Shapley values

The code related to this subject can be found in `Shapley.ipynb` file.

We considered the problem of `Fair division of taxi fare`:

- Multiple agents onboard on a taxi trip
- The amount the agents have to pay is given by the distance to the last stop.

Shapley values computation

The exact shapley values were computed for a considerably small problem size: n = {4, 5}.

For bigger problem sizes, computing the exact shapley values with the proposed method, is computationally intractable due to the fact that 2 ^ n permutations of agents must be taken into consideration.

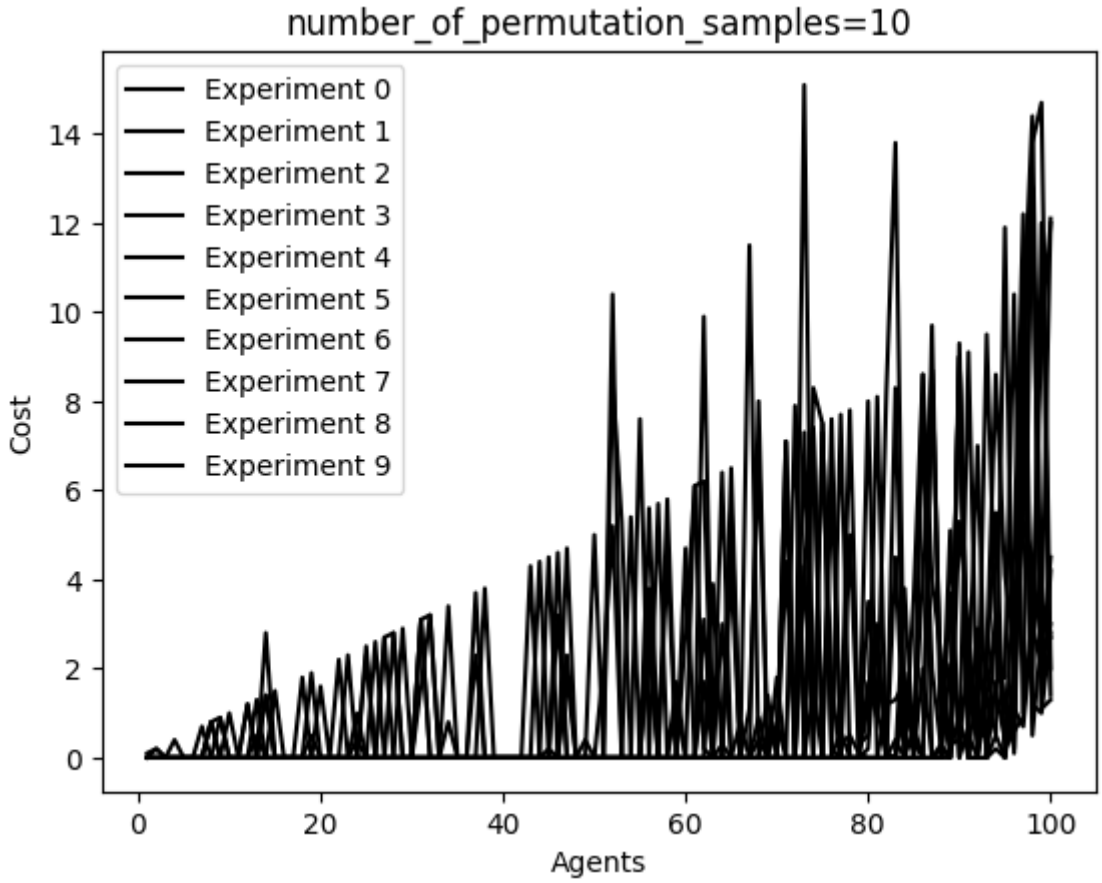
Estimation of shapley values

Instead of processing 2 ^ n permutations, a smaller number of permutation are sampled and estimates of exact shapley values are produced.

