Grafos

Fundamentos

Prof. Edson Alves

Faculdade UnB Gama

Por que estudar grafos?

Por que estudar grafos?

- **Os grafos abstraem todas as outras estruturas de dados**

Por que estudar grafos?

- ⋆ **Os grafos abstraem todas as outras estruturas de dados**
- ⋆ **Grafos modelam muitos problemas reais**

Por que estudar grafos?

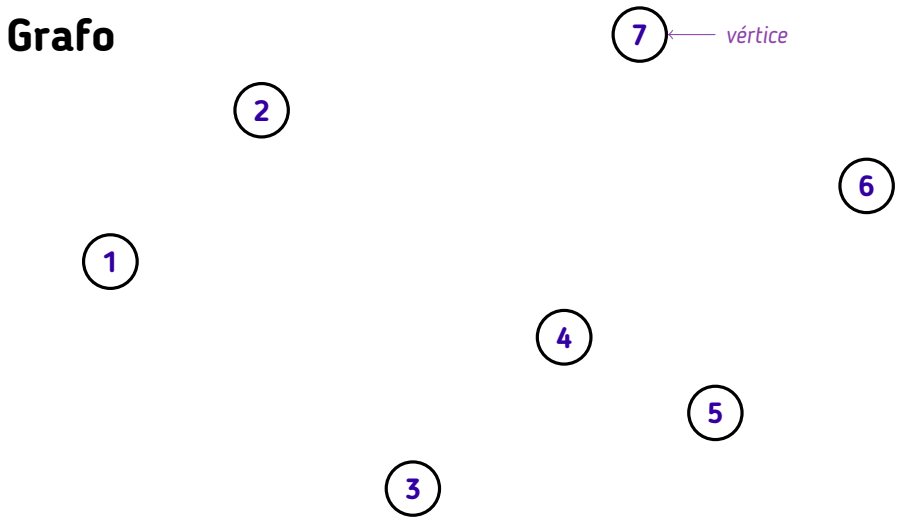
- Os grafos abstraem todas as outras estruturas de dados
- Grafos modelam muitos problemas reais
- Travessias em grafos são eficientes e úteis

Por que estudar grafos?

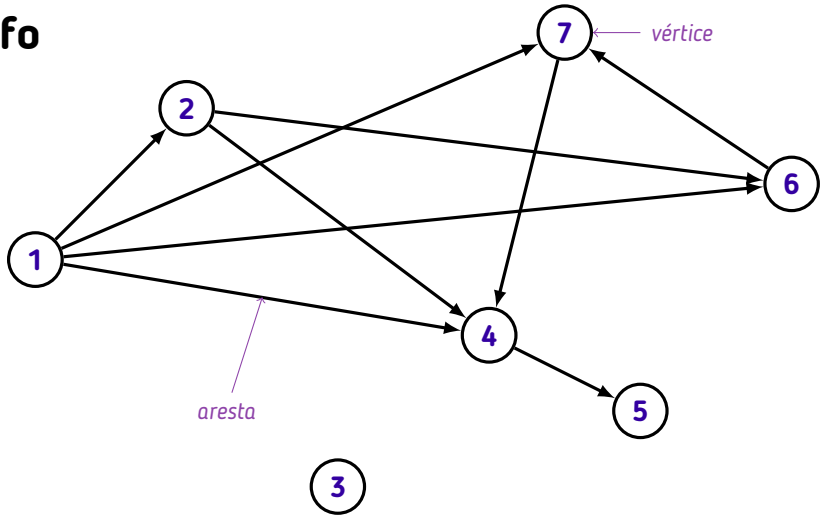
- ⋆ Os grafos abstraem todas as outras estruturas de dados
- ⋆ Grafos modelam muitos problemas reais
- ⋆ Travessias em grafos são eficientes e úteis
- ⋆ Algoritmos clássicos resolvem problemas recorrentes

