó } b \in V'$

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Que es equivalente a $\forall \{a,b\} \in E \Rightarrow a \in V' \text{ ó } b \in V'$

\Rightarrow i.e. V' es una cubierta por vértices (VC) de $f^{-1}(G) \rightleftarrows$

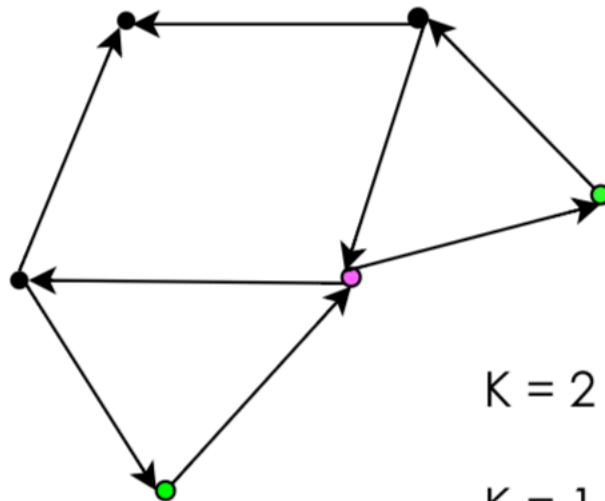
tal que $|V'| \leq K$ que de hecho es el problema VC de G y K

$\Rightarrow VC \propto FVS$

y el problema VC es NPC

Feedback Vertex Set in Digraphs

D:



$$K = 2$$

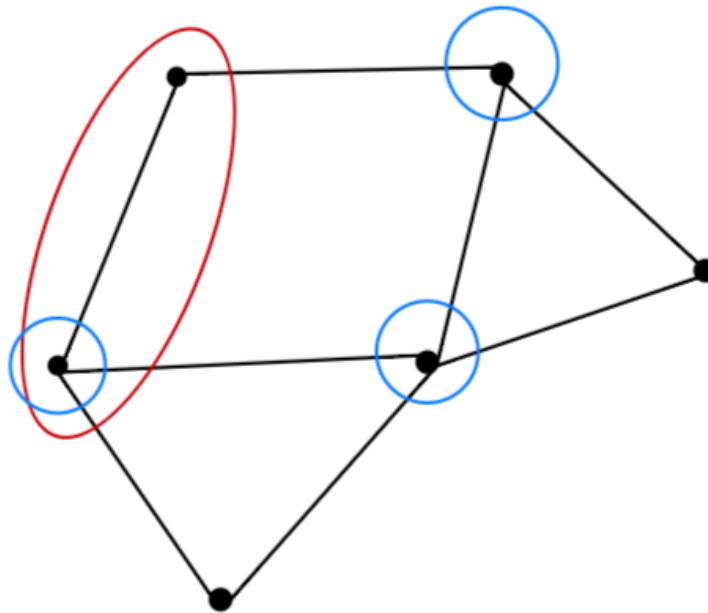
$$K = 1$$

Feedback Vertex Set in Digraphs

G:

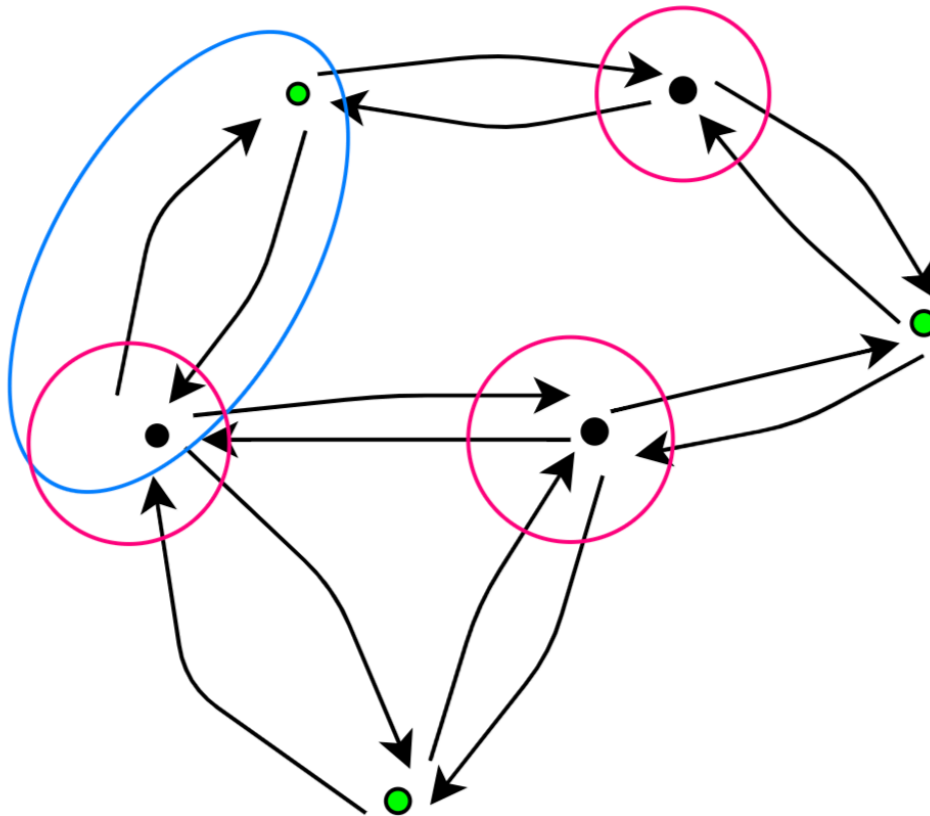
K=1

K=2



Feedback Vertex Set in Digraphs

H:



~~$k = 2$~~

$k = 3$

Feedback Edge Set Problem

Feedback Edge Set in Digraphs

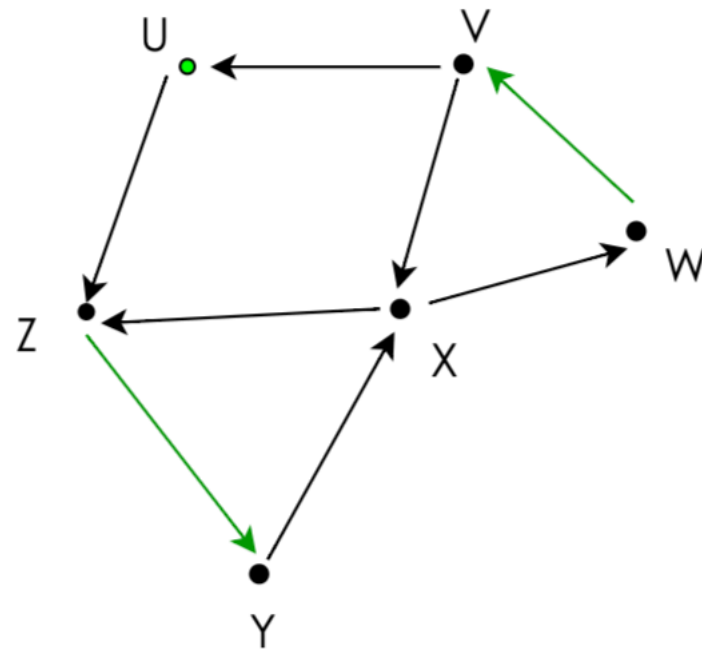
Dada $G(V,E)$ y $k \in \mathbb{N}$

¿Existe un $E' \subseteq E$ tal que $G \setminus E'$ es acíclica
y $|E'| \leq k$?

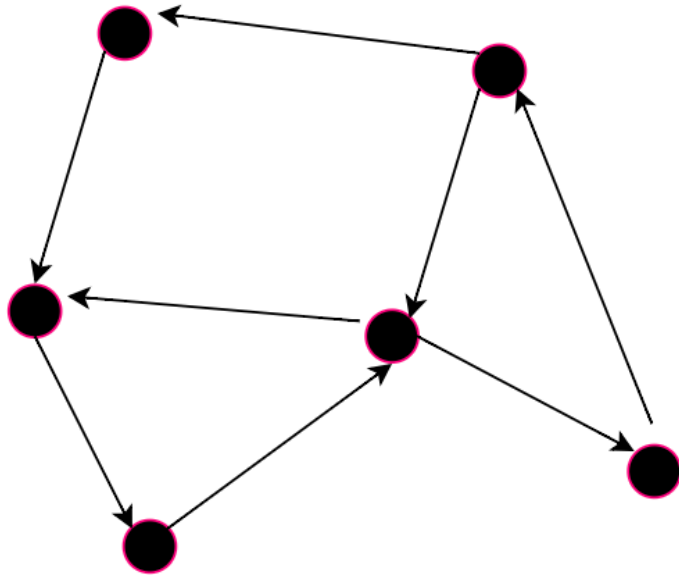
Feedback Edge Set in Digraphs

G:

$k = 2$



Aplicaciones



Aplicaciones

