Machine Learning 1 – Exercise 6

Machine Learning for Computer Vision
TU Dresden

1 Ordering

a) Define a procedure for computing the difference $\varphi(y^{\text{transpose}_{jk}[\alpha]}) - \varphi(y^\alpha)$ in Algorithm 7 of the lecture notes efficiently. Establish the time complexity of your algorithm.

b) As an example of an ordering problem with known costs, consider the season ranking of teams in a sports league in which every team competes against every other team twice (home and away) in a season. Consider two mathematical abstractions of the ranking problem:

- Scores are assigned to teams based on the outcomes of the individual competitions: a win is worth 3 points, a tie is worth 1 point, and a loss is worth 0 points. A total preorder of the teams is defined as the total preorder of their respective total scores.

- A solution to the linear ordering problem with costs defined as follows. For every individual competition (a, b) of Team a (home) versus Team b (away), let $c_{ab} = -1$ in case a wins, $c_{ab} = 1$ in case b wins, and $c_{ab} = 0$ in case of a tie.

Give an example of outcomes of a season's games in which the two abstractions lead to different rankings.

Explain informally how the two systems differ. Are all games equally important?