Grafo

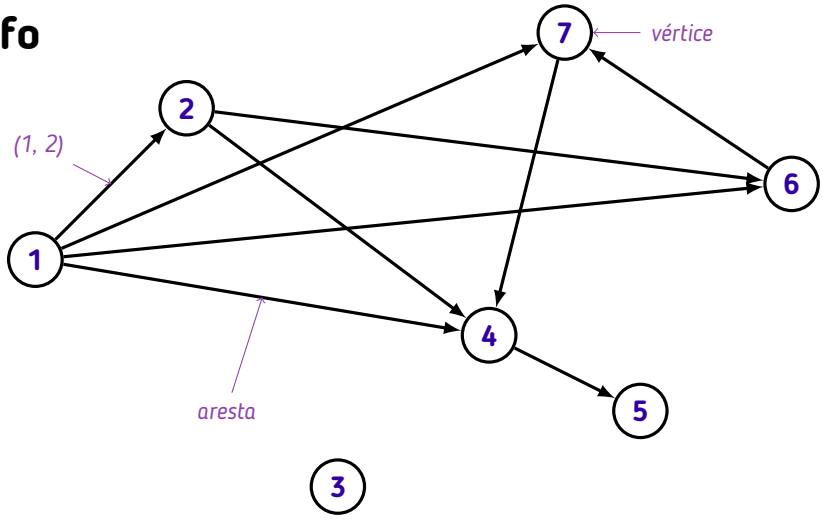
Grafo



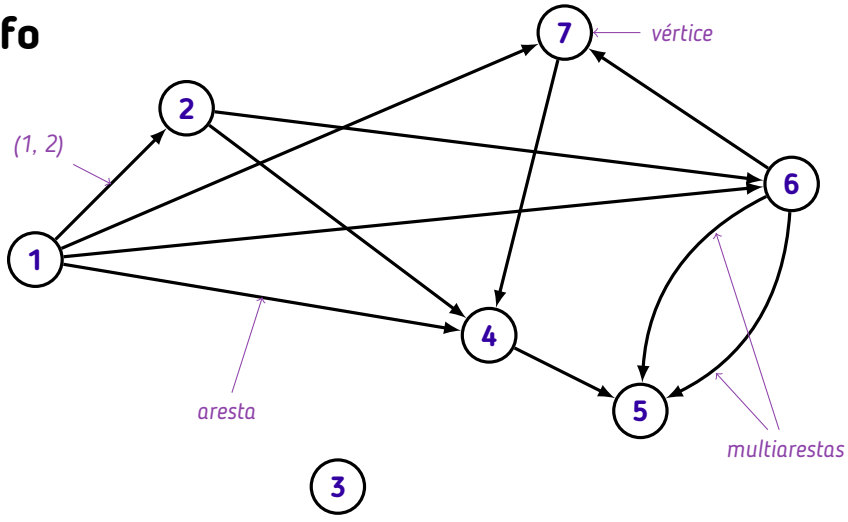
Grafo



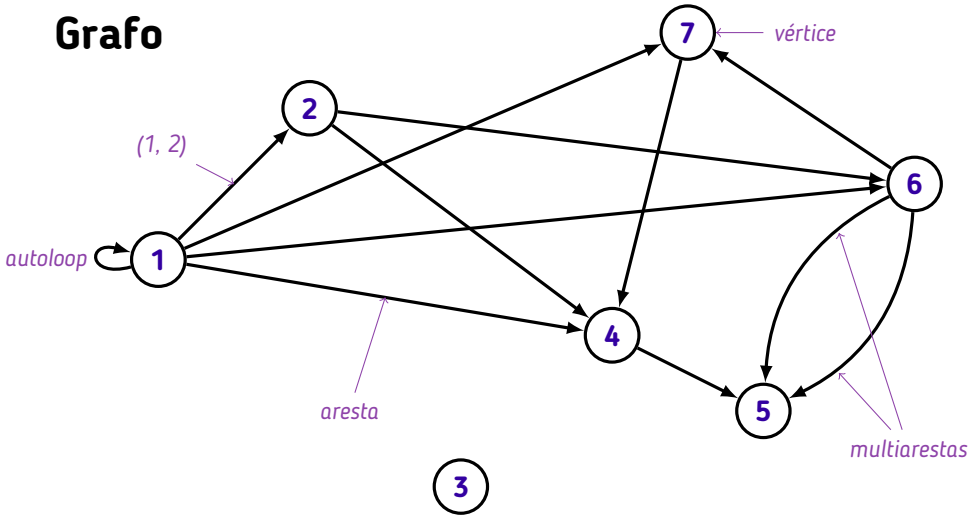
Grafo



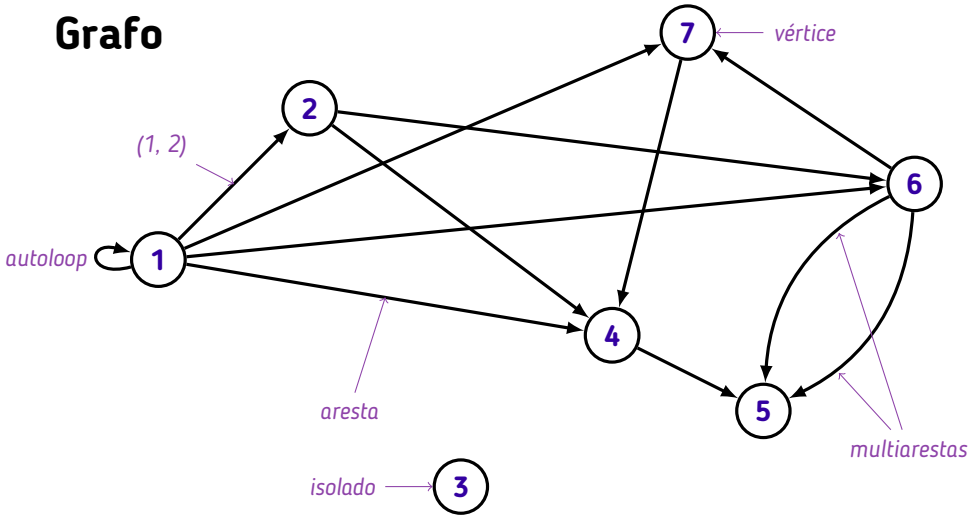
Grafo



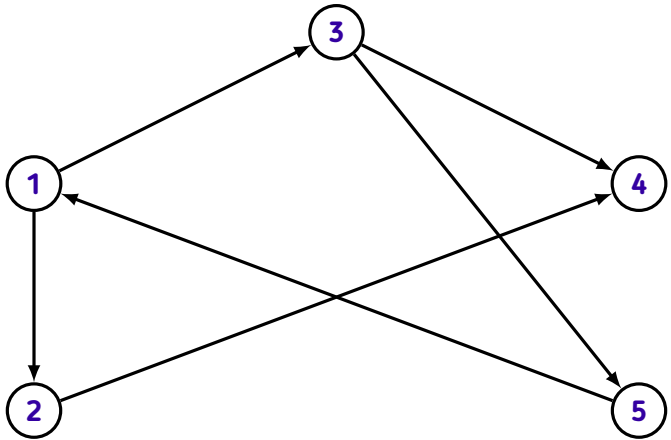
Grafo



