Cost sharing methods in transportation problems

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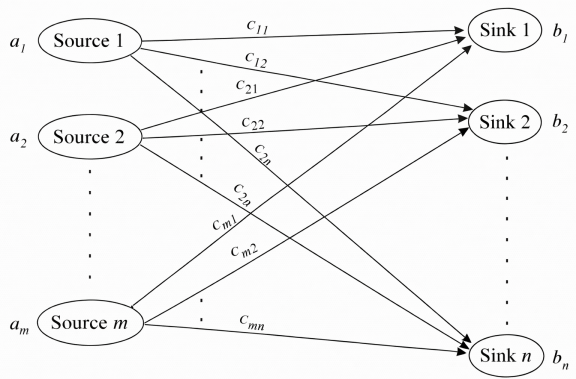
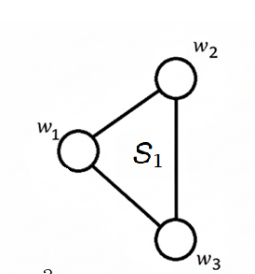
Motivation

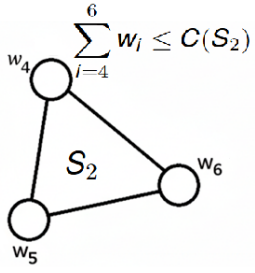
- A classic transportation problem, where companies want to deliver ores from mines to factories. It may benefit them to cooperate.
- A public institution is subsidizing a public service. Agents (e.g., cities) will cooperate if they have to pay a fair price. The institution wants to distribute the total cost of the service.



Framework - Game theory

- Given: N players. Cost function for all coalitions; now min Hamiltonian circuit.
- Goal: A fair cost allocation.
- Optimal cost share: No one wants to break away and the sum of the weights is maximal.



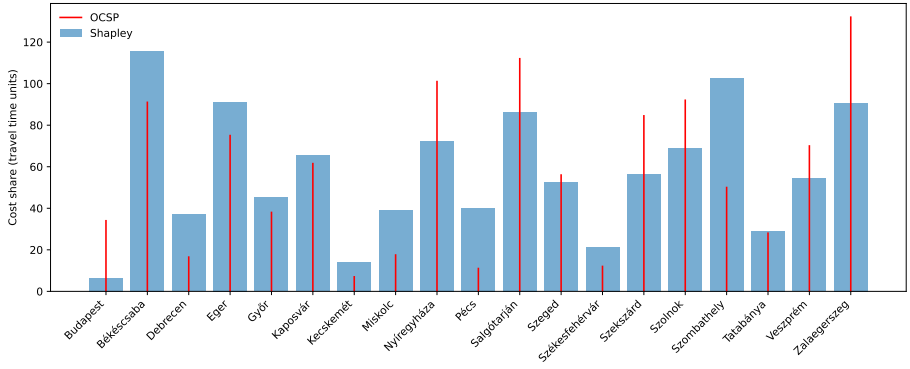


Methods

- Shapley allocation: expected value of the increment on the price when a player enters a coalition.
- Caprara and Letchford. They give an optimal cost share for the unrooted TSP.

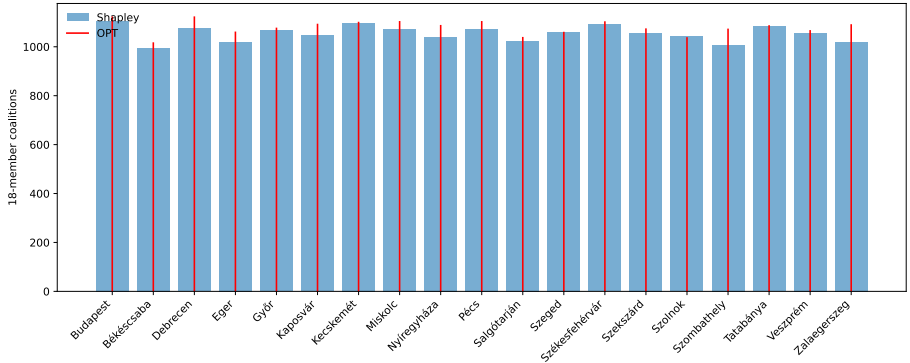
Result

- I used the 19 county seats of Hungary



Result

- The Shapley is almost in the semi-core.



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AI

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