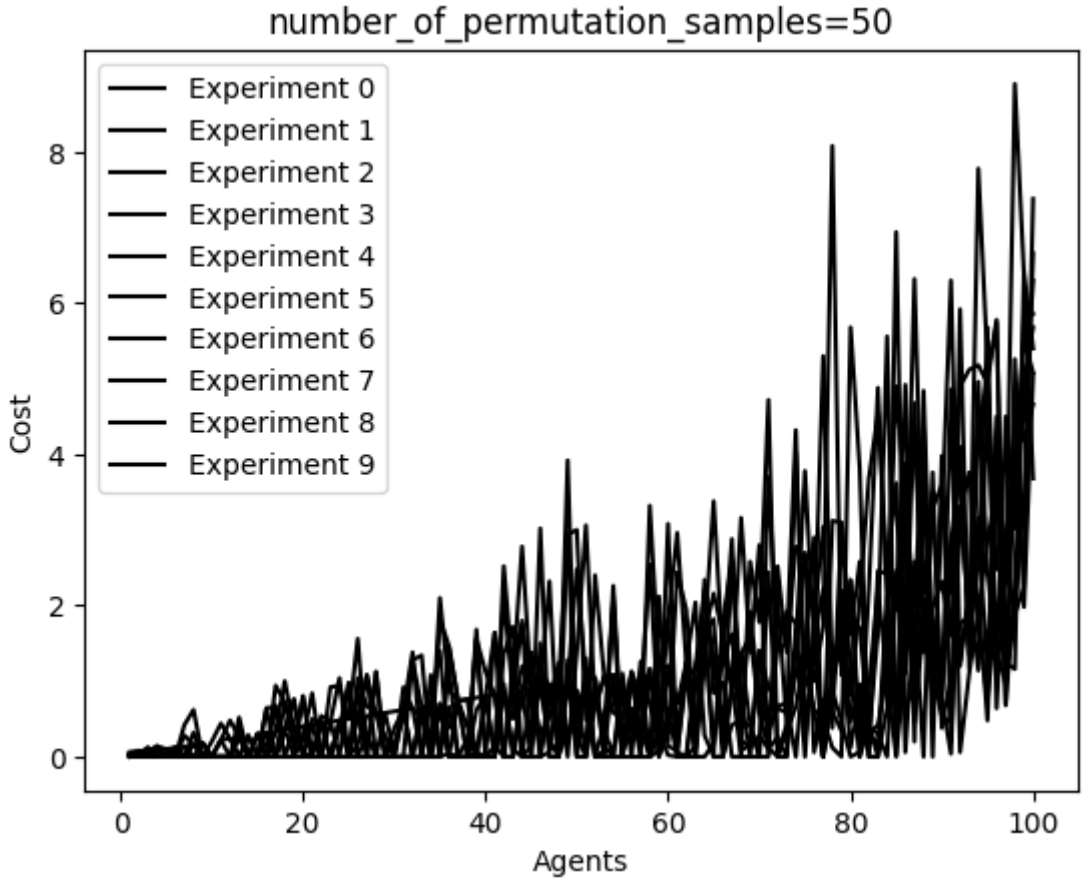
Considering n = 100 agents, 10 experiments were conducted with different numbers of samples: [10, 50, 100, 500, 1000, 5000, 10000].

Arguably, for this problem size, by sampling more the 5000 permutations, the estimates stabilizes.

