List of problems

1. **PACE 2025: Dominating set** (exact/heuristic track)
   Random Features Strengthen Graph Neural Networks, 2021

2. **PACE 2025: Hitting set** (exact/heuristic track)

3. Deep learning for **Constraint satisfaction/Satisfiability**

   - Deep learning to predict the satisfiabilities of CSP
     H. Xu et al. *Towards Effective Deep Learning for Constraint Satisfaction Problems*, 2018
   - Survey: *Machine Learning Methods in Solving the Boolean Satisfiability Problem*, 2022

4. Deep learning for **optimization** problems (multiple TSP)

   - NeuroLKH: Combining Deep Learning Model with LKH Heuristic

5. Deep learning for **Graph coloring**

   - *Graph Colouring Meets Deep Learning: Effective Graph Neural Network Models for Combinatorial Problems*, 2019

6. **Automated algorithm selection**
   Case study: multiple TSP
   Search algorithms (deterministic/heuristics), select attributes, construct the dataset, use ML techniques for prediction
   TSP example: *Improving the state-of-the-art in the traveling salesman problem: an anytime automatic algorithm selection*, 2022

7. **Nurse rostering**

   - an initial feasible solution is computed with CP and is further improved by LS: *A Hybrid Constraint Programming Approach for Nurse Rostering Problems*, 2008
   - the integration of deep learning techniques

8. **Sorting networks**
   A *comparator network* $C_{n,k}$: k parallel horizontal lines, called *wires* (*channels*), and a sequence of n vertical segments, each connecting two wires, called *comparators*.
   A comparator network is called a *sorting network* if its output is sorted ascending for every possible input.

   - task: the min number of comparators needed to create a sorting network on n wires

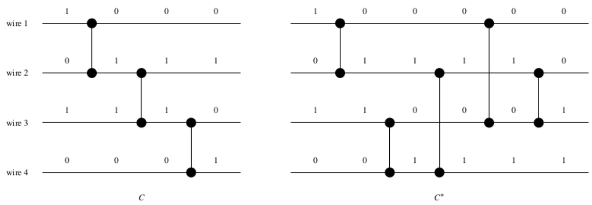

Fig. 1: $C = (1,2); (2;3); (3,4)$ is a comparator network having 4 wires and 3 comparators, operating on the input sequence 1010. Its output is 0101. $C^* = (1,2); (3,4); (2,4); (1,3); (2,3)$ is a sorting network, thus its output is always sorted ($n = 5$ is optimal for 4 wires).