



**FACULTAD DE
INGENIERÍAS**

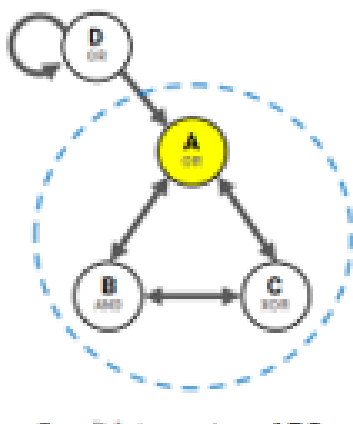
DESARROLLO SOLUCIÓN ENTREGA #1

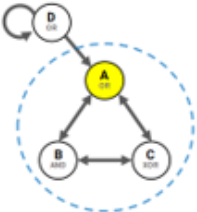
Docente: Luz Enith Guerrero Mendieta

Presentado por:

Cristian David Gómez Becerra

Stiven Vélez Bedoya

Grafo Inicial

Entrada de datos	Medida de distancia	Esquema de partición	Resultados con CM	Resultados sin CM	Observaciones
Grafo:  <pre> tpm = np.array([[0, 0, 0], [0, 0, 1], [1, 0, 1], [1, 0, 0], [1, 1, 0], [1, 1, 1], [1, 1, 1], [1, 1, 0]]) </pre>	EMD	biparticion	MIP: Cut [B, C] —// → [A] Phi: $\Phi = 2.3125$ Time: 0.246312 s	MIP: Cut [B, C] —// → [A] Phi: $\Phi = 2.3125$ Time: 0.505238 s	
	EMD	tripartición	MIP: Cut [B, C] —// → [A] Phi: $\Phi = 2.3125$ Time: 0.217384 s	MIP: Cut [B, C] —// → [A] Phi: $\Phi = 2.3125$ Time: 0.476244 s	

<pre>cm = np.array([[0, 0, 1], [1, 0, 1], [1, 1, 0]])</pre>	KLD	bipartición	MIP: Cut [B, C] —// → [A] Phi: $\Phi = 2.3125$ Time: 0.223403 s	MIP: Cut [B, C] —// → [A] Phi: $\Phi = 2.3125$ Time: 0.495682 s	
	KLD	tripartición	MIP: Cut [B, C] —// → [A] Phi: $\Phi = 2.3125$ Time: 0.223404 s	MIP: Cut [B, C] —// → [A] Phi: $\Phi = 2.3125$ Time: 0.448496 s	

- EMD-Bipartición-con CM

```
Evaluating  $\Phi$  cuts: 0%| 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 67%| 4/6 [00:00<00:00, 36.80it/s]
Computing concepts: 0%| 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| 0/5 [00:00<?, ?it/s]
MIP:
Cut [B, C] —// → [A]
Phi:
 $\Phi = 2.3125$ 
Time:
0.246312 s
```

- **EMD-Bipartición-sin CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 50%|██████| | 3/6 [00:00<00:00, 22.12it/s]
Computing concepts: 0%| | | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]
MIP:
Cut [B, C]  $\text{---/} \text{--->}$  [A]
Phi:
 $\Phi = 2.3125$ 
Time:
0.357047 s

In [16]:

```

- **EMD-Tripartición-con CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 83%|██████████| | 5/6 [00:00<00:00, 39.37it/s]
Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

MIP:
Cut [B, C]  $\text{---/} \text{--->}$  [A]
Phi:
 $\Phi = 2.3125$ 
Time:
0.213141 s

```

- **EMD-Tripartición-sin CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 50%|██████| 3/6 [00:00<00:00, 22.45it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]
MIP:
Cut [B, C]  $\rightarrow$  /  $\rightarrow$  [A]
Phi:
 $\Phi$  = 2.3125
Time:
0.36401 s

```

- **KLD-Bipartición-con CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 83%|██████████| 5/6 [00:00<00:00, 43.39it/s]
Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

MIP:
Cut [B, C]  $\rightarrow$  /  $\rightarrow$  [A]
Phi:
 $\Phi$  = 2.3125
Time:
0.197516 s

```

- **KLD-Bipartición-sin CM**

Evaluating Φ cuts: 0%	0/6 [00:00<?, ?it/s]
Computing concepts: 0%	0/5 [00:00<?, ?it/s]
Computing concepts: 0%	0/5 [00:00<?, ?it/s]
Computing concepts: 0%	0/6 [00:00<?, ?it/s]
Evaluating Φ cuts: 50% ██████	3/6 [00:00<00:00, 26.73it/s]
Computing concepts: 0%	0/6 [00:00<?, ?it/s]
Computing concepts: 0%	0/5 [00:00<?, ?it/s]
Computing concepts: 0%	0/5 [00:00<?, ?it/s]

MIP:
 Cut [B, C] ---/ /---> [A]
 Phi:
 $\Phi = 2.3125$
 Time:
 0.343236 s

- **KLD-Tripartición-con CM**

Evaluating Φ cuts: 0%	0/6 [00:00<?, ?it/s]
Computing concepts: 0%	0/5 [00:00<?, ?it/s]
Computing concepts: 0%	0/5 [00:00<?, ?it/s]
Computing concepts: 0%	0/6 [00:00<?, ?it/s]
Computing concepts: 0%	0/6 [00:00<?, ?it/s]
Computing concepts: 0%	0/5 [00:00<?, ?it/s]
Computing concepts: 0%	0/5 [00:00<?, ?it/s]

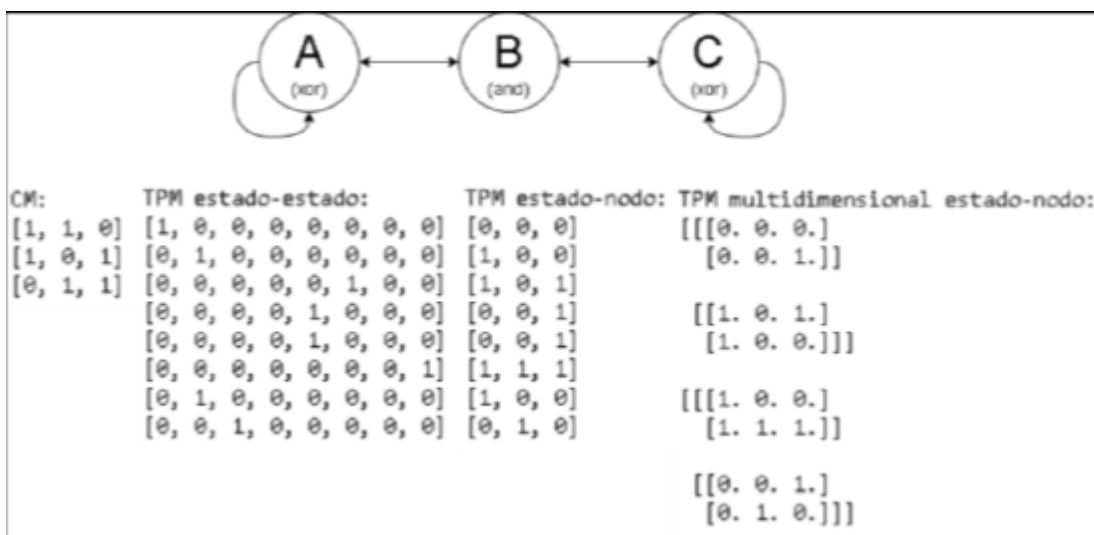
MIP:
 Cut [B, C] ---/ /---> [A]
 Phi:
 $\Phi = 2.3125$
 Time:
 0.172539 s

- **KLD-Tripartición-sin CM**

Evaluating Φ cuts: 0%	0/6 [00:00<?, ?it/s]
Computing concepts: 0%	0/5 [00:00<?, ?it/s]
Computing concepts: 0%	0/5 [00:00<?, ?it/s]
Computing concepts: 0%	0/6 [00:00<?, ?it/s]
Evaluating Φ cuts: 50% ██████	3/6 [00:00<00:00, 25.07it/s]
Computing concepts: 0%	0/6 [00:00<?, ?it/s]
Computing concepts: 0%	0/5 [00:00<?, ?it/s]
Computing concepts: 0%	0/5 [00:00<?, ?it/s]

MIP:
 Cut [B, C] ---/ /---> [A]
 Phi:
 $\Phi = 2.3125$
 Time:
 0.351062 s

Grafo 2



→ Estado-estado

Entrada de datos	Medida de distancia	Esquema de partición	Resultados con CM	Resultados sin CM	Observaciones
Grafo: <pre> tpm = np.array([[1, 0, 0, 0, 0, 0, 0, 0], [0, 1, 0, 0, 0, 0, 0, 0], [0, 0, 0, 0, 0, 1, 0, 0], [0, 0, 0, 0, 1, 0, 0, 0], [0, 0, 0, 0, 1, 0, 0, 0], [0, 0, 0, 0, 0, 0, 0, 1], [0, 1, 0, 0, 0, 0, 0, 0], [0, 0, 1, 0, 0, 0, 0, 0]]) </pre>	EMD	biparticion	MIP: Cut [A, B] ——— / / ———> [C] Phi: $\Phi = 0.520834$ Time: 0.341088 s	MIP: Cut [A, B] ——— / / ———> [C] Phi: $\Phi = 0.520834$ Time: 0.256316 s	
	EMD	tripartición	MIP: Cut [A, B] ——— / / ———> [C] Phi: $\Phi = 0.520834$ Time: 0.271785 s	MIP: Cut [A, B] ——— / / ———> [C] Phi: $\Phi = 0.520834$ Time: 0.296044 s	

<pre>cm = np.array([[1, 1, 0], [1, 0, 1], [0, 1, 1]])</pre>	KLD	bipartición	MIP: Cut [A, B] — / —> [C] Phi: $\Phi = 0.520834$ Time: 0.262299 s	MIP: Cut [A, B] — / —> [C] Phi: $\Phi = 0.520834$ Time: 0.278293 s	
	KLD	tripartición	MIP: Cut [A, B] — / —> [C] Phi: $\Phi = 0.520834$ Time: 0.277937 s	MIP: Cut [A, B] — / —> [C] Phi: $\Phi = 0.520834$ Time: 0.289227 s	

- EMD-Bipartición-con CM

```
Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 50%|██████| 3/6 [00:00<00:00, 27.85it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
MIP:
Cut [A, B] — / —> [C]
Phi:
 $\Phi = 0.520834$ 
Time:
0.341088 s
```

- EMD-Bipartición-sin CM


```

Evaluating  $\Phi$  cuts: 0%| 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 50%| 3/6 [00:00<00:00, 29.79it/s]
Computing concepts: 0%| 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\rightarrow$  /  $\rightarrow$  [C]
Phi:
 $\Phi$  = 0.520834
Time:
0.256316 s

```

- **EMD-Tripartición-con CM**

```

Evaluating  $\Phi$  cuts: 0%| 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 67%| 4/6 [00:00<00:00, 28.24it/s]
Computing concepts: 0%| 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\rightarrow$  /  $\rightarrow$  [C]
Phi:
 $\Phi$  = 0.520834
Time:
0.271785 s

```

- **EMD-Tripartición-sin CM**

```

Evaluating  $\Phi$  cuts: 0%| 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 50%| 3/6 [00:00<00:00, 27.35it/s]
Computing concepts: 0%| 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\rightarrow$  /  $\rightarrow$  [C]
Phi:
 $\Phi$  = 0.520834
Time:
0.296044 s

```

- **KLD-Bipartición-con CM**

```

Evaluating  $\Phi$  cuts: 0%| 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 67%| 4/6 [00:00<00:00, 29.49it/s]
Computing concepts: 0%| 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\text{---/ /--->}$  [C]
Phi:
 $\Phi = 0.520834$ 
Time:
0.262299 s

```

- **KLD-Bipartición-sin CM**

```

Evaluating  $\Phi$  cuts: 0%| 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 50%| 3/6 [00:00<00:00, 29.20it/s]
Computing concepts: 0%| 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\text{---/ /--->}$  [C]
Phi:
 $\Phi = 0.520834$ 
Time:
0.278293 s

```

- **KLD-Tripartición-con CM**

```

Evaluating  $\Phi$  cuts: 0%| 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 50%| 3/6 [00:00<00:00, 27.94it/s]
Computing concepts: 0%| 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\text{---/ /--->}$  [C]
Phi:
 $\Phi = 0.520834$ 
Time:
0.277937 s

```

- KLD-Tripartición-sin CM**

```

Evaluating  $\Phi$  cuts: 0% | 0/6 [00:00<?, ?it/s]
Computing concepts: 0% | 0/6 [00:00<?, ?it/s]

Computing concepts: 0% | 0/5 [00:00<?, ?it/s]

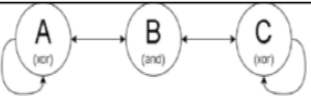
Computing concepts: 0% | 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 50% | 3/6 [00:00<00:00, 27.35it/s]
Computing concepts: 0% | 0/6 [00:00<?, ?it/s]

Computing concepts: 0% | 0/5 [00:00<?, ?it/s]

Computing concepts: 0% | 0/6 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\text{---} / \text{---} \rightarrow$  [C]
Phi:
 $\Phi = 0.520834$ 
Time:
0.289227 s

```

→ Estado-nodo

Entrada de datos	Medida de distancia	Esquema de partición	Resultados con CM	Resultados sin CM	Observaciones
Grafo:  <pre> tpm = np.array([[0, 0, 0], [1, 0, 0], [1, 0, 1], [0, 0, 1], [0, 0, 1], [1, 1, 1], [1, 0, 0], [0, 1, 0]]) </pre>	EMD	biparticion	MIP: Cut [A, B] $\text{---} / \text{---} \rightarrow$ [C] Phi: $\Phi = 0.520834$ Time: 0.215677 s	MIP: Cut [A, B] $\text{---} / \text{---} \rightarrow$ [C] Phi: $\Phi = 0.520834$ Time: 0.300695 s	
	EMD	tripartición	MIP: Cut [A, B] $\text{---} / \text{---} \rightarrow$ [C] Phi: $\Phi = 0.520834$ Time: 0.216105 s	MIP: Cut [A, B] $\text{---} / \text{---} \rightarrow$ [C] Phi: $\Phi = 0.520834$ Time: 0.316358 s	

<pre>cm = np.array([[1, 1, 0], [1, 0, 1], [0, 1, 1]])</pre>	KLD	bipartición	MIP: Cut [A, B] ——— //————> [C] Phi: $\Phi = 0.520834$ Time: 0.21994 s	MIP: Cut [A, B] ——— //————> [C] Phi: $\Phi = 0.520834$ Time: 0.300732 s	
	KLD	tripartición	MIP: Cut [A, B] ——— //————> [C] Phi: $\Phi = 0.520834$ Time: 0.285125 s	MIP: Cut [A, B] ——— //————> [C] Phi: $\Phi = 0.520834$ Time: 0.416471 s	

- **EMD-Bipartición-con CM**

```
Evaluating  $\Phi$  cuts: 0%| 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 67%| 4/6 [00:00<00:00, 39.90it/s]
Computing concepts: 0%| 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]
MIP:
Cut [A, B] — / —> [C]
Phi:
 $\Phi = 0.520834$ 
Time:
0.215677 s
```

- **EMD-Bipartición-sin CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 50%|██████| | 3/6 [00:00<00:00, 25.89it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\dashv$  /  $\dashv$   $\rightarrow$  [C]
Phi:
 $\Phi$  = 0.520834
Time: |
0.300695 s

```

- **EMD-Tripartición-con CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 67%|██████| | 4/6 [00:00<00:00, 34.53it/s]
Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\dashv$  /  $\dashv$   $\rightarrow$  [C]
Phi:
 $\Phi$  = 0.520834
Time: |
0.216105 s
|

```

- **EMD-Tripartición-sin CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 50%|██████| | 3/6 [00:00<00:00, 25.89it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\dashv$  /  $\dashv$   $\rightarrow$  [C]
Phi:
 $\Phi$  = 0.520834
Time: |
0.316358 s
|

```

- **KLD-bipartición-con CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 67%|██████| | 4/6 [00:00<00:00, 33.35it/s]
Computing concepts: 0%| | | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\text{---/ /--->}$  [C]
Phi:
 $\Phi = 0.520834$ 
Time: |
0.21994 s

```

- **KLD-Bipartición-sin CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 50%|██████| | 3/6 [00:00<00:00, 25.89it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\text{---/ /--->}$  [C]
Phi:
 $\Phi = 0.520834$ 
Time: |
0.300732 s

```

- **KLD-Tripartición-con CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 50%|██████| | 3/6 [00:00<00:00, 25.89it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\text{---/ /--->}$  [C]
Phi:
 $\Phi = 0.520834$ 
Time: |
0.285125 s

```

- **KLD-Tripartición-sin CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

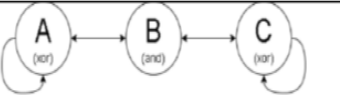
Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 33%| | 2/6 [00:00<00:00, 15.21it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 83%| | 5/6 [00:00<00:00, 16.72it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\rightarrow$  [C]
Phi:
 $\Phi = 0.520834$ 
Time:
0.416471 s

```

→ **TPM-Multidimensional estado-nodo**

Entrada de datos	Medida de distancia	Esquema de partición	Resultados con CM	Resultados sin CM	Observaciones
Grafo:  <pre> tpm = np.array([[[[0.0, 0.0, 0.0], [0.0, 0.0, 1.0]], [[1.0, 0.0, 1.0], [1.0, 0.0, 0.0]]], [[[1.0, 0.0, 0.0], [1.0, 1.0, 1.0]], [[0.0, 0.0, 1.0], [0.0, 1.0, 0.0]]]]) </pre>	EMD	biparticion	MIP: Cut [A, B] \rightarrow [C] Phi: $\Phi = 0.520834$ Time: 0.255029 s	MIP: Cut [A, B] \rightarrow [C] Phi: $\Phi = 0.520834$ Time: 0.269397 s	
	EMD	tripartición	MIP: Cut [A, B] \rightarrow [C] Phi: $\Phi = 0.520834$ Time: 0.231735 s	MIP: Cut [A, B] \rightarrow [C] Phi: $\Phi = 0.520834$ Time: 0.21608 s	

<pre>cm = np.array([[1, 1, 0], [1, 0, 1], [0, 1, 1]])</pre>	KLD	bipartición	MIP: Cut [A, B] ——— //————> [C] Phi: $\Phi = 0.520834$ Time: 0.231457 s	MIP: Cut [A, B] ——— //————> [C] Phi: $\Phi = 0.520834$ Time: 0.216126 s	
	KLD	tripartición	MIP: Cut [A, B] ——— //————> [C] Phi: $\Phi = 0.520834$ Time: 0.231697 s	MIP: Cut [A, B] ——— //————> [C] Phi: $\Phi = 0.520834$ Time: 0.216092 s	

- EMD-Bipartición-con CM

```
Evaluating  $\Phi$  cuts: 0%| 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 67%| 4/6 [00:00<00:00, 32.68it/s]
Computing concepts: 0%| 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]
MIP:
Cut [A, B] — / —> [C]
Phi:
 $\Phi = 0.520834$ 
Time:
0.255029 s
```

- EMD-Bipartición-sin CM


```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 67%|██████| | 4/6 [00:00<00:00, 34.55it/s]
Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
MIP:
  Cut [A, B]  $\rightarrow$  /  $\rightarrow$  [C]
Phi:
   $\Phi$  = 0.520834
Time:
  0.269397 s

```

- **EMD-Tripartición-con CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 67%|██████| | 4/6 [00:00<00:00, 34.52it/s]
Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
MIP:
  Cut [A, B]  $\rightarrow$  /  $\rightarrow$  [C]
Phi:
   $\Phi$  = 0.520834
Time:
  0.231735 s

```

- **EMD-Tripartición-sin CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 67%|██████| | 4/6 [00:00<00:00, 34.53it/s]
Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
MIP:
  Cut [A, B]  $\rightarrow$  /  $\rightarrow$  [C]
Phi:
   $\Phi$  = 0.520834
Time:
  0.21608 s

```

- **KLD-Bipartición-con CM**

```

Evaluating  $\Phi$  cuts: 0%| 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 67%| 4/6 [00:00<00:00, 34.53it/s]
Computing concepts: 0%| 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\text{---/ /--->}$  [C]
Phi:
 $\Phi = 0.520834$ 
Time:
0.231457 s

```

- **KLD-Bipartición-sin CM**

```

Evaluating  $\Phi$  cuts: 0%| 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 50%| 3/6 [00:00<00:00, 29.93it/s]
Computing concepts: 0%| 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| 0/6 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\text{---/ /--->}$  [C]
Phi:
 $\Phi = 0.520834$ 
Time:
0.216126 s

```

- **KLD-Tripartición-con CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 67%|██████| | 4/6 [00:00<00:00, 34.52it/s]
Computing concepts: 0%| | | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\rightarrow$  /  $\rightarrow$  [C]
Phi:
 $\Phi$  = 0.520834
Time:
0.231697 s

```

- **KLD-Tripartición-sin CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/5 [00:00<?, ?it/s]

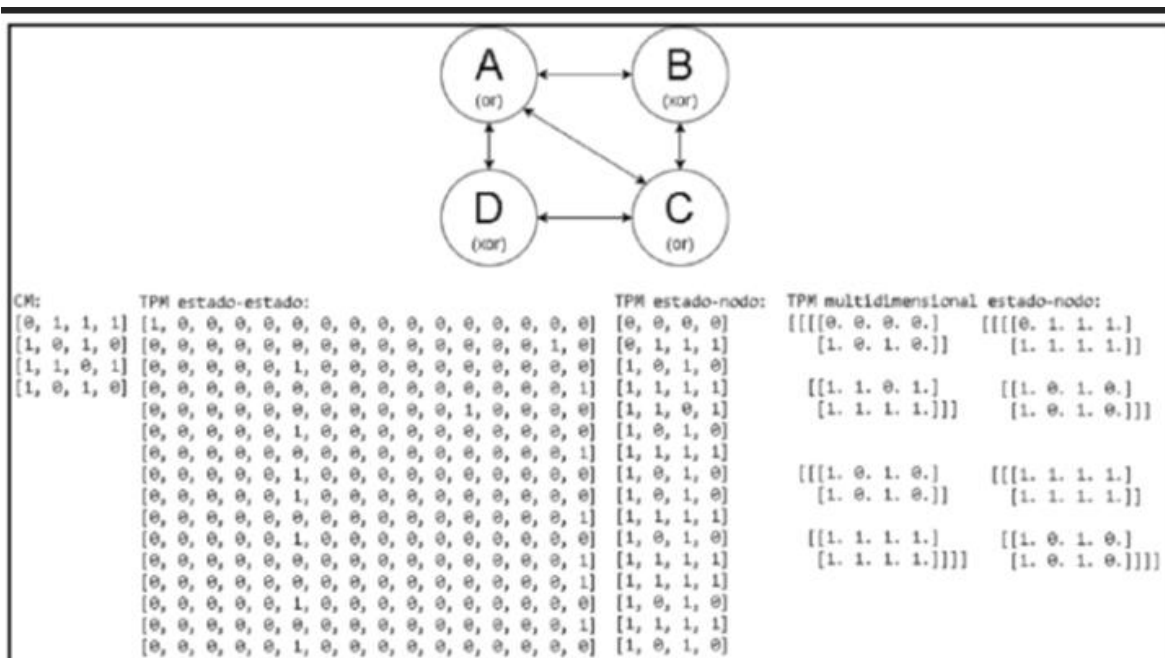
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 67%|██████| | 4/6 [00:00<00:00, 32.03it/s]
Computing concepts: 0%| | | 0/5 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\rightarrow$  /  $\rightarrow$  [C]
Phi:
 $\Phi$  = 0.520834
Time:
0.216092 s

```

Grafo 2



→ Estado-estado

Entrada de datos	Medida de distancia	Esquema de partición	Resultados con CM	Resultados sin CM	Observaciones
Grafo:	EMD	bipartición	MIP: Cut [A, B, C] —// —> [D] Phi: $\Phi = 1.28125$ Time: 1.71135 s	MIP: Cut [A, B, C] —// —> [D] Phi: $\Phi = 1.28125$ Time: 1.685544	
	EMD	tripartición	MIP: Cut [A, B, C] —// —> [D] Phi: $\Phi = 1.28125$ Time:	MIP: Cut [A, B, C] —// —> [D] Phi: $\Phi = 1.28125$ Time:	

<pre> tpm = np.array([[1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0], [0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1], [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0], [0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1], [0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1], [0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1], [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1], [0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1], [0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0],]) cm = np.array([[0, 1, 1, 1], [1, 0, 1, 0], [1, 1, 0, 1], [1, 0, 1, 0],]) </pre>			1.701052 s	1.617769 s	
	KLD	bipartición	MIP: Cut [A, B, C] —// —> [D] Phi: $\Phi = 1.28125$ Time: 1.665161 s	MIP: Cut [A, B, C] —// —> [D] Phi: $\Phi = 1.28125$ Time: 1.648836 s	
	KLD	tripartición	MIP: Cut [A, B, C] —// —> [D] Phi: $\Phi = 1.28125$ Time: 1.686463 s	MIP: Cut [A, B, C] —// —> [D] Phi: $\Phi = 1.28125$ Time: 1.562435 s	

- EMD-Bipartición-con CM

```

Computing concepts: 0% | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 79% | 11/14 [00:01<00:00, 9.92it/s]
Computing concepts: 0% | 0/15 [00:00<?, ?it/s]

Computing concepts: 0% | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93% | 13/14 [00:01<00:00, 9.97it/s]
Computing concepts: 0% | 0/13 [00:00<?, ?it/s]
MIP:
Cut [A, B, C] —// —> [D]
Phi:
 $\Phi = 1.28125$ 
Time:
1.71135 s

```

- EMD-Bipartición-sin CM

```

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 79%|██████| | 11/14 [00:01<00:00, 10.13it/s]
Computing concepts: 0%|          | 0/15 [00:00<?, ?it/s]

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████| | 13/14 [00:01<00:00, 10.18it/s]
Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
MIP:
Cut [A, B, C]  $\dashv$  /  $\dashv$   $\rightarrow$  [D]
Phi:
 $\Phi$  = 1.28125
Time:
1.685544 s

```

- **EMD-Tripartición-con CM**

```

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 79%|██████| | 11/14 [00:01<00:00, 9.97it/s]
Computing concepts: 0%|          | 0/15 [00:00<?, ?it/s]

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████| | 13/14 [00:01<00:00, 10.19it/s]
Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
MIP:
Cut [A, B, C]  $\dashv$  /  $\dashv$   $\rightarrow$  [D]
Phi:
 $\Phi$  = 1.28125
Time:
1.701052 s

```

- **EMD-Tripartición-sin CM**

```

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 79%|██████| | 11/14 [00:00<00:00, 10.83it/s]
Computing concepts: 0%|          | 0/15 [00:00<?, ?it/s]

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████| | 13/14 [00:01<00:00, 10.76it/s]
Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
MIP:
Cut [A, B, C]  $\dashv$  /  $\dashv$   $\rightarrow$  [D]
Phi:
 $\Phi$  = 1.28125
Time:
1.617769 s

```

- **KLD-Bipartición-con CM**

```

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 79%|██████| 11/14 [00:01<00:00, 10.07it/s]
Computing concepts: 0%|          | 0/15 [00:00<?, ?it/s]

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████| 13/14 [00:01<00:00, 10.18it/s]
Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
MIP:
Cut [A, B, C]  $\rightarrow$  /  $\rightarrow$  [D]
Phi:
 $\Phi$  = 1.28125
Time:
1.665161 s

```

- **KLD-Bipartición-sin CM**

```

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 79%|██████| 11/14 [00:01<00:00, 10.16it/s]
Computing concepts: 0%|          | 0/15 [00:00<?, ?it/s]

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████| 13/14 [00:01<00:00, 10.67it/s]
Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
MIP:
Cut [A, B, C]  $\rightarrow$  /  $\rightarrow$  [D]
Phi:
 $\Phi$  = 1.28125
Time:
1.648836 s

```

- **KLD-Tripartición-con CM**

```

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 79%|██████| 11/14 [00:01<00:00, 10.04it/s]
Computing concepts: 0%|          | 0/15 [00:00<?, ?it/s]

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████| 13/14 [00:01<00:00, 10.34it/s]
Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
MIP:
Cut [A, B, C]  $\rightarrow$  /  $\rightarrow$  [D]
Phi:
 $\Phi$  = 1.28125
Time:
1.686463 s

```

- **KLD-Tripartición-sin CM**

```

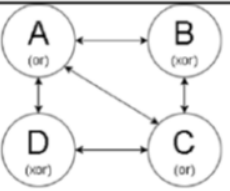
Evaluating  $\Phi$  cuts: 71%|██████████| 10/14 [00:00<00:00, 10.89it/s]
Computing concepts: 0%|██████████| 0/13 [00:00<?, ?it/s]

Computing concepts: 0%|██████████| 0/15 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 86%|██████████| 12/14 [00:01<00:00, 10.94it/s]
Computing concepts: 0%|██████████| 0/13 [00:00<?, ?it/s]

Computing concepts: 0%|██████████| 0/13 [00:00<?, ?it/s]
MIP:
  Cut [A, B, C]  $\longrightarrow$  [D]
Phi:
 $\Phi = 1.28125$ 
Time:
1.562435 s

```

→ Estado-nodo

Entrada de datos	Medida de distancia	Esquema de partición	Resultados con CM	Resultados sin CM	Observaciones
Grafo:  <pre> tpm = np.array([[0, 0, 0, 0], [0, 1, 1, 1], [1, 0, 1, 0], [1, 1, 1, 1], [1, 1, 0, 1], [1, 0, 1, 0], [1, 1, 1, 1], [1, 0, 1, 0], [1, 0, 1, 0], [1, 1, 1, 1], [1, 0, 1, 0], [1, 1, 1, 1], [1, 1, 1, 1], [1, 0, 1, 0], [1, 1, 1, 1], [1, 0, 1, 0]]) cm = np.array([[0, 1, 1, 1], [1, 0, 1, 0], [1, 1, 0, 1], [1, 0, 1, 0]]) </pre>	EMD	biparticion	MIP: Cut [A, B, C] \longrightarrow [D] Phi: $\Phi = 1.28125$ Time: 2.08013 s	MIP: Cut [A, B, C] \longrightarrow [D] Phi: $\Phi = 1.28125$ Time: 1.750886 s	
	EMD	tripartición	MIP: Cut [A, B, C] \longrightarrow [D] Phi: $\Phi = 1.28125$ Time: 1.778046 s	MIP: Cut [A, B, C] \longrightarrow [D] Phi: $\Phi = 1.28125$ Time: 1.688907 s	
	KLD	bipartición	MIP: Cut [A, B, C] \longrightarrow [D] Phi: $\Phi = 1.28125$ Time: 1.680897 s	MIP: Cut [A, B, C] \longrightarrow [D] Phi: $\Phi = 1.28125$ Time: 1.66701 s	

	KLD	tripartición	MIP: Cut [A, B, C] —/ /—> [D] Phi: $\Phi = 1.28125$ Time: 1.720237 s	MIP: Cut [A, B, C] —/ /—> [D] Phi: $\Phi = 1.28125$ Time: 1.644308 s
--	-----	--------------	---	---

- EMD-Bipartición-con CM

```

Computing concepts:  0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 79%|██████| 11/14 [00:01<00:00, 7.98it/s]
Computing concepts:  0%|          | 0/15 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 86%|██████| 12/14 [00:01<00:00, 8.14it/s]
Computing concepts:  0%|          | 0/13 [00:00<?, ?it/s]

Computing concepts:  0%|          | 0/13 [00:00<?, ?it/s]
MIP:
Cut [A, B, C] —/ /—> [D]
Phi:
 $\Phi = 1.28125$ 
Time:
2.08013 s

```

- EMD-Bipartición-sin CM

```

Computing concepts:  0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 79%|██████| 11/14 [00:01<00:00, 9.56it/s]
Computing concepts:  0%|          | 0/15 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 86%|██████| 12/14 [00:01<00:00, 9.29it/s]
Computing concepts:  0%|          | 0/13 [00:00<?, ?it/s]

Computing concepts:  0%|          | 0/13 [00:00<?, ?it/s]
MIP:
Cut [A, B, C] —/ /—> [D]
Phi:
 $\Phi = 1.28125$ 
Time:
1.750886 s

```

- EMD-Tripartición-con CM

```

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 79%|██████| 11/14 [00:01<00:00, 9.24it/s]
Computing concepts: 0%|          | 0/15 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 86%|██████| 12/14 [00:01<00:00, 8.99it/s]
Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]

```

```

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
MIP:
Cut [A, B, C]  $\text{---/ /--->}$  [D]
Phi:
 $\Phi = 1.28125$ 
Time:
1.778046 s

```

- **EMD-Tripartición-sin CM**

```

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 79%|██████| 11/14 [00:01<00:00, 10.01it/s]
Computing concepts: 0%|          | 0/15 [00:00<?, ?it/s]

```

```

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████| 13/14 [00:01<00:00, 10.33it/s]
Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]

```

```

MIP:
Cut [A, B, C]  $\text{---/ /--->}$  [D]
Phi:
 $\Phi = 1.28125$ 
Time:
1.688907 s

```

- **KLD-Bipartición-con CM**

```

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 79%|██████| 11/14 [00:01<00:00, 9.83it/s]
Computing concepts: 0%|          | 0/15 [00:00<?, ?it/s]

```

```

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████| 13/14 [00:01<00:00, 10.21it/s]
Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]

```

```

MIP:
Cut [A, B, C]  $\text{---/ /--->}$  [D]
Phi:
 $\Phi = 1.28125$ 
Time:
1.680897 s

```

- **KLD-Bipartición-sin CM**

```

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 79%|██████| 11/14 [00:01<00:00, 10.02it/s]
Computing concepts: 0%|          | 0/15 [00:00<?, ?it/s]

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████| 13/14 [00:01<00:00, 10.21it/s]
Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
MIP:
Cut [A, B, C]  $\rightarrow$  /  $\rightarrow$  [D]
Phi:
 $\Phi$  = 1.28125
Time:
1.66701 s

```

- **KLD-Tripartición-con CM**

```

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 79%|██████| 11/14 [00:01<00:00, 9.99it/s]
Computing concepts: 0%|          | 0/15 [00:00<?, ?it/s]

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████| 13/14 [00:01<00:00, 10.15it/s]
Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
MIP:
Cut [A, B, C]  $\rightarrow$  /  $\rightarrow$  [D]
Phi:
 $\Phi$  = 1.28125
Time:
1.720237 s

```

- **KLD-Tripartición-sin CM**

```

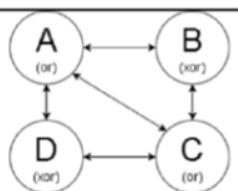
Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 79%|██████| 11/14 [00:01<00:00, 10.36it/s]
Computing concepts: 0%|          | 0/15 [00:00<?, ?it/s]

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████| 13/14 [00:01<00:00, 10.53it/s]
Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
MIP:
Cut [A, B, C]  $\rightarrow$  /  $\rightarrow$  [D]
Phi:
 $\Phi$  = 1.28125
Time:
1.644308 s

```

→ Estado-nodo-multidimensional

Entrada de datos	Medida de distancia	Esquema de partición	Resultados con CM	Resultados sin CM	Observaciones

<p>Grafo:</p>  <pre> tpm = np.array([[[[0.0, 0.0, 0.0, 0.0], [1.0, 0.0, 1.0, 0.0]], [[1.0, 1.0, 0.0, 1.0], [1.0, 1.0, 1.0, 1.0]]], [[[1.0, 0.0, 1.0, 0.0], [1.0, 0.0, 1.0, 0.0]], [[1.0, 1.0, 1.0, 1.0], [1.0, 1.0, 1.0, 1.0]]]], [[[0.0, 1.0, 1.0, 1.0], [1.0, 1.0, 1.0, 1.0]], [[[1.0, 0.0, 1.0, 0.0], [1.0, 0.0, 1.0, 0.0]], [[[1.0, 1.0, 1.0, 1.0], [1.0, 1.0, 1.0, 1.0]]], [[[1.0, 0.0, 1.0, 0.0], [1.0, 0.0, 1.0, 0.0]]]]]]) cm = np.array([[0, 1, 1, 1], [1, 0, 1, 0], [1, 1, 0, 1], [1, 0, 1, 0],]) </pre>	EMD	bipartición	MIP: Cut [A, B, C] ——/ /—— > [D] Phi: $\Phi = 1.28125$ Time: 1.933 s	MIP: Cut [A, B, C] ——/ /—— > [D] Phi: $\Phi = 1.28125$ Time: 1.670471 s	
	EMD	tripartición	MIP: Cut [A, B, C] ——/ /—— > [D] Phi: $\Phi = 1.28125$ Time: 1.665161 s	MIP: Cut [A, B, C] ——/ /—— > [D] Phi: $\Phi = 1.28125$ Time: 1.733072 s	
	KLD	bipartición	MIP: Cut [A, B, C] ——/ /—— > [D] Phi: $\Phi = 1.28125$ Time: 1.81586 s	MIP: Cut [A, B, C] ——/ /—— > [D] Phi: $\Phi = 1.28125$ Time: 1.777333 s	
	KLD	tripartición	MIP: Cut [A, B, C] ——/ /—— > [D] Phi: $\Phi = 1.28125$ Time: 1.779506 s	MIP: Cut [A, B, C] ——/ /—— > [D] Phi: $\Phi = 1.28125$ Time: 1.844154 s	

- EMD-Bipartición-con CM

```

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 79%|██████| | 11/14 [00:01<00:00, 8.36it/s]
Computing concepts: 0%|          | 0/15 [00:00<?, ?it/s]

```