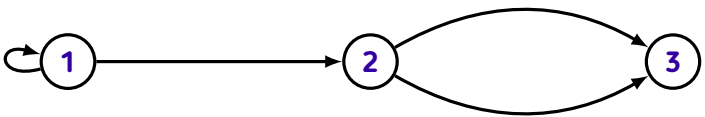
Grafo



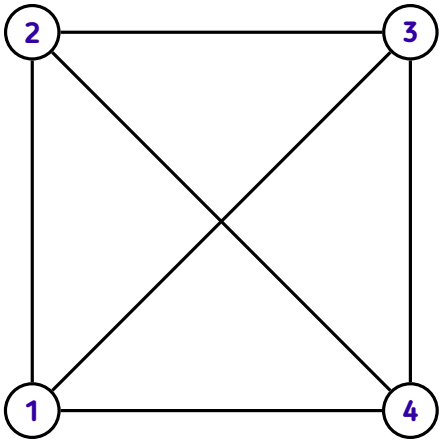
Grafo simples



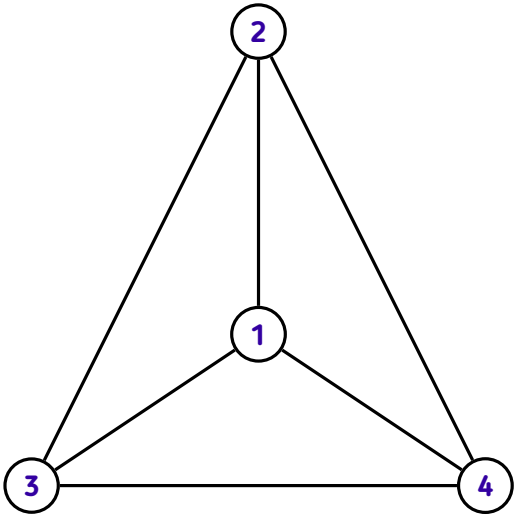
Multigrafo



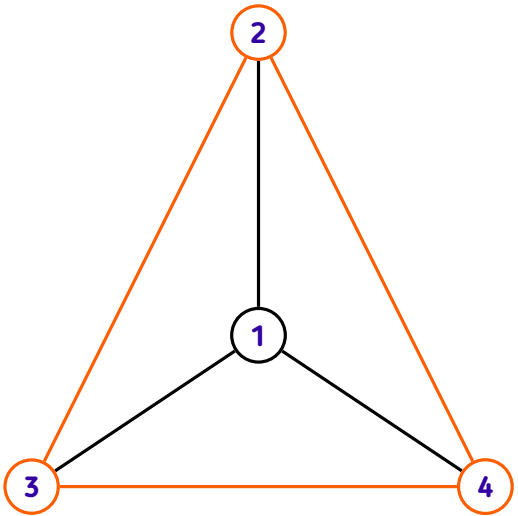
Grafo completo



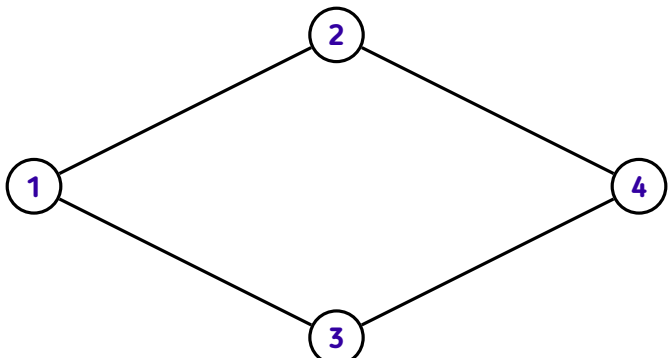
Subgrafo



