Usage of Game-Theory in Energy, Cyber Security and COVID-19

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Summary:

Game Theory (GT) is a branch of mathematics that deals with the analysis of competitive situations. It was first introduced for problems in economics, but is nowadays applied in many areas including energy, biology, and computer science. In this talk, a smart energy management scheme based on a non-cooperative dynamic game approach will be presented. The game participants compete for the lowest electricity bill by scheduling their individual energy storage systems.

The developed system takes advantage of a pricing tariff offered by a utility company that aims at flattening the aggregated load of a neighborhood of households during peak times. Simulations show whether a GT approach between households is more efficient than an individualistic one and if a near-constant load can be achieved when a critical mass of battery owners is available. In the second part of this talk, the energy scheduling game will be mapped to address the issue of the shortage of Personal Protective Equipment (PPE) during the COVID-19 outbreak.

Simulations based on bed-occupancy data from seven English NHS regions reveal what the best PPE supply management response could have been and what stock management strategies can be put in place to avoid PPE shortages during the second wave.