```

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████| | 13/14 [00:01<00:00, 8.96it/s]
Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]

```

MIP:

Cut [A, B, C] $\text{---/} \text{--->}$ [D]

Phi:

$\Phi = 1.28125$

Time:

1.933 s

- **EMD-Bipartición-sin CM**

```

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 79%|██████| | 11/14 [00:01<00:00, 9.93it/s]
Computing concepts: 0%|          | 0/15 [00:00<?, ?it/s]

```

```

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████| | 13/14 [00:01<00:00, 10.25it/s]
Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]

```

MIP:

Cut [A, B, C] $\text{---/} \text{--->}$ [D]

Phi:

$\Phi = 1.28125$

Time:

1.670471 s

- **EMD-Tripartición-con CM**

```

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 79%|██████| | 11/14 [00:01<00:00, 10.23it/s]
Computing concepts: 0%|          | 0/15 [00:00<?, ?it/s]

```

```

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████| | 13/14 [00:01<00:00, 10.34it/s]
Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]

```

MIP:

Cut [A, B, C] $\text{---/} \text{--->}$ [D]

Phi:

$\Phi = 1.28125$

Time:

1.665161 s

- **EMD-Tripartición-sin CM**

```

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 79%|██████| 11/14 [00:01<00:00, 9.77it/s]
Computing concepts: 0%|          | 0/15 [00:00<?, ?it/s]

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████| 13/14 [00:01<00:00, 9.98it/s]
Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
MIP:
Cut [A, B, C]  $\rightarrow$  /  $\rightarrow$  [D]
Phi:
 $\Phi$  = 1.28125
Time:
1.733072 s

```

- **KLD-Bipartición-con CM**

```

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 79%|██████| 11/14 [00:01<00:00, 9.10it/s]
Computing concepts: 0%|          | 0/15 [00:00<?, ?it/s]

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████| 13/14 [00:01<00:00, 9.50it/s]
Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
MIP:
Cut [A, B, C]  $\rightarrow$  /  $\rightarrow$  [D]
Phi:
 $\Phi$  = 1.28125
Time:
1.81586 s

```

- **KLD-Bipartición-sin CM**

```

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 79%|██████| 11/14 [00:01<00:00, 9.07it/s]
Computing concepts: 0%|          | 0/15 [00:00<?, ?it/s]

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████| 13/14 [00:01<00:00, 9.06it/s]
Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
MIP:
Cut [A, B, C]  $\rightarrow$  /  $\rightarrow$  [D]
Phi:
 $\Phi$  = 1.28125
Time:
1.777333 s

```

- **KLD-Tripartición-con CM**

```

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 79%|██████| 11/14 [00:01<00:00, 9.31it/s]
Computing concepts: 0%|          | 0/15 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 86%|██████| 12/14 [00:01<00:00, 8.95it/s]
Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
MIP:
Cut [A, B, C]  $\rightarrow$  /  $\rightarrow$  [D]
Phi:
 $\Phi$  = 1.28125
Time:
1.779506 s

```

- **KLD-Tripartición-sin CM**

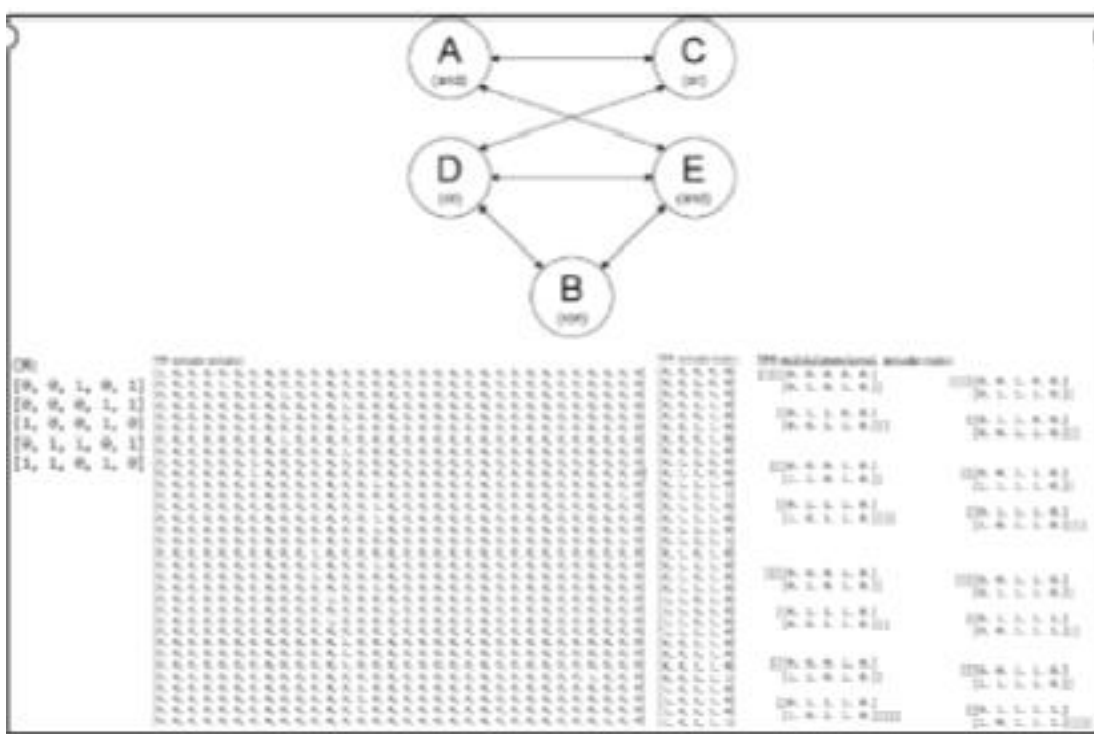
```

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 79%|██████| 11/14 [00:01<00:00, 9.08it/s]
Computing concepts: 0%|          | 0/15 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 86%|██████| 12/14 [00:01<00:00, 8.80it/s]
Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]

Computing concepts: 0%|          | 0/13 [00:00<?, ?it/s]
MIP:
Cut [A, B, C]  $\rightarrow$  /  $\rightarrow$  [D]
Phi:
 $\Phi$  = 1.28125
Time:
1.844154 s

```

Grafo 3



→ Estado-estado

Entrada de datos	Medida de distancia	Esquema de partición	Resultados con CM	Resultados sin CM
<p>Grafo:</p> <pre> tpe = np.array([[1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]]) </pre>	EMD	biparticion	MIP: Cut [A, B, C, D] — — / / —→ [E] Phi: $\Phi = 0.209503$ Time: 6.12972 s	MIP: Cut [A, B, C, D] — — / / —→ [E] Phi: $\Phi = 0.209503$ Time: 6.331663 s
	EMD	tripartición	MIP: Cut [A, B, C, D] — — / / —→ [E] Phi: $\Phi = 0.209503$ Time: 6.283878 s	MIP: Cut [A, B, C, D] — — / / —→ [E] Phi: $\Phi = 0.209503$ Time: 6.463549 s

<pre>cm = np.array([[0,0,1,0,1], [0,0,0,1,1], [1,0,0,1,0], [0,1,1,0,1], [1,1,0,1,0]])</pre>	KLD	bipartición	MIP: Cut [A, B, C, D] — —/ /—> [E] Phi: $\Phi = 0.209503$ Time: 6.455328 s	MIP: Cut [A, B, C, D] — —/ /—> [E] Phi: $\Phi = 0.209503$ Time: 6.738606 s
	KLD	tripartición	MIP: Cut [A, B, C, D] — —/ /—> [E] Phi: $\Phi = 0.209503$ Time: 6.454886 s	MIP: Cut [A, B, C, D] — —/ /—> [E] Phi: $\Phi = 0.209503$ Time: 6.286688 s

- EMD-Bipartición-con CM

```

Computing concepts: 0% | 0/27 [00:00<?, ?it/s]
Computing concepts: 59% | 16/27 [00:00<00:00, 159.61it/s]
Evaluating  $\Phi$  cuts: 63% | 19/30 [00:03<00:01, 5.67it/s]
Computing concepts: 0% | 0/26 [00:00<?, ?it/s]

Computing concepts: 0% | 0/26 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 70% | 21/30 [00:03<00:01, 6.93it/s]
Computing concepts: 0% | 0/28 [00:00<?, ?it/s]

Computing concepts: 0% | 0/22 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 77% | 23/30 [00:03<00:00, 7.83it/s]
Computing concepts: 0% | 0/27 [00:00<?, ?it/s]
Computing concepts: 81% | 22/27 [00:00<00:00, 219.47it/s]
Evaluating  $\Phi$  cuts: 80% | 24/30 [00:03<00:00, 7.38it/s]
Computing concepts: 0% | 0/27 [00:00<?, ?it/s]

Computing concepts: 0% | 0/27 [00:00<?, ?it/s]
Computing concepts: 26% | 7/27 [00:00<00:00, 60.42it/s]
Computing concepts: 81% | 22/27 [00:00<00:00, 66.79it/s]
Evaluating  $\Phi$  cuts: 87% | 26/30 [00:04<00:00, 6.13it/s]
Computing concepts: 0% | 0/21 [00:00<?, ?it/s]
Computing concepts: 81% | 17/21 [00:00<00:00, 169.59it/s]
Evaluating  $\Phi$  cuts: 90% | 27/30 [00:04<00:00, 6.51it/s]
Computing concepts: 0% | 0/26 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93% | 28/30 [00:04<00:00, 7.23it/s]
Computing concepts: 0% | 0/20 [00:00<?, ?it/s]
Computing concepts: 60% | 12/20 [00:00<00:00, 105.86it/s]
Evaluating  $\Phi$  cuts: 97% | 29/30 [00:04<00:00, 6.60it/s]
Computing concepts: 0% | 0/22 [00:00<?, ?it/s]
Computing concepts: 32% | 7/22 [00:00<00:00, 60.41it/s]
MIP:
Cut [A, B, C, D]  $\rightarrow$  [E]
Phi:
 $\Phi = 0.209503$ 
Time:
6.12972 s

```

- EMD-Bipartición-sin CM

```

Evaluating  $\Phi$  cuts: 63%|██████████| 19/30 [00:03<00:01, 5.89it/s]
Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]

Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 70%|██████████| 21/30 [00:03<00:01, 7.21it/s]
Computing concepts: 0%|██████████| 0/28 [00:00<?, ?it/s]

Computing concepts: 0%|██████████| 0/22 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 77%|██████████| 23/30 [00:03<00:00, 8.17it/s]
Computing concepts: 0%|██████████| 0/27 [00:00<?, ?it/s]
Computing concepts: 78%|██████████| 21/27 [00:00<00:00, 209.49it/s]

Computing concepts: 0%|██████████| 0/27 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 83%|██████████| 25/30 [00:03<00:00, 8.12it/s]
Computing concepts: 0%|██████████| 0/27 [00:00<?, ?it/s]
Computing concepts: 26%|██████████| 7/27 [00:00<00:00, 69.83it/s]
Computing concepts: 81%|██████████| 22/27 [00:00<00:00, 73.39it/s]
Evaluating  $\Phi$  cuts: 87%|██████████| 26/30 [00:04<00:00, 5.22it/s]
Computing concepts: 0%|██████████| 0/21 [00:00<?, ?it/s]
Computing concepts: 76%|██████████| 16/21 [00:00<00:00, 159.61it/s]
Evaluating  $\Phi$  cuts: 90%|██████████| 27/30 [00:04<00:00, 5.41it/s]
Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████████| 28/30 [00:04<00:00, 6.27it/s]
Computing concepts: 0%|██████████| 0/20 [00:00<?, ?it/s]
Computing concepts: 50%|██████████| 10/20 [00:00<00:00, 99.74it/s]
Evaluating  $\Phi$  cuts: 97%|██████████| 29/30 [00:04<00:00, 5.98it/s]
Computing concepts: 0%|██████████| 0/22 [00:00<?, ?it/s]
Computing concepts: 14%|██████████| 3/22 [00:00<00:00, 25.97it/s]
Computing concepts: 82%|██████████| 18/22 [00:00<00:00, 34.54it/s]
MIP:
Cut [A, B, C, D]  $\rightarrow$  /  $\rightarrow$  [E]
Phi:
 $\Phi = 0.209503$ 
Time:
6.331663 s

```

- EMD-Tripartición-con CM

```

Computing concepts: 0%|          | 0/26 [00:00<?, ?it/s]

Computing concepts: 0%|          | 0/26 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 70%|██████| 21/30 [00:03<00:01, 6.87it/s]
Computing concepts: 0%|          | 0/28 [00:00<?, ?it/s]

Computing concepts: 0%|          | 0/22 [00:00<?, ?it/s]
Computing concepts: 100%|████████| 22/22 [00:00<00:00, 219.47it/s]
Evaluating  $\Phi$  cuts: 77%|██████| 23/30 [00:03<00:00, 7.86it/s]
Computing concepts: 0%|          | 0/27 [00:00<?, ?it/s]
Computing concepts: 96%|████████| 26/27 [00:00<00:00, 241.43it/s]
Evaluating  $\Phi$  cuts: 80%|██████| 24/30 [00:03<00:00, 7.38it/s]
Computing concepts: 0%|          | 0/27 [00:00<?, ?it/s]

Computing concepts: 0%|          | 0/27 [00:00<?, ?it/s]
Computing concepts: 26%|██████| 7/27 [00:00<00:00, 67.15it/s]
Computing concepts: 78%|████████| 21/27 [00:00<00:00, 79.54it/s]
Computing concepts: 100%|████████| 27/27 [00:00<00:00, 65.04it/s]
Evaluating  $\Phi$  cuts: 87%|██████| 26/30 [00:04<00:00, 6.01it/s]
Computing concepts: 0%|          | 0/21 [00:00<?, ?it/s]
Computing concepts: 76%|████████| 16/21 [00:00<00:00, 159.62it/s]
Evaluating  $\Phi$  cuts: 90%|██████| 27/30 [00:04<00:00, 6.33it/s]
Computing concepts: 0%|          | 0/26 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████| 28/30 [00:04<00:00, 7.11it/s]
Computing concepts: 0%|          | 0/20 [00:00<?, ?it/s]
Computing concepts: 55%|██████| 11/20 [00:00<00:00, 109.72it/s]
Evaluating  $\Phi$  cuts: 97%|██████| 29/30 [00:04<00:00, 6.58it/s]
Computing concepts: 0%|          | 0/22 [00:00<?, ?it/s]
Computing concepts: 32%|██████| 7/22 [00:00<00:00, 65.58it/s]
MIP:
Cut [A, B, C, D]  $\rightarrow$  /  $\rightarrow$  [E]
Phi: |
 $\Phi$  = 0.209503
Time:
6.283878 s

```

- EMD-Tripartición-sin CM

```

Evaluating  $\Phi$  cuts: 63%|██████████| 19/30 [00:03<00:02, 5.41it/s]
Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]

Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 70%|██████████| 21/30 [00:03<00:01, 6.56it/s]
Computing concepts: 0%|██████████| 0/28 [00:00<?, ?it/s]

Computing concepts: 0%|██████████| 0/22 [00:00<?, ?it/s]
Computing concepts: 100%|██████████| 22/22 [00:00<00:00, 219.48it/s]
Evaluating  $\Phi$  cuts: 77%|██████████| 23/30 [00:03<00:00, 7.49it/s]
Computing concepts: 0%|██████████| 0/27 [00:00<?, ?it/s]
Computing concepts: 74%|██████████| 20/27 [00:00<00:00, 199.53it/s]
Evaluating  $\Phi$  cuts: 80%|██████████| 24/30 [00:03<00:00, 7.07it/s]
Computing concepts: 0%|██████████| 0/27 [00:00<?, ?it/s]

Computing concepts: 0%|██████████| 0/27 [00:00<?, ?it/s]
Computing concepts: 26%|██████████| 7/27 [00:00<00:00, 69.81it/s]
Computing concepts: 81%|██████████| 22/27 [00:00<00:00, 74.55it/s]
Evaluating  $\Phi$  cuts: 87%|██████████| 26/30 [00:04<00:00, 6.14it/s]
Computing concepts: 0%|██████████| 0/21 [00:00<?, ?it/s]
Computing concepts: 95%|██████████| 20/21 [00:00<00:00, 199.53it/s]
Evaluating  $\Phi$  cuts: 90%|██████████| 27/30 [00:04<00:00, 6.43it/s]
Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████████| 28/30 [00:04<00:00, 7.20it/s]
Computing concepts: 0%|██████████| 0/20 [00:00<?, ?it/s]
Computing concepts: 50%|██████████| 10/20 [00:00<00:00, 99.73it/s]
Evaluating  $\Phi$  cuts: 97%|██████████| 29/30 [00:04<00:00, 6.85it/s]
Computing concepts: 0%|██████████| 0/22 [00:00<?, ?it/s]
Computing concepts: 32%|██████████| 7/22 [00:00<00:00, 57.19it/s]
MIP:
Cut [A, B, C, D]  $\rightarrow$  /  $\rightarrow$  [E]
Phi:
 $\Phi$  = 0.209503
Time: |
6.463549 s

```

- KLD-Bipartición-con CM

```

Computing concepts: 0%|          | 0/26 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 70%|██████| 21/30 [00:03<00:01, 6.94it/s]
Computing concepts: 0%|          | 0/28 [00:00<?, ?it/s]

Computing concepts: 0%|          | 0/22 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 77%|██████| 23/30 [00:03<00:00, 7.92it/s]
Computing concepts: 0%|          | 0/27 [00:00<?, ?it/s]
Computing concepts: 78%|██████| 21/27 [00:00<00:00, 209.42it/s]
Evaluating  $\Phi$  cuts: 80%|██████| 24/30 [00:03<00:00, 7.39it/s]
Computing concepts: 0%|          | 0/27 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 83%|██████| 25/30 [00:03<00:00, 7.90it/s]
Computing concepts: 0%|          | 0/27 [00:00<?, ?it/s]
Computing concepts: 15%|███| 4/27 [00:00<00:00, 39.89it/s]
Computing concepts: 59%|██████| 16/27 [00:00<00:00, 49.87it/s]
Computing concepts: 81%|██████| 22/27 [00:00<00:00, 45.11it/s]
Evaluating  $\Phi$  cuts: 87%|██████| 26/30 [00:04<00:00, 4.36it/s]
Computing concepts: 0%|          | 0/21 [00:00<?, ?it/s]
Computing concepts: 76%|██████| 16/21 [00:00<00:00, 159.61it/s]
Evaluating  $\Phi$  cuts: 90%|██████| 27/30 [00:04<00:00, 4.73it/s]
Computing concepts: 0%|          | 0/26 [00:00<?, ?it/s]
Computing concepts: 81%|██████| 21/26 [00:00<00:00, 209.47it/s]
Evaluating  $\Phi$  cuts: 93%|██████| 28/30 [00:04<00:00, 5.33it/s]
Computing concepts: 0%|          | 0/20 [00:00<?, ?it/s]
Computing concepts: 50%|██████| 10/20 [00:00<00:00, 99.74it/s]
Evaluating  $\Phi$  cuts: 97%|██████| 29/30 [00:04<00:00, 5.36it/s]
Computing concepts: 0%|          | 0/22 [00:00<?, ?it/s]
Computing concepts: 14%|███| 3/22 [00:00<00:00, 25.89it/s]
Computing concepts: 73%|██████| 16/22 [00:00<00:00, 34.07it/s]
MIP:
Cut [A, B, C, D]  $\rightarrow$  /  $\rightarrow$  [E]
Phi:
 $\Phi$  = 0.209503
Time: |
6.455328 s

```

- KLD-Bipartición-sin CM

```

Computing concepts: 70%|██████████| 19/27 [00:00<00:00, 166.12it/s]
Evaluating  $\Phi$  cuts: 63%|██████████| 19/30 [00:03<00:01, 5.79it/s]
Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]

Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 70%|██████████| 21/30 [00:03<00:01, 7.19it/s]
Computing concepts: 0%|██████████| 0/28 [00:00<?, ?it/s]

Computing concepts: 0%|██████████| 0/22 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 77%|██████████| 23/30 [00:03<00:00, 8.05it/s]
Computing concepts: 0%|██████████| 0/27 [00:00<?, ?it/s]
Computing concepts: 96%|██████████| 26/27 [00:00<00:00, 243.54it/s]

Computing concepts: 0%|██████████| 0/27 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 83%|██████████| 25/30 [00:04<00:00, 8.15it/s]
Computing concepts: 0%|██████████| 0/27 [00:00<?, ?it/s]
Computing concepts: 26%|██████████| 7/27 [00:00<00:00, 69.83it/s]
Computing concepts: 81%|██████████| 22/27 [00:00<00:00, 72.87it/s]
Evaluating  $\Phi$  cuts: 87%|██████████| 26/30 [00:04<00:00, 5.13it/s]
Computing concepts: 0%|██████████| 0/21 [00:00<?, ?it/s]
Computing concepts: 95%|██████████| 20/21 [00:00<00:00, 187.34it/s]
Evaluating  $\Phi$  cuts: 90%|██████████| 27/30 [00:04<00:00, 5.62it/s]
Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████████| 28/30 [00:04<00:00, 6.47it/s]
Computing concepts: 0%|██████████| 0/20 [00:00<?, ?it/s]
Computing concepts: 50%|██████████| 10/20 [00:00<00:00, 99.76it/s]
Evaluating  $\Phi$  cuts: 97%|██████████| 29/30 [00:04<00:00, 6.11it/s]
Computing concepts: 0%|██████████| 0/22 [00:00<?, ?it/s]
Computing concepts: 32%|██████████| 7/22 [00:00<00:00, 60.40it/s]
MIP:
Cut [A, B, C, D]  $\rightarrow$  /  $\rightarrow$  [E]
Phi:
 $\Phi = 0.209503$ 
Time:
6.738606 s

```

- **KLD-Tripartición-con CM**


```

Computing concepts: 59%|██████████| 16/27 [00:00<00:00, 159.60it/s]
Evaluating  $\Phi$  cuts: 63%|██████████| 19/30 [00:03<00:02, 5.46it/s]
Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]

Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 70%|██████████| 21/30 [00:03<00:01, 6.56it/s]
Computing concepts: 0%|██████████| 0/28 [00:00<?, ?it/s]

Computing concepts: 0%|██████████| 0/22 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 77%|██████████| 23/30 [00:03<00:00, 7.51it/s]
Computing concepts: 0%|██████████| 0/27 [00:00<?, ?it/s]
Computing concepts: 81%|██████████| 22/27 [00:00<00:00, 206.15it/s]
Evaluating  $\Phi$  cuts: 80%|██████████| 24/30 [00:03<00:00, 6.90it/s]
Computing concepts: 0%|██████████| 0/27 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 83%|██████████| 25/30 [00:04<00:00, 7.56it/s]
Computing concepts: 0%|██████████| 0/27 [00:00<?, ?it/s]
Computing concepts: 26%|██████████| 7/27 [00:00<00:00, 62.86it/s]
Computing concepts: 81%|██████████| 22/27 [00:00<00:00, 67.42it/s]
Evaluating  $\Phi$  cuts: 87%|██████████| 26/30 [00:04<00:00, 4.81it/s]
Computing concepts: 0%|██████████| 0/21 [00:00<?, ?it/s]
Computing concepts: 95%|██████████| 20/21 [00:00<00:00, 172.60it/s]
Evaluating  $\Phi$  cuts: 90%|██████████| 27/30 [00:04<00:00, 5.35it/s]
Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████████| 28/30 [00:04<00:00, 6.21it/s]
Computing concepts: 0%|██████████| 0/20 [00:00<?, ?it/s]
Computing concepts: 50%|██████████| 10/20 [00:00<00:00, 99.76it/s]
Evaluating  $\Phi$  cuts: 97%|██████████| 29/30 [00:04<00:00, 5.95it/s]
Computing concepts: 0%|██████████| 0/22 [00:00<?, ?it/s]
Computing concepts: 32%|██████████| 7/22 [00:00<00:00, 60.41it/s]
MIP:
Cut [A, B, C, D]  $\rightarrow$  /  $\rightarrow$  [E]
Phi:
 $\Phi = 0.209503$ 
Time: |
6.454886 s

```

- KLD-Tripartición-sin CM


```

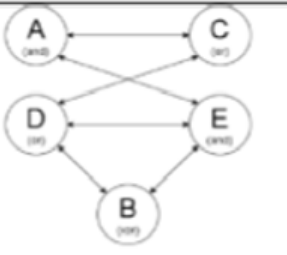
Evaluating  $\Phi$  cuts: 63%|██████████| 19/30 [00:03<00:01, 5.93it/s]
Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]

Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 70%|██████████| 21/30 [00:03<00:01, 7.14it/s]
Computing concepts: 0%|██████████| 0/28 [00:00<?, ?it/s]

Computing concepts: 0%|██████████| 0/22 [00:00<?, ?it/s]
Computing concepts: 100%|██████████| 22/22 [00:00<00:00, 219.54it/s]
Evaluating  $\Phi$  cuts: 77%|██████████| 23/30 [00:03<00:00, 8.10it/s]
Computing concepts: 0%|██████████| 0/27 [00:00<?, ?it/s]
Computing concepts: 81%|██████████| 22/27 [00:00<00:00, 219.47it/s]
Evaluating  $\Phi$  cuts: 80%|██████████| 24/30 [00:03<00:00, 7.39it/s]
Computing concepts: 0%|██████████| 0/27 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 83%|██████████| 25/30 [00:03<00:00, 8.02it/s]
Computing concepts: 0%|██████████| 0/27 [00:00<?, ?it/s]
Computing concepts: 26%|██████████| 7/27 [00:00<00:00, 69.83it/s]
Computing concepts: 81%|██████████| 22/27 [00:00<00:00, 73.57it/s]
Evaluating  $\Phi$  cuts: 87%|██████████| 26/30 [00:04<00:00, 5.17it/s]
Computing concepts: 0%|██████████| 0/21 [00:00<?, ?it/s]
Computing concepts: 76%|██████████| 16/21 [00:00<00:00, 159.53it/s]
Evaluating  $\Phi$  cuts: 90%|██████████| 27/30 [00:04<00:00, 5.72it/s]
Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████████| 28/30 [00:04<00:00, 6.28it/s]
Computing concepts: 0%|██████████| 0/20 [00:00<?, ?it/s]
Computing concepts: 50%|██████████| 10/20 [00:00<00:00, 86.30it/s]
Evaluating  $\Phi$  cuts: 97%|██████████| 29/30 [00:04<00:00, 6.06it/s]
Computing concepts: 0%|██████████| 0/22 [00:00<?, ?it/s]
Computing concepts: 32%|██████████| 7/22 [00:00<00:00, 60.40it/s]
MIP:
Cut [A, B, C, D]  $\rightarrow$  /  $\rightarrow$  [E]
Phi:
 $\Phi = 0.209503$ 
Time:
6.286688 s

```

→ Estado-nodo

Entrada de datos	Medida de distancia	Esquema de partición	Resultados con CM	Resultados sin CM
Grafo: 	EMD	biparticion	MIP: Cut [A, C] \rightarrow / \rightarrow \rightarrow [B, D, E] Phi: $\Phi = 0.249999$ Time: 9.922279 s	MIP: Cut [A, C] \rightarrow / \rightarrow \rightarrow [B, D, E] Phi: $\Phi = 0.249999$ Time: 39.720679 s

<pre>tpm = np.array([[0,0,0,0,0], [0,0,1,0,1], [0,0,0,1,1], [0,0,1,1,1], [1,0,0,1,0], [1,0,1,1,1], [1,0,0,1,1], [1,0,1,1,1], [0,1,1,0,1], [0,1,1,0,1], [0,1,1,1,1], [0,1,1,1,1], [1,1,1,1,1], [1,1,1,1,1], [1,1,1,1,1], [1,1,0,1,0], [1,1,1,1,1], [1,1,0,1,1], [1,1,1,1,1], [1,1,0,1,0], [1,1,1,1,1], [1,1,0,1,1], [1,1,1,1,1], [1,1,1,1,1], [1,1,1,1,1], [1,1,1,1,1], [1,1,1,1,1]]) cm = np.array([[0,0,1,0,1], [0,0,0,1,1], [1,0,0,1,0], [0,1,1,0,1], [1,1,0,1,0]])</pre>	EMD	tripartición	MIP: Cut [A, C] — / /— ➤ [B, D, E] Phi: Φ = 0.249999 Time: 12.107863 s	MIP: Cut [A, C] — / /— ➤ [B, D, E] Phi: Φ = 0.249999 Time: 39.274809 s
	KLD	bipartición	MIP: Cut [A, C] — / /— ➤ [B, D, E] Phi: Φ = 0.249999 Time: 10.109698 s	MIP: Cut [A, C] — / /— ➤ [B, D, E] Phi: Φ = 0.249999 Time: 44.130286 s
	KLD	tripartición	MIP: Cut [A, C] — / /— ➤ [B, D, E] Phi: Φ = 0.249999 Time: 10.796676 s	MIP: Cut [A, C] — / /— ➤ [B, D, E] Phi: Φ = 0.249999 Time: 39.269661 s

- **EMD-Bipartición-con CM**

```

Computing concepts: 69%|██████████| 18/26 [00:00<00:00, 39.38it/s]
Computing concepts: 96%|██████████| 25/26 [00:00<00:00, 42.71it/s]
Evaluating  $\Phi$  cuts: 80%|██████████| 24/30 [00:05<00:01, 3.57it/s]
Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]
Computing concepts: 69%|██████████| 18/26 [00:00<00:00, 179.56it/s]
Evaluating  $\Phi$  cuts: 83%|██████████| 25/30 [00:05<00:01, 4.13it/s]
Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]
Computing concepts: 12%|██████████| 3/26 [00:00<00:02, 10.43it/s]
Computing concepts: 50%|██████████| 13/26 [00:00<00:00, 13.78it/s]
Computing concepts: 58%|██████████| 15/26 [00:00<00:00, 15.19it/s]
Computing concepts: 77%|██████████| 20/26 [00:00<00:00, 19.20it/s]
Computing concepts: 88%|██████████| 23/26 [00:00<00:00, 19.54it/s]
Evaluating  $\Phi$  cuts: 87%|██████████| 26/30 [00:06<00:01, 2.27it/s]
Computing concepts: 0%|██████████| 0/20 [00:00<?, ?it/s]
Computing concepts: 15%|██████████| 3/20 [00:00<00:00, 29.93it/s]
Computing concepts: 65%|██████████| 13/20 [00:00<00:00, 37.88it/s]
Computing concepts: 95%|██████████| 19/20 [00:00<00:00, 42.57it/s]
Evaluating  $\Phi$  cuts: 90%|██████████| 27/30 [00:07<00:01, 2.48it/s]
Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]
Computing concepts: 81%|██████████| 21/26 [00:00<00:00, 209.49it/s]
Evaluating  $\Phi$  cuts: 93%|██████████| 28/30 [00:07<00:00, 3.05it/s]
Computing concepts: 0%|██████████| 0/20 [00:00<?, ?it/s]
Computing concepts: 20%|██████████| 4/20 [00:00<00:00, 39.91it/s]
Computing concepts: 55%|██████████| 11/20 [00:00<00:00, 45.79it/s]
Computing concepts: 100%|██████████| 20/20 [00:00<00:00, 53.68it/s]
Evaluating  $\Phi$  cuts: 97%|██████████| 29/30 [00:07<00:00, 3.04it/s]
Computing concepts: 0%|██████████| 0/20 [00:00<?, ?it/s]
Computing concepts: 15%|██████████| 3/20 [00:00<00:00, 25.89it/s]
Computing concepts: 60%|██████████| 12/20 [00:00<00:00, 32.91it/s]
MIP:
Cut [A, C]  $\longleftrightarrow$  [B, D, E]
Phi:
 $\Phi = 0.249999$ 
Time:
9.922279 s

```

- EMD-Bipartición-sin CM

```

Computing concepts: 0%| 0/26 [00:00<?, ?it/s]
Computing concepts: 12%| 3/26 [00:00<00:00, 29.93it/s]
Computing concepts: 15%| 4/26 [00:00<00:01, 18.70it/s]
Computing concepts: 27%| 7/26 [00:00<00:00, 21.07it/s]
Computing concepts: 38%| 10/26 [00:00<00:00, 20.86it/s]
Computing concepts: 54%| 14/26 [00:00<00:00, 22.78it/s]
Computing concepts: 65%| 17/26 [00:00<00:00, 21.28it/s]
Computing concepts: 77%| 20/26 [00:00<00:00, 22.48it/s]
Computing concepts: 88%| 23/26 [00:00<00:00, 23.05it/s]
Computing concepts: 100%| 26/26 [00:01<00:00, 24.76it/s]
Evaluating  $\Phi$  cuts: 93%| 28/30 [00:34<00:02, 1.24s/it]
Computing concepts: 0%| 0/20 [00:00<?, ?it/s]
Computing concepts: 15%| 3/20 [00:00<00:00, 29.93it/s]
Computing concepts: 20%| 4/20 [00:00<00:01, 14.39it/s]
Computing concepts: 25%| 5/20 [00:00<00:01, 12.70it/s]
Computing concepts: 35%| 7/20 [00:00<00:00, 13.36it/s]
Computing concepts: 50%| 10/20 [00:00<00:00, 16.02it/s]
Computing concepts: 60%| 12/20 [00:00<00:00, 15.07it/s]
Computing concepts: 80%| 16/20 [00:00<00:00, 17.34it/s]
Computing concepts: 90%| 18/20 [00:01<00:00, 17.31it/s]
Evaluating  $\Phi$  cuts: 97%| 29/30 [00:35<00:01, 1.20s/it]
Computing concepts: 0%| 0/20 [00:00<?, ?it/s]
Computing concepts: 15%| 3/20 [00:00<00:01, 13.88it/s]
Computing concepts: 30%| 6/20 [00:00<00:00, 14.51it/s]
Computing concepts: 50%| 10/20 [00:00<00:00, 17.94it/s]
Computing concepts: 60%| 12/20 [00:00<00:00, 17.02it/s]
Computing concepts: 70%| 14/20 [00:00<00:00, 16.81it/s]
Computing concepts: 85%| 17/20 [00:00<00:00, 17.75it/s]
MIP:
Cut [A, C]  $\rightarrow$  /  $\rightarrow$  [B, D, E]
Phi:
 $\Phi = 0.249999$ 
Time:
39.720679 s

```

- EMD-Tripartición-con CM

```

Evaluating  $\Phi$  cuts: 83%|██████████| 25/30 [00:07<00:01, 3.66it/s]
Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]
Computing concepts: 12%|██████████| 3/26 [00:00<00:02, 9.98it/s]
Computing concepts: 27%|██████████| 7/26 [00:00<00:01, 12.24it/s]
Computing concepts: 50%|██████████| 13/26 [00:00<00:00, 15.50it/s]
Computing concepts: 58%|██████████| 15/26 [00:00<00:00, 14.17it/s]
Computing concepts: 77%|██████████| 20/26 [00:00<00:00, 17.18it/s]
Computing concepts: 88%|██████████| 23/26 [00:01<00:00, 17.82it/s]
Evaluating  $\Phi$  cuts: 87%|██████████| 26/30 [00:08<00:02, 1.84it/s]
Computing concepts: 0%|██████████| 0/20 [00:00<?, ?it/s]
Computing concepts: 15%|██████████| 3/20 [00:00<00:00, 29.93it/s]
Computing concepts: 65%|██████████| 13/20 [00:00<00:00, 37.88it/s]
Computing concepts: 95%|██████████| 19/20 [00:00<00:00, 42.57it/s]
Evaluating  $\Phi$  cuts: 90%|██████████| 27/30 [00:08<00:01, 2.09it/s]
Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]
Computing concepts: 31%|██████████| 8/26 [00:00<00:00, 69.04it/s]
Computing concepts: 81%|██████████| 21/26 [00:00<00:00, 80.31it/s]
Evaluating  $\Phi$  cuts: 93%|██████████| 28/30 [00:09<00:00, 2.35it/s]
Computing concepts: 0%|██████████| 0/20 [00:00<?, ?it/s]
Computing concepts: 20%|██████████| 4/20 [00:00<00:00, 21.64it/s]
Computing concepts: 35%|██████████| 7/20 [00:00<00:00, 21.30it/s]
Computing concepts: 80%|██████████| 16/20 [00:00<00:00, 26.79it/s]
Computing concepts: 100%|██████████| 20/20 [00:00<00:00, 29.72it/s]
Evaluating  $\Phi$  cuts: 97%|██████████| 29/30 [00:09<00:00, 2.10it/s]
Computing concepts: 0%|██████████| 0/20 [00:00<?, ?it/s]
Computing concepts: 15%|██████████| 3/20 [00:00<00:01, 14.96it/s]
Computing concepts: 60%|██████████| 12/20 [00:00<00:00, 19.08it/s]
Computing concepts: 70%|██████████| 14/20 [00:00<00:00, 19.33it/s]
Computing concepts: 85%|██████████| 17/20 [00:00<00:00, 20.92it/s]
MIP:
Cut [A, C]  $\rightarrow$  /  $\rightarrow$  [B, D, E]
Phi:
 $\Phi = 0.249999$ 
Time:
12.107863 s|

```

- EMD-Tripartición-sin CM