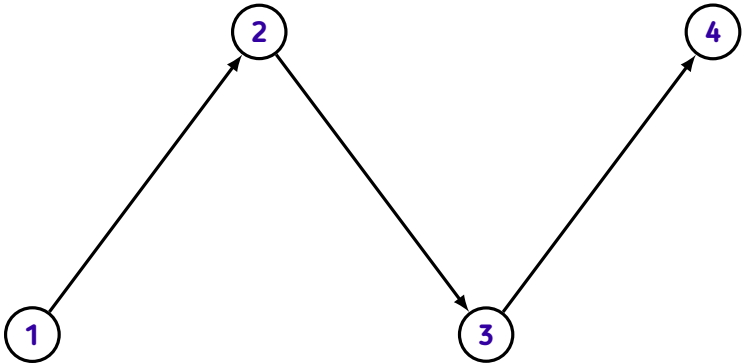
Subgrafo



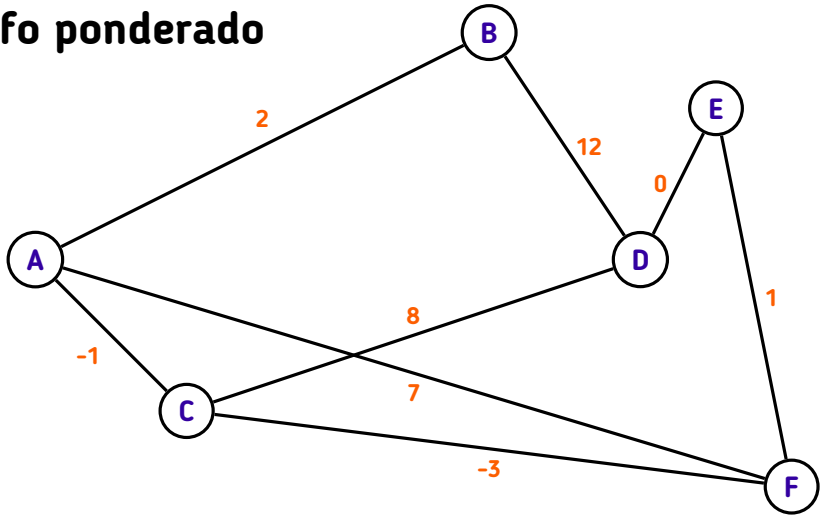
Grafo não-direcionado



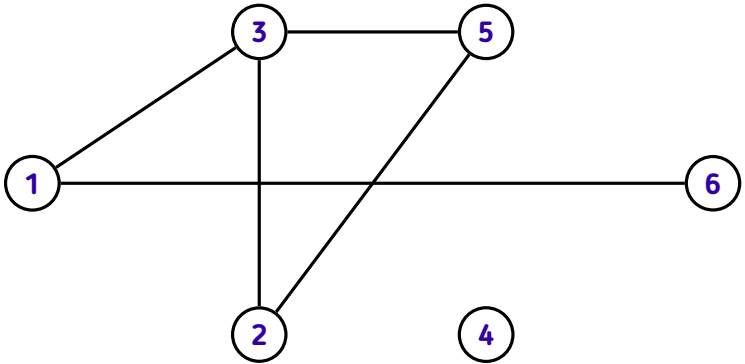
Grafo direcionado



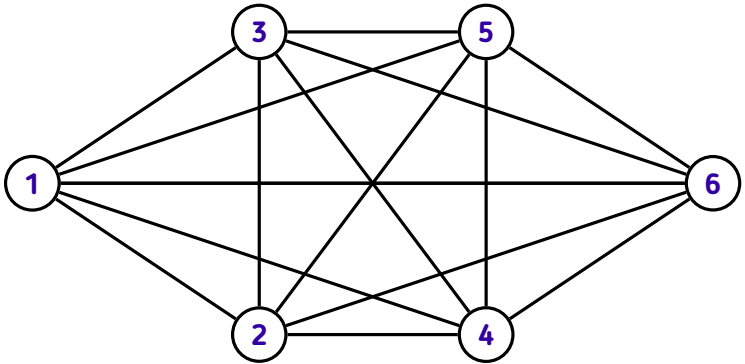
Grafo ponderado



Grafo esparso



Grafo denso



Graus

Graus

