

# In Congestion Games, Taxes Achieve Optimal Approximation

Dr Dario Paccagnan

*Imperial College London*

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## **Abstract:**

Congestion games are a prototypical class of games used to model resource allocation problems subject to congestion, with applications spanning transportation, telecommunications, scheduling, and many other disciplines. In this context, a significant bulk of the literature has focused on assessing to what extent equilibria (e.g., Nash equilibria) incur near optimal social cost. Motivated by fleet management in autonomous mobility, in this work we take an opposite view on congestion games, and ask the following question: how good of an approximation can we find to the minimum social cost problem?

During the talk, I will present a comprehensive set of results providing tight hardness results and a polynomial time algorithm with optimal approximation. Interestingly, such algorithm is based on the utilization of carefully designed taxes, thus showing that self-interested decision makers can be incentivized to settle on an allocation with as good performance as that achievable with complete control. Finally, I will show that, although worst-case, the approximation factors obtained are near optimal (i.e., close to one) for many real-world instances of interest.