```

Computing concepts: 0% | 0/26 [00:00<?, ?it/s]
Computing concepts: 12% | 3/26 [00:00<00:00, 25.60it/s]
Computing concepts: 15% | 4/26 [00:00<00:01, 14.64it/s]
Computing concepts: 27% | 7/26 [00:00<00:01, 16.84it/s]
Computing concepts: 38% | 10/26 [00:00<00:00, 17.77it/s]
Computing concepts: 54% | 14/26 [00:00<00:00, 20.10it/s]
Computing concepts: 62% | 16/26 [00:00<00:00, 20.05it/s]
Computing concepts: 69% | 18/26 [00:00<00:00, 20.02it/s]
Computing concepts: 81% | 21/26 [00:01<00:00, 20.13it/s]
Computing concepts: 96% | 25/26 [00:01<00:00, 23.65it/s]
Evaluating  $\Phi$  cuts: 93% | 28/30 [00:34<00:02, 1.32s/it]
Computing concepts: 0% | 0/20 [00:00<?, ?it/s]
Computing concepts: 15% | 3/20 [00:00<00:00, 25.89it/s]
Computing concepts: 20% | 4/20 [00:00<00:01, 14.05it/s]
Computing concepts: 25% | 5/20 [00:00<00:01, 12.52it/s]
Computing concepts: 35% | 7/20 [00:00<00:00, 13.64it/s]
Computing concepts: 50% | 10/20 [00:00<00:00, 16.13it/s]
Computing concepts: 60% | 12/20 [00:00<00:00, 17.12it/s]
Computing concepts: 80% | 16/20 [00:00<00:00, 19.26it/s]
Computing concepts: 95% | 19/20 [00:00<00:00, 20.74it/s]
Evaluating  $\Phi$  cuts: 97% | 29/30 [00:35<00:01, 1.24s/it]
Computing concepts: 0% | 0/20 [00:00<?, ?it/s]
Computing concepts: 10% | 2/20 [00:00<00:00, 19.95it/s]
Computing concepts: 15% | 3/20 [00:00<00:01, 12.32it/s]
Computing concepts: 30% | 6/20 [00:00<00:01, 13.45it/s]
Computing concepts: 50% | 10/20 [00:00<00:00, 16.72it/s]
Computing concepts: 60% | 12/20 [00:00<00:00, 15.98it/s]
Computing concepts: 70% | 14/20 [00:00<00:00, 17.00it/s]
Computing concepts: 85% | 17/20 [00:00<00:00, 17.89it/s]
MIP:
Cut [A, C]  $\rightarrow$  [B, D, E]
Phi:
 $\Phi = 0.249999$ 
Time:
39.274809 s

```

- KLD-Bipartición-con CM


```

Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]
Computing concepts: 77%|██████████| 20/26 [00:00<00:00, 187.42it/s]
Evaluating  $\Phi$  cuts: 83%|██████████| 25/30 [00:05<00:01, 4.17it/s]
Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]
Computing concepts: 12%|███| 3/26 [00:00<00:02, 10.88it/s]
Computing concepts: 27%|██████| 7/26 [00:00<00:01, 13.69it/s]
Computing concepts: 54%|██████████| 14/26 [00:00<00:00, 18.04it/s]
Computing concepts: 65%|██████████| 17/26 [00:00<00:00, 19.25it/s]
Computing concepts: 81%|██████████| 21/26 [00:00<00:00, 21.96it/s]
Computing concepts: 96%|██████████| 25/26 [00:00<00:00, 24.65it/s]
Evaluating  $\Phi$  cuts: 87%|██████████| 26/30 [00:06<00:01, 2.28it/s]
Computing concepts: 0%| | 0/20 [00:00<?, ?it/s]
Computing concepts: 15%|███| 3/20 [00:00<00:00, 29.92it/s]
Computing concepts: 65%|██████████| 13/20 [00:00<00:00, 37.87it/s]
Computing concepts: 95%|██████████| 19/20 [00:00<00:00, 41.19it/s]
Evaluating  $\Phi$  cuts: 90%|██████████| 27/30 [00:07<00:01, 2.42it/s]
Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]
Computing concepts: 62%|██████████| 16/26 [00:00<00:00, 159.56it/s]
Evaluating  $\Phi$  cuts: 93%|██████████| 28/30 [00:07<00:00, 3.00it/s]
Computing concepts: 0%| | 0/20 [00:00<?, ?it/s]
Computing concepts: 20%|███| 4/20 [00:00<00:00, 34.51it/s]
Computing concepts: 60%|██████████| 12/20 [00:00<00:00, 41.59it/s]
Computing concepts: 100%|██████████| 20/20 [00:00<00:00, 48.56it/s]
Evaluating  $\Phi$  cuts: 97%|██████████| 29/30 [00:07<00:00, 2.94it/s]
Computing concepts: 0%| | 0/20 [00:00<?, ?it/s]
Computing concepts: 15%|███| 3/20 [00:00<00:00, 25.89it/s]
Computing concepts: 60%|██████████| 12/20 [00:00<00:00, 32.92it/s]
Computing concepts: 95%|██████████| 19/20 [00:00<00:00, 39.12it/s]
MIP:
  Cut [A, C]  $\rightarrow$  /  $\rightarrow$  [B, D, E]
Phi:
   $\Phi$  = 0.249999
Time:
  10.109698 s|

```

- KLD-Bipartición-sin CM

```

Evaluating  $\Phi$  cuts: 90% | 27/26 [00:37<00:04, 1.50s/it]
Computing concepts: 0% | 0/26 [00:00<?, ?it/s]
Computing concepts: 12% | 3/26 [00:00<00:00, 29.93it/s]
Computing concepts: 15% | 4/26 [00:00<00:01, 18.70it/s]
Computing concepts: 27% | 7/26 [00:00<00:00, 21.08it/s]
Computing concepts: 38% | 10/26 [00:00<00:00, 20.87it/s]
Computing concepts: 54% | 14/26 [00:00<00:00, 23.04it/s]
Computing concepts: 65% | 17/26 [00:00<00:00, 21.86it/s]
Computing concepts: 77% | 20/26 [00:00<00:00, 22.93it/s]
Computing concepts: 88% | 23/26 [00:00<00:00, 23.74it/s]
Computing concepts: 100% | 26/26 [00:01<00:00, 25.31it/s]
Evaluating  $\Phi$  cuts: 93% | 28/30 [00:38<00:02, 1.43s/it]
Computing concepts: 0% | 0/20 [00:00<?, ?it/s]
Computing concepts: 15% | 3/20 [00:00<00:00, 25.89it/s]
Computing concepts: 20% | 4/20 [00:00<00:01, 13.53it/s]
Computing concepts: 30% | 6/20 [00:00<00:00, 14.34it/s]
Computing concepts: 40% | 8/20 [00:00<00:00, 15.34it/s]
Computing concepts: 50% | 10/20 [00:00<00:00, 16.48it/s]
Computing concepts: 60% | 12/20 [00:00<00:00, 17.39it/s]
Computing concepts: 80% | 16/20 [00:00<00:00, 19.31it/s]
Computing concepts: 90% | 18/20 [00:00<00:00, 19.50it/s]
Evaluating  $\Phi$  cuts: 97% | 29/30 [00:39<00:01, 1.32s/it]
Computing concepts: 0% | 0/20 [00:00<?, ?it/s]
Computing concepts: 10% | 2/20 [00:00<00:00, 19.95it/s]
Computing concepts: 15% | 3/20 [00:00<00:01, 13.42it/s]
Computing concepts: 30% | 6/20 [00:00<00:00, 14.16it/s]
Computing concepts: 50% | 10/20 [00:00<00:00, 17.56it/s]
Computing concepts: 60% | 12/20 [00:00<00:00, 16.15it/s]
Computing concepts: 70% | 14/20 [00:00<00:00, 16.84it/s]
Computing concepts: 85% | 17/20 [00:00<00:00, 17.77it/s]
MIP:
Cut [A, C]  $\rightarrow$  [B, D, E]
Phi:
 $\Phi = 0.249999$ 
Time:
44.130286 s

```

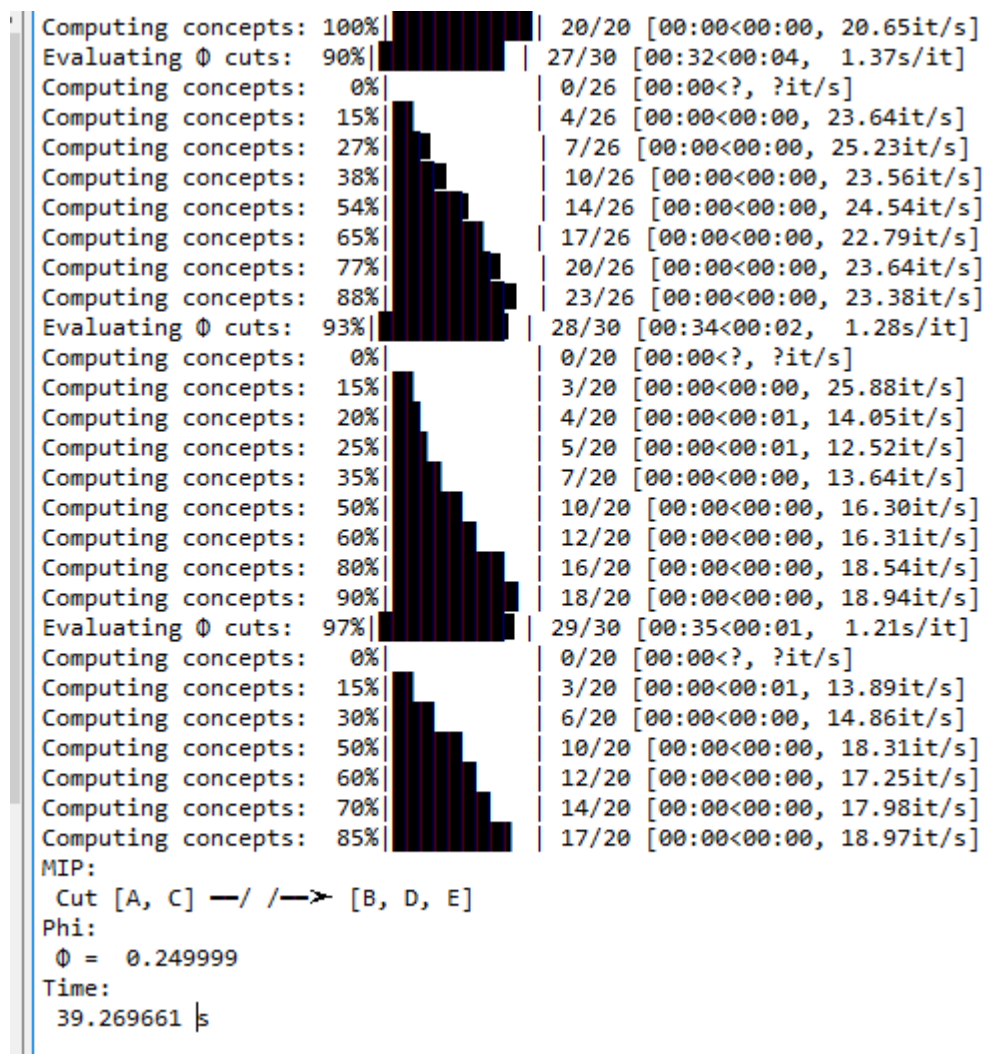
- KLD-Tripartición-con CM


```

Computing concepts: 85% | ██████████ | 22/26 [00:00<00:00, 32.01it/s]
Evaluating  $\Phi$  cuts: 80% | ██████████ | 24/30 [00:06<00:01, 3.19it/s]
Computing concepts: 0% | ██████████ | 0/26 [00:00<?, ?it/s]
Computing concepts: 77% | ██████████ | 20/26 [00:00<00:00, 180.01it/s]
Evaluating  $\Phi$  cuts: 83% | ██████████ | 25/30 [00:06<00:01, 3.71it/s]
Computing concepts: 0% | ██████████ | 0/26 [00:00<?, ?it/s]
Computing concepts: 12% | ██████████ | 3/26 [00:00<00:02, 8.63it/s]
Computing concepts: 27% | ██████████ | 7/26 [00:00<00:01, 11.28it/s]
Computing concepts: 50% | ██████████ | 13/26 [00:00<00:00, 14.91it/s]
Computing concepts: 62% | ██████████ | 16/26 [00:00<00:00, 17.56it/s]
Computing concepts: 81% | ██████████ | 21/26 [00:00<00:00, 20.37it/s]
Computing concepts: 92% | ██████████ | 24/26 [00:00<00:00, 22.53it/s]
Evaluating  $\Phi$  cuts: 87% | ██████████ | 26/30 [00:07<00:01, 2.08it/s]
Computing concepts: 0% | ██████████ | 0/20 [00:00<?, ?it/s]
Computing concepts: 15% | ██████████ | 3/20 [00:00<00:00, 29.93it/s]
Computing concepts: 65% | ██████████ | 13/20 [00:00<00:00, 37.88it/s]
Computing concepts: 95% | ██████████ | 19/20 [00:00<00:00, 42.57it/s]
Evaluating  $\Phi$  cuts: 90% | ██████████ | 27/30 [00:08<00:01, 2.30it/s]
Computing concepts: 0% | ██████████ | 0/26 [00:00<?, ?it/s]
Computing concepts: 69% | ██████████ | 18/26 [00:00<00:00, 179.57it/s]
Evaluating  $\Phi$  cuts: 93% | ██████████ | 28/30 [00:08<00:00, 2.81it/s]
Computing concepts: 0% | ██████████ | 0/20 [00:00<?, ?it/s]
Computing concepts: 20% | ██████████ | 4/20 [00:00<00:00, 39.90it/s]
Computing concepts: 60% | ██████████ | 12/20 [00:00<00:00, 46.94it/s]
Computing concepts: 100% | ██████████ | 20/20 [00:00<00:00, 53.56it/s]
Evaluating  $\Phi$  cuts: 97% | ██████████ | 29/30 [00:08<00:00, 2.91it/s]
Computing concepts: 0% | ██████████ | 0/20 [00:00<?, ?it/s]
Computing concepts: 15% | ██████████ | 3/20 [00:00<00:00, 20.39it/s]
Computing concepts: 65% | ██████████ | 13/20 [00:00<00:00, 26.45it/s]
MIP:
Cut [A, C]  $\xrightarrow{\quad} / \xrightarrow{\quad} [B, D, E]$ 
Phi:
 $\Phi = 0.249999$ 
Time:
10.796676 s

```

- KLD-Tripartición-sin CM



→ Multidimensional estado-nodo

Entrada de datos	Medida de distancia	Esquema de partición	Resultados con CM	Resultados sin CM
Grafo:	EMD	bipartición	MIP: Cut [A, B, C, D] —/ / —> [E] Phi: Φ = 0.216339 Time: 6.197377 s	MIP: Cut [A, B, C, D] —/ / —> [E] Phi: Φ = 0.545098 Time: 37.868354 s

<pre> tpm = np.array([[[[[[0.0, 0.0, 0.0,0.0,0.0], [0.0, 1.0, 0.0,1.0,0.0]], [[0.0, 1.0, 1.0,0.0,0.0], [0.0, 0.0, 1.0,1.0,0.0]]], [[[0.0, 0.0, 0.0,1.0,0.0], [1.0, 1.0, 0.0,1.0,0.0]], [[0.0, 1.0, 1.0,1.0,0.0], [1.0, 0.0, 1.0,1.0,0.0]]]], [[[[[0.0, 0.0, 0.0,1.0,0.0], [0.0, 1.0, 0.0,1.0,0.0]], [[0.0, 1.0, 1.0,1.0,0.0], [0.0, 0.0, 1.0,1.0,0.0]]], [[[0.0, 0.0, 0.0,1.0,0.0], [1.0, 1.0, 0.0,1.0,0.0]], [[0.0, 1.0, 1.0,1.0,0.0], [0.0, 0.0, 1.0,1.0,0.0]]], [[[[[0.0, 0.0, 1.0,0.0,0.0], [0.0, 1.0, 1.0,1.0,0.0]], [[0.0, 1.0, 1.0,1.0,0.0], [0.0, 0.0, 1.0,1.0,0.0]]], [[[0.0, 0.0, 1.0,1.0,0.0], [1.0, 1.0, 1.0,1.0,0.0]], [[0.0, 0.0, 1.0,1.0,1.0], [0.0, 0.0, 1.0,1.0,1.0]]], [[[0.0, 0.0, 1.0,1.0,0.0], [1.0, 1.0, 1.0,1.0,0.0]], [[0.0, 1.0, 1.0,1.0,1.0], [1.0, 0.0, 1.0,1.0,1.0]]]]]]]) cm = np.array([[0,0,1,0,1], [0,0,0,1,1], [1,0,0,1,0], [0,1,1,0,1], [1,1,0,1,0]]) </pre>	EMD	tripartición	MIP: Cut [A, B, C, D] —// → [E] Phi: $\Phi = 0.216339$ Time: 6.332247 s	MIP: Cut [A, B, C, D] —// → [E] Phi: $\Phi = 0.545098$ Time: 38.488696 s
	KLD	bipartición	MIP: Cut [A, B, C, D] —// → [E] Phi: $\Phi = 0.216339$ Time: 6.330175 s	MIP: Cut [A, B, C, D] —// → [E] Phi: $\Phi = 0.545098$ Time: 41.678278 s
	KLD	tripartición	MIP: Cut [A, B, C, D] —// → [E] Phi: $\Phi = 0.216339$ Time: 6.279065 s	MIP: Cut [A, B, C, D] —// → [E] Phi: $\Phi = 0.545098$ Time: 39.336349 s

- **EMD-Bipartición-con CM**

```

Computing concepts: 63%|██████████| 17/27 [00:00<00:00, 169.57it/s]
Evaluating  $\Phi$  cuts: 63%|██████████| 19/30 [00:03<00:01, 5.72it/s]
Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]

Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 70%|██████████| 21/30 [00:03<00:01, 7.04it/s]
Computing concepts: 0%|██████████| 0/28 [00:00<?, ?it/s]

Computing concepts: 0%|██████████| 0/22 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 77%|██████████| 23/30 [00:03<00:00, 8.01it/s]
Computing concepts: 0%|██████████| 0/27 [00:00<?, ?it/s]
Computing concepts: 93%|██████████| 25/27 [00:00<00:00, 249.35it/s]

Computing concepts: 0%|██████████| 0/27 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 83%|██████████| 25/30 [00:03<00:00, 8.03it/s]
Computing concepts: 0%|██████████| 0/27 [00:00<?, ?it/s]
Computing concepts: 26%|██████████| 7/27 [00:00<00:00, 69.81it/s]
Computing concepts: 81%|██████████| 22/27 [00:00<00:00, 74.56it/s]
Evaluating  $\Phi$  cuts: 87%|██████████| 26/30 [00:04<00:00, 5.17it/s]
Computing concepts: 0%|██████████| 0/21 [00:00<?, ?it/s]
Computing concepts: 81%|██████████| 17/21 [00:00<00:00, 169.59it/s]
Evaluating  $\Phi$  cuts: 90%|██████████| 27/30 [00:04<00:00, 5.57it/s]
Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████████| 28/30 [00:04<00:00, 6.42it/s]
Computing concepts: 0%|██████████| 0/20 [00:00<?, ?it/s]
Computing concepts: 50%|██████████| 10/20 [00:00<00:00, 99.76it/s]
Evaluating  $\Phi$  cuts: 97%|██████████| 29/30 [00:04<00:00, 6.08it/s]
Computing concepts: 0%|██████████| 0/22 [00:00<?, ?it/s]
Computing concepts: 32%|██████████| 7/22 [00:00<00:00, 60.42it/s]
MIP:
Cut [A, B, C, D]  $\rightarrow$  /  $\rightarrow$  [E]
Phi:
 $\Phi$  = 0.216339
Time:
6.197377 s

```

- **EMD-Bipartición-sin CM**

```

Evaluating  $\Phi$  cuts: 90%|██████████| 27/30 [00:31<00:03, 1.21s/it]
Computing concepts: 0%|██████████| 0/28 [00:00<?, ?it/s]
Computing concepts: 7%|██████████| 2/28 [00:00<00:01, 19.95it/s]
Computing concepts: 14%|██████████| 4/28 [00:00<00:01, 16.81it/s]
Computing concepts: 21%|██████████| 6/28 [00:00<00:01, 17.64it/s]
Computing concepts: 29%|██████████| 8/28 [00:00<00:01, 18.28it/s]
Computing concepts: 43%|██████████| 12/28 [00:00<00:00, 21.73it/s]
Computing concepts: 54%|██████████| 15/28 [00:00<00:00, 21.85it/s]
Computing concepts: 64%|██████████| 18/28 [00:00<00:00, 20.70it/s]
Computing concepts: 79%|██████████| 22/28 [00:01<00:00, 22.06it/s]
Computing concepts: 93%|██████████| 26/28 [00:01<00:00, 24.74it/s]
Evaluating  $\Phi$  cuts: 93%|██████████| 28/30 [00:33<00:02, 1.22s/it]
Computing concepts: 0%|██████████| 0/21 [00:00<?, ?it/s]
Computing concepts: 10%|██████████| 2/21 [00:00<00:01, 17.26it/s]
Computing concepts: 19%|██████████| 4/21 [00:00<00:01, 14.64it/s]
Computing concepts: 24%|██████████| 5/21 [00:00<00:01, 12.11it/s]
Computing concepts: 33%|██████████| 7/21 [00:00<00:01, 13.30it/s]
Computing concepts: 48%|██████████| 10/21 [00:00<00:00, 15.96it/s]
Computing concepts: 57%|██████████| 12/21 [00:00<00:00, 16.33it/s]
Computing concepts: 76%|██████████| 16/21 [00:00<00:00, 18.79it/s]
Computing concepts: 95%|██████████| 20/21 [00:01<00:00, 20.71it/s]
Evaluating  $\Phi$  cuts: 97%|██████████| 29/30 [00:34<00:01, 1.18s/it]
Computing concepts: 0%|██████████| 0/24 [00:00<?, ?it/s]
Computing concepts: 17%|██████████| 4/24 [00:00<00:01, 19.95it/s]
Computing concepts: 25%|██████████| 6/24 [00:00<00:00, 19.95it/s]
Computing concepts: 42%|██████████| 10/24 [00:00<00:00, 22.24it/s]
Computing concepts: 58%|██████████| 14/24 [00:00<00:00, 24.90it/s]
Computing concepts: 71%|██████████| 17/24 [00:00<00:00, 25.19it/s]
Computing concepts: 83%|██████████| 20/24 [00:00<00:00, 25.40it/s]
MIP:
Cut [A, B, C, D] —/ /—> [E]
Phi:
 $\Phi = 0.545098$ 
Time: |
37.868354 s

```

- EMD-Tripartición-con CM

```

Computing concepts: 0%|          | 0/26 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 70%|██████| 21/30 [00:03<00:01, 7.37it/s]
Computing concepts: 0%|          | 0/28 [00:00<?, ?it/s]

Computing concepts: 0%|          | 0/22 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 77%|██████| 23/30 [00:03<00:00, 8.32it/s]
Computing concepts: 0%|          | 0/27 [00:00<?, ?it/s]
Computing concepts: 78%|██████| 21/27 [00:00<00:00, 209.56it/s]

Computing concepts: 0%|          | 0/27 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 83%|██████| 25/30 [00:03<00:00, 8.09it/s]
Computing concepts: 0%|          | 0/27 [00:00<?, ?it/s]
Computing concepts: 22%|███| 6/27 [00:00<00:00, 59.90it/s]
Computing concepts: 78%|██████| 21/27 [00:00<00:00, 73.04it/s]
Computing concepts: 100%|██████| 27/27 [00:00<00:00, 61.89it/s]
Evaluating  $\Phi$  cuts: 87%|██████| 26/30 [00:04<00:00, 5.07it/s]
Computing concepts: 0%|          | 0/21 [00:00<?, ?it/s]
Computing concepts: 95%|██████| 20/21 [00:00<00:00, 172.64it/s]
Evaluating  $\Phi$  cuts: 90%|██████| 27/30 [00:04<00:00, 5.57it/s]
Computing concepts: 0%|          | 0/26 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████| 28/30 [00:04<00:00, 6.23it/s]
Computing concepts: 0%|          | 0/20 [00:00<?, ?it/s]
Computing concepts: 50%|██████| 10/20 [00:00<00:00, 86.27it/s]
Evaluating  $\Phi$  cuts: 97%|██████| 29/30 [00:04<00:00, 5.96it/s]
Computing concepts: 0%|          | 0/22 [00:00<?, ?it/s]
Computing concepts: 14%|██| 3/22 [00:00<00:00, 29.93it/s]
Computing concepts: 77%|██████| 17/22 [00:00<00:00, 39.16it/s]
MIP:
Cut [A, B, C, D]  $\rightarrow$  /  $\rightarrow$  [E]
Phi:
 $\Phi$  = 0.216339
Time:
6.332247 s

```

- EMD-Tripartición-sin CM


```

Evaluating  $\Phi$  cuts: 90%|██████████| 27/30 [00:32<00:03, 1.24s/it]
Computing concepts: 0%|██████████| 0/28 [00:00<?, ?it/s]
Computing concepts: 7%|██████████| 2/28 [00:00<00:01, 17.26it/s]
Computing concepts: 14%|██████████| 4/28 [00:00<00:01, 15.72it/s]
Computing concepts: 21%|██████████| 6/28 [00:00<00:01, 16.79it/s]
Computing concepts: 29%|██████████| 8/28 [00:00<00:01, 16.93it/s]
Computing concepts: 43%|██████████| 12/28 [00:00<00:00, 20.46it/s]
Computing concepts: 54%|██████████| 15/28 [00:00<00:00, 20.44it/s]
Computing concepts: 64%|██████████| 18/28 [00:00<00:00, 20.16it/s]
Computing concepts: 79%|██████████| 22/28 [00:01<00:00, 21.62it/s]
Computing concepts: 93%|██████████| 26/28 [00:01<00:00, 23.68it/s]
Evaluating  $\Phi$  cuts: 93%|██████████| 28/30 [00:33<00:02, 1.24s/it]
Computing concepts: 0%|██████████| 0/21 [00:00<?, ?it/s]
Computing concepts: 10%|██████████| 2/21 [00:00<00:01, 17.26it/s]
Computing concepts: 19%|██████████| 4/21 [00:00<00:01, 14.64it/s]
Computing concepts: 24%|██████████| 5/21 [00:00<00:01, 12.11it/s]
Computing concepts: 33%|██████████| 7/21 [00:00<00:01, 12.96it/s]
Computing concepts: 52%|██████████| 11/21 [00:00<00:00, 15.90it/s]
Computing concepts: 62%|██████████| 13/21 [00:00<00:00, 16.29it/s]
Computing concepts: 76%|██████████| 16/21 [00:00<00:00, 18.11it/s]
Computing concepts: 95%|██████████| 20/21 [00:01<00:00, 20.13it/s]
Evaluating  $\Phi$  cuts: 97%|██████████| 29/30 [00:34<00:01, 1.20s/it]
Computing concepts: 0%|██████████| 0/24 [00:00<?, ?it/s]
Computing concepts: 17%|██████████| 4/24 [00:00<00:01, 19.32it/s]
Computing concepts: 25%|██████████| 6/24 [00:00<00:00, 19.51it/s]
Computing concepts: 42%|██████████| 10/24 [00:00<00:00, 21.86it/s]
Computing concepts: 58%|██████████| 14/24 [00:00<00:00, 23.87it/s]
Computing concepts: 71%|██████████| 17/24 [00:00<00:00, 24.45it/s]
Computing concepts: 83%|██████████| 20/24 [00:00<00:00, 24.48it/s]
MIP:
Cut [A, B, C, D]  $\rightarrow$  /  $\rightarrow$  [E]
Phi:
 $\Phi$  = 0.545098
Time:
38.488696 s

```

- KLD-Bipartición-con CM

```

Evaluating  $\Phi$  cuts: 63%|██████████| 19/30 [00:03<00:01, 6.10it/s]
Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]

Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 70%|██████████| 21/30 [00:03<00:01, 7.30it/s]
Computing concepts: 0%|██████████| 0/28 [00:00<?, ?it/s]

Computing concepts: 0%|██████████| 0/22 [00:00<?, ?it/s]
Computing concepts: 100%|██████████| 22/22 [00:00<00:00, 219.45it/s]
Evaluating  $\Phi$  cuts: 77%|██████████| 23/30 [00:03<00:00, 8.25it/s]
Computing concepts: 0%|██████████| 0/27 [00:00<?, ?it/s]
Computing concepts: 78%|██████████| 21/27 [00:00<00:00, 209.45it/s]
Evaluating  $\Phi$  cuts: 80%|██████████| 24/30 [00:03<00:00, 7.37it/s]
Computing concepts: 0%|██████████| 0/27 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 83%|██████████| 25/30 [00:03<00:00, 7.95it/s]
Computing concepts: 0%|██████████| 0/27 [00:00<?, ?it/s]
Computing concepts: 48%|██████████| 13/27 [00:00<00:00, 114.67it/s]
Computing concepts: 81%|██████████| 22/27 [00:00<00:00, 85.13it/s]
Evaluating  $\Phi$  cuts: 87%|██████████| 26/30 [00:04<00:00, 5.05it/s]
Computing concepts: 0%|██████████| 0/21 [00:00<?, ?it/s]
Computing concepts: 95%|██████████| 20/21 [00:00<00:00, 172.62it/s]
Evaluating  $\Phi$  cuts: 90%|██████████| 27/30 [00:04<00:00, 5.47it/s]
Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████████| 28/30 [00:04<00:00, 6.33it/s]
Computing concepts: 0%|██████████| 0/20 [00:00<?, ?it/s]
Computing concepts: 50%|██████████| 10/20 [00:00<00:00, 99.75it/s]
Evaluating  $\Phi$  cuts: 97%|██████████| 29/30 [00:04<00:00, 6.02it/s]
Computing concepts: 0%|██████████| 0/22 [00:00<?, ?it/s]
Computing concepts: 32%|██████████| 7/22 [00:00<00:00, 60.42it/s]
MIP:
Cut [A, B, C, D]  $\rightarrow$  /  $\rightarrow$  [E]
Phi:
 $\Phi = 0.216339$ 
Time:
6.330175 s

```

- KLD-Bipartición-sin CM


```

Evaluating  $\Phi$  cuts: 30% | 27/30 [00:33<00:00, 1.51s/it]
Computing concepts: 0% | 0/28 [00:00<?, ?it/s]
Computing concepts: 7% | 2/28 [00:00<00:01, 19.95it/s]
Computing concepts: 14% | 4/28 [00:00<00:01, 16.54it/s]
Computing concepts: 21% | 6/28 [00:00<00:01, 17.43it/s]
Computing concepts: 36% | 10/28 [00:00<00:00, 18.93it/s]
Computing concepts: 50% | 14/28 [00:00<00:00, 21.35it/s]
Computing concepts: 57% | 16/28 [00:00<00:00, 20.91it/s]
Computing concepts: 64% | 18/28 [00:00<00:00, 19.66it/s]
Computing concepts: 79% | 22/28 [00:01<00:00, 22.00it/s]
Computing concepts: 93% | 26/28 [00:01<00:00, 24.39it/s]
Evaluating  $\Phi$  cuts: 93% | 28/30 [00:36<00:02, 1.28s/it]
Computing concepts: 0% | 0/21 [00:00<?, ?it/s]
Computing concepts: 10% | 2/21 [00:00<00:01, 17.26it/s]
Computing concepts: 19% | 4/21 [00:00<00:01, 15.16it/s]
Computing concepts: 24% | 5/21 [00:00<00:01, 12.36it/s]
Computing concepts: 33% | 7/21 [00:00<00:01, 12.93it/s]
Computing concepts: 48% | 10/21 [00:00<00:00, 14.52it/s]
Computing concepts: 57% | 12/21 [00:00<00:00, 14.51it/s]
Computing concepts: 76% | 16/21 [00:00<00:00, 16.55it/s]
Computing concepts: 95% | 20/21 [00:01<00:00, 17.44it/s]
Evaluating  $\Phi$  cuts: 97% | 29/30 [00:37<00:01, 1.28s/it]
Computing concepts: 0% | 0/24 [00:00<?, ?it/s]
Computing concepts: 17% | 4/24 [00:00<00:01, 19.95it/s]
Computing concepts: 25% | 6/24 [00:00<00:00, 18.25it/s]
Computing concepts: 33% | 8/24 [00:00<00:00, 16.93it/s]
Computing concepts: 54% | 13/24 [00:00<00:00, 20.70it/s]
Computing concepts: 67% | 16/24 [00:00<00:00, 18.57it/s]
Computing concepts: 79% | 19/24 [00:00<00:00, 20.95it/s]
MIP:
Cut [A, B, C, D]  $\rightarrow$  /  $\rightarrow$  [E]
Phi:
 $\Phi = 0.545098$ 
Time:
41.678278 s

```

- KLD-Tripartición-con CM

```

Evaluating  $\Phi$  cuts: 63%|██████████| 19/30 [00:03<00:01, 6.06it/s]
Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]

Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 70%|██████████| 21/30 [00:03<00:01, 7.27it/s]
Computing concepts: 0%|██████████| 0/28 [00:00<?, ?it/s]

Computing concepts: 0%|██████████| 0/22 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 77%|██████████| 23/30 [00:03<00:00, 8.28it/s]
Computing concepts: 0%|██████████| 0/27 [00:00<?, ?it/s]
Computing concepts: 96%|██████████| 26/27 [00:00<00:00, 249.41it/s]
Evaluating  $\Phi$  cuts: 80%|██████████| 24/30 [00:03<00:00, 7.66it/s]
Computing concepts: 0%|██████████| 0/27 [00:00<?, ?it/s]

Computing concepts: 0%|██████████| 0/27 [00:00<?, ?it/s]
Computing concepts: 26%|██████████| 7/27 [00:00<00:00, 69.83it/s]
Computing concepts: 78%|██████████| 21/27 [00:00<00:00, 82.16it/s]
Computing concepts: 100%|██████████| 27/27 [00:00<00:00, 62.99it/s]
Evaluating  $\Phi$  cuts: 87%|██████████| 26/30 [00:04<00:00, 6.18it/s]
Computing concepts: 0%|██████████| 0/21 [00:00<?, ?it/s]
Computing concepts: 95%|██████████| 20/21 [00:00<00:00, 172.64it/s]
Evaluating  $\Phi$  cuts: 90%|██████████| 27/30 [00:04<00:00, 6.35it/s]
Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 93%|██████████| 28/30 [00:04<00:00, 7.13it/s]
Computing concepts: 0%|██████████| 0/20 [00:00<?, ?it/s]
Computing concepts: 50%|██████████| 10/20 [00:00<00:00, 99.78it/s]
Evaluating  $\Phi$  cuts: 97%|██████████| 29/30 [00:04<00:00, 6.32it/s]
Computing concepts: 0%|██████████| 0/22 [00:00<?, ?it/s]
Computing concepts: 23%|██████████| 5/22 [00:00<00:00, 49.88it/s]
MIP:
Cut [A, B, C, D]  $\rightarrow$  [E]
Phi:
 $\Phi = 0.216339$ 
Time:
6.279065 s

```

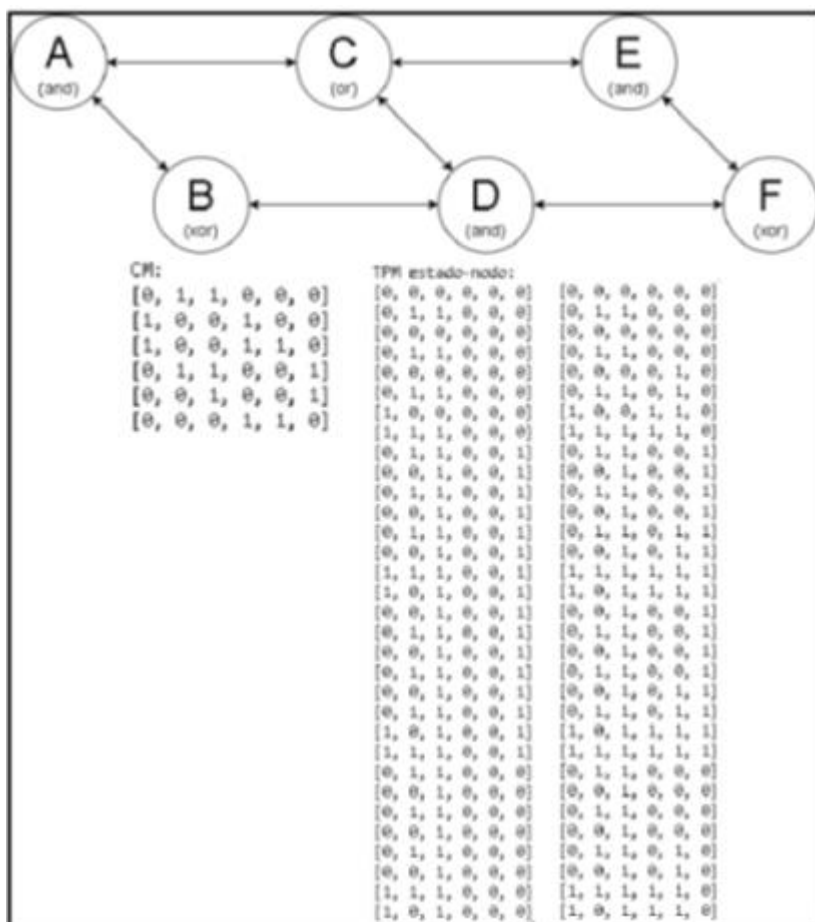
- KLD-tripartición-sin CM