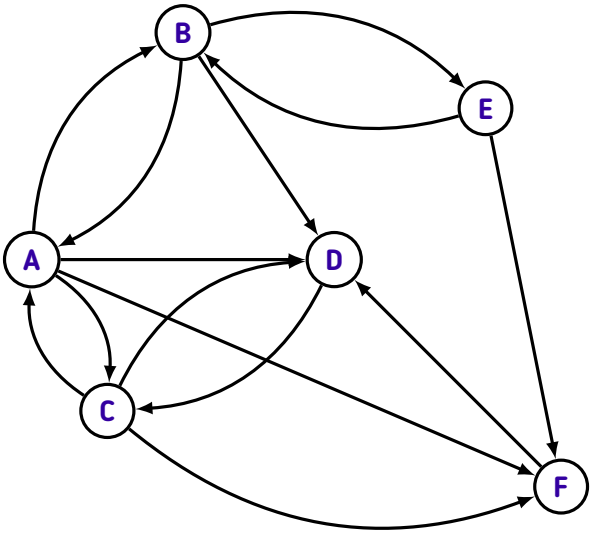
- ⋆ **Grau de entrada $g_i(u)$: # arestas que chegam em u**

Graus

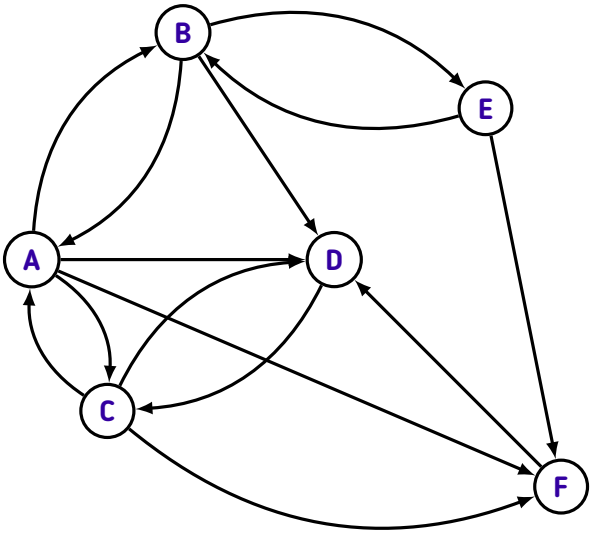
- ⋆ **Grau de entrada $g_i(u)$: # arestas que chegam em u**
- ⋆ **Grau de saída $g_o(u)$: # arestas que partem de u**

