Solving cooperative games for sustainable supply chain

Fabio Mercurio – Eindhoven University of Technology

In the current supply chain context, horizontal collaborations between companies about resource sharing (e.g. trucks, depots, etc.) is seen as a solution for reducing losses that companies can face when acting separately. In order to sustain such type of collaboration, it is important to think about the fair allocation of potential cost savings and/or incomes among the participants. In order to tackle such allocation problems in collaborative supply chain settings, we formulate and study several transportation-oriented cooperative games and introduce possible associated allocation rules. In particular, we investigate whether these rules produce allocations belonging to the core. The core is the set of allocations for which no player nor group of players has reasons to break from the collaboration. Checking whether an allocation belongs to the core is difficult, as it requires solving an optimization problem per group of players, and this number grows exponentially in the size of a game. In order to deal with this computational complexity, we propose to make use of data-driven algorithms and machine learning (ML) techniques that can help to discover underlying patterns within our problem environments to identify core allocations.