```

Evaluating  $\Phi$  cuts: 90% | ██████████ | 27/30 [00:33<00:03, 1.32s/it]
Computing concepts: 0% | | 0/28 [00:00<?, ?it/s]
Computing concepts: 7% | █ | 2/28 [00:00<00:01, 19.95it/s]
Computing concepts: 14% | ███ | 4/28 [00:00<00:01, 16.81it/s]
Computing concepts: 21% | █████ | 6/28 [00:00<00:01, 16.94it/s]
Computing concepts: 29% | ███████ | 8/28 [00:00<00:01, 17.74it/s]
Computing concepts: 43% | ██████████ | 12/28 [00:00<00:00, 21.07it/s]
Computing concepts: 54% | ████████████ | 15/28 [00:00<00:00, 21.57it/s]
Computing concepts: 64% | ██████████████ | 18/28 [00:00<00:00, 20.25it/s]
Computing concepts: 79% | ████████████████ | 22/28 [00:01<00:00, 21.93it/s]
Computing concepts: 93% | ██████████████████ | 26/28 [00:01<00:00, 24.62it/s]
Evaluating  $\Phi$  cuts: 93% | ██████████ | 28/30 [00:34<00:02, 1.30s/it]
Computing concepts: 0% | | 0/21 [00:00<?, ?it/s]
Computing concepts: 10% | █ | 2/21 [00:00<00:01, 17.57it/s]
Computing concepts: 19% | ███ | 4/21 [00:00<00:01, 15.26it/s]
Computing concepts: 24% | █████ | 5/21 [00:00<00:01, 12.40it/s]
Computing concepts: 33% | ███████ | 7/21 [00:00<00:01, 13.99it/s]
Computing concepts: 48% | ██████████ | 10/21 [00:00<00:00, 16.59it/s]
Computing concepts: 62% | ████████████ | 13/21 [00:00<00:00, 17.93it/s]
Computing concepts: 76% | ██████████████ | 16/21 [00:00<00:00, 19.76it/s]
Computing concepts: 95% | ████████████████ | 20/21 [00:01<00:00, 20.99it/s]
Evaluating  $\Phi$  cuts: 97% | ██████████ | 29/30 [00:35<00:01, 1.23s/it]
Computing concepts: 0% | | 0/24 [00:00<?, ?it/s]
Computing concepts: 17% | ███ | 4/24 [00:00<00:01, 19.95it/s]
Computing concepts: 25% | █████ | 6/24 [00:00<00:00, 19.95it/s]
Computing concepts: 42% | ██████████ | 10/24 [00:00<00:00, 22.25it/s]
Computing concepts: 58% | ████████████ | 14/24 [00:00<00:00, 24.20it/s]
Computing concepts: 71% | ██████████████ | 17/24 [00:00<00:00, 24.29it/s]
Computing concepts: 83% | ████████████████ | 20/24 [00:00<00:00, 24.75it/s]
MIP:
Cut [A, B, C, D]  $\rightarrow$  /  $\rightarrow$  [E]
Phi:
 $\Phi = 0.545098$ 
Time:
39.336349 s

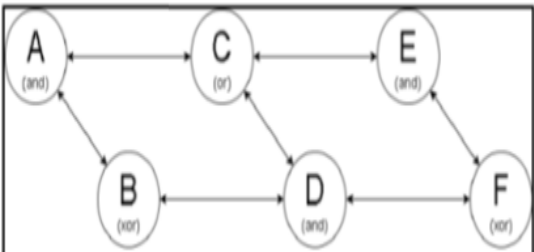
```

Grafo 4



→ Estado-nodo

➔ Entrada de datos

→ Entrada de datos	Medida de distancia	Esquema de partición	Resultados con CM	Resultados sin CM	Observaciones
Grafo: 	EMD	biparticion	MIP: Cut [A, B, C, E, F] — — / / — ➤ [D]	MIP: Cut [A, B, C, E, F] — — / / — ➤ [D]	
			Phi: $\Phi = 0.250981$	Phi: $\Phi = 0.250981$	
			Time: 5.380019 s	Time: 5.257774 s	

<pre> tpm = np.array([[0, 0, 0, 0, 0, 0], [0, 1, 1, 0, 0, 0], [0, 0, 0, 0, 0, 0], [0, 1, 1, 0, 0, 0], [0, 0, 0, 0, 0, 0], [0, 1, 1, 0, 0, 0], [1, 0, 0, 0, 0, 0], [1, 1, 1, 0, 0, 0], [0, 1, 1, 0, 0, 1], [0, 0, 1, 0, 0, 1], [0, 1, 1, 0, 0, 1], [0, 0, 1, 0, 0, 1], [0, 1, 1, 0, 0, 1], [0, 0, 1, 0, 0, 1], [1, 1, 1, 0, 0, 1], [1, 0, 1, 0, 0, 1], [0, 0, 1, 0, 0, 1], [0, 1, 1, 0, 0, 1], [0, 0, 1, 0, 0, 1], [0, 1, 1, 0, 0, 1], [1, 0, 1, 0, 0, 1], [1, 1, 1, 0, 0, 1], [0, 1, 1, 0, 0, 0], [0, 0, 1, 0, 0, 0], [0, 1, 1, 0, 0, 0], [0, 0, 1, 0, 0, 0], [0, 1, 1, 0, 0, 0], [0, 0, 0, 0, 0, 0], [0, 1, 1, 0, 0, 0],]) </pre>	EMD	tripartición	MIP: Cut [A, B, C, E, F] — — / — > [D] Phi: $\Phi =$ 0.250981 Time: 4.995994 s	MIP: Cut [A, B, C, E, F] — — / — > [D] Phi: $\Phi =$ 0.250981 Time: 5.316542 s
	KLD	bipartición	MIP: Cut [A, B, C, E, F] — — / — > [D] Phi: $\Phi =$ 0.250981 Time: 5.143403 s	MIP: Cut [A, B, C, E, F] — — / — > [D] Phi: $\Phi =$ 0.250981 Time: 5.167946 s
	KLD	tripartición	MIP: Cut [A, B, C, E, F] — — / — > [D] Phi: $\Phi =$ 0.250981 Time: 5.128369 s	MIP: Cut [A, B, C, E, F] — — / — > [D] Phi: $\Phi =$ 0.250981 Time: 5.14777 s

```

[0, 0, 0, 0, 1, 0],
[0, 1, 1, 0, 1, 0],
[1, 0, 0, 1, 1, 0],
[1, 1, 1, 1, 1, 0],
[0, 1, 1, 0, 0, 1],
[0, 0, 1, 0, 0, 1],
[0, 1, 1, 0, 0, 1],
[0, 0, 1, 0, 0, 1],
[0, 1, 1, 0, 1, 1],
[0, 0, 1, 0, 1, 1],
[1, 1, 1, 1, 1, 1],
[1, 0, 1, 1, 1, 1],
[0, 0, 1, 0, 0, 1],
[0, 1, 1, 0, 0, 1],
[0, 0, 1, 0, 0, 1],
[0, 1, 1, 0, 0, 1],
[0, 0, 1, 0, 1, 1],
[0, 1, 1, 0, 1, 1],
[1, 0, 1, 1, 1, 1],
[1, 1, 1, 1, 1, 1],
[0, 1, 1, 0, 0, 0],
[0, 0, 1, 0, 0, 0],
[0, 1, 1, 0, 0, 0],
[0, 0, 1, 0, 0, 0],
[0, 1, 1, 0, 1, 0],
[0, 0, 1, 0, 1, 0],
[1, 1, 1, 1, 1, 0],
[1, 0, 1, 1, 1, 0],
])

cm = np.array([
[0, 1, 1, 0, 0, 0],
[1, 0, 0, 1, 0, 0],
[1, 0, 0, 1, 1, 0],
[0, 1, 1, 0, 0, 1],
[0, 0, 1, 0, 0, 1],
[0, 0, 0, 1, 1, 0],
])

```

- EMD-Bipartición-con CM

```

Computing concepts:  0%|          | 0/52 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 97%|██████████| 60/62 [00:04<00:00, 12.88it/s]
Computing concepts:  0%|          | 0/41 [00:00<?, ?it/s]

Computing concepts:  0%|          | 0/38 [00:00<?, ?it/s]
MIP:
Cut [A, B, C, E, F]  $\text{---/ /--->}$  [D]
Phi:
 $\Phi = 0.250981$ 
Time:
5.380019 s

```

- **EMD-Bipartición-sin CM**

```

Computing concepts:  0%|          | 0/41 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 98%|██████████| 61/62 [00:04<00:00, 12.21it/s]
Computing concepts:  0%|          | 0/38 [00:00<?, ?it/s]
MIP:
Cut [A, B, C, E, F]  $\text{---/ /--->}$  [D]
Phi:
 $\Phi = 0.250981$ 
Time:
5.257774 s

```

- **EMD-Tripartición-con CM**

```

Computing concepts:  0%|          | 0/52 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 97%|██████████| 60/62 [00:04<00:00, 14.12it/s]
Computing concepts:  0%|          | 0/41 [00:00<?, ?it/s]

Computing concepts:  0%|          | 0/38 [00:00<?, ?it/s]
MIP:
Cut [A, B, C, E, F]  $\text{---/ /--->}$  [D]
Phi:
 $\Phi = 0.250981$ 
Time:
4.995994 s

```

- **EMD-Tripartición-sin CM**

```

Computing concepts:  0%|          | 0/41 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 98%|██████████| 61/62 [00:04<00:00, 12.00it/s]
Computing concepts:  0%|          | 0/38 [00:00<?, ?it/s]
MIP:
Cut [A, B, C, E, F]  $\text{---/ /--->}$  [D]
Phi:
 $\Phi = 0.250981$ 
Time:
5.316542 s

```

- **KLD-Bipartición-con CM**

```

Computing concepts:  0%|          | 0/41 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 98%|██████████| 61/62 [00:04<00:00, 13.83it/s]
Computing concepts:  0%|          | 0/38 [00:00<?, ?it/s]
MIP:
Cut [A, B, C, E, F] —/ /—> [D]
Phi:
 $\Phi$  = 0.250981
Time:
5.143403 s

```

- **KLD-Bipartición-sin CM**

```

Computing concepts:  0%|          | 0/41 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 98%|██████████| 61/62 [00:04<00:00, 13.59it/s]
Computing concepts:  0%|          | 0/38 [00:00<?, ?it/s]
MIP:
Cut [A, B, C, E, F] —/ /—> [D]
Phi:
 $\Phi$  = 0.250981
Time:
5.167946 s

```

- **KLD-Tripartición-con CM**

```

Computing concepts:  0%|          | 0/52 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 97%|██████████| 60/62 [00:04<00:00, 13.50it/s]
Computing concepts:  0%|          | 0/41 [00:00<?, ?it/s]

Computing concepts:  0%|          | 0/38 [00:00<?, ?it/s]
MIP:
Cut [A, B, C, E, F] —/ /—> [D]
Phi:
 $\Phi$  = 0.250981
Time:
5.128369 s

```

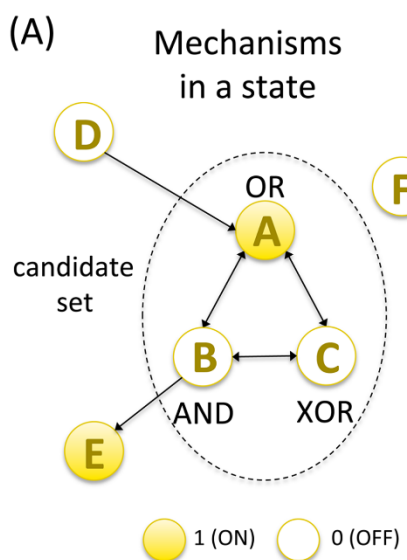
- **KLD-Tripartición-sin CM**

```

Computing concepts:  0%|          | 0/52 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 97%|██████████| 60/62 [00:04<00:00, 13.27it/s]
Computing concepts:  0%|          | 0/41 [00:00<?, ?it/s]

Computing concepts:  0%|          | 0/38 [00:00<?, ?it/s]
MIP:
Cut [A, B, C, E, F] —/ /—> [D]
Phi:
 $\Phi$  = 0.250981
Time:
5.14777 s

```


Grafo 5**(B) Transition Probability Matrix (TPM)**

$t_0 \backslash t_1$		t_1								
		ABC	000	100	010	110	001	101	011	111
t_0	ABC									
	000	1	0	0	0	0	0	0	0	0
	100	0	0	0	0	1	0	0	0	0
	010	0	0	0	0	0	1	0	0	0
	110	0	1	0	0	0	0	0	0	0
	001	0	1	0	0	0	0	0	0	0
	101	0	0	0	0	0	0	0	0	1
	011	0	0	0	0	0	1	0	0	0
	111	0	0	0	1	0	0	0	0	0

current state $s_0(ABC) = 100$



→ Estado-nodo

Entrada de datos	Medida de distancia	Esquema de partición	Resultados con CM	Resultados sin CM
Grafo:	EMD	biparticion	MIP: Cut [A, B] — / — → [C] Phi: $\Phi = 1.916665$ Time: 0.247361 s	MIP: Cut [A, B] — / — → [C] Phi: $\Phi = 1.916665$ Time: 0.458124 s

[illegible]

```
cm = np.array([
[0,1,1,0,0,0],
[1,0,1,0,1,0],
[1,1,0,0,0,0],
[1,0,0,0,0,0],
[0,0,0,0,0,0],
[0,0,0,0,0,0]
])
```

• EMD-bipartición-con CM

```
Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 67%|██████| | 4/6 [00:00<00:00, 39.90it/s]
Computing concepts: 0%| | | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\dashv$  /  $\dashv$   $\rightarrow$  [C]
Phi:
 $\Phi$  = 1.916665
Time:
0.247361 s
```

• EMD-bipartición-sin CM

```
Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 33%|██████| | 2/6 [00:00<00:00, 19.45it/s]
Computing concepts: 0%| | | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 67%|██████| | 4/6 [00:00<00:00, 19.25it/s]
Computing concepts: 0%| | | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\dashv$  /  $\dashv$   $\rightarrow$  [C]
Phi:
 $\Phi$  = 1.916665
Time: |
0.458124 s
```

- **EMD-Tripartición-con CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 50%|██████| | 3/6 [00:00<00:00, 29.93it/s]
Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\rightarrow$  /  $\rightarrow$   $\rightarrow$  [C]
Phi:
 $\Phi$  = 1.916665
Time:
0.300724 s

```

- **EMD-Tripartición-sin CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 50%|██████| | 3/6 [00:00<00:00, 21.64it/s]
Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 83%|██████████| | 5/6 [00:00<00:00, 21.01it/s]
Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\rightarrow$  /  $\rightarrow$   $\rightarrow$  [C]
Phi:
 $\Phi$  = 1.916665
Time:
0.460342 s

```

- **KLD-Bipartición-con CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 67%|██████| | 4/6 [00:00<00:00, 37.47it/s]
Computing concepts: 0%| | | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\dashv$  /  $\dashv$   $\rightarrow$  [C]
Phi:
 $\Phi$  = 1.916665
Time:
0.255092 s

```

- **KLD-Bipartición-sin CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 50%|██████| | 3/6 [00:00<00:00, 21.09it/s]
Computing concepts: 0%| | | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 83%|██████| | 5/6 [00:00<00:00, 20.08it/s]
Computing concepts: 0%| | | 0/7 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\dashv$  /  $\dashv$   $\rightarrow$  [C]
Phi:
 $\Phi$  = 1.916665
Time:
0.46486 s

```

- **KLD-Tripartición-con CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 67%|██████| | 4/6 [00:00<00:00, 36.80it/s]
Computing concepts: 0%| | | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\rightarrow$  /  $\rightarrow$  [C]
Phi:
 $\Phi$  = 1.916665
Time:
0.291669 s

```

- **KLD-Tripartición-sin CM**

```

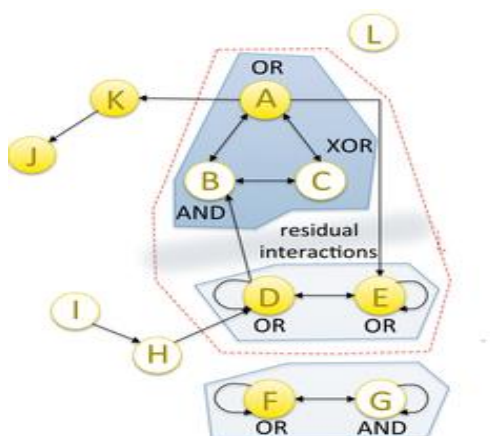
Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

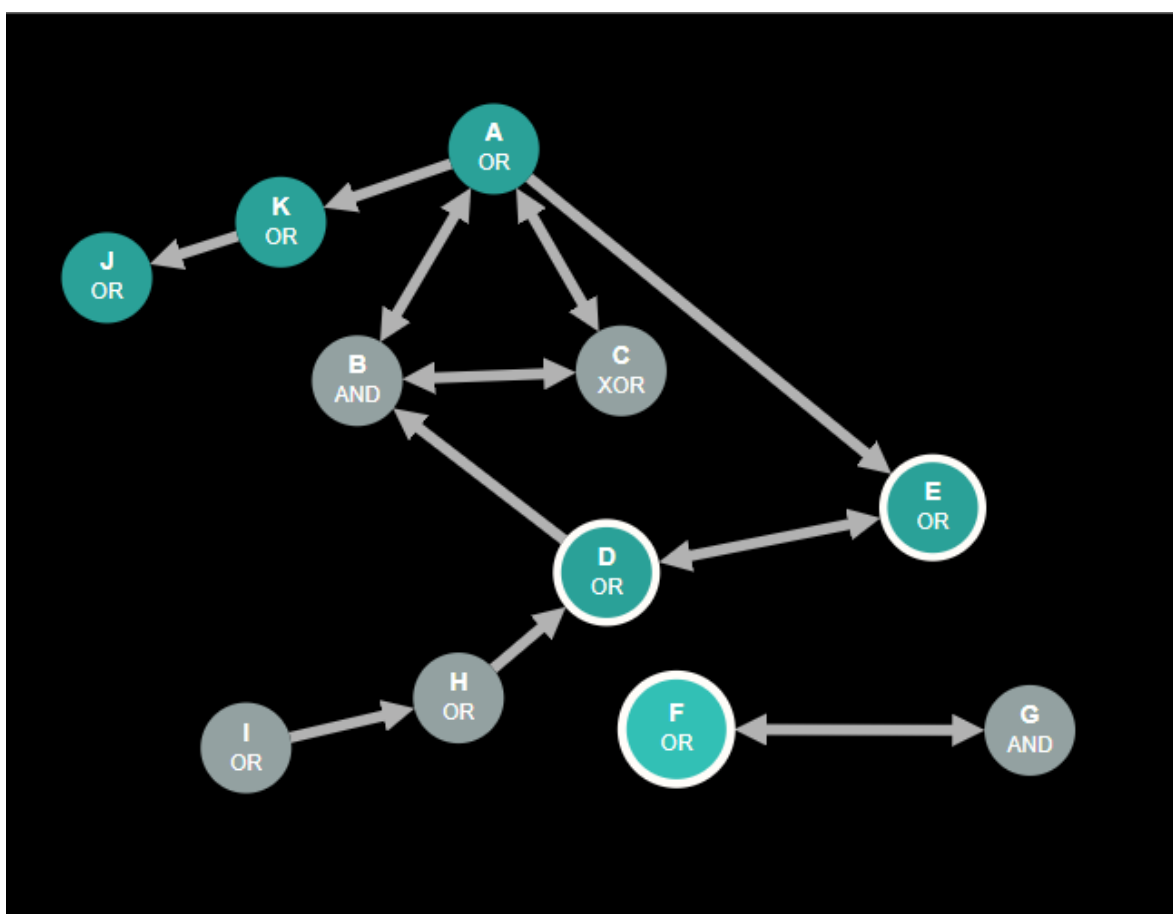
Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 50%|██████| | 3/6 [00:00<00:00, 22.81it/s]
Computing concepts: 0%| | | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 83%|██████| | 5/6 [00:00<00:00, 21.87it/s]
Computing concepts: 0%| | | 0/7 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\rightarrow$  /  $\rightarrow$  [C]
Phi:
 $\Phi$  = 1.916665
Time:
0.438747 s

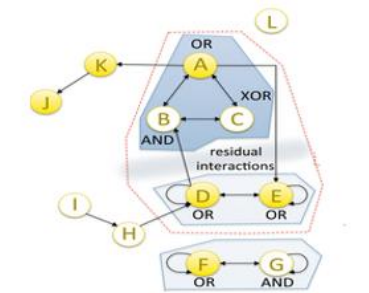
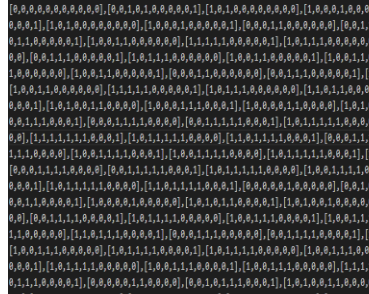
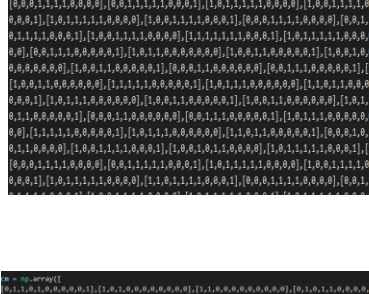
```

Grafo 6

Estado inicial : (1, 0, 0, 1, 1, 1, 0)



→ Estado-nodo

Entrada de datos	Medida de distancia	Esquema de partición	Resultados con CM	Resultados sin CM
Grafo:	EMD	biparticion	MIP: Cut [A, B] — // → [C] Phi: $\Phi = 1.916665$ Time: 1.149807 s	MIP: Cut [A, B] — // → [C] Phi: $\Phi = 1.916665$ Time: 1.138073 s
	EMD	tripartición	MIP: Cut [A, B] — // → [C] Phi: $\Phi = 1.916665$ Time: 1.088171 s	MIP: Cut [A, B] — // → [C] Phi: $\Phi = 1.916665$ Time: 1.114285 s
	KLD	bipartición	MIP: Cut [A, B] — // → [C] Phi: $\Phi = 1.916665$ Time: 1.087204 s	IP: Cut [A, B] — // → [C] Phi: $\Phi = 1.916665$ Time: 1.08725 s
	KLD	tripartición	MIP: Cut [A, B] — // → [C] Phi: $\Phi = 1.916665$ Time: 1.102643 s	MIP: Cut [A, B] — // → [C] Phi: $\Phi = 1.916665$ Time: 1.10255 s

- **EMD-Bipartición-con CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 67%|██████| | 4/6 [00:00<00:00, 33.36it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\rightarrow$  /  $\rightarrow$  [C]
Phi:
 $\Phi$  = 1.916665
Time:
1.149807 s

```

- **EMD-Bipartición-sin CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 67%|██████| | 4/6 [00:00<00:00, 34.52it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\rightarrow$  /  $\rightarrow$  [C]
Phi:
 $\Phi$  = 1.916665
Time:
1.138073 s

```

- **EMD-Tripartición-con CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 67%|██████| 4/6 [00:00<00:00, 39.90it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\rightarrow$  /  $\rightarrow$  [C]
Phi:
 $\Phi$  = 1.916665
Time:
1.088171 s

```

- **EMD-Tripartición-sin CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 67%|██████| 4/6 [00:00<00:00, 34.52it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\rightarrow$  /  $\rightarrow$  [C]
Phi:
 $\Phi$  = 1.916665
Time:
1.114285 s

```

- **KLD-Bipartición-con CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 67%|██████| 4/6 [00:00<00:00, 34.52it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\text{---/ /--->}$  [C]
Phi:
 $\Phi = 1.916665$ 
Time:
1.087204 s

```

- **KLD-Bipartición-sin CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 67%|██████| 4/6 [00:00<00:00, 39.90it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\text{---/ /--->}$  [C]
Phi:
 $\Phi = 1.916665$ 
Time:
1.08725 s

```

- **KLD-Tripartición-con CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 67%|██████████| 4/6 [00:00<00:00, 39.37it/s]
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\xrightarrow{\quad} / \xrightarrow{\quad} [C]$ 
Phi:
 $\Phi = 1.916665$ 
Time:
1.102643 s

```

- **KLD-Tripartición-sin CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/6 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

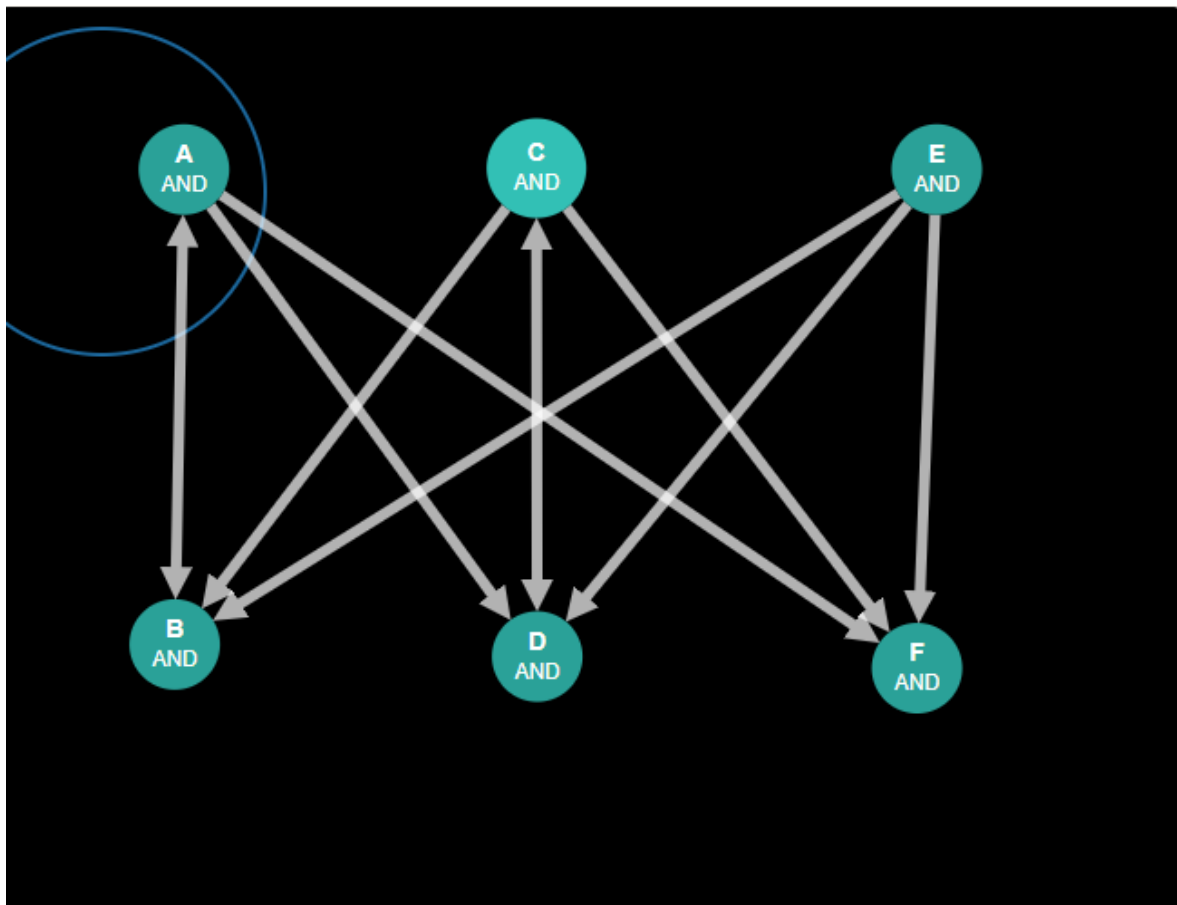
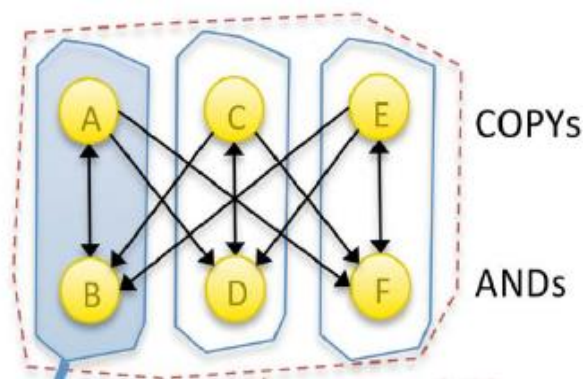
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 50%|██████████| 3/6 [00:00<00:00, 29.14it/s]
Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]

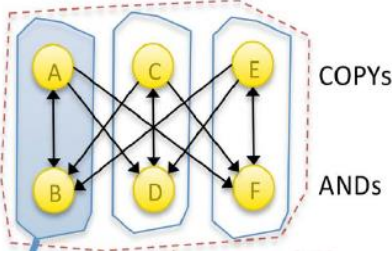
Computing concepts: 0%| | 0/6 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/7 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\xrightarrow{\quad} / \xrightarrow{\quad} [C]$ 
Phi:
 $\Phi = 1.916665$ 
Time:
1.10255 s

```

Grafo 7

→ Estado-nodo

Entrada de datos	Medida de distancia	Esquema de partición	Resultados con CM	Resultados sin CM
<p>Grafo:</p>  <pre> tpm = np.array([[0,0,0,0,1,0], [0,0,0,0,1,0], [1,0,0,0,1,0], [1,0,0,0,1,0], [0,0,0,0,1,0], [0,0,0,0,1,0], [1,0,0,0,1,0], [1,0,0,0,1,0], [0,0,1,0,1,0], [0,0,1,0,1,0], [1,0,1,0,1,0], [1,0,1,0,1,0], [0,0,1,0,1,0], [0,0,1,0,1,0], [1,0,1,0,1,0], [1,0,1,0,1,0], [0,0,0,0,1,0], [0,0,0,0,1,0], [1,0,0,0,1,0], [1,0,0,0,1,0], [0,0,0,0,1,0], [0,1,0,1,1,1], [1,0,0,0,1,0], [1,1,0,1,1,1], [0,0,1,0,1,0], [0,0,1,0,1,0], [1,0,1,0,1,0], [1,0,1,0,1,0], [0,0,1,0,1,0], [0,1,1,1,1,1], [1,0,1,0,1,0], [1,1,1,1,1,1], [0,0,0,0,1,0], [0,0,0,0,1,0], [1,0,0,0,1,0], [1,0,0,0,1,0]]) cm = np.array([[0,1,0,1,0,1], [1,0,0,0,0,0], [0,1,0,1,0,1], [0,0,1,0,0,0], [0,1,0,1,0,1], [0,0,0,0,0,0]]) </pre>	EMD	bipartición	MIP: Cut [A, B] — / / —> [C, D] Phi: $\Phi = 0.3125$ Time: 0.398937 s	MIP: Cut [A, B] — / / —> [C, D] Phi: $\Phi = 0.3125$ Time: 0.400629 s
	EMD	tripartición	MIP: Cut [A, B] — / / —> [C, D] Phi: $\Phi = 0.3125$ Time: 0.369676 s	MIP: Cut [A, B] — / / —> [C, D] Phi: $\Phi = 0.3125$ Time: 0.369705 s
	KLD	bipartición	MIP: Cut [A, B] — / / —> [C, D] Phi: $\Phi = 0.3125$ Time: 0.378836 s	MIP: Cut [A, B] — / / —> [C, D] Phi: $\Phi = 0.3125$ Time: 0.384262 s
	KLD	tripartición	MIP: Cut [A, B] — / / —> [C, D] Phi: $\Phi = 0.3125$ Time: 0.365484 s	MIP: Cut [A, B] — / / —> [C, D] Phi: $\Phi = 0.3125$ Time: 0.413015 s

- **EMD-Bipartición-con CM**

```

Evaluating  $\Phi$  cuts: 0%| | 0/14 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 29%|███| 4/14 [00:00<00:00, 39.71it/s]
Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 64%|██████| 9/14 [00:00<00:00, 41.72it/s]
Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\xrightarrow{\quad} / \xrightarrow{\quad} [C, D]$ 
Phi:
 $\Phi = 0.3125$ 
Time:
0.398937 s

```

- **EMD-Bipartición-sin CM**


```

Evaluating  $\Phi$  cuts: 0%| | 0/14 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 29%|██████| 4/14 [00:00<00:00, 39.89it/s]
Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 57%|██████████| 8/14 [00:00<00:00, 39.90it/s]
Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\rightarrow$  /  $\rightarrow$  [C, D]
Phi:
 $\Phi$  = 0.3125
Time: |
0.400629 s

```

- EMD-Tripartición-con CM

```

Evaluating  $\Phi$  cuts: 0%| | 0/14 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 36%| | 5/14 [00:00<00:00, 49.87it/s]
Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 79%| | 11/14 [00:00<00:00, 50.70it/s]
Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\rightarrow$  /  $\rightarrow$  [C, D]
Phi:
 $\Phi$  = 0.3125
Time:
0.369676 s

```

- EMD-Tripartición-sin CM

```

Evaluating  $\Phi$  cuts: 0%| | 0/14 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 43%|██████| 6/14 [00:00<00:00, 51.78it/s]
Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 86%|██████████| 12/14 [00:00<00:00, 51.78it/s]
Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\rightarrow$  /  $\rightarrow$  [C, D]
Phi:
 $\Phi$  = 0.3125
Time:
0.369705 s

```

- KLD-Bipartición-con CM

```

Evaluating  $\Phi$  cuts: 0%| 0/14 [00:00<?, ?it/s]
Computing concepts: 0%| 0/11 [00:00<?, ?it/s]

Computing concepts: 0%| 0/11 [00:00<?, ?it/s]
Computing concepts: 0%| 0/13 [00:00<?, ?it/s]
Computing concepts: 0%| 0/11 [00:00<?, ?it/s]
Computing concepts: 0%| 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 36%| 5/14 [00:00<00:00, 49.87it/s]
Computing concepts: 0%| 0/13 [00:00<?, ?it/s]

Computing concepts: 0%| 0/11 [00:00<?, ?it/s]
Computing concepts: 0%| 0/11 [00:00<?, ?it/s]
Computing concepts: 0%| 0/13 [00:00<?, ?it/s]
Computing concepts: 0%| 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 71%| 10/14 [00:00<00:00, 49.88it/s]
Computing concepts: 0%| 0/11 [00:00<?, ?it/s]

Computing concepts: 0%| 0/13 [00:00<?, ?it/s]
Computing concepts: 0%| 0/11 [00:00<?, ?it/s]
Computing concepts: 0%| 0/11 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\xrightarrow{\quad} [C, D]$ 
Phi:
 $\Phi = 0.3125$ 
Time:
0.378836 s

```

- KLD-Bipartición-sin CM

```

Evaluating  $\Phi$  cuts: 0%| | 0/14 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 36%|██████| | 5/14 [00:00<00:00, 49.31it/s]
Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 71%|██████████| | 10/14 [00:00<00:00, 49.41it/s]
Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\dashv$  /  $\dashv$   $\rightarrow$  [C, D]
Phi:
 $\Phi$  = 0.3125
Time:
0.384262 s

```

- KLD-Tripatición-con CM

```

Evaluating  $\Phi$  cuts: 0%| | 0/14 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]

Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 43%|██████| 6/14 [00:00<00:00, 51.78it/s]
Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 79%|██████████| 11/14 [00:00<00:00, 51.19it/s]
Computing concepts: 0%| | 0/13 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/11 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\rightarrow$  /  $\rightarrow$  [C, D]
Phi:
 $\Phi$  = 0.3125
Time:
0.365484 s

```

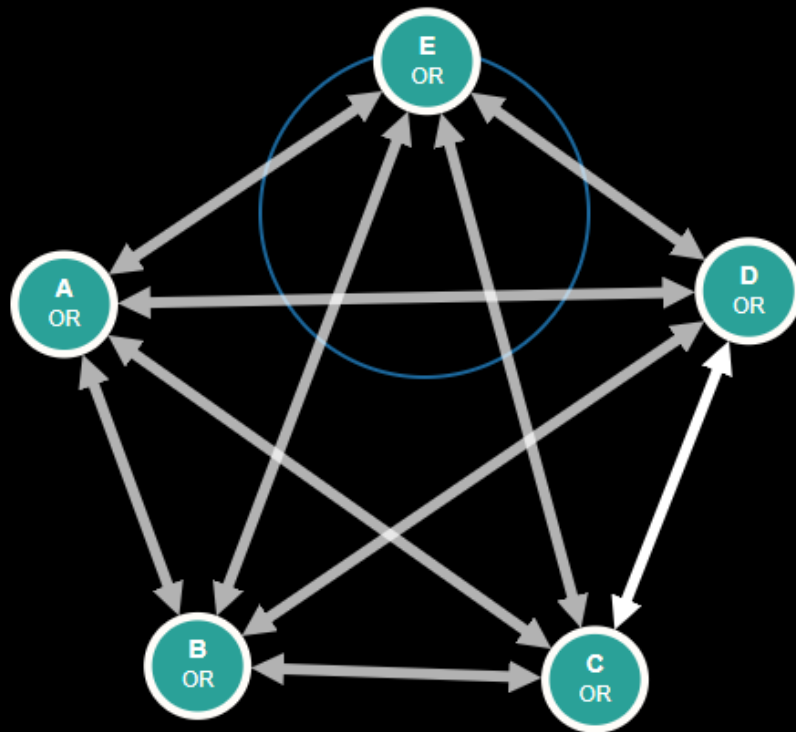
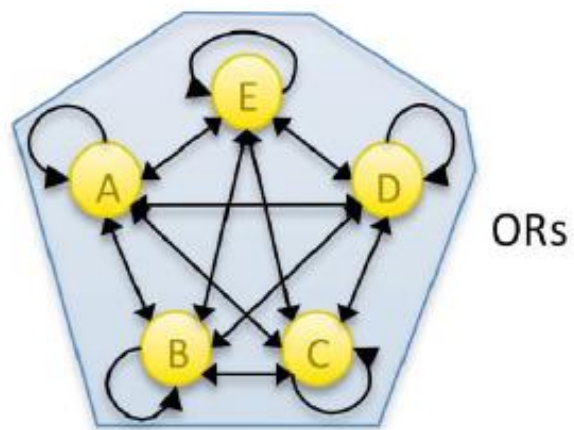
- KLD-Tripartición-sin CM

```

Evaluating  $\Phi$  cuts: 0%| 0/14 [00:00<?, ?it/s]
Computing concepts: 0%| 0/11 [00:00<?, ?it/s]

Computing concepts: 0%| 0/11 [00:00<?, ?it/s]
Computing concepts: 0%| 0/13 [00:00<?, ?it/s]
Computing concepts: 0%| 0/11 [00:00<?, ?it/s]
Computing concepts: 0%| 0/13 [00:00<?, ?it/s]
Computing concepts: 0%| 0/13 [00:00<?, ?it/s]
Computing concepts: 0%| 0/13 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 43%| 6/14 [00:00<00:00, 51.78it/s]
Computing concepts: 0%| 0/11 [00:00<?, ?it/s]
Computing concepts: 0%| 0/11 [00:00<?, ?it/s]
Computing concepts: 0%| 0/13 [00:00<?, ?it/s]
Computing concepts: 0%| 0/13 [00:00<?, ?it/s]
Computing concepts: 0%| 0/11 [00:00<?, ?it/s]
Evaluating  $\Phi$  cuts: 79%| 11/14 [00:00<00:00, 47.84it/s]
Computing concepts: 0%| 0/13 [00:00<?, ?it/s]
Computing concepts: 0%| 0/11 [00:00<?, ?it/s]
Computing concepts: 0%| 0/11 [00:00<?, ?it/s]
MIP:
Cut [A, B]  $\rightarrow$  /  $\rightarrow$  [C, D]
Phi:
 $\Phi$  = 0.3125
Time:
0.413015 s