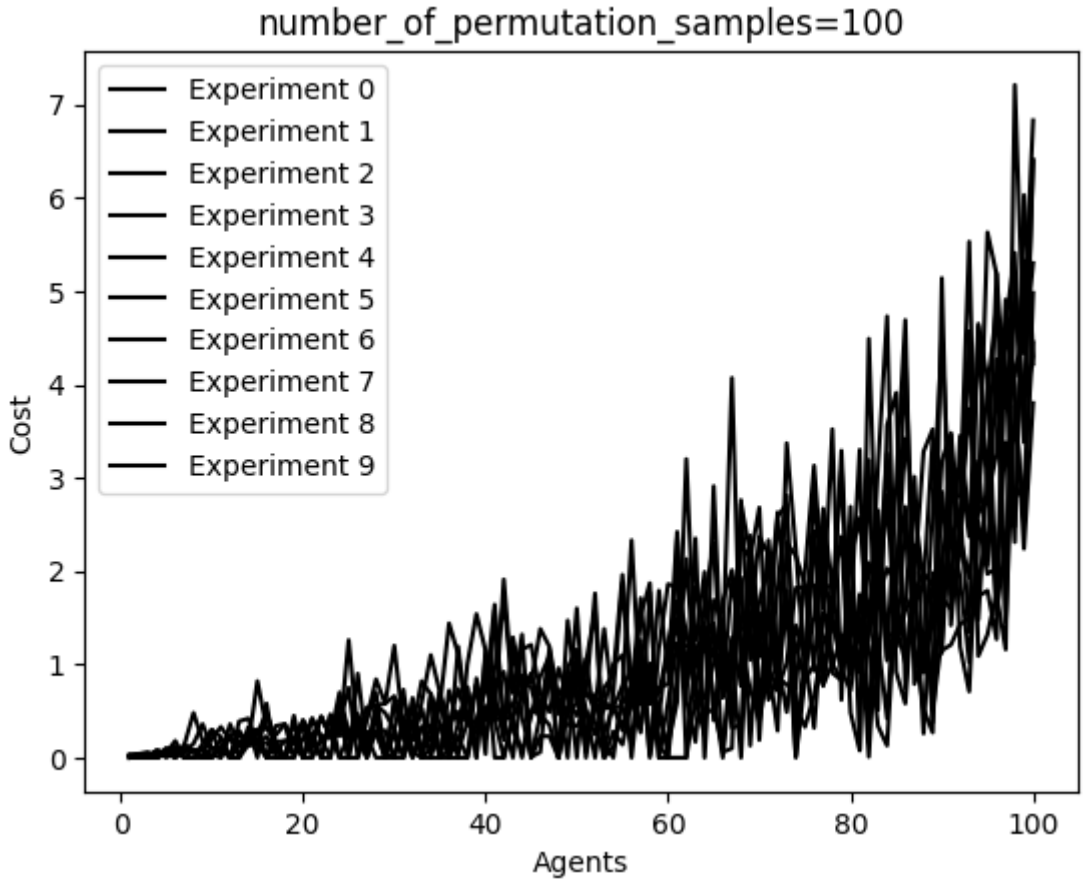
10 samples of permutations



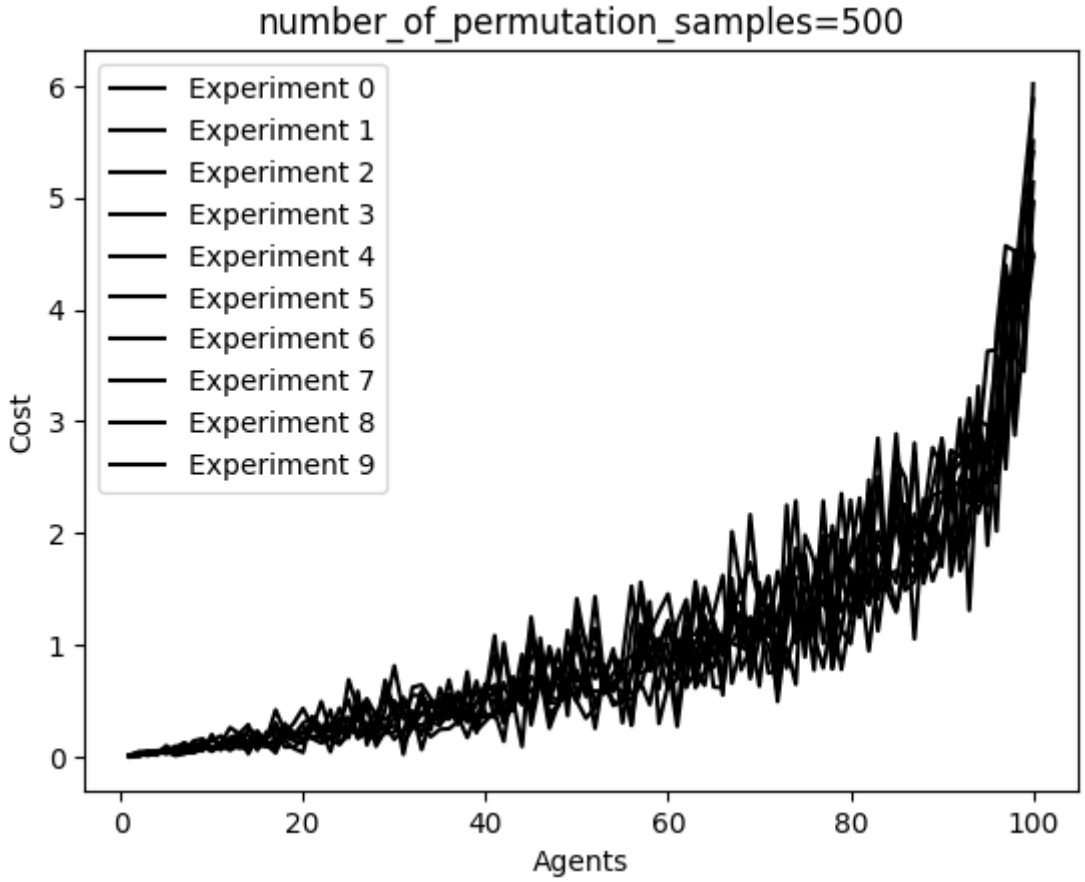
50 samples of permutations