Graus

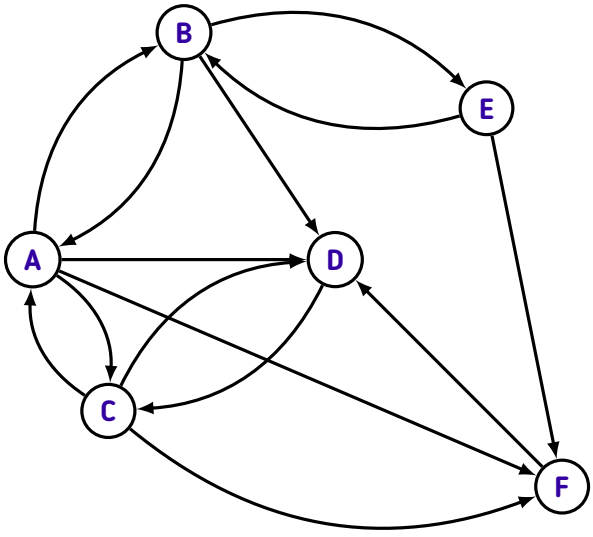
- ⋆ **Grau de entrada $g_i(u)$: # arestas que chegam em u**
- ⋆ **Grau de saída $g_o(u)$: # arestas que partem de u**
- ⋆ **Se G é não-direcionado, então $g_i(u) = g_o(u)$, $\forall u \in V$**