```

Grafo 8

→ Estado-nodo

Entrada de datos	Medida de distancia	Esquema de partición	Resultados con CM	Resultados sin CM
<p>Grafo:</p> <p>ORs</p> <pre>tpm = np.array([[0,0,0,0,0], [1,1,1,1,1]])</pre>	EMD	biparticion	MIP: Cut [A] ——— / / ——— ➤ [B, C, D, E] Phi: Φ = 0.003057 Time: 180.102077 s	MIP: Cut [A] ——— / / ——— ➤ [B, C, D, E] Phi: Φ = 0.003057 Time: 175.997137 s
	EMD	tripartición	MIP: Cut [A] ——— / / ——— ➤ [B, C, D, E] Phi: Φ = 0.003057 Time: 189.102577 s	MIP: Cut [A] ——— / / ——— ➤ [B, C, D, E] Phi: Φ = 0.003057 Time: 178.882237 s
	KLD	bipartición	MIP: Cut [A] ——— / / ——— ➤ [B, C, D, E] Phi: Φ = 0.003057 Time: 183.202997 s	MIP: Cut [A] ——— / / ——— ➤ [B, C, D, E] Phi: Φ = 0.003057 Time: 175.23443 s
	KLD	tripartición	MIP: Cut [A] ——— / / ——— ➤ [B, C, D, E] Phi: Φ = 0.003057 Time: 179.102077 s	MIP: Cut [A] ——— / / ——— ➤ [B, C, D, E] Phi: Φ = 0.003057 Time: 176.00092 s

```
cm = np.array([
[1,1,1,1,1],
[1,1,1,1,1],
[1,1,1,1,1],
[1,1,1,1,1],
[1,1,1,1,1]
])
```

- Variación en el tiempo y consumo de las particiones con CM**

Computing concepts: 77% | ██████████ | 20/26 [00:04<00:01, 4.01it/s]
Computing concepts: 81% | ██████████ | 21/26 [00:05<00:01, 3.61it/s]
Computing concepts: 92% | ██████████ | 24/26 [00:05<00:00, 4.53it/s]
Computing concepts: 96% | ██████████ | 25/26 [00:05<00:00, 4.29it/s]
Computing concepts: 100% | ██████████ | 26/26 [00:05<00:00, 4.73it/s]
Evaluating Φ cuts: 23% | █████ | 7/30 [00:43<02:21, 6.17s/it]
Computing concepts: 0% | | 0/20 [00:00<?, ?it/s]
Computing concepts: 5% | | 1/20 [00:00<00:02, 6.38it/s]
Computing concepts: 10% | | 2/20 [00:00<00:03, 4.90it/s]
Computing concepts: 15% | | 3/20 [00:01<00:08, 2.10it/s]
Computing concepts: 20% | | 4/20 [00:01<00:06, 2.61it/s]
Computing concepts: 25% | | 5/20 [00:02<00:06, 2.32it/s]
Computing concepts: 35% | | 7/20 [00:02<00:04, 2.92it/s]
Computing concepts: 45% | | 9/20 [00:03<00:03, 3.03it/s]
Computing concepts: 50% | | 10/20 [00:03<00:03, 3.15it/s]
Computing concepts: 55% | | 11/20 [00:03<00:03, 2.65it/s]
Computing concepts: 60% | | 12/20 [00:04<00:02, 3.24it/s]
Computing concepts: 70% | | 14/20 [00:04<00:01, 3.83it/s]
Computing concepts: 75% | | 15/20 [00:04<00:01, 3.00it/s]
Computing concepts: 90% | | 18/20 [00:05<00:00, 3.79it/s]
Computing concepts: 95% | | 19/20 [00:05<00:00, 3.67it/s]
Computing concepts: 100% | | 20/20 [00:05<00:00, 4.18it/s]
Evaluating Φ cuts: 27% | █████ | 8/30 [00:49<02:12, 6.04s/it]
Computing concepts: 0% | | 0/26 [00:00<?, ?it/s]
Computing concepts: 4% | | 1/26 [00:00<00:04, 5.36it/s]
Computing concepts: 8% | | 2/26 [00:00<00:05, 4.62it/s]
Computing concepts: 12% | | 3/26 [00:00<00:05, 4.53it/s]
Computing concepts: 15% | | 4/26 [00:01<00:08, 2.63it/s]
Computing concepts: 19% | | 5/26 [00:01<00:07, 2.83it/s]
Computing concepts: 23% | | 6/26 [00:02<00:07, 2.77it/s]
Computing concepts: 31% | | 8/26 [00:02<00:05, 3.49it/s]

Computing concepts: 38%|██████ | 10/26 [00:02<00:03, 4.43it/s]
 Computing concepts: 42%|██████ | 11/26 [00:02<00:03, 4.02it/s]
 Computing concepts: 46%|██████ | 12/26 [00:03<00:04, 3.46it/s]
 Computing concepts: 50%|██████ | 13/26 [00:03<00:03, 3.53it/s]
 Computing concepts: 54%|██████ | 14/26 [00:03<00:03, 3.18it/s]
 Computing concepts: 58%|██████ | 15/26 [00:04<00:03, 3.66it/s]
 Computing concepts: 62%|██████ | 16/26 [00:04<00:02, 4.18it/s]
 Computing concepts: 69%|██████ | 18/26 [00:04<00:01, 4.98it/s]
 Computing concepts: 73%|██████ | 19/26 [00:04<00:02, 3.34it/s]
 Computing concepts: 77%|██████ | 20/26 [00:05<00:02, 2.66it/s]
 Computing concepts: 88%|██████ | 23/26 [00:05<00:00, 3.40it/s]
 Computing concepts: 92%|██████ | 24/26 [00:06<00:00, 3.38it/s]
 Computing concepts: 96%|██████ | 25/26 [00:06<00:00, 3.91it/s]
 Computing concepts: 100%|██████ | 26/26 [00:06<00:00, 4.45it/s]
 Evaluating Φ cuts: 30%|██████ | 9/30 [00:55<02:09, 6.17s/it]
 Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]
 Computing concepts: 4%| | 1/26 [00:00<00:07, 3.20it/s]
 Computing concepts: 8%| | 2/26 [00:00<00:07, 3.36it/s]
 Computing concepts: 12%| | 3/26 [00:01<00:10, 2.27it/s]
 Computing concepts: 15%| | 4/26 [00:01<00:08, 2.49it/s]
 Computing concepts: 19%| | 5/26 [00:01<00:07, 2.98it/s]
 Computing concepts: 23%| | 6/26 [00:01<00:05, 3.54it/s]
 Computing concepts: 27%| | 7/26 [00:02<00:06, 3.11it/s]
 Computing concepts: 35%| | 9/26 [00:02<00:04, 3.69it/s]
 Computing concepts: 42%| | 11/26 [00:03<00:03, 4.00it/s]
 Computing concepts: 46%| | 12/26 [00:03<00:03, 4.44it/s]
 Computing concepts: 50%| | 13/26 [00:03<00:02, 4.44it/s]
 Computing concepts: 54%| | 14/26 [00:04<00:03, 3.13it/s]
 Computing concepts: 58%| | 15/26 [00:04<00:03, 3.64it/s]
 Computing concepts: 62%| | 16/26 [00:04<00:02, 3.59it/s]
 Computing concepts: 65%| | 17/26 [00:04<00:02, 4.01it/s]
 Computing concepts: 73%| | 19/26 [00:04<00:01, 4.53it/s]
 Computing concepts: 77%| | 20/26 [00:05<00:01, 3.86it/s]
 Computing concepts: 81%| | 21/26 [00:05<00:01, 3.01it/s]
 Computing concepts: 92%| | 24/26 [00:06<00:00, 3.94it/s]
 Computing concepts: 96%| | 25/26 [00:06<00:00, 3.85it/s]
 Computing concepts: 100%| | 26/26 [00:06<00:00, 4.36it/s]
 Evaluating Φ cuts: 33%|██████ | 10/30 [01:02<02:05, 6.28s/it]
 Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]
 Computing concepts: 4%| | 1/26 [00:00<00:05, 4.28it/s]

Computing concepts: 8% | 2/26 [00:00<00:08, 2.68it/s]

Computing concepts: 12% | 3/26 [00:01<00:07, 3.04it/s]

Computing concepts: 15% | 4/26 [00:01<00:06, 3.62it/s]

Computing concepts: 19% | 5/26 [00:01<00:06, 3.32it/s]

Computing concepts: 27% | 7/26 [00:01<00:04, 4.09it/s]

Computing concepts: 35% | 9/26 [00:02<00:03, 5.10it/s]

Computing concepts: 38% | 10/26 [00:02<00:03, 4.51it/s]

Computing concepts: 42% | 11/26 [00:02<00:03, 3.81it/s]

Computing concepts: 46% | 12/26 [00:02<00:03, 4.34it/s]

Computing concepts: 50% | 13/26 [00:03<00:02, 4.47it/s]

Computing concepts: 54% | 14/26 [00:03<00:03, 3.74it/s]

Computing concepts: 58% | 15/26 [00:03<00:02, 4.24it/s]

Computing concepts: 62% | 16/26 [00:03<00:02, 4.04it/s]

Computing concepts: 69% | 18/26 [00:04<00:01, 4.86it/s]

Computing concepts: 73% | 19/26 [00:04<00:01, 3.86it/s]

Computing concepts: 77% | 20/26 [00:04<00:01, 3.45it/s]

Computing concepts: 88% | 23/26 [00:05<00:00, 4.45it/s]

Computing concepts: 92% | 24/26 [00:05<00:00, 3.89it/s]

Computing concepts: 96% | 25/26 [00:05<00:00, 4.12it/s]

Computing concepts: 100% | 26/26 [00:05<00:00, 4.16it/s]

Evaluating Φ cuts: 37% | 11/30 [01:08<01:57, 6.17s/it]

Computing concepts: 0% | 0/26 [00:00<?, ?it/s]

Computing concepts: 4% | 1/26 [00:00<00:05, 4.50it/s]

Computing concepts: 8% | 2/26 [00:00<00:05, 4.02it/s]

Computing concepts: 12% | 3/26 [00:00<00:05, 4.36it/s]

Computing concepts: 15% | 4/26 [00:00<00:05, 4.23it/s]

Computing concepts: 19% | 5/26 [00:01<00:08, 2.59it/s]

Computing concepts: 23% | 6/26 [00:01<00:06, 3.10it/s]

Computing concepts: 27% | 7/26 [00:02<00:05, 3.59it/s]

Computing concepts: 31% | 8/26 [00:02<00:06, 2.89it/s]

Computing concepts: 38% | 10/26 [00:02<00:04, 3.60it/s]

Computing concepts: 46% | 12/26 [00:03<00:03, 4.26it/s]

Computing concepts: 50% | 13/26 [00:03<00:03, 3.42it/s]

Computing concepts: 54% | 14/26 [00:03<00:03, 3.60it/s]

Computing concepts: 58% | 15/26 [00:04<00:03, 3.27it/s]

Computing concepts: 62% | 16/26 [00:04<00:03, 3.33it/s]

Computing concepts: 69% | 18/26 [00:04<00:02, 3.99it/s]

Computing concepts: 73% | 19/26 [00:05<00:02, 3.46it/s]

Computing concepts: 77% | 20/26 [00:05<00:02, 2.83it/s]

Computing concepts: 88%|██████████ | 23/26 [00:05<00:00, 3.62it/s]
 Computing concepts: 92%|██████████ | 24/26 [00:06<00:00, 3.86it/s]
 Computing concepts: 96%|██████████ | 25/26 [00:06<00:00, 4.36it/s]
 Computing concepts: 100%|██████████ | 26/26 [00:06<00:00, 4.84it/s]
 Evaluating Φ cuts: 40%|██████ | 12/30 [01:14<01:52, 6.24s/it]
 Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]
 Computing concepts: 4%| | 1/26 [00:00<00:04, 5.66it/s]
 Computing concepts: 8%| | 2/26 [00:00<00:04, 5.16it/s]
 Computing concepts: 12%| | 3/26 [00:00<00:04, 5.03it/s]
 Computing concepts: 15%| | 4/26 [00:01<00:07, 2.84it/s]
 Computing concepts: 19%| | 5/26 [00:01<00:06, 3.01it/s]
 Computing concepts: 23%| | 6/26 [00:01<00:05, 3.53it/s]
 Computing concepts: 27%| | 7/26 [00:02<00:05, 3.26it/s]
 Computing concepts: 38%| | 10/26 [00:02<00:03, 4.32it/s]
 Computing concepts: 42%| | 11/26 [00:02<00:03, 4.39it/s]
 Computing concepts: 46%| | 12/26 [00:02<00:03, 3.84it/s]
 Computing concepts: 50%| | 13/26 [00:03<00:03, 3.89it/s]
 Computing concepts: 54%| | 14/26 [00:03<00:03, 3.41it/s]
 Computing concepts: 58%| | 15/26 [00:03<00:03, 3.38it/s]
 Computing concepts: 62%| | 16/26 [00:03<00:02, 3.92it/s]
 Computing concepts: 69%| | 18/26 [00:04<00:01, 4.72it/s]
 Computing concepts: 73%| | 19/26 [00:04<00:01, 3.95it/s]
 Computing concepts: 77%| | 20/26 [00:04<00:01, 3.54it/s]
 Computing concepts: 88%|██████████ | 23/26 [00:05<00:00, 4.37it/s]
 Computing concepts: 92%|██████████ | 24/26 [00:05<00:00, 4.32it/s]
 Computing concepts: 96%|██████████ | 25/26 [00:05<00:00, 4.48it/s]
 Computing concepts: 100%|██████████ | 26/26 [00:05<00:00, 4.92it/s]
 Evaluating Φ cuts: 43%|██████ | 13/30 [01:20<01:44, 6.13s/it]
 Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]
 Computing concepts: 4%| | 1/26 [00:00<00:07, 3.19it/s]
 Computing concepts: 8%| | 2/26 [00:00<00:06, 3.74it/s]
 Computing concepts: 12%| | 3/26 [00:00<00:06, 3.74it/s]
 Computing concepts: 15%| | 4/26 [00:01<00:08, 2.46it/s]
 Computing concepts: 19%| | 5/26 [00:01<00:07, 2.64it/s]
 Computing concepts: 23%| | 6/26 [00:01<00:06, 3.16it/s]
 Computing concepts: 27%| | 7/26 [00:02<00:06, 2.89it/s]
 Computing concepts: 35%| | 9/26 [00:02<00:04, 3.57it/s]
 Computing concepts: 42%| | 11/26 [00:02<00:03, 4.12it/s]
 Computing concepts: 46%| | 12/26 [00:03<00:03, 3.58it/s]
 Computing concepts: 50%| | 13/26 [00:03<00:03, 3.92it/s]

Computing concepts: 54% | 14/26 [00:03<00:03, 3.37it/s]
 Computing concepts: 58% | 15/26 [00:04<00:03, 3.53it/s]
 Computing concepts: 62% | 16/26 [00:04<00:02, 4.06it/s]
 Computing concepts: 69% | 18/26 [00:04<00:01, 4.68it/s]
 Computing concepts: 73% | 19/26 [00:04<00:01, 3.95it/s]
 Computing concepts: 77% | 20/26 [00:05<00:01, 3.62it/s]
 Computing concepts: 88% | 23/26 [00:05<00:00, 4.64it/s]
 Computing concepts: 92% | 24/26 [00:05<00:00, 4.62it/s]
 Computing concepts: 96% | 25/26 [00:05<00:00, 5.06it/s]
 Computing concepts: 100% | 26/26 [00:06<00:00, 5.41it/s]
 Evaluating Φ cuts: 47% | 14/30 [01:26<01:37, 6.11s/it]
 Computing concepts: 0% | 0/20 [00:00<?, ?it/s]
 Computing concepts: 5% | 1/20 [00:00<00:10, 1.75it/s]
 Computing concepts: 10% | 2/20 [00:00<00:08, 2.23it/s]
 Computing concepts: 15% | 3/20 [00:01<00:06, 2.48it/s]
 Computing concepts: 30% | 6/20 [00:01<00:04, 3.35it/s]
 Computing concepts: 35% | 7/20 [00:01<00:03, 3.78it/s]
 Computing concepts: 40% | 8/20 [00:01<00:02, 4.38it/s]
 Computing concepts: 45% | 9/20 [00:01<00:02, 4.02it/s]
 Computing concepts: 50% | 10/20 [00:01<00:02, 4.39it/s]
 Computing concepts: 60% | 12/20 [00:02<00:01, 5.38it/s]
 Computing concepts: 65% | 13/20 [00:02<00:01, 4.60it/s]
 Computing concepts: 70% | 14/20 [00:02<00:01, 4.20it/s]
 Computing concepts: 85% | 17/20 [00:02<00:00, 5.41it/s]
 Computing concepts: 90% | 18/20 [00:03<00:00, 5.45it/s]
 Computing concepts: 95% | 19/20 [00:03<00:00, 5.76it/s]
 Computing concepts: 100% | 20/20 [00:03<00:00, 6.10it/s]
 Evaluating Φ cuts: 50% | 15/30 [01:29<01:19, 5.31s/it]
 Computing concepts: 0% | 0/20 [00:00<?, ?it/s]
 Computing concepts: 5% | 1/20 [00:01<00:21, 1.12s/it]
 Computing concepts: 10% | 2/20 [00:01<00:15, 1.14it/s]
 Computing concepts: 15% | 3/20 [00:01<00:13, 1.30it/s]
 Computing concepts: 30% | 6/20 [00:02<00:07, 1.80it/s]
 Computing concepts: 35% | 7/20 [00:02<00:06, 2.10it/s]
 Computing concepts: 40% | 8/20 [00:02<00:04, 2.62it/s]
 Computing concepts: 45% | 9/20 [00:03<00:04, 2.34it/s]
 Computing concepts: 50% | 10/20 [00:03<00:03, 2.61it/s]
 Computing concepts: 60% | 12/20 [00:03<00:02, 3.21it/s]
 Computing concepts: 65% | 13/20 [00:04<00:02, 2.66it/s]
 Computing concepts: 70% | 14/20 [00:04<00:02, 2.39it/s]
 Computing concepts: 85% | 17/20 [00:05<00:00, 3.09it/s]
 Computing concepts: 90% | 18/20 [00:05<00:00, 3.20it/s]

Computing concepts: 95%|██████████| 19/20 [00:05<00:00, 3.75it/s]
 Computing concepts: 100%|██████████| 20/20 [00:05<00:00, 4.26it/s]
 Evaluating Φ cuts: 53%|██████████| 16/30 [01:35<01:15, 5.42s/it]
 Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]
 Computing concepts: 4%|██████████| 1/26 [00:00<00:07, 3.33it/s]
 Computing concepts: 8%|██████████| 2/26 [00:00<00:06, 3.88it/s]
 Computing concepts: 12%|██████████| 3/26 [00:00<00:06, 3.60it/s]
 Computing concepts: 15%|██████████| 4/26 [00:01<00:09, 2.42it/s]
 Computing concepts: 19%|██████████| 5/26 [00:01<00:07, 2.80it/s]
 Computing concepts: 23%|██████████| 6/26 [00:01<00:05, 3.34it/s]
 Computing concepts: 27%|██████████| 7/26 [00:02<00:06, 3.12it/s]
 Computing concepts: 35%|██████████| 9/26 [00:02<00:04, 3.73it/s]
 Computing concepts: 42%|██████████| 11/26 [00:02<00:03, 4.51it/s]
 Computing concepts: 46%|██████████| 12/26 [00:03<00:04, 3.18it/s]
 Computing concepts: 50%|██████████| 13/26 [00:03<00:03, 3.69it/s]
 Computing concepts: 54%|██████████| 14/26 [00:03<00:03, 3.27it/s]
 Computing concepts: 58%|██████████| 15/26 [00:04<00:03, 3.31it/s]
 Computing concepts: 62%|██████████| 16/26 [00:04<00:02, 3.84it/s]
 Computing concepts: 69%|██████████| 18/26 [00:04<00:01, 4.57it/s]
 Computing concepts: 73%|██████████| 19/26 [00:05<00:02, 3.19it/s]
 Computing concepts: 77%|██████████| 20/26 [00:05<00:01, 3.02it/s]
 Computing concepts: 88%|██████████| 23/26 [00:05<00:00, 3.82it/s]
 Computing concepts: 92%|██████████| 24/26 [00:06<00:00, 3.71it/s]
 Computing concepts: 96%|██████████| 25/26 [00:06<00:00, 4.19it/s]
 Computing concepts: 100%|██████████| 26/26 [00:06<00:00, 4.54it/s]
 Evaluating Φ cuts: 57%|██████████| 17/30 [01:42<01:14, 5.74s/it]
 Computing concepts: 0%|██████████| 0/26 [00:00<?, ?it/s]
 Computing concepts: 4%|██████████| 1/26 [00:00<00:04, 5.91it/s]
 Computing concepts: 8%|██████████| 2/26 [00:00<00:05, 4.75it/s]
 Computing concepts: 12%|██████████| 3/26 [00:00<00:05, 4.25it/s]
 Computing concepts: 15%|██████████| 4/26 [00:01<00:08, 2.57it/s]
 Computing concepts: 19%|██████████| 5/26 [00:01<00:07, 2.91it/s]
 Computing concepts: 23%|██████████| 6/26 [00:01<00:05, 3.44it/s]
 Computing concepts: 27%|██████████| 7/26 [00:02<00:06, 3.10it/s]
 Computing concepts: 38%|██████████| 10/26 [00:02<00:03, 4.12it/s]
 Computing concepts: 42%|██████████| 11/26 [00:02<00:03, 3.89it/s]
 Computing concepts: 46%|██████████| 12/26 [00:03<00:04, 2.95it/s]
 Computing concepts: 50%|██████████| 13/26 [00:03<00:04, 3.10it/s]
 Computing concepts: 54%|██████████| 14/26 [00:04<00:04, 2.63it/s]
 Computing concepts: 58%|██████████| 15/26 [00:04<00:03, 3.01it/s]

Computing concepts: 62%|██████ | 16/26 [00:04<00:02, 3.52it/s]
 Computing concepts: 69%|██████ | 18/26 [00:04<00:01, 4.13it/s]
 Computing concepts: 73%|██████ | 19/26 [00:05<00:01, 3.53it/s]
 Computing concepts: 77%|██████ | 20/26 [00:05<00:01, 3.12it/s]
 Computing concepts: 88%|██████ | 23/26 [00:05<00:00, 4.07it/s]
 Computing concepts: 92%|██████ | 24/26 [00:06<00:00, 3.95it/s]
 Computing concepts: 96%|██████ | 25/26 [00:06<00:00, 4.29it/s]
 Computing concepts: 100%|██████ | 26/26 [00:06<00:00, 4.66it/s]
 Evaluating Φ cuts: 60%|██████ | 18/30 [01:48<01:11, 5.96s/it]
 Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]
 Computing concepts: 4%| | 1/26 [00:00<00:04, 5.83it/s]
 Computing concepts: 8%| | 2/26 [00:00<00:04, 5.25it/s]
 Computing concepts: 12%| | 3/26 [00:00<00:04, 5.56it/s]
 Computing concepts: 15%| | 4/26 [00:00<00:04, 5.16it/s]
 Computing concepts: 19%| | 5/26 [00:01<00:07, 2.89it/s]
 Computing concepts: 23%| | 6/26 [00:01<00:05, 3.46it/s]
 Computing concepts: 27%| | 7/26 [00:01<00:04, 4.00it/s]
 Computing concepts: 31%| | 8/26 [00:02<00:05, 3.54it/s]
 Computing concepts: 38%| | 10/26 [00:02<00:03, 4.16it/s]
 Computing concepts: 46%| | 12/26 [00:02<00:02, 5.04it/s]
 Computing concepts: 50%| | 13/26 [00:03<00:03, 4.05it/s]
 Computing concepts: 54%| | 14/26 [00:03<00:03, 3.93it/s]
 Computing concepts: 58%| | 15/26 [00:03<00:03, 3.50it/s]
 Computing concepts: 62%| | 16/26 [00:03<00:02, 3.78it/s]
 Computing concepts: 69%| | 18/26 [00:04<00:01, 4.69it/s]
 Computing concepts: 73%| | 19/26 [00:04<00:01, 3.88it/s]
 Computing concepts: 77%| | 20/26 [00:04<00:01, 3.57it/s]
 Computing concepts: 88%| | 23/26 [00:04<00:00, 4.63it/s]
 Computing concepts: 92%| | 24/26 [00:05<00:00, 4.27it/s]
 Computing concepts: 96%| | 25/26 [00:05<00:00, 4.45it/s]
 Computing concepts: 100%| | 26/26 [00:05<00:00, 4.87it/s]
 Evaluating Φ cuts: 63%|██████ | 19/30 [01:54<01:04, 5.86s/it]
 Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]
 Computing concepts: 4%| | 1/26 [00:00<00:07, 3.16it/s]
 Computing concepts: 8%| | 2/26 [00:01<00:11, 2.14it/s]
 Computing concepts: 12%| | 3/26 [00:01<00:09, 2.42it/s]
 Computing concepts: 15%| | 4/26 [00:01<00:07, 2.94it/s]
 Computing concepts: 19%| | 5/26 [00:02<00:08, 2.47it/s]
 Computing concepts: 27%| | 7/26 [00:02<00:06, 3.05it/s]
 Computing concepts: 35%| | 9/26 [00:02<00:04, 3.91it/s]

Computing concepts: 38%|██████ | 10/26 [00:02<00:04, 3.92it/s]
 Computing concepts: 42%|██████ | 11/26 [00:03<00:05, 2.94it/s]
 Computing concepts: 46%|██████ | 12/26 [00:03<00:04, 3.47it/s]
 Computing concepts: 50%|██████ | 13/26 [00:03<00:03, 3.47it/s]
 Computing concepts: 54%|██████ | 14/26 [00:04<00:03, 3.10it/s]
 Computing concepts: 58%|██████ | 15/26 [00:04<00:02, 3.67it/s]
 Computing concepts: 62%|██████ | 16/26 [00:04<00:02, 3.75it/s]
 Computing concepts: 69%|██████ | 18/26 [00:04<00:01, 4.32it/s]
 Computing concepts: 73%|██████ | 19/26 [00:05<00:01, 3.59it/s]
 Computing concepts: 77%|██████ | 20/26 [00:05<00:01, 3.12it/s]
 Computing concepts: 88%|██████ | 23/26 [00:06<00:00, 3.95it/s]
 Computing concepts: 92%|██████ | 24/26 [00:06<00:00, 4.16it/s]
 Computing concepts: 96%|██████ | 25/26 [00:06<00:00, 4.55it/s]
 Computing concepts: 100%|██████ | 26/26 [00:06<00:00, 4.90it/s]
 Evaluating Φ cuts: 67%|██████ | 20/30 [02:00<01:01, 6.10s/it]
 Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]
 Computing concepts: 4%| | 1/26 [00:00<00:05, 4.36it/s]
 Computing concepts: 8%| | 2/26 [00:00<00:06, 3.99it/s]
 Computing concepts: 12%| | 3/26 [00:01<00:08, 2.61it/s]
 Computing concepts: 15%| | 4/26 [00:01<00:07, 3.01it/s]
 Computing concepts: 19%| | 5/26 [00:01<00:05, 3.58it/s]
 Computing concepts: 23%| | 6/26 [00:01<00:04, 4.06it/s]
 Computing concepts: 27%| | 7/26 [00:02<00:05, 3.58it/s]
 Computing concepts: 35%| | 9/26 [00:02<00:03, 4.43it/s]
 Computing concepts: 42%| | 11/26 [00:02<00:03, 4.67it/s]
 Computing concepts: 46%| | 12/26 [00:02<00:02, 5.02it/s]
 Computing concepts: 50%| | 13/26 [00:03<00:02, 4.48it/s]
 Computing concepts: 54%| | 14/26 [00:03<00:03, 3.67it/s]
 Computing concepts: 58%| | 15/26 [00:03<00:02, 4.18it/s]
 Computing concepts: 62%| | 16/26 [00:03<00:02, 4.14it/s]
 Computing concepts: 65%| | 17/26 [00:04<00:01, 4.56it/s]
 Computing concepts: 73%| | 19/26 [00:04<00:01, 5.35it/s]
 Computing concepts: 77%| | 20/26 [00:04<00:01, 4.00it/s]
 Computing concepts: 81%| | 21/26 [00:05<00:01, 3.42it/s]
 Computing concepts: 92%| | 24/26 [00:05<00:00, 4.26it/s]
 Computing concepts: 96%| | 25/26 [00:05<00:00, 4.30it/s]
 Computing concepts: 100%| | 26/26 [00:05<00:00, 4.73it/s]
 Evaluating Φ cuts: 70%| | 21/30 [02:06<00:54, 6.03s/it]
 Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]
 Computing concepts: 4%| | 1/26 [00:00<00:04, 6.23it/s]

Computing concepts: 8% | 2/26 [00:00<00:04, 5.30it/s]

Computing concepts: 12% | 3/26 [00:00<00:05, 4.16it/s]

Computing concepts: 15% | 4/26 [00:01<00:08, 2.60it/s]

Computing concepts: 19% | 5/26 [00:01<00:07, 2.94it/s]

Computing concepts: 23% | 6/26 [00:02<00:07, 2.76it/s]

Computing concepts: 31% | 8/26 [00:02<00:05, 3.39it/s]

Computing concepts: 38% | 10/26 [00:02<00:03, 4.33it/s]

Computing concepts: 42% | 11/26 [00:02<00:03, 4.28it/s]

Computing concepts: 46% | 12/26 [00:03<00:03, 3.59it/s]

Computing concepts: 50% | 13/26 [00:03<00:03, 3.88it/s]

Computing concepts: 54% | 14/26 [00:03<00:03, 3.37it/s]

Computing concepts: 58% | 15/26 [00:03<00:02, 4.00it/s]

Computing concepts: 62% | 16/26 [00:04<00:02, 4.43it/s]

Computing concepts: 69% | 18/26 [00:04<00:01, 5.01it/s]

Computing concepts: 73% | 19/26 [00:04<00:01, 4.00it/s]

Computing concepts: 77% | 20/26 [00:05<00:01, 3.36it/s]

Computing concepts: 88% | 23/26 [00:05<00:00, 4.34it/s]

Computing concepts: 92% | 24/26 [00:05<00:00, 4.37it/s]

Computing concepts: 96% | 25/26 [00:05<00:00, 4.75it/s]

Computing concepts: 100% | 26/26 [00:05<00:00, 5.09it/s]

Evaluating Φ cuts: 73% | 22/30 [02:12<00:48, 6.02s/it]

Computing concepts: 0% | 0/20 [00:00<?, ?it/s]

Computing concepts: 5% | 1/20 [00:00<00:02, 6.64it/s]

Computing concepts: 10% | 2/20 [00:00<00:02, 6.24it/s]

Computing concepts: 15% | 3/20 [00:00<00:04, 3.47it/s]

Computing concepts: 20% | 4/20 [00:01<00:03, 4.10it/s]

Computing concepts: 25% | 5/20 [00:01<00:03, 3.87it/s]

Computing concepts: 35% | 7/20 [00:01<00:02, 4.77it/s]

Computing concepts: 45% | 9/20 [00:01<00:02, 5.23it/s]

Computing concepts: 50% | 10/20 [00:02<00:01, 5.30it/s]

Computing concepts: 55% | 11/20 [00:02<00:02, 4.49it/s]

Computing concepts: 60% | 12/20 [00:02<00:01, 5.11it/s]

Computing concepts: 70% | 14/20 [00:02<00:00, 6.03it/s]

Computing concepts: 75% | 15/20 [00:02<00:01, 4.73it/s]

Computing concepts: 90% | 18/20 [00:03<00:00, 5.90it/s]

Computing concepts: 95% | 19/20 [00:03<00:00, 5.90it/s]








































Computing concepts: 100% | 20/20 [00:03<00:00, 6.08it/s]

Evaluating Φ cuts: 77% | 23/30 [02:16<00:36, 5.28s/it]

Computing concepts: 0% | 0/26 [00:00<?, ?it/s]

Computing concepts: 4% | 1/26 [00:00<00:04, 5.54it/s]

Computing concepts: 8% | 2/26 [00:00<00:05, 4.52it/s]

Computing concepts: 12%		3/26 [00:01<00:10, 2.24it/s]
Computing concepts: 15%		4/26 [00:01<00:08, 2.49it/s]
Computing concepts: 19%		5/26 [00:01<00:06, 3.00it/s]
Computing concepts: 23%		6/26 [00:02<00:07, 2.71it/s]
Computing concepts: 31%		8/26 [00:02<00:05, 3.30it/s]
Computing concepts: 38%		10/26 [00:02<00:03, 4.20it/s]
Computing concepts: 42%		11/26 [00:03<00:03, 3.94it/s]
Computing concepts: 46%		12/26 [00:03<00:04, 2.94it/s]
Computing concepts: 50%		13/26 [00:03<00:03, 3.45it/s]
Computing concepts: 54%		14/26 [00:04<00:03, 3.43it/s]
Computing concepts: 58%		15/26 [00:04<00:03, 2.84it/s]
Computing concepts: 62%		16/26 [00:04<00:02, 3.37it/s]
Computing concepts: 65%		17/26 [00:05<00:02, 3.42it/s]
Computing concepts: 73%		19/26 [00:05<00:01, 4.13it/s]
Computing concepts: 77%		20/26 [00:05<00:01, 3.29it/s]
Computing concepts: 81%		21/26 [00:06<00:01, 2.67it/s]
Computing concepts: 92%		24/26 [00:06<00:00, 3.47it/s]
Computing concepts: 96%		25/26 [00:06<00:00, 3.59it/s]
Computing concepts: 100%		26/26 [00:07<00:00, 4.04it/s]
Evaluating Φ cuts: 80%		24/30 [02:23<00:34, 5.82s/it]
Computing concepts: 0%		0/26 [00:00<?, ?it/s]
Computing concepts: 4%		1/26 [00:00<00:04, 5.36it/s]
Computing concepts: 8%		2/26 [00:00<00:05, 4.48it/s]
Computing concepts: 12%		3/26 [00:00<00:04, 4.87it/s]
Computing concepts: 15%		4/26 [00:00<00:04, 4.89it/s]
Computing concepts: 19%		5/26 [00:01<00:07, 2.83it/s]
Computing concepts: 23%		6/26 [00:01<00:06, 3.09it/s]
Computing concepts: 27%		7/26 [00:02<00:06, 2.94it/s]
Computing concepts: 35%		9/26 [00:02<00:04, 3.58it/s]
Computing concepts: 42%		11/26 [00:02<00:03, 4.34it/s]
Computing concepts: 46%		12/26 [00:03<00:04, 3.50it/s]
Computing concepts: 50%		13/26 [00:03<00:03, 3.72it/s]
Computing concepts: 54%		14/26 [00:03<00:03, 3.68it/s]
Computing concepts: 58%		15/26 [00:04<00:03, 3.27it/s]
Computing concepts: 62%		16/26 [00:04<00:02, 3.80it/s]
Computing concepts: 65%		17/26 [00:04<00:02, 3.54it/s]
Computing concepts: 69%		18/26 [00:04<00:01, 4.05it/s]
Computing concepts: 77%		20/26 [00:05<00:01, 4.15it/s]
Computing concepts: 81%		21/26 [00:05<00:01, 3.64it/s]
Computing concepts: 92%		24/26 [00:05<00:00, 4.48it/s]