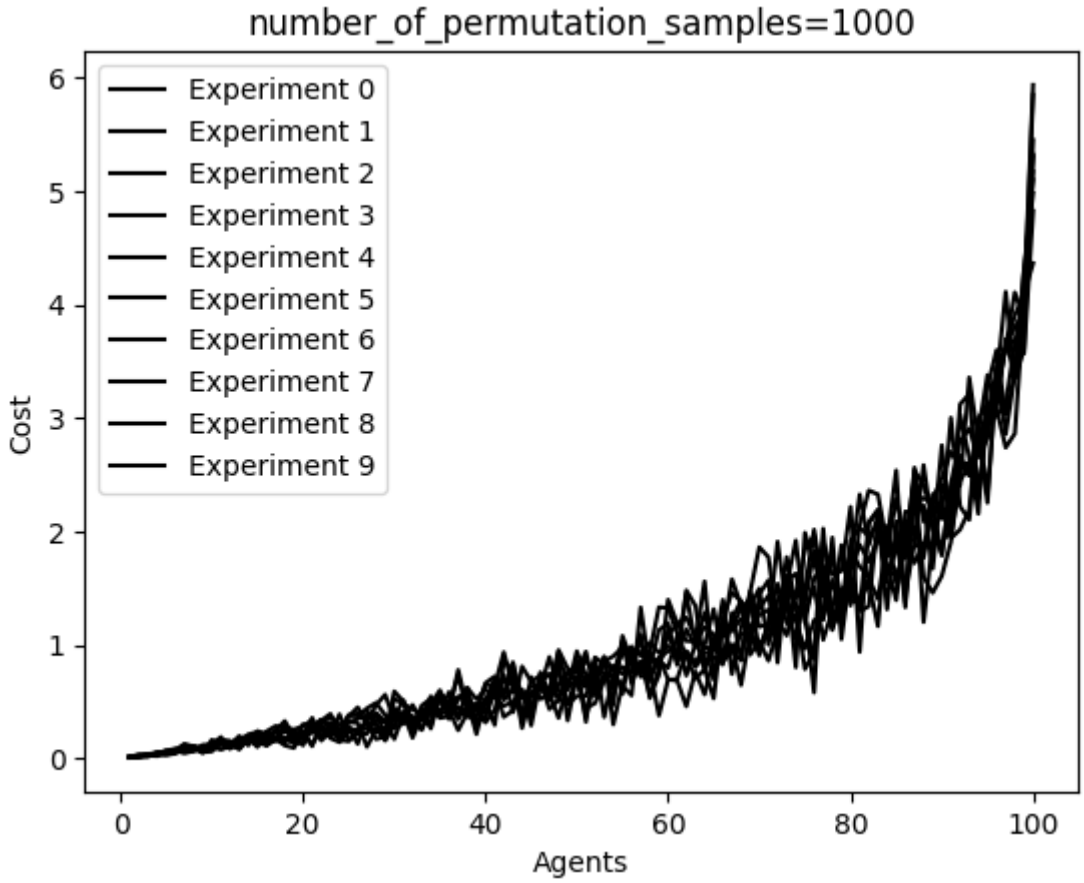
100 samples of permutations



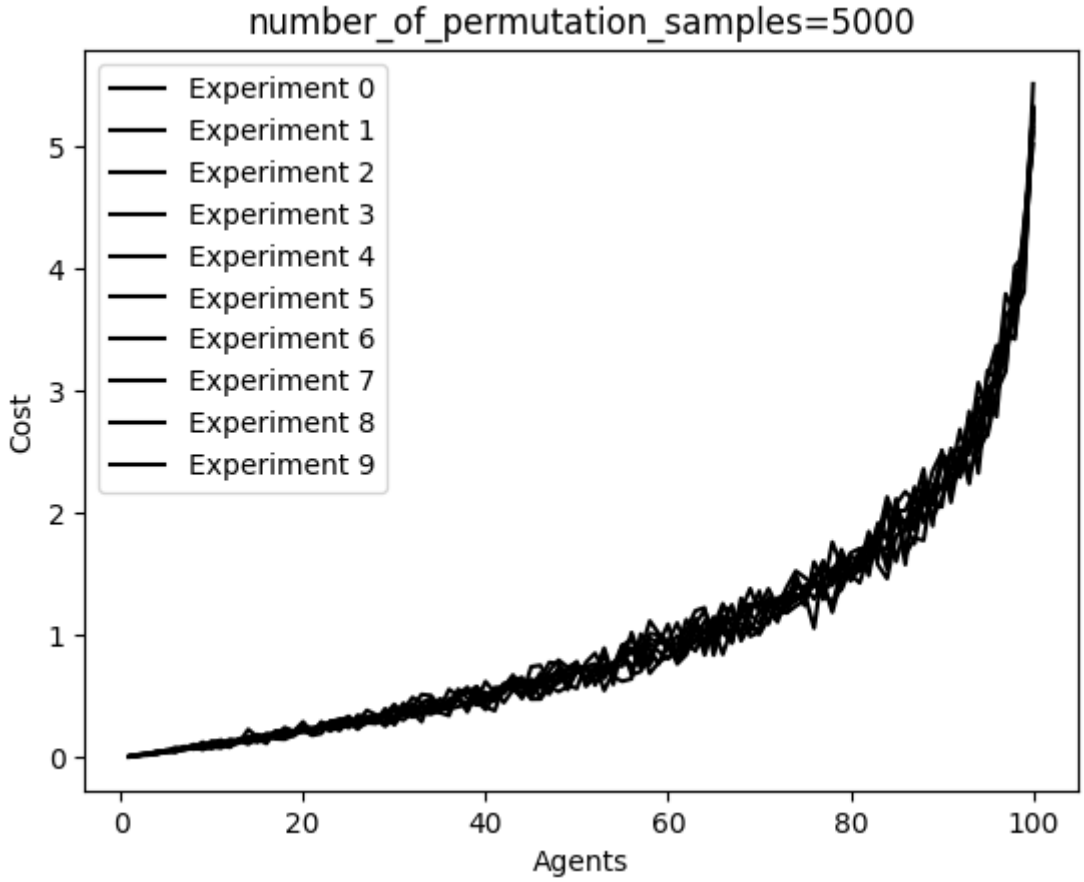
