Capstone Proposal

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Carbon credit allocation problems: constructing a feasible mechanism design to meet carbon reduction objectives.

Advances in game theory have brought to attention the benefits that game theoretic approaches can provide when solving a range of problems in various disciplines — from theoretical economics, to algorithmic computer science, to machine learning. Climate change research has particularly benefitted from these approaches, as researches strive to understand how countries can voluntarily agree to reduce carbon emissions, and how to minimise the cost of imposed emission caps.

This capstone will build on game theory and optimisation theory to tackle one of four problems, focused at the industry level: (1) Carbon credit allocation (CCA), (2) Carbon credit buying (CCB), (3) Carbon credit selling (CCS) or (4) Carbon credit exchange (CCE). These problems involve the trading of carbon credits (i.e., tons of carbon legally allowed to emit) between agents (firms), which aim at minimising the cost of carbon emissions reduction, according to each firm's cost function. Because cost functions are not known by the (institutional) social planner who designs the trading market, these problems can be formulated as games of incomplete information. Hence, they are not solvable via constrained optimisation.

The aim of this thesis is to construct (or explore extensions of) one or more (existing) *feasible mechanism designs* to be used to approach these problems. Designs will be evaluated in terms of computational complexity of the determination algorithm (both at the agent and mechanism level), as well as how many of the desirable properties of mechanisms are satisfied. That is, whether it yields a solution equilibrium, it is Pareto efficient, individually rational, budget balanced, whether the solution is stable, fair, and whether it minimises costs for the agents involved.

** literature research later in the year might indicate that a less granular problem (i.e., the allocation of emissions caps between countries) is a more interesting and/or feasible problem for the scope of this thesis. The topic is not yet focused and open to changes as more literature is read.

Bibliography

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