Computing concepts: 96% | ██████████ | 25/26 [00:06<00:00, 4.20it/s]
 Computing concepts: 100% | ██████████ | 26/26 [00:06<00:00, 4.52it/s]
 Evaluating Φ cuts: 83% | ██████████ | 25/30 [02:29<00:29, 5.96s/it]
 Computing concepts: 0% | | 0/26 [00:00<?, ?it/s]
 Computing concepts: 4% | | 1/26 [00:00<00:08, 2.86it/s]
 Computing concepts: 8% | | 2/26 [00:00<00:07, 3.14it/s]
 Computing concepts: 12% | | 3/26 [00:01<00:10, 2.23it/s]
 Computing concepts: 15% | | 4/26 [00:01<00:08, 2.50it/s]
 Computing concepts: 19% | | 5/26 [00:01<00:06, 3.04it/s]
 Computing concepts: 23% | | 6/26 [00:01<00:05, 3.61it/s]
 Computing concepts: 27% | | 7/26 [00:02<00:05, 3.25it/s]
 Computing concepts: 35% | | 9/26 [00:02<00:04, 3.85it/s]
 Computing concepts: 42% | | 11/26 [00:02<00:03, 4.81it/s]
 Computing concepts: 46% | | 12/26 [00:03<00:03, 4.40it/s]
 Computing concepts: 50% | | 13/26 [00:03<00:03, 3.65it/s]
 Computing concepts: 54% | | 14/26 [00:03<00:03, 3.91it/s]
 Computing concepts: 58% | | 15/26 [00:04<00:03, 3.26it/s]
 Computing concepts: 62% | | 16/26 [00:04<00:02, 3.81it/s]
 Computing concepts: 65% | | 17/26 [00:04<00:02, 4.04it/s]
 Computing concepts: 69% | | 18/26 [00:04<00:01, 4.45it/s]
 Computing concepts: 77% | | 20/26 [00:04<00:01, 5.16it/s]
 Computing concepts: 81% | | 21/26 [00:05<00:01, 4.16it/s]
 Computing concepts: 85% | | 22/26 [00:05<00:01, 3.52it/s]
 Computing concepts: 96% | | 25/26 [00:05<00:00, 4.49it/s]
 Computing concepts: 100% | | 26/26 [00:06<00:00, 4.88it/s]
 Evaluating Φ cuts: 87% | ██████████ | 26/30 [02:35<00:23, 6.00s/it]
 Computing concepts: 0% | | 0/20 [00:00<?, ?it/s]
 Computing concepts: 5% | | 1/20 [00:00<00:03, 4.94it/s]
 Computing concepts: 10% | | 2/20 [00:00<00:03, 5.37it/s]
 Computing concepts: 15% | | 3/20 [00:01<00:06, 2.81it/s]
 Computing concepts: 20% | | 4/20 [00:01<00:04, 3.38it/s]
 Computing concepts: 30% | | 6/20 [00:01<00:03, 4.20it/s]
 Computing concepts: 40% | | 8/20 [00:01<00:02, 5.06it/s]
 Computing concepts: 45% | | 9/20 [00:02<00:02, 4.18it/s]
 Computing concepts: 50% | | 10/20 [00:02<00:02, 4.31it/s]
 Computing concepts: 55% | | 11/20 [00:02<00:03, 2.97it/s]
 Computing concepts: 60% | | 12/20 [00:02<00:02, 3.57it/s]
 Computing concepts: 65% | | 13/20 [00:03<00:01, 3.98it/s]
 Computing concepts: 75% | | 15/20 [00:03<00:01, 4.53it/s]
 Computing concepts: 80% | | 16/20 [00:03<00:00, 4.20it/s]
 Computing concepts: 95% | | 19/20 [00:03<00:00, 5.29it/s]

Computing concepts: 100% | ██████████ | 20/20 [00:04<00:00, 5.52it/s]
 Evaluating Φ cuts: 90% | ██████████ | 27/30 [02:39<00:16, 5.45s/it]
 Computing concepts: 0% | | 0/26 [00:00<?, ?it/s]
 Computing concepts: 4% | █ | 1/26 [00:00<00:04, 5.42it/s]
 Computing concepts: 8% | ███ | 2/26 [00:00<00:05, 4.46it/s]
 Computing concepts: 12% | █████ | 3/26 [00:00<00:05, 4.12it/s]
 Computing concepts: 15% | ███████ | 4/26 [00:01<00:09, 2.44it/s]
 Computing concepts: 19% | ████████ | 5/26 [00:01<00:07, 2.68it/s]
 Computing concepts: 23% | █████████ | 6/26 [00:02<00:06, 3.16it/s]
 Computing concepts: 27% | ██████████ | 7/26 [00:02<00:05, 3.64it/s]
 Computing concepts: 31% | ███████████ | 8/26 [00:02<00:05, 3.13it/s]
 Computing concepts: 38% | ████████████ | 10/26 [00:02<00:04, 3.87it/s]
 Computing concepts: 46% | █████████████ | 12/26 [00:03<00:02, 4.87it/s]
 Computing concepts: 50% | ██████████████ | 13/26 [00:03<00:02, 4.55it/s]
 Computing concepts: 54% | ███████████████ | 14/26 [00:03<00:03, 3.59it/s]
 Computing concepts: 58% | ████████████████ | 15/26 [00:03<00:02, 4.23it/s]
 Computing concepts: 62% | █████████████████ | 16/26 [00:04<00:02, 4.34it/s]
 Computing concepts: 65% | ██████████████████ | 17/26 [00:04<00:02, 3.77it/s]
 Computing concepts: 69% | ███████████████████ | 18/26 [00:04<00:02, 3.99it/s]
 Computing concepts: 77% | ████████████████████ | 20/26 [00:04<00:01, 4.58it/s]
 Computing concepts: 81% | █████████████████████ | 21/26 [00:05<00:01, 3.79it/s]
 Computing concepts: 85% | ██████████████████████ | 22/26 [00:05<00:01, 3.28it/s]
 Computing concepts: 96% | ███████████████████████ | 25/26 [00:05<00:00, 4.23it/s]
 Computing concepts: 100% | █████████████████████████ | 26/26 [00:06<00:00, 4.83it/s]
 Evaluating Φ cuts: 93% | ████████████████ | 28/30 [02:45<00:11, 5.65s/it]
 Computing concepts: 0% | | 0/20 [00:00<?, ?it/s]
 Computing concepts: 5% | █ | 1/20 [00:00<00:02, 7.24it/s]
 Computing concepts: 10% | ███ | 2/20 [00:00<00:02, 6.66it/s]
 Computing concepts: 15% | █████ | 3/20 [00:00<00:02, 6.42it/s]
 Computing concepts: 20% | ███████ | 4/20 [00:01<00:04, 3.79it/s]
 Computing concepts: 25% | █████████ | 5/20 [00:01<00:03, 4.24it/s]
 Computing concepts: 30% | ██████████ | 6/20 [00:01<00:02, 4.89it/s]
 Computing concepts: 35% | ███████████ | 7/20 [00:01<00:02, 4.47it/s]
 Computing concepts: 50% | █████████████ | 10/20 [00:01<00:01, 5.22it/s]
 Computing concepts: 55% | ██████████████ | 11/20 [00:02<00:01, 5.57it/s]
 Computing concepts: 60% | ███████████████ | 12/20 [00:02<00:01, 5.00it/s]
 Computing concepts: 65% | ████████████████ | 13/20 [00:02<00:01, 4.84it/s]
 Computing concepts: 70% | █████████████████ | 14/20 [00:02<00:01, 5.05it/s]
 Computing concepts: 80% | ██████████████████ | 16/20 [00:03<00:00, 5.34it/s]
 Computing concepts: 85% | ███████████████████ | 17/20 [00:03<00:00, 4.76it/s]
 Computing concepts: 100% | █████████████████████ | 20/20 [00:03<00:00, 5.93it/s]

Evaluating Φ cuts: 97% | 29/30 [02:49<00:05, 5.03s/it]
 Computing concepts: 0% | 0/20 [00:00<?, ?it/s]
 Computing concepts: 5% | 1/20 [00:00<00:03, 5.42it/s]
 Computing concepts: 10% | 2/20 [00:00<00:03, 5.28it/s]
 Computing concepts: 15% | 3/20 [00:00<00:04, 3.42it/s]
 Computing concepts: 20% | 4/20 [00:01<00:04, 3.78it/s]
 Computing concepts: 25% | 5/20 [00:01<00:03, 4.20it/s]
 Computing concepts: 30% | 6/20 [00:01<00:03, 3.62it/s]
 Computing concepts: 40% | 8/20 [00:01<00:02, 4.44it/s]
 Computing concepts: 50% | 10/20 [00:02<00:01, 5.62it/s]
 Computing concepts: 55% | 11/20 [00:02<00:01, 5.55it/s]
 Computing concepts: 60% | 12/20 [00:02<00:01, 4.73it/s]
 Computing concepts: 65% | 13/20 [00:02<00:01, 4.20it/s]
 Computing concepts: 70% | 14/20 [00:02<00:01, 4.85it/s]
 Computing concepts: 80% | 16/20 [00:03<00:00, 5.73it/s]
 Computing concepts: 85% | 17/20 [00:03<00:00, 4.82it/s]
 Computing concepts: 100% | 20/20 [00:03<00:00,

- Variación en el tiempo y consumo de las particiones sin CM**

Computing concepts: 77% | 20/26 [00:04<00:01, 4.32it/s]
 Computing concepts: 81% | 21/26 [00:04<00:01, 3.60it/s]
 Computing concepts: 92% | 24/26 [00:05<00:00, 4.33it/s]
 Computing concepts: 96% | 25/26 [00:05<00:00, 3.90it/s]
 Computing concepts: 100% | 26/26 [00:05<00:00, 4.26it/s]
 Evaluating Φ cuts: 23% | 7/30 [00:43<02:18, 6.03s/it]
 Computing concepts: 0% | 0/20 [00:00<?, ?it/s]
 Computing concepts: 5% | 1/20 [00:00<00:03, 5.41it/s]
 Computing concepts: 10% | 2/20 [00:00<00:04, 4.25it/s]
 Computing concepts: 15% | 3/20 [00:01<00:09, 1.78it/s]
 Computing concepts: 20% | 4/20 [00:02<00:07, 2.19it/s]
 Computing concepts: 25% | 5/20 [00:02<00:07, 1.98it/s]
 Computing concepts: 35% | 7/20 [00:03<00:05, 2.43it/s]
 Computing concepts: 45% | 9/20 [00:03<00:04, 2.59it/s]
 Computing concepts: 50% | 10/20 [00:04<00:03, 2.70it/s]
 Computing concepts: 55% | 11/20 [00:04<00:04, 2.15it/s]
 Computing concepts: 60% | 12/20 [00:04<00:03, 2.53it/s]
 Computing concepts: 70% | 14/20 [00:05<00:01, 3.04it/s]
 Computing concepts: 75% | 15/20 [00:06<00:02, 2.33it/s]
 Computing concepts: 90% | 18/20 [00:06<00:00, 2.98it/s]
 Computing concepts: 95% | 19/20 [00:06<00:00, 2.89it/s]
 Computing concepts: 100% | 20/20 [00:06<00:00, 3.34it/s]
 Evaluating Φ cuts: 27% | 8/30 [00:50<02:19, 6.32s/it]
 Computing concepts: 0% | 0/26 [00:00<?, ?it/s]

Computing concepts: 4%	1/26 [00:00<00:05, 4.23it/s]
Computing concepts: 8%	2/26 [00:00<00:06, 3.56it/s]
Computing concepts: 12%	3/26 [00:00<00:06, 3.63it/s]
Computing concepts: 15%	4/26 [00:01<00:09, 2.23it/s]
Computing concepts: 19%	5/26 [00:02<00:08, 2.36it/s]
Computing concepts: 23%	6/26 [00:02<00:08, 2.34it/s]
Computing concepts: 31%	8/26 [00:02<00:06, 2.95it/s]
Computing concepts: 38%	10/26 [00:03<00:04, 3.75it/s]
Computing concepts: 42%	11/26 [00:03<00:04, 3.40it/s]
Computing concepts: 46%	12/26 [00:03<00:04, 2.98it/s]
Computing concepts: 50%	13/26 [00:04<00:04, 2.94it/s]
Computing concepts: 54%	14/26 [00:04<00:04, 2.72it/s]
Computing concepts: 58%	15/26 [00:04<00:03, 3.15it/s]
Computing concepts: 62%	16/26 [00:04<00:02, 3.55it/s]
Computing concepts: 69%	18/26 [00:05<00:01, 4.20it/s]
Computing concepts: 73%	19/26 [00:05<00:02, 2.77it/s]
Computing concepts: 77%	20/26 [00:06<00:02, 2.45it/s]
Computing concepts: 88%	23/26 [00:06<00:00, 3.20it/s]
Computing concepts: 92%	24/26 [00:06<00:00, 3.40it/s]
Computing concepts: 96%	25/26 [00:07<00:00, 3.92it/s]
Computing concepts: 100%	26/26 [00:07<00:00, 4.36it/s]
Evaluating Φ cuts: 30%	9/30 [00:57<02:18, 6.62s/it]
Computing concepts: 0%	0/26 [00:00<?, ?it/s]
Computing concepts: 4%	1/26 [00:00<00:06, 3.60it/s]
Computing concepts: 8%	2/26 [00:00<00:06, 3.63it/s]
Computing concepts: 12%	3/26 [00:01<00:09, 2.45it/s]
Computing concepts: 15%	4/26 [00:01<00:08, 2.70it/s]
Computing concepts: 19%	5/26 [00:01<00:06, 3.24it/s]
Computing concepts: 23%	6/26 [00:01<00:05, 3.82it/s]
Computing concepts: 27%	7/26 [00:02<00:05, 3.40it/s]
Computing concepts: 35%	9/26 [00:02<00:04, 4.07it/s]
Computing concepts: 42%	11/26 [00:02<00:03, 4.45it/s]
Computing concepts: 46%	12/26 [00:03<00:02, 4.96it/s]
Computing concepts: 50%	13/26 [00:03<00:02, 4.86it/s]
Computing concepts: 54%	14/26 [00:03<00:03, 3.45it/s]
Computing concepts: 58%	15/26 [00:03<00:02, 4.02it/s]
Computing concepts: 62%	16/26 [00:04<00:02, 3.85it/s]
Computing concepts: 65%	17/26 [00:04<00:02, 4.34it/s]
Computing concepts: 73%	19/26 [00:04<00:01, 4.84it/s]
Computing concepts: 77%	20/26 [00:04<00:01, 3.91it/s]

Computing concepts: 81%|██████████ | 21/26 [00:05<00:01, 2.78it/s]
 Computing concepts: 92%|██████████ | 24/26 [00:05<00:00, 3.59it/s]
 Computing concepts: 96%|██████████ | 25/26 [00:06<00:00, 3.34it/s]
 Computing concepts: 100%|██████████ | 26/26 [00:06<00:00, 3.79it/s]
 Evaluating Φ cuts: 33%|██████ | 10/30 [01:04<02:11, 6.56s/it]
 Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]
 Computing concepts: 4%|██ | 1/26 [00:00<00:06, 3.81it/s]
 Computing concepts: 8%|████ | 2/26 [00:01<00:10, 2.38it/s]
 Computing concepts: 12%|██████ | 3/26 [00:01<00:08, 2.70it/s]
 Computing concepts: 15%|████████ | 4/26 [00:01<00:07, 3.14it/s]
 Computing concepts: 19%|██████████ | 5/26 [00:01<00:07, 2.87it/s]
 Computing concepts: 27%|██████████ | 7/26 [00:02<00:05, 3.56it/s]
 Computing concepts: 35%|██████████ | 9/26 [00:02<00:03, 4.37it/s]
 Computing concepts: 38%|██████████ | 10/26 [00:02<00:04, 3.82it/s]
 Computing concepts: 42%|██████████ | 11/26 [00:03<00:04, 3.29it/s]
 Computing concepts: 46%|██████████ | 12/26 [00:03<00:03, 3.67it/s]
 Computing concepts: 50%|██████████ | 13/26 [00:03<00:03, 3.56it/s]
 Computing concepts: 54%|██████████ | 14/26 [00:04<00:03, 3.21it/s]
 Computing concepts: 58%|██████████ | 15/26 [00:04<00:03, 3.42it/s]
 Computing concepts: 62%|██████████ | 16/26 [00:04<00:03, 3.24it/s]
 Computing concepts: 69%|██████████ | 18/26 [00:04<00:02, 3.90it/s]
 Computing concepts: 73%|██████████ | 19/26 [00:05<00:02, 3.23it/s]
 Computing concepts: 77%|██████████ | 20/26 [00:05<00:02, 2.84it/s]
 Computing concepts: 88%|██████████ | 23/26 [00:06<00:00, 3.65it/s]
 Computing concepts: 92%|██████████ | 24/26 [00:06<00:00, 3.21it/s]
 Computing concepts: 96%|██████████ | 25/26 [00:06<00:00, 3.59it/s]
 Computing concepts: 100%|██████████ | 26/26 [00:06<00:00, 3.92it/s]
 Evaluating Φ cuts: 37%|██████ | 11/30 [01:11<02:06, 6.67s/it]
 Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]
 Computing concepts: 4%|██ | 1/26 [00:00<00:04, 5.23it/s]
 Computing concepts: 8%|████ | 2/26 [00:00<00:05, 4.09it/s]
 Computing concepts: 12%|██████ | 3/26 [00:00<00:05, 4.22it/s]
 Computing concepts: 15%|████████ | 4/26 [00:01<00:06, 3.63it/s]
 Computing concepts: 19%|██████████ | 5/26 [00:02<00:09, 2.18it/s]
 Computing concepts: 23%|██████████ | 6/26 [00:02<00:07, 2.59it/s]
 Computing concepts: 27%|██████████ | 7/26 [00:02<00:06, 3.07it/s]
 Computing concepts: 31%|██████████ | 8/26 [00:02<00:06, 2.58it/s]
 Computing concepts: 38%|██████████ | 10/26 [00:03<00:04, 3.27it/s]
 Computing concepts: 46%|██████████ | 12/26 [00:03<00:03, 3.93it/s]
 Computing concepts: 50%|██████████ | 13/26 [00:03<00:03, 3.35it/s]

Computing concepts: 54% | 14/26 [00:04<00:03, 3.59it/s]
 Computing concepts: 58% | 15/26 [00:04<00:03, 3.32it/s]
 Computing concepts: 62% | 16/26 [00:04<00:02, 3.37it/s]
 Computing concepts: 69% | 18/26 [00:05<00:01, 4.02it/s]
 Computing concepts: 73% | 19/26 [00:05<00:01, 3.61it/s]
 Computing concepts: 77% | 20/26 [00:05<00:02, 2.95it/s]
 Computing concepts: 88% | 23/26 [00:06<00:00, 3.76it/s]
 Computing concepts: 92% | 24/26 [00:06<00:00, 4.06it/s]
 Computing concepts: 96% | 25/26 [00:06<00:00, 4.62it/s]
 Computing concepts: 100% | 26/26 [00:06<00:00, 4.95it/s]
 Evaluating Φ cuts: 40% | 12/30 [01:17<02:00, 6.67s/it]
 Computing concepts: 0% | 0/26 [00:00<?, ?it/s]
 Computing concepts: 4% | 1/26 [00:00<00:04, 5.96it/s]
 Computing concepts: 8% | 2/26 [00:00<00:04, 5.49it/s]
 Computing concepts: 12% | 3/26 [00:00<00:04, 5.33it/s]
 Computing concepts: 15% | 4/26 [00:01<00:07, 3.11it/s]
 Computing concepts: 19% | 5/26 [00:01<00:06, 3.27it/s]
 Computing concepts: 23% | 6/26 [00:01<00:05, 3.78it/s]
 Computing concepts: 27% | 7/26 [00:02<00:05, 3.44it/s]
 Computing concepts: 38% | 10/26 [00:02<00:03, 4.58it/s]
 Computing concepts: 42% | 11/26 [00:02<00:03, 4.32it/s]
 Computing concepts: 46% | 12/26 [00:02<00:04, 3.30it/s]
 Computing concepts: 50% | 13/26 [00:03<00:03, 3.41it/s]
 Computing concepts: 54% | 14/26 [00:03<00:03, 3.23it/s]
 Computing concepts: 58% | 15/26 [00:03<00:03, 3.31it/s]
 Computing concepts: 62% | 16/26 [00:03<00:02, 3.74it/s]
 Computing concepts: 69% | 18/26 [00:04<00:01, 4.61it/s]
 Computing concepts: 73% | 19/26 [00:04<00:01, 3.55it/s]
 Computing concepts: 77% | 20/26 [00:05<00:01, 3.15it/s]
 Computing concepts: 88% | 23/26 [00:05<00:00, 4.01it/s]
 Computing concepts: 92% | 24/26 [00:05<00:00, 4.18it/s]
 Computing concepts: 96% | 25/26 [00:05<00:00, 4.39it/s]
 Computing concepts: 100% | 26/26 [00:05<00:00, 4.87it/s]
 Evaluating Φ cuts: 43% | 13/30 [01:23<01:49, 6.45s/it]
 Computing concepts: 0% | 0/26 [00:00<?, ?it/s]
 Computing concepts: 4% | 1/26 [00:00<00:06, 3.97it/s]
 Computing concepts: 8% | 2/26 [00:00<00:06, 3.99it/s]
 Computing concepts: 12% | 3/26 [00:00<00:05, 3.99it/s]
 Computing concepts: 15% | 4/26 [00:01<00:08, 2.70it/s]
 Computing concepts: 19% | 5/26 [00:01<00:07, 2.94it/s]

Computing concepts: 23%		6/26 [00:01<00:05, 3.48it/s]
Computing concepts: 27%		7/26 [00:02<00:05, 3.32it/s]
Computing concepts: 35%		9/26 [00:02<00:04, 4.10it/s]
Computing concepts: 42%		11/26 [00:02<00:03, 4.74it/s]
Computing concepts: 46%		12/26 [00:02<00:03, 4.04it/s]
Computing concepts: 50%		13/26 [00:03<00:02, 4.61it/s]
Computing concepts: 54%		14/26 [00:03<00:03, 3.87it/s]
Computing concepts: 58%		15/26 [00:03<00:02, 4.15it/s]
Computing concepts: 62%		16/26 [00:03<00:02, 4.62it/s]
Computing concepts: 69%		18/26 [00:04<00:01, 5.25it/s]
Computing concepts: 73%		19/26 [00:04<00:01, 4.30it/s]
Computing concepts: 77%		20/26 [00:04<00:01, 3.61it/s]
Computing concepts: 88%		23/26 [00:05<00:00, 4.67it/s]
Computing concepts: 92%		24/26 [00:05<00:00, 4.76it/s]
Computing concepts: 96%		25/26 [00:05<00:00, 5.31it/s]
Computing concepts: 100%		26/26 [00:05<00:00, 5.53it/s]
Evaluating Φ cuts: 47%		14/30 [01:29<01:38, 6.18s/it]
Computing concepts: 0%		0/20 [00:00<?, ?it/s]
Computing concepts: 5%		1/20 [00:00<00:10, 1.87it/s]
Computing concepts: 10%		2/20 [00:00<00:07, 2.38it/s]
Computing concepts: 15%		3/20 [00:00<00:06, 2.69it/s]
Computing concepts: 30%		6/20 [00:01<00:03, 3.64it/s]
Computing concepts: 35%		7/20 [00:01<00:03, 4.07it/s]
Computing concepts: 40%		8/20 [00:01<00:02, 4.79it/s]
Computing concepts: 45%		9/20 [00:01<00:02, 4.45it/s]
Computing concepts: 50%		10/20 [00:01<00:02, 4.80it/s]
Computing concepts: 60%		12/20 [00:02<00:01, 5.76it/s]
Computing concepts: 65%		13/20 [00:02<00:01, 4.88it/s]
Computing concepts: 70%		14/20 [00:02<00:01, 4.45it/s]
Computing concepts: 85%		17/20 [00:02<00:00, 5.74it/s]
Computing concepts: 90%		18/20 [00:02<00:00, 5.79it/s]
Computing concepts: 95%		19/20 [00:03<00:00, 6.43it/s]
Computing concepts: 100%		20/20 [00:03<00:00, 6.74it/s]
Evaluating Φ cuts: 50%		15/30 [01:32<01:19, 5.29s/it]
Computing concepts: 0%		0/20 [00:00<?, ?it/s]
Computing concepts: 5%		1/20 [00:01<00:19, 1.03s/it]
Computing concepts: 10%		2/20 [00:01<00:14, 1.25it/s]
Computing concepts: 15%		3/20 [00:01<00:12, 1.41it/s]
Computing concepts: 30%		6/20 [00:01<00:07, 1.94it/s]
Computing concepts: 35%		7/20 [00:02<00:05, 2.27it/s]
Computing concepts: 40%		8/20 [00:02<00:04, 2.82it/s]
Computing concepts: 45%		9/20 [00:02<00:04, 2.48it/s]

Computing concepts: 50%|██████ | 10/20 [00:03<00:03, 2.77it/s]
 Computing concepts: 60%|██████ | 12/20 [00:03<00:02, 3.41it/s]
 Computing concepts: 65%|██████ | 13/20 [00:03<00:02, 2.81it/s]
 Computing concepts: 70%|██████ | 14/20 [00:04<00:02, 2.51it/s]
 Computing concepts: 85%|██████ | 17/20 [00:04<00:00, 3.25it/s]
 Computing concepts: 90%|██████ | 18/20 [00:04<00:00, 3.40it/s]
 Computing concepts: 95%|██████ | 19/20 [00:05<00:00, 3.97it/s]
 Computing concepts: 100%|██████ | 20/20 [00:05<00:00, 4.49it/s]
 Evaluating Φ cuts: 53%|██████ | 16/30 [01:37<01:14, 5.31s/it]
 Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]
 Computing concepts: 4%| | 1/26 [00:00<00:07, 3.51it/s]
 Computing concepts: 8%| | 2/26 [00:00<00:05, 4.10it/s]
 Computing concepts: 12%| | 3/26 [00:00<00:05, 3.92it/s]
 Computing concepts: 15%| | 4/26 [00:01<00:08, 2.66it/s]
 Computing concepts: 19%| | 5/26 [00:01<00:06, 3.09it/s]
 Computing concepts: 23%| | 6/26 [00:01<00:05, 3.63it/s]
 Computing concepts: 27%| | 7/26 [00:02<00:05, 3.46it/s]
 Computing concepts: 35%| | 9/26 [00:02<00:04, 4.09it/s]
 Computing concepts: 42%| | 11/26 [00:02<00:03, 4.97it/s]
 Computing concepts: 46%| | 12/26 [00:03<00:04, 3.44it/s]
 Computing concepts: 50%| | 13/26 [00:03<00:03, 3.90it/s]
 Computing concepts: 54%| | 14/26 [00:03<00:03, 3.52it/s]
 Computing concepts: 58%| | 15/26 [00:03<00:03, 3.52it/s]
 Computing concepts: 62%| | 16/26 [00:03<00:02, 4.11it/s]
 Computing concepts: 69%| | 18/26 [00:04<00:01, 4.99it/s]
 Computing concepts: 73%| | 19/26 [00:04<00:02, 3.44it/s]
 Computing concepts: 77%| | 20/26 [00:05<00:01, 3.18it/s]
 Computing concepts: 88%| | 23/26 [00:05<00:00, 4.06it/s]
 Computing concepts: 92%| | 24/26 [00:05<00:00, 3.81it/s]
 Computing concepts: 96%| | 25/26 [00:05<00:00, 4.35it/s]
 Computing concepts: 100%| | 26/26 [00:05<00:00, 4.75it/s]
 Evaluating Φ cuts: 57%|██████ | 17/30 [01:43<01:11, 5.51s/it]
 Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]
 Computing concepts: 4%| | 1/26 [00:00<00:04, 6.14it/s]
 Computing concepts: 8%| | 2/26 [00:00<00:04, 5.01it/s]
 Computing concepts: 12%| | 3/26 [00:00<00:04, 4.63it/s]
 Computing concepts: 15%| | 4/26 [00:01<00:08, 2.73it/s]
 Computing concepts: 19%| | 5/26 [00:01<00:06, 3.07it/s]
 Computing concepts: 23%| | 6/26 [00:01<00:05, 3.64it/s]
 Computing concepts: 27%| | 7/26 [00:02<00:05, 3.31it/s]

Computing concepts: 38%|██████ | 10/26 [00:02<00:03, 4.39it/s]
 Computing concepts: 42%|██████ | 11/26 [00:02<00:03, 4.16it/s]
 Computing concepts: 46%|██████ | 12/26 [00:03<00:04, 3.09it/s]
 Computing concepts: 50%|██████ | 13/26 [00:03<00:03, 3.26it/s]
 Computing concepts: 54%|██████ | 14/26 [00:03<00:04, 2.74it/s]
 Computing concepts: 58%|██████ | 15/26 [00:04<00:03, 3.17it/s]
 Computing concepts: 62%|██████ | 16/26 [00:04<00:02, 3.70it/s]
 Computing concepts: 69%|██████ | 18/26 [00:04<00:01, 4.31it/s]
 Computing concepts: 73%|██████ | 19/26 [00:04<00:01, 3.73it/s]
 Computing concepts: 77%|██████ | 20/26 [00:05<00:01, 3.37it/s]
 Computing concepts: 88%|██████ | 23/26 [00:05<00:00, 4.36it/s]
 Computing concepts: 92%|██████ | 24/26 [00:05<00:00, 4.14it/s]
 Computing concepts: 96%|██████ | 25/26 [00:05<00:00, 4.65it/s]
 Computing concepts: 100%|██████ | 26/26 [00:06<00:00, 5.02it/s]
 Evaluating Φ cuts: 60%|██████ | 18/30 [01:50<01:08, 5.69s/it]
 Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]
 Computing concepts: 4%| | 1/26 [00:00<00:03, 6.80it/s]
 Computing concepts: 8%| | 2/26 [00:00<00:04, 5.89it/s]
 Computing concepts: 12%| | 3/26 [00:00<00:03, 6.13it/s]
 Computing concepts: 15%| | 4/26 [00:00<00:03, 5.59it/s]
 Computing concepts: 19%| | 5/26 [00:01<00:06, 3.06it/s]
 Computing concepts: 23%| | 6/26 [00:01<00:05, 3.72it/s]
 Computing concepts: 27%| | 7/26 [00:01<00:04, 4.29it/s]
 Computing concepts: 31%| | 8/26 [00:02<00:04, 3.80it/s]
 Computing concepts: 38%| | 10/26 [00:02<00:03, 4.50it/s]
 Computing concepts: 46%| | 12/26 [00:02<00:02, 5.39it/s]
 Computing concepts: 50%| | 13/26 [00:02<00:02, 4.36it/s]
 Computing concepts: 54%| | 14/26 [00:03<00:02, 4.26it/s]
 Computing concepts: 58%| | 15/26 [00:03<00:02, 3.76it/s]
 Computing concepts: 62%| | 16/26 [00:03<00:02, 4.06it/s]
 Computing concepts: 69%| | 18/26 [00:03<00:01, 4.94it/s]
 Computing concepts: 73%| | 19/26 [00:04<00:01, 4.23it/s]
 Computing concepts: 77%| | 20/26 [00:04<00:01, 3.84it/s]
 Computing concepts: 88%| | 23/26 [00:04<00:00, 4.94it/s]
 Computing concepts: 92%| | 24/26 [00:04<00:00, 4.63it/s]
 Computing concepts: 96%| | 25/26 [00:05<00:00, 5.07it/s]
 Computing concepts: 100%| | 26/26 [00:05<00:00, 5.43it/s]
 Evaluating Φ cuts: 63%| | 19/30 [01:55<01:01, 5.55s/it]
 Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]
 Computing concepts: 4%| | 1/26 [00:00<00:07, 3.51it/s]

Computing concepts: 8% | 2/26 [00:01<00:10, 2.30it/s]

Computing concepts: 12% | 3/26 [00:01<00:08, 2.61it/s]

Computing concepts: 15% | 4/26 [00:01<00:06, 3.18it/s]

Computing concepts: 19% | 5/26 [00:01<00:07, 2.70it/s]

Computing concepts: 27% | 7/26 [00:02<00:05, 3.34it/s]

Computing concepts: 35% | 9/26 [00:02<00:03, 4.27it/s]

Computing concepts: 38% | 10/26 [00:02<00:03, 4.17it/s]

Computing concepts: 42% | 11/26 [00:03<00:04, 3.01it/s]

Computing concepts: 46% | 12/26 [00:03<00:03, 3.53it/s]

Computing concepts: 50% | 13/26 [00:03<00:03, 3.58it/s]

Computing concepts: 54% | 14/26 [00:04<00:03, 3.28it/s]

Computing concepts: 58% | 15/26 [00:04<00:02, 3.86it/s]

Computing concepts: 62% | 16/26 [00:04<00:02, 4.06it/s]

Computing concepts: 69% | 18/26 [00:04<00:01, 4.70it/s]

Computing concepts: 73% | 19/26 [00:05<00:01, 3.95it/s]

Computing concepts: 77% | 20/26 [00:05<00:01, 3.31it/s]

Computing concepts: 88% | 23/26 [00:05<00:00, 4.06it/s]

Computing concepts: 92% | 24/26 [00:05<00:00, 4.21it/s]

Computing concepts: 96% | 25/26 [00:06<00:00, 4.71it/s]

Computing concepts: 100% | 26/26 [00:06<00:00, 5.02it/s]

Evaluating Φ cuts: 67% | 20/30 [02:01<00:57, 5.80s/it]

Computing concepts: 0% | 0/26 [00:00<?, ?it/s]

Computing concepts: 4% | 1/26 [00:00<00:05, 4.31it/s]

Computing concepts: 8% | 2/26 [00:00<00:05, 4.11it/s]

Computing concepts: 12% | 3/26 [00:01<00:08, 2.69it/s]

Computing concepts: 15% | 4/26 [00:01<00:07, 3.13it/s]

Computing concepts: 19% | 5/26 [00:01<00:05, 3.73it/s]

Computing concepts: 23% | 6/26 [00:01<00:04, 4.28it/s]

Computing concepts: 27% | 7/26 [00:02<00:05, 3.80it/s]

Computing concepts: 35% | 9/26 [00:02<00:03, 4.67it/s]

Computing concepts: 42% | 11/26 [00:02<00:02, 5.01it/s]

Computing concepts: 46% | 12/26 [00:02<00:02, 5.38it/s]

Computing concepts: 50% | 13/26 [00:02<00:02, 4.85it/s]

Computing concepts: 54% | 14/26 [00:03<00:02, 4.10it/s]

Computing concepts: 58% | 15/26 [00:03<00:02, 4.65it/s]

Computing concepts: 62% | 16/26 [00:03<00:02, 4.60it/s]

Computing concepts: 65% | 17/26 [00:03<00:01, 5.22it/s]

Computing concepts: 73% | 19/26 [00:03<00:01, 6.09it/s]

Computing concepts: 77% | 20/26 [00:04<00:01, 4.56it/s]

Computing concepts: 81% | 21/26 [00:04<00:01, 3.92it/s]