500 samples of permutations



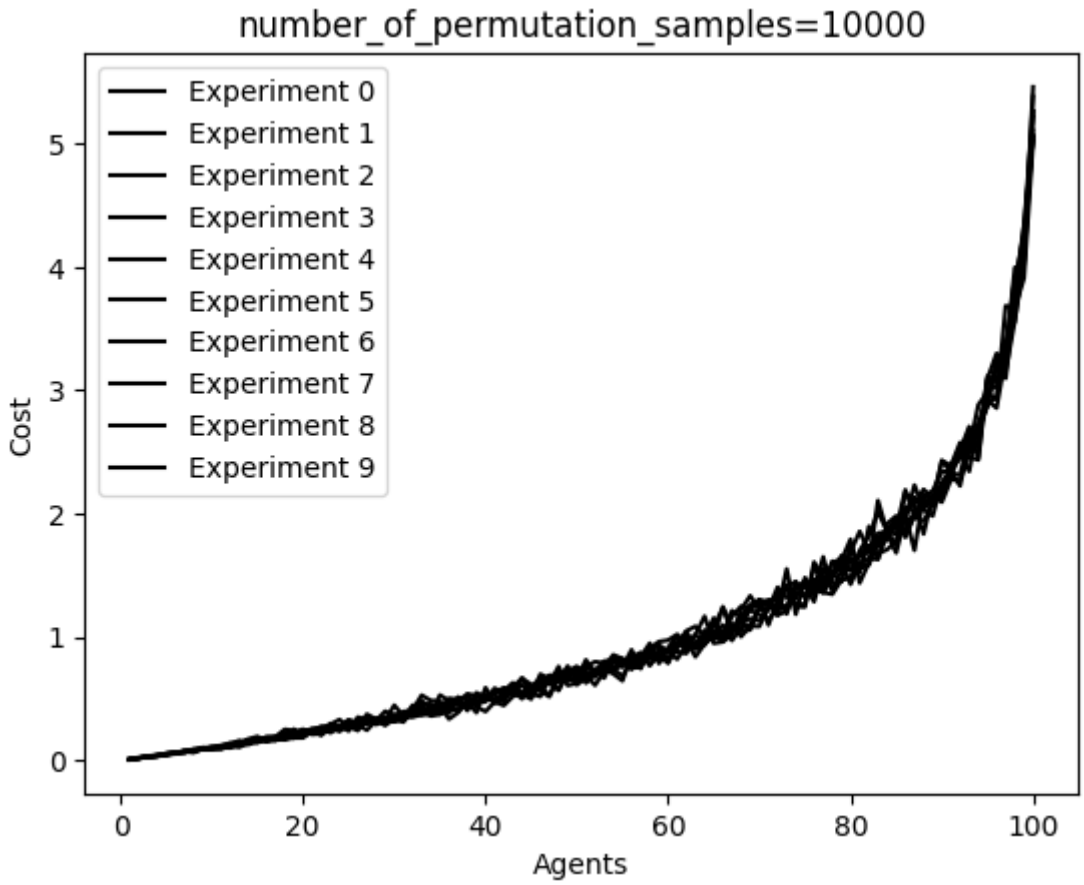
1000 samples of permutations



5000 samples of permutations



10000 samples of permutations



Reinforcement Learning

The code related to this subject can be found in `ReinforcementLearning.ipynb` file.