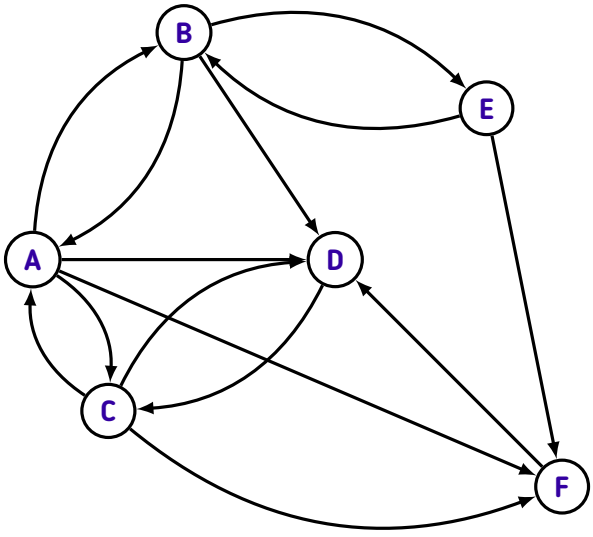
u	$g_i(u)$	$g_o(u)$



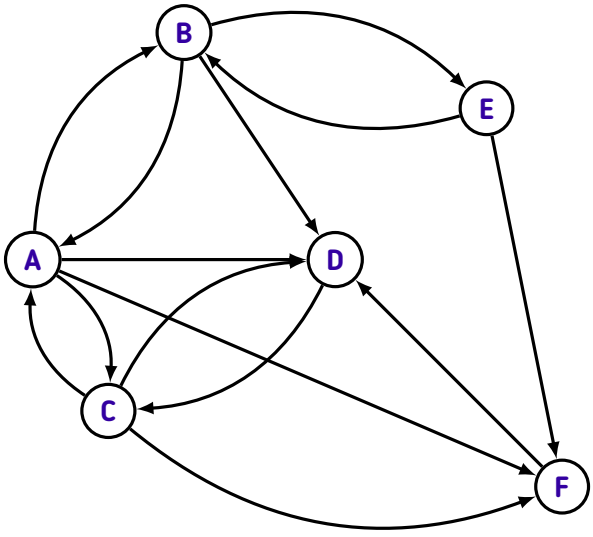
u	$g_i(u)$	$g_o(u)$
A	2	4



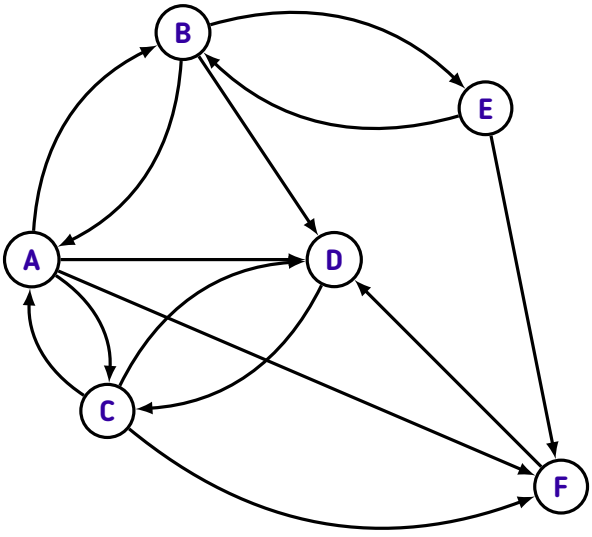
u	$g_i(u)$	$g_o(u)$
A	2	4
B	2	3



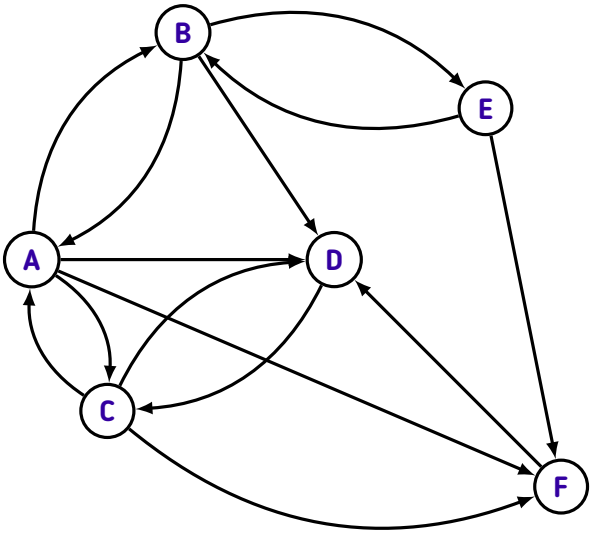
u	$g_i(u)$	$g_o(u)$
A	2	4
B	2	3
C	2	3



u	$g_i(u)$	$g_o(u)$
A	2	4
B	2	3
C	2	3
D	4	1



u	$g_i(u)$	$g_o(u)$
A	2	4
B	2	3
C	2	3
D	4	1
E	1	2



u	$g_i(u)$	$g_o(u)$
A	2	4
B	2	3
C	2	3
D	4	1
E	1	2
F	3	1

Caminhos

Um caminho é uma sequência não-nula de vértices da forma

$$(u, w_1), (w_1, w_2), (w_2, w_3), \ldots, (w_{n-1}, w_n), (w_n, v)$$

onde u é o ponto de partida e v o ponto de chegada

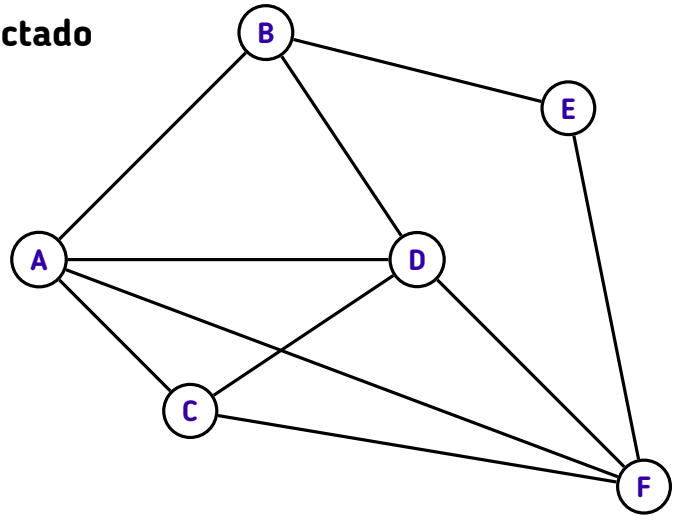