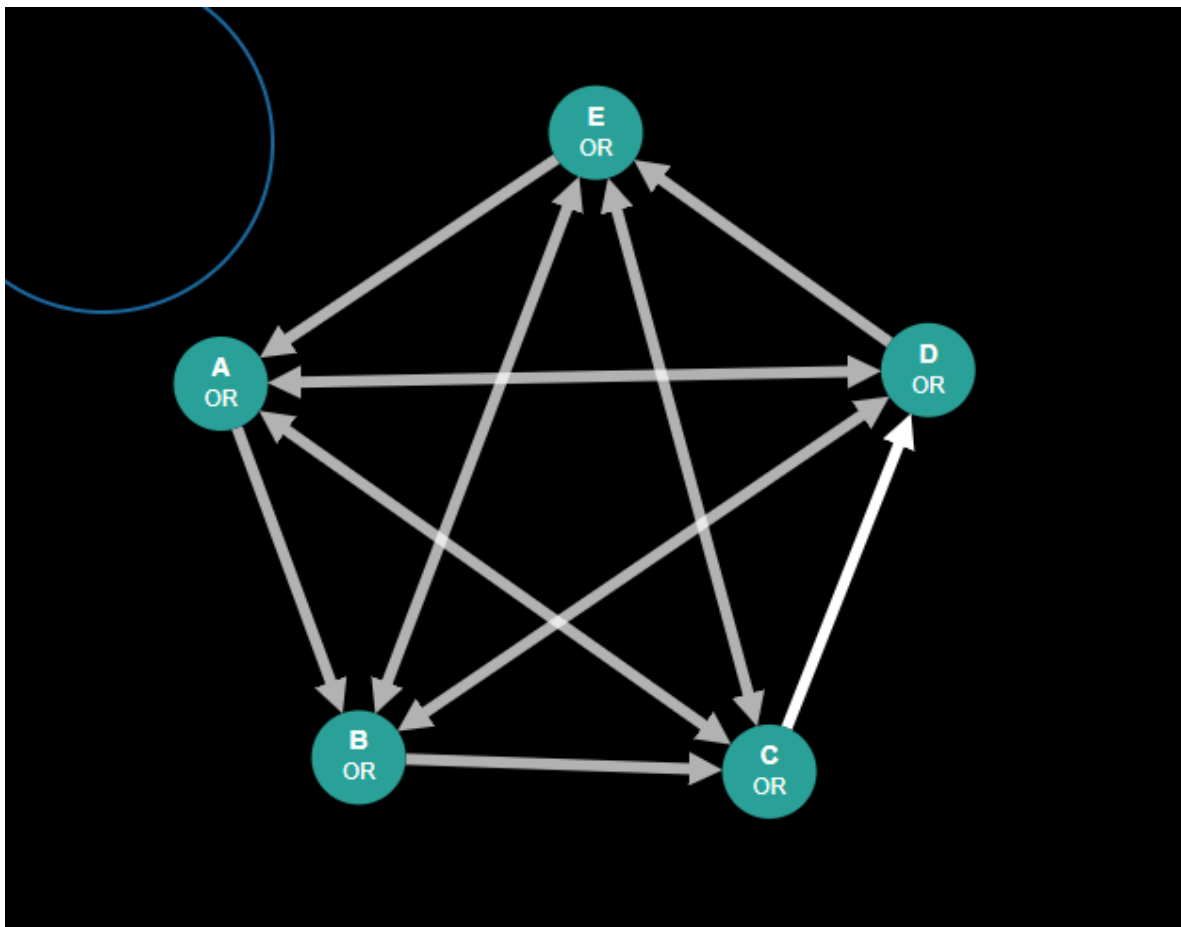
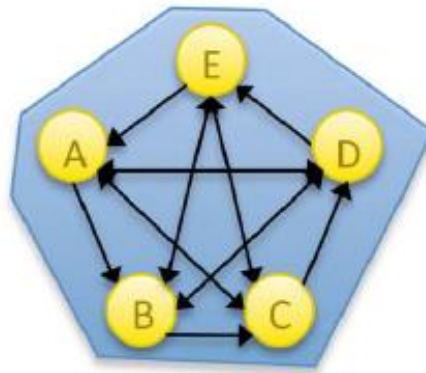
Computing concepts: 92% | ██████████ | 24/26 [00:04<00:00, 4.88it/s]
 Computing concepts: 96% | ██████████ | 25/26 [00:05<00:00, 4.91it/s]
 Computing concepts: 100% | ██████████ | 26/26 [00:05<00:00, 5.30it/s]
 Evaluating Φ cuts: 70% | ██████████ | 21/30 [02:06<00:50, 5.66s/it]
 Computing concepts: 0% | | 0/26 [00:00<?, ?it/s]
 Computing concepts: 4% | | 1/26 [00:00<00:03, 6.51it/s]
 Computing concepts: 8% | | 2/26 [00:00<00:04, 5.50it/s]
 Computing concepts: 12% | | 3/26 [00:00<00:04, 4.92it/s]
 Computing concepts: 15% | | 4/26 [00:01<00:08, 2.73it/s]
 Computing concepts: 19% | | 5/26 [00:01<00:07, 2.96it/s]
 Computing concepts: 23% | | 6/26 [00:02<00:06, 2.92it/s]
 Computing concepts: 31% | | 8/26 [00:02<00:05, 3.57it/s]
 Computing concepts: 38% | | 10/26 [00:02<00:03, 4.58it/s]
 Computing concepts: 42% | | 11/26 [00:02<00:03, 4.50it/s]
 Computing concepts: 46% | | 12/26 [00:03<00:03, 3.82it/s]
 Computing concepts: 50% | | 13/26 [00:03<00:03, 4.11it/s]
 Computing concepts: 54% | | 14/26 [00:03<00:03, 3.58it/s]
 Computing concepts: 58% | | 15/26 [00:03<00:02, 4.22it/s]
 Computing concepts: 62% | | 16/26 [00:03<00:02, 4.76it/s]
 Computing concepts: 69% | | 18/26 [00:04<00:01, 5.33it/s]
 Computing concepts: 73% | | 19/26 [00:04<00:01, 4.33it/s]
 Computing concepts: 77% | | 20/26 [00:04<00:01, 3.67it/s]
 Computing concepts: 88% | | 23/26 [00:05<00:00, 4.75it/s]
 Computing concepts: 92% | | 24/26 [00:05<00:00, 4.93it/s]
 Computing concepts: 96% | | 25/26 [00:05<00:00, 5.24it/s]
 Computing concepts: 100% | | 26/26 [00:05<00:00, 5.56it/s]
 Evaluating Φ cuts: 73% | | 22/30 [02:12<00:45, 5.64s/it]
 Computing concepts: 0% | | 0/20 [00:00<?, ?it/s]
 Computing concepts: 5% | | 1/20 [00:00<00:02, 7.24it/s]
 Computing concepts: 10% | | 2/20 [00:00<00:02, 6.87it/s]
 Computing concepts: 15% | | 3/20 [00:00<00:04, 3.79it/s]
 Computing concepts: 20% | | 4/20 [00:00<00:03, 4.47it/s]
 Computing concepts: 25% | | 5/20 [00:01<00:03, 4.13it/s]
 Computing concepts: 35% | | 7/20 [00:01<00:02, 5.13it/s]
 Computing concepts: 45% | | 9/20 [00:01<00:01, 5.68it/s]
 Computing concepts: 50% | | 10/20 [00:01<00:01, 5.75it/s]
 Computing concepts: 55% | | 11/20 [00:02<00:01, 4.94it/s]
 Computing concepts: 60% | | 12/20 [00:02<00:01, 5.52it/s]
 Computing concepts: 70% | | 14/20 [00:02<00:00, 6.57it/s]
 Computing concepts: 75% | | 15/20 [00:02<00:00, 5.53it/s]
 Computing concepts: 90% | | 18/20 [00:02<00:00, 6.82it/s]

Computing concepts: 95%|██████████| 19/20 [00:03<00:00, 6.72it/s]
 Computing concepts: 100%|██████████| 20/20 [00:03<00:00, 6.97it/s]
 Evaluating Φ cuts: 77%|██████████| 23/30 [02:15<00:34, 4.92s/it]
 Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]
 Computing concepts: 4%| | 1/26 [00:00<00:03, 6.51it/s]
 Computing concepts: 8%| | 2/26 [00:00<00:04, 5.18it/s]
 Computing concepts: 12%| | 3/26 [00:01<00:09, 2.44it/s]
 Computing concepts: 15%| | 4/26 [00:01<00:07, 2.75it/s]
 Computing concepts: 19%| | 5/26 [00:01<00:06, 3.30it/s]
 Computing concepts: 23%| | 6/26 [00:02<00:06, 2.97it/s]
 Computing concepts: 31%| | 8/26 [00:02<00:04, 3.62it/s]
 Computing concepts: 38%| | 10/26 [00:02<00:03, 4.57it/s]
 Computing concepts: 42%| | 11/26 [00:02<00:03, 4.31it/s]
 Computing concepts: 46%| | 12/26 [00:03<00:04, 3.20it/s]
 Computing concepts: 50%| | 13/26 [00:03<00:03, 3.77it/s]
 Computing concepts: 54%| | 14/26 [00:03<00:03, 3.75it/s]
 Computing concepts: 58%| | 15/26 [00:04<00:03, 3.21it/s]
 Computing concepts: 62%| | 16/26 [00:04<00:02, 3.75it/s]
 Computing concepts: 65%| | 17/26 [00:04<00:02, 3.80it/s]
 Computing concepts: 73%| | 19/26 [00:04<00:01, 4.57it/s]
 Computing concepts: 77%| | 20/26 [00:05<00:01, 3.60it/s]
 Computing concepts: 81%| | 21/26 [00:05<00:01, 2.90it/s]
 Computing concepts: 92%| | 24/26 [00:06<00:00, 3.77it/s]
 Computing concepts: 96%| | 25/26 [00:06<00:00, 3.92it/s]
 Computing concepts: 100%| | 26/26 [00:06<00:00, 4.45it/s]
 Evaluating Φ cuts: 80%|██████████| 24/30 [02:22<00:32, 5.39s/it]
 Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]
 Computing concepts: 4%| | 1/26 [00:00<00:03, 6.51it/s]
 Computing concepts: 8%| | 2/26 [00:00<00:04, 5.33it/s]
 Computing concepts: 12%| | 3/26 [00:00<00:04, 5.68it/s]
 Computing concepts: 15%| | 4/26 [00:00<00:03, 5.59it/s]
 Computing concepts: 19%| | 5/26 [00:01<00:06, 3.13it/s]
 Computing concepts: 23%| | 6/26 [00:01<00:05, 3.52it/s]
 Computing concepts: 27%| | 7/26 [00:01<00:05, 3.33it/s]
 Computing concepts: 35%| | 9/26 [00:02<00:04, 4.15it/s]
 Computing concepts: 42%| | 11/26 [00:02<00:02, 5.05it/s]
 Computing concepts: 46%| | 12/26 [00:02<00:03, 4.20it/s]
 Computing concepts: 50%| | 13/26 [00:02<00:02, 4.60it/s]
 Computing concepts: 54%| | 14/26 [00:03<00:02, 4.42it/s]
 Computing concepts: 58%| | 15/26 [00:03<00:02, 3.78it/s]

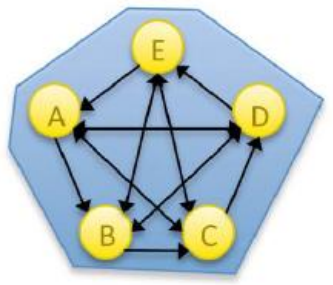
Computing concepts: 62%|██████ | 16/26 [00:03<00:02, 3.92it/s]
 Computing concepts: 65%|██████ | 17/26 [00:03<00:02, 3.66it/s]
 Computing concepts: 69%|██████ | 18/26 [00:04<00:02, 3.98it/s]
 Computing concepts: 77%|██████ | 20/26 [00:04<00:01, 4.10it/s]
 Computing concepts: 81%|██████ | 21/26 [00:04<00:01, 3.70it/s]
 Computing concepts: 92%|██████ | 24/26 [00:05<00:00, 4.71it/s]
 Computing concepts: 96%|██████ | 25/26 [00:05<00:00, 4.45it/s]
 Computing concepts: 100%|██████ | 26/26 [00:05<00:00, 4.60it/s]
 Evaluating Φ cuts: 83%|██████ | 25/30 [02:27<00:27, 5.49s/it]
 Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]
 Computing concepts: 4%| | 1/26 [00:00<00:06, 3.71it/s]
 Computing concepts: 8%| | 2/26 [00:00<00:06, 3.65it/s]
 Computing concepts: 12%| | 3/26 [00:01<00:08, 2.56it/s]
 Computing concepts: 15%| | 4/26 [00:01<00:07, 2.94it/s]
 Computing concepts: 19%| | 5/26 [00:01<00:06, 3.48it/s]
 Computing concepts: 23%| | 6/26 [00:01<00:05, 3.70it/s]
 Computing concepts: 27%| | 7/26 [00:02<00:05, 3.28it/s]
 Computing concepts: 35%| | 9/26 [00:02<00:04, 3.80it/s]
 Computing concepts: 42%| | 11/26 [00:02<00:03, 4.79it/s]
 Computing concepts: 46%| | 12/26 [00:03<00:03, 4.32it/s]
 Computing concepts: 50%| | 13/26 [00:03<00:03, 3.74it/s]
 Computing concepts: 54%| | 14/26 [00:03<00:02, 4.06it/s]
 Computing concepts: 58%| | 15/26 [00:03<00:03, 3.42it/s]
 Computing concepts: 62%| | 16/26 [00:04<00:02, 3.98it/s]
 Computing concepts: 65%| | 17/26 [00:04<00:02, 4.24it/s]
 Computing concepts: 69%| | 18/26 [00:04<00:01, 4.78it/s]
 Computing concepts: 77%| | 20/26 [00:04<00:01, 5.49it/s]
 Computing concepts: 81%| | 21/26 [00:05<00:01, 4.49it/s]
 Computing concepts: 85%| | 22/26 [00:05<00:01, 3.85it/s]
 Computing concepts: 96%| | 25/26 [00:05<00:00, 4.87it/s]
 Computing concepts: 100%| | 26/26 [00:05<00:00, 5.27it/s]
 Evaluating Φ cuts: 87%|██████ | 26/30 [02:33<00:22, 5.58s/it]
 Computing concepts: 0%| | 0/20 [00:00<?, ?it/s]
 Computing concepts: 5%| | 1/20 [00:00<00:03, 5.61it/s]
 Computing concepts: 10%| | 2/20 [00:00<00:02, 6.19it/s]
 Computing concepts: 15%| | 3/20 [00:00<00:04, 3.73it/s]
 Computing concepts: 20%| | 4/20 [00:00<00:03, 4.40it/s]
 Computing concepts: 30%| | 6/20 [00:01<00:02, 5.42it/s]
 Computing concepts: 40%| | 8/20 [00:01<00:01, 6.42it/s]
 Computing concepts: 45%| | 9/20 [00:01<00:02, 5.40it/s]
 Computing concepts: 50%| | 10/20 [00:01<00:01, 5.69it/s]

Computing concepts: 55%		11/20 [00:01<00:01, 4.95it/s]
Computing concepts: 60%		12/20 [00:02<00:01, 5.52it/s]
Computing concepts: 65%		13/20 [00:02<00:01, 5.80it/s]
Computing concepts: 75%		15/20 [00:02<00:00, 6.20it/s]
Computing concepts: 80%		16/20 [00:02<00:00, 5.22it/s]
Computing concepts: 95%		19/20 [00:03<00:00, 6.42it/s]
Computing concepts: 100%		20/20 [00:03<00:00, 6.86it/s]
Evaluating Φ cuts: 90%		27/30 [02:36<00:14, 4.86s/it]
Computing concepts: 0%		0/26 [00:00<?, ?it/s]
Computing concepts: 4%		1/26 [00:00<00:04, 5.77it/s]
Computing concepts: 8%		2/26 [00:00<00:04, 4.86it/s]
Computing concepts: 12%		3/26 [00:00<00:05, 4.58it/s]
Computing concepts: 15%		4/26 [00:01<00:08, 2.72it/s]
Computing concepts: 19%		5/26 [00:01<00:07, 2.92it/s]
Computing concepts: 23%		6/26 [00:01<00:05, 3.49it/s]
Computing concepts: 27%		7/26 [00:02<00:04, 4.01it/s]
Computing concepts: 31%		8/26 [00:02<00:05, 3.51it/s]
Computing concepts: 38%		10/26 [00:02<00:03, 4.27it/s]
Computing concepts: 46%		12/26 [00:02<00:02, 5.28it/s]
Computing concepts: 50%		13/26 [00:03<00:02, 5.07it/s]
Computing concepts: 54%		14/26 [00:03<00:03, 3.87it/s]
Computing concepts: 58%		15/26 [00:03<00:02, 4.50it/s]
Computing concepts: 62%		16/26 [00:03<00:02, 4.44it/s]
Computing concepts: 65%		17/26 [00:04<00:02, 3.82it/s]
Computing concepts: 69%		18/26 [00:04<00:02, 4.00it/s]
Computing concepts: 77%		20/26 [00:04<00:01, 4.82it/s]
Computing concepts: 81%		21/26 [00:04<00:01, 3.93it/s]
Computing concepts: 85%		22/26 [00:05<00:01, 3.46it/s]
Computing concepts: 96%		25/26 [00:05<00:00, 4.44it/s]
Computing concepts: 100%		26/26 [00:05<00:00, 4.90it/s]
Evaluating Φ cuts: 93%		28/30 [02:42<00:10, 5.12s/it]
Computing concepts: 0%		0/20 [00:00<?, ?it/s]
Computing concepts: 5%		1/20 [00:00<00:03, 5.91it/s]
Computing concepts: 10%		2/20 [00:00<00:03, 5.75it/s]
Computing concepts: 15%		3/20 [00:00<00:02, 5.80it/s]
Computing concepts: 20%		4/20 [00:01<00:04, 3.63it/s]
Computing concepts: 25%		5/20 [00:01<00:03, 4.11it/s]
Computing concepts: 30%		6/20 [00:01<00:02, 4.75it/s]
Computing concepts: 35%		7/20 [00:01<00:02, 4.42it/s]
Computing concepts: 50%		10/20 [00:01<00:01, 5.35it/s]
Computing concepts: 55%		11/20 [00:02<00:01, 5.87it/s]

Computing concepts: 60%|██████████ | 12/20 [00:02<00:01, 5.73it/s]
 Computing concepts: 65%|██████████ | 13/20 [00:02<00:01, 5.63it/s]
 Computing concepts: 70%|██████████ | 14/20 [00:02<00:00, 6.03it/s]
 Computing concepts: 80%|██████████ | 16/20 [00:02<00:00, 6.20it/s]
 Computing concepts: 85%|██████████ | 17/20 [00:03<00:00, 5.22it/s]
 Computing concepts: 100%|██████████ | 20/20 [00:03<00:00, 6.42it/s]
 Evaluating Φ cuts: 97%|██████████ | 29/30 [02:46<00:04, 4.59s/it]
 Computing concepts: 0%| | 0/20 [00:00<?, ?it/s]
 Computing concepts: 5%| | 1/20 [00:00<00:03, 4.99it/s]
 Computing concepts: 10%| | 2/20 [00:00<00:03, 4.99it/s]
 Computing concepts: 15%| | 3/20 [00:00<00:05, 3.33it/s]
 Computing concepts: 20%| | 4/20 [00:01<00:04, 3.77it/s]
 Computing concepts: 25%| | 5/20 [00:01<00:03, 4.38it/s]
 Computing concepts: 30%| | 6/20 [00:01<00:03, 4.13it/s]
 Computing concepts: 40%| | 8/20 [00:01<00:02, 5.01it/s]
 Computing concepts: 50%| | 10/20 [00:01<00:01, 6.23it/s]
 Computing concepts: 55%| | 11/20 [00:02<00:01, 5.80it/s]
 Computing concepts: 60%| | 12/20 [00:02<00:01, 4.78it/s]
 Computing concepts: 65%| | 13/20 [00:02<00:01, 4.31it/s]
 Computing concepts: 70%| | 14/20 [00:02<00:01, 5.03it/s]
 Computing concepts: 80%| | 16/20 [00:02<00:00, 5.90it/s]
 Computing concepts: 85%| | 17/20 [00:03<00:00, 5.06it/s]
 Computing concepts: 100%| | 20/20 [00:03<00:00, 6.58it/s]

Grafo 9

→ Estado-nodo

Entrada de datos	Medida de distancia	Esquema de partición	Resultados con CM	Resultados sin CM
Grafo: 	EMD	biparticion	MIP: Cut [A, C] — / /— → [B, D, E] Phi: $\Phi = 0.056123$ Time: 58.900532 s	MIP: Cut [A, C] — / /— → [B, D, E] Phi: $\Phi = 0.056123$ Time: 92.620368 s
<pre>tpm = np.array([[0,0,0,0,0], [0,1,1,1,0], [0,0,1,1,1], [0,1,1,1,1], [1,0,0,1,1], [1,1,1,1,1], [1,0,1,1,1], [1,1,1,1,1], [1,1,0,0,1], [1,1,1,1,1], [1,1,1,1,1], [1,1,1,1,1], [1,1,0,1,1], [1,1,1,1,1], [1,1,1,1,1], [1,1,1,1,1], [1,1,1,1,1], [1,1,1,0,0], [1,1,1,1,0], [1,1,1,1,1], [1,1,1,1,1], [1,1,1,1,1], [1,1,1,1,1], [1,1,1,1,1], [1,1,1,1,1], [1,1,1,0,1], [1,1,1,1,1], [1,1,1,1,1], [1,1,1,1,1], [1,1,1,1,1], [1,1,1,1,1], [1,1,1,1,1],])</pre>	EMD	tripartición	MIP: Cut [A, C] — / /— → [B, D, E] Phi: $\Phi = 0.056123$ Time: 59.000532 s	MIP: Cut [A, C] — / /— → [B, D, E] Phi: $\Phi = 0.056123$ Time: 92.634038 s
	KLD	bipartición	MIP: Cut [A, C] — / /— → [B, D, E] Phi: $\Phi = 0.056123$ Time: 57.287965 s	MIP: Cut [A, C] — / /— → [B, D, E] Phi: $\Phi = 0.056123$ Time: 94.820368 s
	KLD	tripartición	MIP: Cut [A, C] — / /— → [B, D, E] Phi: $\Phi = 0.056123$ Time: 58. <u>809456</u> s	MIP: Cut [A, C] — / /— → [B, D, E] Phi: $\Phi = 0.056123$ Time: 93.314567 s

```
cm = np.array([
[0,1,1,1,0],
[0,0,1,1,1],
[1,0,0,1,1],
[1,1,0,0,1],
[1,1,1,0,0]
])
```

- Variación en el tiempo y consumo en las diferentes particiones con CM**

Evaluating Φ cuts: 0%| | 0/30 [00:00<?, ?it/s]
Computing concepts: 0%| | 0/20 [00:00<?, ?it/s]
Computing concepts: 10%| | 2/20 [00:00<00:00, 19.95it/s]
Computing concepts: 15%| | 3/20 [00:00<00:01, 10.37it/s]
Computing concepts: 30%| | 6/20 [00:00<00:01, 12.00it/s]
Computing concepts: 55%| | 11/20 [00:00<00:00, 15.22it/s]
Computing concepts: 65%| | 13/20 [00:00<00:00, 13.75it/s]
Computing concepts: 85%| | 17/20 [00:00<00:00, 16.01it/s]
Evaluating Φ cuts: 3%| | 1/30 [00:00<00:27, 1.05it/s]
Computing concepts: 0%| | 0/20 [00:00<?, ?it/s]
Computing concepts: 15%| | 3/20 [00:00<00:00, 21.74it/s]
Computing concepts: 20%| | 4/20 [00:00<00:01, 11.41it/s]
Computing concepts: 35%| | 7/20 [00:00<00:00, 13.15it/s]
Computing concepts: 50%| | 10/20 [00:00<00:00, 15.78it/s]
Computing concepts: 70%| | 14/20 [00:00<00:00, 18.88it/s]
Computing concepts: 85%| | 17/20 [00:00<00:00, 18.52it/s]
Evaluating Φ cuts: 7%| | 2/30 [00:01<00:26, 1.06it/s]
Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]
Computing concepts: 15%| | 4/26 [00:00<00:01, 17.29it/s]
Computing concepts: 31%| | 8/26 [00:00<00:00, 19.86it/s]
Computing concepts: 54%| | 14/26 [00:00<00:00, 24.17it/s]
Computing concepts: 69%| | 18/26 [00:00<00:00, 27.41it/s]
Computing concepts: 85%| | 22/26 [00:00<00:00, 27.35it/s]
Evaluating Φ cuts: 10%| | 3/30 [00:02<00:24, 1.11it/s]
Computing concepts: 0%| | 0/20 [00:00<?, ?it/s]
Computing concepts: 15%| | 3/20 [00:00<00:01, 11.41it/s]
Computing concepts: 40%| | 8/20 [00:00<00:00, 14.36it/s]
Computing concepts: 50%| | 10/20 [00:00<00:00, 14.60it/s]
Computing concepts: 60%| | 12/20 [00:00<00:00, 15.88it/s]

Computing concepts: 75% | ██████████ | 15/20 [00:00<00:00, 17.01it/s]
 Computing concepts: 95% | ██████████ | 19/20 [00:00<00:00, 19.87it/s]
 Evaluating Φ cuts: 13% | ████ | 4/30 [00:03<00:23, 1.09it/s]
 Computing concepts: 0% | | 0/26 [00:00<?, ?it/s]
 Computing concepts: 4% | ████ | 1/26 [00:00<00:05, 4.49it/s]
 Computing concepts: 12% | ████████ | 3/26 [00:01<00:06, 3.43it/s]
 Computing concepts: 27% | ████████ | 7/26 [00:01<00:04, 4.63it/s]
 Computing concepts: 35% | ████████ | 9/26 [00:01<00:03, 5.59it/s]
 Computing concepts: 46% | ████████ | 12/26 [00:01<00:02, 6.57it/s]
 Computing concepts: 50% | ████████ | 13/26 [00:02<00:02, 4.75it/s]
 Computing concepts: 58% | ████████ | 15/26 [00:02<00:02, 4.64it/s]
 Computing concepts: 69% | ████████ | 18/26 [00:02<00:01, 6.21it/s]
 Computing concepts: 81% | ████████ | 21/26 [00:02<00:00, 7.95it/s]
 Computing concepts: 88% | ████████ | 23/26 [00:03<00:00, 6.40it/s]
 Evaluating Φ cuts: 17% | ████████ | 5/30 [00:07<00:41, 1.65s/it]
 Computing concepts: 0% | | 0/26 [00:00<?, ?it/s]
 Computing concepts: 15% | ████████ | 4/26 [00:00<00:00, 34.52it/s]
 Computing concepts: 23% | ████████ | 6/26 [00:00<00:00, 21.90it/s]
 Computing concepts: 42% | ████████ | 11/26 [00:00<00:00, 26.33it/s]
 Computing concepts: 54% | ████████ | 14/26 [00:00<00:00, 25.17it/s]
 Computing concepts: 65% | ████████ | 17/26 [00:00<00:00, 25.38it/s]
 Computing concepts: 81% | ████████ | 21/26 [00:00<00:00, 25.57it/s]
 Evaluating Φ cuts: 20% | ████████ | 6/30 [00:07<00:33, 1.41s/it]
 Computing concepts: 0% | | 0/26 [00:00<?, ?it/s]
 Computing concepts: 23% | ████████ | 6/26 [00:00<00:00, 59.06it/s]
 Computing concepts: 42% | ████████ | 11/26 [00:00<00:00, 37.04it/s]
 Computing concepts: 65% | ████████ | 17/26 [00:00<00:00, 36.99it/s]
 Computing concepts: 81% | ████████ | 21/26 [00:00<00:00, 18.46it/s]
 Evaluating Φ cuts: 23% | ████████ | 7/30 [00:08<00:29, 1.30s/it]
 Computing concepts: 0% | | 0/20 [00:00<?, ?it/s]
 Computing concepts: 15% | ████████ | 3/20 [00:00<00:01, 10.53it/s]
 Computing concepts: 25% | ████████ | 5/20 [00:00<00:01, 12.27it/s]
 Computing concepts: 45% | ████████ | 9/20 [00:00<00:00, 14.69it/s]
 Computing concepts: 55% | ████████ | 11/20 [00:00<00:00, 14.84it/s]
 Computing concepts: 75% | ████████ | 15/20 [00:00<00:00, 16.71it/s]
 Evaluating Φ cuts: 27% | ████████ | 8/30 [00:09<00:26, 1.20s/it]
 Computing concepts: 0% | | 0/26 [00:00<?, ?it/s]
 Computing concepts: 12% | ████████ | 3/26 [00:00<00:02, 10.53it/s]
 Computing concepts: 15% | ████████ | 4/26 [00:01<00:07, 2.76it/s]
 Computing concepts: 23% | ████████ | 6/26 [00:01<00:06, 3.11it/s]
 Computing concepts: 31% | ████████ | 8/26 [00:01<00:04, 3.77it/s]

Computing concepts: 46% | 12/26 [00:02<00:03, 4.31it/s]
 Computing concepts: 54% | 14/26 [00:03<00:02, 4.21it/s]
 Computing concepts: 69% | 18/26 [00:03<00:01, 5.40it/s]
 Computing concepts: 73% | 19/26 [00:03<00:01, 6.26it/s]
 Computing concepts: 77% | 20/26 [00:03<00:00, 6.82it/s]
 Computing concepts: 92% | 24/26 [00:03<00:00, 9.08it/s]
 Evaluating Φ cuts: 30% | 9/30 [00:13<00:41, 1.98s/it]
 Computing concepts: 0% | 0/26 [00:00<?, ?it/s]
 Computing concepts: 4% | 1/26 [00:00<00:03, 6.71it/s]
 Computing concepts: 8% | 2/26 [00:00<00:04, 5.02it/s]
 Computing concepts: 12% | 3/26 [00:01<00:10, 2.26it/s]
 Computing concepts: 27% | 7/26 [00:01<00:06, 2.90it/s]
 Computing concepts: 42% | 11/26 [00:02<00:04, 3.51it/s]
 Computing concepts: 50% | 13/26 [00:02<00:03, 4.25it/s]
 Computing concepts: 54% | 14/26 [00:02<00:02, 5.13it/s]
 Computing concepts: 73% | 19/26 [00:02<00:01, 6.98it/s]
 Computing concepts: 81% | 21/26 [00:03<00:00, 6.05it/s]
 Computing concepts: 92% | 24/26 [00:03<00:00, 7.54it/s]
 Evaluating Φ cuts: 33% | 10/30 [00:17<00:49, 2.50s/it]
 Computing concepts: 0% | 0/26 [00:00<?, ?it/s]
 Computing concepts: 8% | 2/26 [00:00<00:10, 2.22it/s]
 Computing concepts: 19% | 5/26 [00:01<00:07, 2.77it/s]
 Computing concepts: 27% | 7/26 [00:01<00:05, 3.54it/s]
 Computing concepts: 42% | 11/26 [00:02<00:03, 4.28it/s]
 Computing concepts: 50% | 13/26 [00:02<00:02, 5.10it/s]
 Computing concepts: 54% | 14/26 [00:02<00:03, 3.86it/s]
 Computing concepts: 69% | 18/26 [00:02<00:01, 5.00it/s]
 Computing concepts: 73% | 19/26 [00:03<00:01, 4.26it/s]
 Computing concepts: 85% | 22/26 [00:03<00:00, 5.73it/s]
 Computing concepts: 92% | 24/26 [00:03<00:00, 6.47it/s]
 Evaluating Φ cuts: 37% | 11/30 [00:20<00:53, 2.83s/it]
 Computing concepts: 0% | 0/26 [00:00<?, ?it/s]
 Computing concepts: 19% | 5/26 [00:00<00:00, 21.58it/s]
 Computing concepts: 38% | 10/26 [00:00<00:00, 25.38it/s]
 Computing concepts: 54% | 14/26 [00:00<00:00, 26.37it/s]
 Computing concepts: 73% | 19/26 [00:00<00:00, 27.54it/s]
 Computing concepts: 92% | 24/26 [00:00<00:00, 31.42it/s]
 Evaluating Φ cuts: 40% | 12/30 [00:21<00:39, 2.22s/it]
 Computing concepts: 0% | 0/26 [00:00<?, ?it/s]

Computing concepts: 8% | 2/26 [00:00<00:02, 8.54it/s]

Computing concepts: 12% | 3/26 [00:00<00:03, 7.32it/s]

Computing concepts: 15% | 4/26 [00:01<00:07, 3.00it/s]

Computing concepts: 27% | 7/26 [00:01<00:05, 3.73it/s]

Computing concepts: 42% | 11/26 [00:01<00:03, 4.91it/s]

Computing concepts: 46% | 12/26 [00:02<00:03, 3.57it/s]

Computing concepts: 54% | 14/26 [00:02<00:03, 3.74it/s]

Computing concepts: 69% | 18/26 [00:03<00:01, 4.78it/s]

Computing concepts: 77% | 20/26 [00:03<00:01, 4.71it/s]

Computing concepts: 92% | 24/26 [00:03<00:00, 6.41it/s]

Evaluating Φ cuts: 43% | 13/30 [00:25<00:44, 2.63s/it]

Computing concepts: 0% | 0/26 [00:00<?, ?it/s]

Computing concepts: 12% | 3/26 [00:00<00:01, 12.13it/s]

Computing concepts: 35% | 9/26 [00:00<00:01, 15.49it/s]

Computing concepts: 46% | 12/26 [00:00<00:01, 10.65it/s]

Computing concepts: 96% | 25/26 [00:00<00:00, 14.69it/s]

Evaluating Φ cuts: 47% | 14/30 [00:26<00:34, 2.14s/it]

Computing concepts: 0% | 0/20 [00:00<?, ?it/s]

Computing concepts: 60% | 12/20 [00:00<00:00, 106.79it/s]

Evaluating Φ cuts: 50% | 15/30 [00:26<00:23, 1.57s/it]

Computing concepts: 0% | 0/20 [00:00<?, ?it/s]

Computing concepts: 5% | 1/20 [00:00<00:03, 4.99it/s]

Computing concepts: 15% | 3/20 [00:00<00:02, 5.87it/s]

Computing concepts: 40% | 8/20 [00:00<00:01, 7.98it/s]

Computing concepts: 50% | 10/20 [00:00<00:01, 9.03it/s]

Computing concepts: 65% | 13/20 [00:00<00:00, 10.84it/s]

Computing concepts: 85% | 17/20 [00:00<00:00, 13.23it/s]

Computing concepts: 100% | 20/20 [00:01<00:00, 15.89it/s]

Evaluating Φ cuts: 53% | 16/30 [00:27<00:19, 1.42s/it]

Computing concepts: 0% | 0/26 [00:00<?, ?it/s]

Computing concepts: 15% | 4/26 [00:00<00:01, 14.34it/s]

Computing concepts: 27% | 7/26 [00:00<00:01, 14.87it/s]

Computing concepts: 35% | 9/26 [00:00<00:01, 13.35it/s]

Computing concepts: 42% | 11/26 [00:00<00:01, 14.46it/s]

Computing concepts: 50% | 13/26 [00:00<00:00, 15.62it/s]

Computing concepts: 58% | 15/26 [00:01<00:00, 11.07it/s]

Computing concepts: 69% | 18/26 [00:01<00:00, 13.45it/s]

Computing concepts: 85% | 22/26 [00:01<00:00, 16.55it/s]

Evaluating Φ cuts: 57% | 17/30 [00:29<00:18, 1.44s/it]

Computing concepts: 0% | 0/26 [00:00<?, ?it/s]

Computing concepts: 8% | 2/26 [00:00<00:02, 11.21it/s]

Computing concepts: 12% | 3/26 [00:00<00:02, 10.09it/s]
 Computing concepts: 15% | 4/26 [00:01<00:08, 2.45it/s]
 Computing concepts: 19% | 5/26 [00:01<00:08, 2.35it/s]
 Computing concepts: 27% | 7/26 [00:02<00:07, 2.55it/s]
 Computing concepts: 46% | 12/26 [00:02<00:03, 3.54it/s]
 Computing concepts: 54% | 14/26 [00:02<00:02, 4.56it/s]
 Computing concepts: 62% | 16/26 [00:03<00:01, 5.17it/s]
 Computing concepts: 73% | 19/26 [00:03<00:01, 5.25it/s]
 Computing concepts: 77% | 20/26 [00:04<00:01, 3.74it/s]
 Computing concepts: 88% | 23/26 [00:04<00:00, 4.74it/s]
 Evaluating Φ cuts: 60% | 18/30 [00:33<00:28, 2.33s/it]
 Computing concepts: 0% | 0/26 [00:00<?, ?it/s]
 Computing concepts: 31% | 8/26 [00:00<00:01, 15.51it/s]
 Computing concepts: 69% | 18/26 [00:00<00:00, 20.58it/s]
 Computing concepts: 88% | 23/26 [00:00<00:00, 22.14it/s]
 Evaluating Φ cuts: 63% | 19/30 [00:34<00:20, 1.91s/it]
 Computing concepts: 0% | 0/26 [00:00<?, ?it/s]
 Computing concepts: 8% | 2/26 [00:01<00:12, 1.97it/s]
 Computing concepts: 19% | 5/26 [00:01<00:07, 2.69it/s]
 Computing concepts: 38% | 10/26 [00:01<00:04, 3.66it/s]
 Computing concepts: 46% | 12/26 [00:01<00:02, 4.80it/s]
 Computing concepts: 54% | 14/26 [00:01<00:02, 4.75it/s]
 Computing concepts: 62% | 16/26 [00:02<00:01, 5.32it/s]
 Computing concepts: 73% | 19/26 [00:02<00:01, 5.35it/s]
 Computing concepts: 77% | 20/26 [00:03<00:01, 3.98it/s]
 Computing concepts: 92% | 24/26 [00:03<00:00, 5.11it/s]
 Evaluating Φ cuts: 67% | 20/30 [00:37<00:23, 2.38s/it]
 Computing concepts: 0% | 0/26 [00:00<?, ?it/s]
 Computing concepts: 4% | 1/26 [00:00<00:05, 4.85it/s]
 Computing concepts: 12% | 3/26 [00:00<00:06, 3.81it/s]
 Computing concepts: 27% | 7/26 [00:01<00:03, 5.14it/s]
 Computing concepts: 35% | 9/26 [00:01<00:02, 6.10it/s]
 Computing concepts: 42% | 11/26 [00:01<00:02, 6.25it/s]
 Computing concepts: 54% | 14/26 [00:02<00:02, 5.87it/s]
 Computing concepts: 62% | 16/26 [00:02<00:01, 6.69it/s]
 Computing concepts: 77% | 20/26 [00:02<00:00, 7.43it/s]
 Computing concepts: 81% | 21/26 [00:03<00:01, 4.24it/s]
 Computing concepts: 96% | 25/26 [00:03<00:00, 5.42it/s]
 Evaluating Φ cuts: 70% | 21/30 [00:41<00:24, 2.75s/it]
 Computing concepts: 0% | 0/26 [00:00<?, ?it/s]

Computing concepts: 12% | 3/26 [00:00<00:00, 25.89it/s]
 Computing concepts: 15% | 4/26 [00:00<00:05, 3.80it/s]
 Computing concepts: 19% | 5/26 [00:01<00:05, 3.94it/s]
 Computing concepts: 23% | 6/26 [00:01<00:05, 3.53it/s]
 Computing concepts: 42% | 11/26 [00:01<00:03, 4.75it/s]
 Computing concepts: 50% | 13/26 [00:01<00:02, 5.90it/s]
 Computing concepts: 58% | 15/26 [00:02<00:01, 6.11it/s]
 Computing concepts: 73% | 19/26 [00:02<00:01, 6.85it/s]
 Computing concepts: 77% | 20/26 [00:02<00:01, 4.40it/s]
 Computing concepts: 88% | 23/26 [00:03<00:00, 5.63it/s]
 Computing concepts: 96% | 25/26 [00:03<00:00, 6.58it/s]
 Evaluating Φ cuts: 73% | 22/30 [00:44<00:23, 2.94s/it]
 Computing concepts: 0% | 0/20 [00:00<?, ?it/s]
 Computing concepts: 60% | 12/20 [00:00<00:00, 119.71it/s]
 Evaluating Φ cuts: 77% | 23/30 [00:45<00:14, 2.11s/it]
 Computing concepts: 0% | 0/26 [00:00<?, ?it/s]
 Computing concepts: 12% | 3/26 [00:00<00:01, 14.96it/s]
 Computing concepts: 31% | 8/26 [00:00<00:00, 18.61it/s]
 Computing concepts: 54% | 14/26 [00:00<00:00, 23.28it/s]
 Computing concepts: 65% | 17/26 [00:00<00:00, 24.02it/s]
 Computing concepts: 77% | 20/26 [00:00<00:00, 23.65it/s]
 Computing concepts: 92% | 24/26 [00:00<00:00, 26.94it/s]
 Evaluating Φ cuts: 80% | 24/30 [00:45<00:10, 1.74s/it]
 Computing concepts: 0% | 0/26 [00:00<?, ?it/s]
 Computing concepts: 35% | 9/26 [00:00<00:00, 38.84it/s]
 Computing concepts: 58% | 15/26 [00:00<00:00, 23.65it/s]
 Computing concepts: 96% | 25/26 [00:00<00:00, 30.24it/s]
 Evaluating Φ cuts: 83% | 25/30 [00:46<00:07, 1.48s/it]
 Computing concepts: 0% | 0/26 [00:00<?, ?it/s]
 Computing concepts: 8% | 2/26 [00:00<00:02, 8.63it/s]
 Computing concepts: 12% | 3/26 [00:00<00:07, 3.25it/s]
 Computing concepts: 15% | 4/26 [00:01<00:05, 3.72it/s]
 Computing concepts: 27% | 7/26 [00:01<00:04, 4.38it/s]
 Computing concepts: 50% | 13/26 [00:01<00:02, 5.54it/s]
 Computing concepts: 54% | 14/26 [00:02<00:02, 5.17it/s]
 Computing concepts: 62% | 16/26 [00:02<00:01, 6.65it/s]
 Computing concepts: 69% | 18/26 [00:02<00:01, 7.58it/s]
 Computing concepts: 81% | 21/26 [00:02<00:00, 7.26it/s]
 Computing concepts: 85% | 22/26 [00:03<00:00, 5.36it/s]
 Evaluating Φ cuts: 87% | 26/30 [00:50<00:08, 2.03s/it]

Computing concepts: 0%| | 0/20 [00:00<?, ?it/s]
 Computing concepts: 55%| | 11/20 [00:00<00:00, 109.70it/s]
 Evaluating Φ cuts: 90%| | 27/30 [00:50<00:04, 1.48s/it]
 Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]
 Computing concepts: 50%| | 13/26 [00:00<00:00, 129.69it/s]
 Computing concepts: 69%| | 18/26 [00:00<00:00, 49.41it/s]
 Computing concepts: 85%| | 22/26 [00:00<00:00, 21.24it/s]
 Evaluating Φ cuts: 93%| | 28/30 [00:51<00:02, 1.30s/it]
 Computing concepts: 0%| | 0/20 [00:00<?, ?it/s]
 Computing concepts: 50%| | 10/20 [00:00<00:00, 99.75it/s]
 Evaluating Φ cuts: 97%| | 29/30 [00:51<00:00, 1.03it/s]
 Computing concepts: 0%| | 0/20 [00:00<?, ?it/s]
 Computing concepts: 50%| | 10/20 [00:00<00:00, 99.76it/s]

- **Variación en el tiempo y consumo en las diferentes particiones sin CM**

Evaluating Φ cuts: 0%| | 0/30 [00:00<?, ?it/s]
 Computing concepts: 0%| | 0/20 [00:00<?, ?it/s]
 Computing concepts: 5%| | 1/20 [00:00<00:04, 4.16it/s]
 Computing concepts: 10%| | 2/20 [00:00<00:03, 4.65it/s]
 Computing concepts: 15%| | 3/20 [00:00<00:03, 4.64it/s]
 Computing concepts: 20%| | 4/20 [00:00<00:02, 5.51it/s]
 Computing concepts: 30%| | 6/20 [00:00<00:02, 6.57it/s]
 Computing concepts: 50%| | 10/20 [00:01<00:01, 8.60it/s]
 Computing concepts: 60%| | 12/20 [00:01<00:00, 8.85it/s]
 Computing concepts: 70%| | 14/20 [00:01<00:00, 9.46it/s]
 Computing concepts: 80%| | 16/20 [00:01<00:00, 11.18it/s]
 Computing concepts: 90%| | 18/20 [00:01<00:00, 10.84it/s]
 Evaluating Φ cuts: 3%| | 1/30 [00:01<00:52, 1.81s/it]
 Computing concepts: 0%| | 0/20 [00:00<?, ?it/s]
 Computing concepts: 10%| | 2/20 [00:00<00:01, 10.90it/s]
 Computing concepts: 15%| | 3/20 [00:00<00:01, 10.26it/s]
 Computing concepts: 20%| | 4/20 [00:00<00:02, 6.66it/s]
 Computing concepts: 30%| | 6/20 [00:00<00:01, 8.26it/s]
 Computing concepts: 35%| | 7/20 [00:00<00:01, 7.76it/s]
 Computing concepts: 50%| | 10/20 [00:00<00:01, 9.52it/s]
 Computing concepts: 60%| | 12/20 [00:01<00:00, 10.93it/s]
 Computing concepts: 70%| | 14/20 [00:01<00:00, 11.61it/s]
 Computing concepts: 80%| | 16/20 [00:01<00:00, 12.64it/s]
 Computing concepts: 90%| | 18/20 [00:01<00:00, 13.41it/s]
 Evaluating Φ cuts: 7%| | 2/30 [00:03<00:48, 1.75s/it]
 Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]
 Computing concepts: 8%| | 2/26 [00:00<00:01, 14.87it/s]

Computing concepts: 15% | 4/26 [00:00<00:02, 10.86it/s]
 Computing concepts: 23% | 6/26 [00:00<00:01, 12.51it/s]
 Computing concepts: 31% | 8/26 [00:00<00:01, 12.73it/s]
 Computing concepts: 50% | 13/26 [00:00<00:00, 15.89it/s]
 Computing concepts: 58% | 15/26 [00:00<00:00, 14.45it/s]
 Computing concepts: 65% | 17/26 [00:01<00:00, 14.68it/s]
 Computing concepts: 73% | 19/26 [00:01<00:00, 15.94it/s]
 Computing concepts: 81% | 21/26 [00:01<00:00, 15.12it/s]
 Computing concepts: 88% | 23/26 [00:01<00:00, 14.98it/s]
 Computing concepts: 100% | 26/26 [00:01<00:00, 17.15it/s]
 Evaluating Φ cuts: 10% | 3/30 [00:05<00:46, 1.72s/it]
 Computing concepts: 0% | 0/20 [00:00<?, ?it/s]
 Computing concepts: 10% | 2/20 [00:00<00:01, 14.33it/s]
 Computing concepts: 15% | 3/20 [00:00<00:02, 7.59it/s]
 Computing concepts: 30% | 6/20 [00:00<00:01, 8.20it/s]
 Computing concepts: 40% | 8/20 [00:00<00:01, 9.49it/s]
 Computing concepts: 45% | 9/20 [00:00<00:01, 8.60it/s]
 Computing concepts: 55% | 11/20 [00:01<00:01, 8.63it/s]
 Computing concepts: 65% | 13/20 [00:01<00:00, 9.82it/s]
 Computing concepts: 75% | 15/20 [00:01<00:00, 10.63it/s]
 Computing concepts: 85% | 17/20 [00:01<00:00, 11.46it/s]
 Computing concepts: 100% | 20/20 [00:01<00:00, 13.37it/s]
 Evaluating Φ cuts: 13% | 4/30 [00:06<00:45, 1.75s/it]
 Computing concepts: 0% | 0/26 [00:00<?, ?it/s]
 Computing concepts: 4% | 1/26 [00:00<00:06, 3.69it/s]
 Computing concepts: 12% | 3/26 [00:01<00:08, 2.86it/s]
 Computing concepts: 19% | 5/26 [00:01<00:05, 3.77it/s]
 Computing concepts: 27% | 7/26 [00:01<00:04, 4.69it/s]
 Computing concepts: 35% | 9/26 [00:01<00:03, 5.39it/s]
 Computing concepts: 46% | 12/26 [00:02<00:02, 6.15it/s]
 Computing concepts: 50% | 13/26 [00:02<00:03, 3.88it/s]
 Computing concepts: 54% | 14/26 [00:02<00:02, 4.68it/s]
 Computing concepts: 58% | 15/26 [00:03<00:03, 3.48it/s]
 Computing concepts: 65% | 17/26 [00:03<00:02, 4.47it/s]
 Computing concepts: 77% | 20/26 [00:03<00:01, 6.00it/s]
 Computing concepts: 85% | 22/26 [00:04<00:00, 4.68it/s]
 Computing concepts: 100% | 26/26 [00:04<00:00, 6.19it/s]
 Evaluating Φ cuts: 17% | 5/30 [00:11<01:03, 2.53s/it]
 Computing concepts: 0% | 0/26 [00:00<?, ?it/s]
 Computing concepts: 8% | 2/26 [00:00<00:01, 15.17it/s]
 Computing concepts: 15% | 4/26 [00:00<00:01, 16.14it/s]

Computing concepts: 19% | 5/26 [00:00<00:02, 8.55it/s]

Computing concepts: 27% | 7/26 [00:00<00:01, 9.76it/s]

Computing concepts: 42% | 11/26 [00:00<00:01, 11.82it/s]

Computing concepts: 50% | 13/26 [00:00<00:01, 11.50it/s]

Computing concepts: 58% | 15/26 [00:01<00:01, 10.87it/s]

Computing concepts: 65% | 17/26 [00:01<00:00, 12.04it/s]

Computing concepts: 77% | 20/26 [00:01<00:00, 13.32it/s]

Computing concepts: 85% | 22/26 [00:01<00:00, 13.84it/s]

Computing concepts: 96% | 25/26 [00:01<00:00, 15.87it/s]

Evaluating Φ cuts: 20% | 6/30 [00:13<00:55, 2.32s/it]

Computing concepts: 0% | 0/26 [00:00<?, ?it/s]

Computing concepts: 8% | 2/26 [00:00<00:01, 15.62it/s]

Computing concepts: 12% | 3/26 [00:00<00:04, 4.93it/s]

Computing concepts: 19% | 5/26 [00:00<00:03, 6.27it/s]

Computing concepts: 31% | 8/26 [00:01<00:02, 7.06it/s]

Computing concepts: 42% | 11/26 [00:01<00:01, 7.84it/s]

Computing concepts: 46% | 12/26 [00:01<00:03, 4.09it/s]

Computing concepts: 54% | 14/26 [00:01<00:02, 5.29it/s]

Computing concepts: 58% | 15/26 [00:02<00:02, 4.72it/s]

Computing concepts: 65% | 17/26 [00:02<00:01, 6.13it/s]

Computing concepts: 77% | 20/26 [00:02<00:00, 7.84it/s]

Computing concepts: 85% | 22/26 [00:02<00:00, 6.10it/s]

Computing concepts: 96% | 25/26 [00:03<00:00, 7.96it/s]

Evaluating Φ cuts: 23% | 7/30 [00:16<00:59, 2.58s/it]

Computing concepts: 0% | 0/20 [00:00<?, ?it/s]

Computing concepts: 10% | 2/20 [00:00<00:01, 15.15it/s]

Computing concepts: 15% | 3/20 [00:00<00:02, 8.13it/s]

Computing concepts: 25% | 5/20 [00:00<00:01, 8.64it/s]

Computing concepts: 35% | 7/20 [00:00<00:01, 10.41it/s]

Computing concepts: 45% | 9/20 [00:00<00:00, 11.50it/s]

Computing concepts: 55% | 11/20 [00:01<00:00, 10.72it/s]

Computing concepts: 70% | 14/20 [00:01<00:00, 12.40it/s]

Computing concepts: 80% | 16/20 [00:01<00:00, 12.74it/s]

Computing concepts: 90% | 18/20 [00:01<00:00, 13.73it/s]

Computing concepts: 100% | 20/20 [00:01<00:00, 13.61it/s]

Evaluating Φ cuts: 27% | 8/30 [00:17<00:50, 2.30s/it]

Computing concepts: 0% | 0/26 [00:00<?, ?it/s]

Computing concepts: 8% | 2/26 [00:00<00:01, 14.49it/s]

Computing concepts: 12% | 3/26 [00:00<00:02, 8.15it/s]

Computing concepts: 15% | 4/26 [00:01<00:08, 2.69it/s]

Computing concepts: 23% | 6/26 [00:01<00:06, 2.98it/s]

Computing concepts: 31% | 8/26 [00:02<00:04, 3.60it/s]
 Computing concepts: 42% | 11/26 [00:02<00:03, 4.76it/s]
 Computing concepts: 46% | 12/26 [00:02<00:04, 3.45it/s]
 Computing concepts: 54% | 14/26 [00:03<00:03, 3.47it/s]
 Computing concepts: 69% | 18/26 [00:03<00:01, 4.43it/s]
 Computing concepts: 73% | 19/26 [00:03<00:01, 5.03it/s]
 Computing concepts: 77% | 20/26 [00:03<00:01, 5.80it/s]
 Computing concepts: 92% | 24/26 [00:04<00:00, 7.39it/s]
 Evaluating Φ cuts: 30% | 9/30 [00:22<01:00, 2.88s/it]
 Computing concepts: 0% | 0/26 [00:00<?, ?it/s]
 Computing concepts: 8% | 2/26 [00:00<00:04, 5.46it/s]
 Computing concepts: 12% | 3/26 [00:01<00:10, 2.26it/s]
 Computing concepts: 19% | 5/26 [00:01<00:06, 3.03it/s]
 Computing concepts: 27% | 7/26 [00:02<00:05, 3.23it/s]
 Computing concepts: 38% | 10/26 [00:02<00:03, 4.38it/s]
 Computing concepts: 46% | 12/26 [00:02<00:03, 4.12it/s]
 Computing concepts: 50% | 13/26 [00:03<00:03, 4.00it/s]
 Computing concepts: 54% | 14/26 [00:03<00:02, 4.65it/s]
 Computing concepts: 62% | 16/26 [00:03<00:01, 5.79it/s]
 Computing concepts: 73% | 19/26 [00:03<00:00, 7.34it/s]
 Computing concepts: 81% | 21/26 [00:04<00:01, 4.47it/s]
 Computing concepts: 92% | 24/26 [00:04<00:00, 5.35it/s]
 Computing concepts: 96% | 25/26 [00:04<00:00, 5.57it/s]
 Evaluating Φ cuts: 33% | 10/30 [00:26<01:09, 3.47s/it]
 Computing concepts: 0% | 0/26 [00:00<?, ?it/s]
 Computing concepts: 8% | 2/26 [00:00<00:11, 2.06it/s]
 Computing concepts: 15% | 4/26 [00:01<00:07, 2.82it/s]
 Computing concepts: 19% | 5/26 [00:01<00:08, 2.54it/s]
 Computing concepts: 27% | 7/26 [00:01<00:05, 3.20it/s]
 Computing concepts: 42% | 11/26 [00:02<00:03, 3.90it/s]
 Computing concepts: 50% | 13/26 [00:02<00:02, 4.50it/s]
 Computing concepts: 54% | 14/26 [00:02<00:03, 3.63it/s]
 Computing concepts: 62% | 16/26 [00:03<00:02, 4.68it/s]
 Computing concepts: 69% | 18/26 [00:03<00:01, 5.36it/s]
 Computing concepts: 73% | 19/26 [00:03<00:01, 4.06it/s]
 Computing concepts: 77% | 20/26 [00:03<00:01, 4.83it/s]
 Computing concepts: 88% | 23/26 [00:04<00:00, 5.87it/s]
 Computing concepts: 92% | 24/26 [00:04<00:00, 6.70it/s]
 Evaluating Φ cuts: 37% | 11/30 [00:31<01:10, 3.73s/it]
 Computing concepts: 0% | 0/26 [00:00<?, ?it/s]

Computing concepts: 8% | 2/26 [00:00<00:01, 17.28it/s]
 Computing concepts: 15% | 4/26 [00:00<00:01, 17.28it/s]
 Computing concepts: 19% | 5/26 [00:00<00:02, 8.72it/s]
 Computing concepts: 27% | 7/26 [00:00<00:01, 10.50it/s]
 Computing concepts: 35% | 9/26 [00:00<00:01, 11.58it/s]
 Computing concepts: 46% | 12/26 [00:00<00:01, 13.36it/s]
 Computing concepts: 54% | 14/26 [00:01<00:00, 12.25it/s]
 Computing concepts: 62% | 16/26 [00:01<00:00, 11.59it/s]
 Computing concepts: 73% | 19/26 [00:01<00:00, 11.79it/s]
 Computing concepts: 88% | 23/26 [00:01<00:00, 13.74it/s]
 Computing concepts: 96% | 25/26 [00:01<00:00, 13.97it/s]
 Evaluating Φ cuts: 40% | 12/30 [00:33<00:57, 3.18s/it]
 Computing concepts: 0% | 0/26 [00:00<?, ?it/s]
 Computing concepts: 8% | 2/26 [00:00<00:03, 6.65it/s]
 Computing concepts: 12% | 3/26 [00:00<00:04, 5.58it/s]
 Computing concepts: 15% | 4/26 [00:01<00:08, 2.53it/s]
 Computing concepts: 23% | 6/26 [00:01<00:05, 3.40it/s]
 Computing concepts: 27% | 7/26 [00:01<00:06, 3.03it/s]
 Computing concepts: 42% | 11/26 [00:02<00:03, 3.96it/s]
 Computing concepts: 46% | 12/26 [00:02<00:04, 3.26it/s]
 Computing concepts: 54% | 14/26 [00:03<00:03, 3.24it/s]
 Computing concepts: 58% | 15/26 [00:03<00:02, 3.90it/s]
 Computing concepts: 69% | 18/26 [00:03<00:01, 4.74it/s]
 Computing concepts: 73% | 19/26 [00:03<00:01, 5.29it/s]
 Computing concepts: 77% | 20/26 [00:04<00:01, 3.54it/s]
 Computing concepts: 88% | 23/26 [00:04<00:00, 4.71it/s]
 Computing concepts: 96% | 25/26 [00:04<00:00, 5.82it/s]
 Evaluating Φ cuts: 43% | 13/30 [00:38<01:02, 3.67s/it]
 Computing concepts: 0% | 0/26 [00:00<?, ?it/s]
 Computing concepts: 8% | 2/26 [00:00<00:01, 13.84it/s]
 Computing concepts: 12% | 3/26 [00:00<00:03, 7.56it/s]
 Computing concepts: 15% | 4/26 [00:01<00:08, 2.61it/s]
 Computing concepts: 23% | 6/26 [00:01<00:05, 3.47it/s]
 Computing concepts: 27% | 7/26 [00:01<00:06, 3.02it/s]
 Computing concepts: 35% | 9/26 [00:02<00:04, 4.05it/s]
 Computing concepts: 46% | 12/26 [00:02<00:03, 4.44it/s]
 Computing concepts: 54% | 14/26 [00:02<00:02, 5.43it/s]
 Computing concepts: 58% | 15/26 [00:02<00:01, 6.11it/s]
 Computing concepts: 73% | 19/26 [00:03<00:01, 6.35it/s]
 Computing concepts: 77% | 20/26 [00:03<00:00, 6.65it/s]

Computing concepts: 88%|██████████ | 23/26 [00:03<00:00, 7.76it/s]
 Computing concepts: 96%|██████████ | 25/26 [00:03<00:00, 9.10it/s]
 Evaluating Φ cuts: 47%|██████ | 14/30 [00:42<01:00, 3.78s/it]
 Computing concepts: 0%| | 0/20 [00:00<?, ?it/s]
 Computing concepts: 5%| | 1/20 [00:00<00:17, 1.11it/s]
 Computing concepts: 15%| | 3/20 [00:01<00:11, 1.42it/s]
 Computing concepts: 35%|██████ | 7/20 [00:01<00:06, 1.96it/s]
 Computing concepts: 45%|██████ | 9/20 [00:02<00:04, 2.35it/s]
 Computing concepts: 60%|████████ | 12/20 [00:02<00:02, 3.09it/s]
 Computing concepts: 65%|████████ | 13/20 [00:02<00:02, 2.88it/s]
 Computing concepts: 70%|████████ | 14/20 [00:03<00:02, 2.78it/s]
 Computing concepts: 85%|██████████ | 17/20 [00:03<00:00, 3.67it/s]
 Computing concepts: 95%|██████████ | 19/20 [00:03<00:00, 4.84it/s]
 Evaluating Φ cuts: 50%|██████ | 15/30 [00:45<00:55, 3.71s/it]
 Computing concepts: 0%| | 0/20 [00:00<?, ?it/s]
 Computing concepts: 5%| | 1/20 [00:00<00:04, 3.95it/s]
 Computing concepts: 10%| | 2/20 [00:00<00:03, 4.82it/s]
 Computing concepts: 15%| | 3/20 [00:00<00:03, 5.42it/s]
 Computing concepts: 35%|██████ | 7/20 [00:00<00:01, 7.10it/s]
 Computing concepts: 45%|██████ | 9/20 [00:00<00:01, 7.69it/s]
 Computing concepts: 55%|████████ | 11/20 [00:00<00:00, 9.37it/s]
 Computing concepts: 65%|████████ | 13/20 [00:01<00:00, 9.13it/s]
 Computing concepts: 75%|████████ | 15/20 [00:01<00:00, 9.80it/s]
 Computing concepts: 85%|██████████ | 17/20 [00:01<00:00, 11.57it/s]
 Computing concepts: 95%|██████████ | 19/20 [00:01<00:00, 11.65it/s]
 Evaluating Φ cuts: 53%|██████ | 16/30 [00:47<00:43, 3.12s/it]
 Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]
 Computing concepts: 8%| | 2/26 [00:00<00:01, 15.24it/s]
 Computing concepts: 15%| | 4/26 [00:00<00:01, 11.59it/s]
 Computing concepts: 23%| | 6/26 [00:00<00:01, 12.48it/s]
 Computing concepts: 27%| | 7/26 [00:00<00:01, 11.01it/s]
 Computing concepts: 42%|██████ | 11/26 [00:00<00:01, 13.32it/s]
 Computing concepts: 50%|██████ | 13/26 [00:00<00:00, 13.41it/s]
 Computing concepts: 58%|████████ | 15/26 [00:01<00:00, 13.20it/s]
 Computing concepts: 73%|██████████ | 19/26 [00:01<00:00, 15.11it/s]
 Computing concepts: 81%|██████████ | 21/26 [00:01<00:00, 16.00it/s]
 Computing concepts: 92%|██████████ | 24/26 [00:01<00:00, 18.12it/s]
 Evaluating Φ cuts: 57%|██████ | 17/30 [00:48<00:34, 2.66s/it]
 Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]
 Computing concepts: 8%| | 2/26 [00:00<00:01, 14.11it/s]
 Computing concepts: 12%| | 3/26 [00:00<00:01, 12.20it/s]
 Computing concepts: 15%| | 4/26 [00:01<00:06, 3.21it/s]

Computing concepts: 19%|██████ | 5/26 [00:01<00:06, 3.41it/s]

Computing concepts: 27%|██████ | 7/26 [00:01<00:05, 3.57it/s]

Computing concepts: 42%|██████ | 11/26 [00:01<00:03, 4.85it/s]

Computing concepts: 50%|██████ | 13/26 [00:02<00:02, 5.73it/s]

Computing concepts: 58%|██████ | 15/26 [00:02<00:01, 5.66it/s]

Computing concepts: 69%|██████ | 18/26 [00:02<00:01, 7.12it/s]

Computing concepts: 77%|██████ | 20/26 [00:03<00:01, 4.43it/s]

Computing concepts: 88%|██████ | 23/26 [00:03<00:00, 5.45it/s]

Computing concepts: 92%|██████ | 24/26 [00:03<00:00, 6.31it/s]

Computing concepts: 100%|██████ | 26/26 [00:04<00:00, 7.66it/s]

Evaluating Φ cuts: 60%|██████ | 18/30 [00:53<00:37, 3.10s/it]

Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]

Computing concepts: 8%|██ | 2/26 [00:00<00:01, 14.48it/s]

Computing concepts: 15%|███ | 4/26 [00:00<00:01, 15.71it/s]

Computing concepts: 19%|████ | 5/26 [00:00<00:02, 7.69it/s]

Computing concepts: 31%|█████ | 8/26 [00:01<00:02, 6.93it/s]

Computing concepts: 46%|██████ | 12/26 [00:01<00:01, 9.21it/s]

Computing concepts: 54%|██████ | 14/26 [00:01<00:01, 10.40it/s]

Computing concepts: 62%|██████ | 16/26 [00:01<00:00, 10.57it/s]

Computing concepts: 73%|██████ | 19/26 [00:01<00:00, 11.31it/s]

Computing concepts: 81%|██████ | 21/26 [00:01<00:00, 9.65it/s]

Computing concepts: 88%|██████ | 23/26 [00:02<00:00, 9.44it/s]

Computing concepts: 100%|██████ | 26/26 [00:02<00:00, 11.89it/s]

Evaluating Φ cuts: 63%|██████ | 19/30 [00:55<00:31, 2.87s/it]

Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]

Computing concepts: 8%|██ | 2/26 [00:00<00:11, 2.01it/s]

Computing concepts: 15%|███ | 4/26 [00:01<00:08, 2.71it/s]

Computing concepts: 19%|████ | 5/26 [00:01<00:06, 3.31it/s]

Computing concepts: 35%|█████ | 9/26 [00:01<00:03, 4.56it/s]

Computing concepts: 42%|██████ | 11/26 [00:01<00:03, 4.98it/s]

Computing concepts: 50%|██████ | 13/26 [00:01<00:02, 6.02it/s]

Computing concepts: 58%|██████ | 15/26 [00:02<00:02, 5.48it/s]

Computing concepts: 62%|██████ | 16/26 [00:02<00:02, 4.91it/s]

Computing concepts: 69%|██████ | 18/26 [00:02<00:01, 6.31it/s]

Computing concepts: 77%|██████ | 20/26 [00:03<00:01, 4.06it/s]

Computing concepts: 88%|██████ | 23/26 [00:03<00:00, 5.44it/s]

Computing concepts: 96%|██████ | 25/26 [00:04<00:00, 5.68it/s]

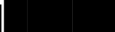



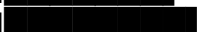
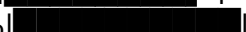


















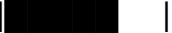
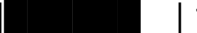
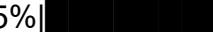







Evaluating Φ cuts: 67%|██████ | 20/30 [00:59<00:32, 3.24s/it]

Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]

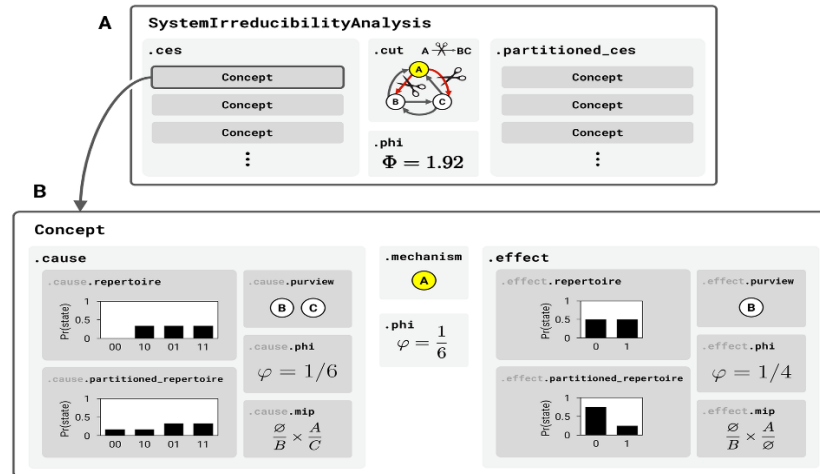
Computing concepts: 4%|██ | 1/26 [00:00<00:06, 3.89it/s]

Computing concepts: 12% | 3/26 [00:01<00:07, 3.17it/s]
 Computing concepts: 19% | 5/26 [00:01<00:05, 4.17it/s]
 Computing concepts: 27% | 7/26 [00:01<00:03, 5.14it/s]
 Computing concepts: 35% | 9/26 [00:01<00:02, 5.78it/s]
 Computing concepts: 42% | 11/26 [00:02<00:02, 5.41it/s]
 Computing concepts: 50% | 13/26 [00:02<00:01, 6.88it/s]
 Computing concepts: 58% | 15/26 [00:02<00:01, 5.68it/s]
 Computing concepts: 62% | 16/26 [00:02<00:01, 5.46it/s]
 Computing concepts: 73% | 19/26 [00:03<00:00, 7.23it/s]
 Computing concepts: 81% | 21/26 [00:03<00:01, 4.60it/s]
 Computing concepts: 96% | 25/26 [00:04<00:00, 5.77it/s]
 Evaluating Φ cuts: 70% | 21/30 [01:03<00:31, 3.53s/it]
 Computing concepts: 0% | 0/26 [00:00<?, ?it/s]
 Computing concepts: 8% | 2/26 [00:00<00:01, 13.39it/s]
 Computing concepts: 15% | 4/26 [00:00<00:03, 5.57it/s]
 Computing concepts: 19% | 5/26 [00:01<00:04, 5.12it/s]
 Computing concepts: 23% | 6/26 [00:01<00:05, 3.89it/s]
 Computing concepts: 38% | 10/26 [00:01<00:03, 5.33it/s]
 Computing concepts: 46% | 12/26 [00:02<00:02, 5.50it/s]
 Computing concepts: 54% | 14/26 [00:02<00:02, 5.08it/s]
 Computing concepts: 69% | 18/26 [00:02<00:01, 6.70it/s]
 Computing concepts: 77% | 20/26 [00:03<00:01, 4.36it/s]
 Computing concepts: 88% | 23/26 [00:03<00:00, 5.44it/s]
 Computing concepts: 96% | 25/26 [00:04<00:00, 5.83it/s]
 Evaluating Φ cuts: 73% | 22/30 [01:07<00:29, 3.70s/it]
 Computing concepts: 0% | 0/20 [00:00<?, ?it/s]
 Computing concepts: 10% | 2/20 [00:00<00:01, 17.26it/s]
 Computing concepts: 15% | 3/20 [00:00<00:03, 5.66it/s]
 Computing concepts: 25% | 5/20 [00:00<00:02, 6.15it/s]
 Computing concepts: 35% | 7/20 [00:01<00:01, 6.92it/s]
 Computing concepts: 45% | 9/20 [00:01<00:01, 6.07it/s]
 Computing concepts: 55% | 11/20 [00:01<00:01, 6.24it/s]
 Computing concepts: 75% | 15/20 [00:02<00:00, 7.42it/s]
 Computing concepts: 90% | 18/20 [00:02<00:00, 9.30it/s]
 Computing concepts: 100% | 20/20 [00:02<00:00, 10.00it/s]
 Evaluating Φ cuts: 77% | 23/30 [01:10<00:23, 3.31s/it]
 Computing concepts: 0% | 0/26 [00:00<?, ?it/s]
 Computing concepts: 8% | 2/26 [00:00<00:01, 18.82it/s]
 Computing concepts: 12% | 3/26 [00:00<00:02, 9.81it/s]
 Computing concepts: 19% | 5/26 [00:00<00:01, 11.27it/s]

Computing concepts: 23% | 6/26 [00:00<00:01, 10.05it/s]
 Computing concepts: 38% | 10/26 [00:00<00:01, 12.79it/s]
 Computing concepts: 46% | 12/26 [00:00<00:01, 12.27it/s]
 Computing concepts: 54% | 14/26 [00:00<00:00, 13.44it/s]
 Computing concepts: 62% | 16/26 [00:01<00:00, 12.52it/s]
 Computing concepts: 69% | 18/26 [00:01<00:00, 14.09it/s]
 Computing concepts: 77% | 20/26 [00:01<00:00, 12.10it/s]
 Computing concepts: 85% | 22/26 [00:01<00:00, 12.74it/s]
 Computing concepts: 96% | 25/26 [00:01<00:00, 13.68it/s]
 Evaluating Φ cuts: 80% | 24/30 [01:12<00:17, 2.89s/it]
 Computing concepts: 0% | 0/26 [00:00<?, ?it/s]
 Computing concepts: 8% | 2/26 [00:00<00:01, 18.87it/s]
 Computing concepts: 15% | 4/26 [00:00<00:01, 15.10it/s]
 Computing concepts: 19% | 5/26 [00:00<00:01, 10.84it/s]
 Computing concepts: 27% | 7/26 [00:00<00:01, 10.21it/s]
 Computing concepts: 35% | 9/26 [00:00<00:01, 9.76it/s]
 Computing concepts: 46% | 12/26 [00:01<00:01, 10.66it/s]
 Computing concepts: 58% | 15/26 [00:01<00:01, 8.54it/s]
 Computing concepts: 69% | 18/26 [00:01<00:00, 10.72it/s]
 Computing concepts: 81% | 21/26 [00:01<00:00, 12.98it/s]
 Computing concepts: 96% | 25/26 [00:02<00:00, 15.30it/s]
 Evaluating Φ cuts: 83% | 25/30 [01:14<00:13, 2.65s/it]
 Computing concepts: 0% | 0/26 [00:00<?, ?it/s]
 Computing concepts: 8% | 2/26 [00:00<00:03, 6.67it/s]
 Computing concepts: 12% | 3/26 [00:01<00:07, 2.90it/s]
 Computing concepts: 15% | 4/26 [00:01<00:07, 3.01it/s]
 Computing concepts: 27% | 7/26 [00:01<00:05, 3.55it/s]
 Computing concepts: 42% | 11/26 [00:02<00:03, 4.87it/s]
 Computing concepts: 50% | 13/26 [00:02<00:02, 4.75it/s]
 Computing concepts: 58% | 15/26 [00:02<00:02, 4.99it/s]
 Computing concepts: 65% | 17/26 [00:03<00:01, 5.49it/s]
 Computing concepts: 77% | 20/26 [00:03<00:00, 7.08it/s]
 Computing concepts: 85% | 22/26 [00:04<00:00, 4.57it/s]
 Computing concepts: 96% | 25/26 [00:04<00:00, 6.12it/s]
 Evaluating Φ cuts: 87% | 26/30 [01:18<00:12, 3.12s/it]
 Computing concepts: 0% | 0/20 [00:00<?, ?it/s]
 Computing concepts: 10% | 2/20 [00:00<00:00, 19.95it/s]
 Computing concepts: 15% | 3/20 [00:00<00:01, 9.15it/s]
 Computing concepts: 30% | 6/20 [00:00<00:01, 10.71it/s]
 Computing concepts: 45% | 9/20 [00:00<00:01, 10.70it/s]

Computing concepts: 50%|  | 10/20 [00:00<00:01, 9.87it/s]
Computing concepts: 55%|  | 11/20 [00:01<00:00, 9.46it/s]
Computing concepts: 65%|  | 13/20 [00:01<00:00, 10.06it/s]
Computing concepts: 75%|  | 15/20 [00:01<00:00, 11.29it/s]
Computing concepts: 85%|  | 17/20 [00:01<00:00, 10.51it/s]
Computing concepts: 100%|  | 20/20 [00:01<00:00, 12.80it/s]
Evaluating Φ cuts: 90%|  | 27/30 [01:20<00:08, 2.69s/it]
Computing concepts: 0%| | 0/26 [00:00<?, ?it/s]
Computing concepts: 8%|  | 2/26 [00:00<00:01, 18.88it/s]
Computing concepts: 15%|  | 4/26 [00:00<00:01, 17.17it/s]
Computing concepts: 23%|  | 6/26 [00:00<00:01, 17.92it/s]
Computing concepts: 31%|  | 8/26 [00:00<00:00, 18.48it/s]
Computing concepts: 46%|  | 12/26 [00:00<00:00, 22.03it/s]
Computing concepts: 58%|  | 15/26 [00:00<00:00, 19.92it/s]
Computing concepts: 69%|  | 18/26 [00:01<00:00, 13.68it/s]
Computing concepts: 81%|  | 21/26 [00:01<00:00, 9.87it/s]
Computing concepts: 92%|  | 24/26 [00:01<00:00, 12.23it/s]
Computing concepts: 100%|  | 26/26 [00:01<00:00, 13.10it/s]
Evaluating Φ cuts: 93%|  | 28/30 [01:21<00:04, 2.44s/it]
Computing concepts: 0%| | 0/20 [00:00<?, ?it/s]
Computing concepts: 10%|  | 2/20 [00:00<00:01, 11.82it/s]
Computing concepts: 15%|  | 3/20 [00:00<00:01, 10.85it/s]
Computing concepts: 20%|  | 4/20 [00:00<00:01, 9.30it/s]
Computing concepts: 35%|  | 7/20 [00:00<00:01, 10.32it/s]
Computing concepts: 50%|  | 10/20 [00:00<00:00, 12.20it/s]
Computing concepts: 60%|  | 12/20 [00:00<00:00, 13.59it/s]
Computing concepts: 75%|  | 15/20 [00:01<00:00, 15.92it/s]
Computing concepts: 85%|  | 17/20 [00:01<00:00, 11.99it/s]
Evaluating Φ cuts: 97%|  | 29/30 [01:23<00:02, 2.12s/it]
Computing concepts: 0%| | 0/20 [00:00<?, ?it/s]
Computing concepts: 10%|  | 2/20 [00:00<00:01, 15.97it/s]
Computing concepts: 20%|  | 4/20 [00:00<00:01, 15.28it/s]
Computing concepts: 30%|  | 6/20 [00:00<00:00, 15.50it/s]
Computing concepts: 50%|  | 10/20 [00:00<00:00, 18.81it/s]
Computing concepts: 60%|  | 12/20 [00:00<00:00, 16.61it/s]
Computing concepts: 70%|  | 14/20 [00:00<00:00, 17.49it/s]
Computing concepts: 85%|  | 17/20 [00:00<00:00, 18.28it/s]

Datos adicionales



Nota:

Para evitar construir TPM y matrices de conectividad a mano, puede utilizar la interfaz gráfica de usuario para PyPhi disponible en línea en <http://integratedinformationtheory.org/calculate.html>. Usted puede construir las redes que se muestran en las figuras y luego usar el botón **Exportar** para obtener un archivo JSON que represente la red. Luego puede importar el archivo a Python así:

```
network = pyphi.network.from_json('path/to/network.json')
```