Caminhos

Um caminho é uma sequência não-nula de vértices da forma

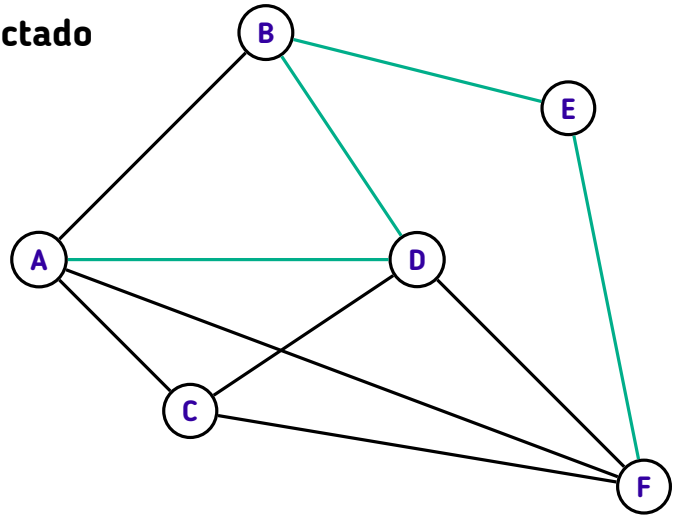
$$(u, w_1), (w_1, w_2), (w_2, w_3), \ldots, (w_{n-1}, w_n), (w_n, v)$$

onde u é o ponto de partida e v o ponto de chegada

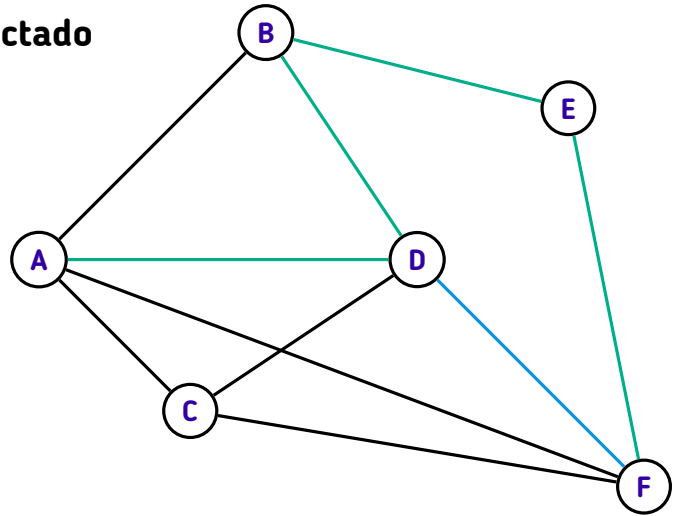
Grafo conectado



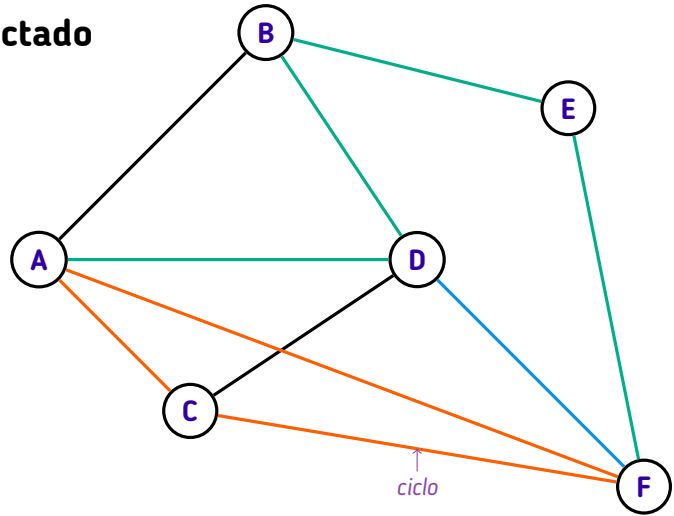
Grafo conectado



Grafo conectado



Grafo conectado



Referências

1. **HALIM**, **Felix**; **HALIM**, **Steve**. ***Competitive Programming 3*, 2010.**

2. **LAAKSONEN**, **Antti**. ***Competitive Programmer's Handbook*, 2018.**

3. **SKIENA**, **Steven**; **REVILLA**, **Miguel**. ***Programming Challenges*, 2003.**