

AGCO Seminar

Speaker: Alexandros Tsigonias-Dimitriadis, Technical University of Munich, (TUM)

Title: Prophet Inequalities via the Expected Competitive Ratio.

Abstract: We consider prophet inequalities under general downward-closed constraints. In a prophet inequality problem, a decision-maker sees a series of online elements and needs to decide immediately and irrevocably whether or not to select each element upon its arrival, subject to an underlying feasibility constraint. Traditionally, the decision-maker's expected performance has been compared to the expected performance of the prophet, i.e., the expected offline optimum. We refer to this measure as the Ratio of Expectations (or, in short, RoE). However, a major limitation of the RoE measure is that it only gives a guarantee against what the optimum would be on average, while, in theory, algorithms still might perform poorly compared to the realized ex-post optimal value.

Hence, we study alternative performance measures. In particular, we suggest the Expected Ratio (or, in short, EoR), which is the expectation of the ratio between the value of the algorithm and the value of the prophet. This measure yields desirable guarantees, e.g., a constant EoR implies achieving a constant fraction of the ex-post offline optimum with constant probability. Moreover, in the single-choice setting, we show that the EoR is equivalent (in the worst case) to the probability of selecting the maximum, a well-studied measure in the literature. This is no longer the case for combinatorial constraints (beyond single-choice), which is the main focus of this paper.

Our main goal is to understand the relation between RoE and EoR in combinatorial settings. Specifically, we establish a two-way black-box reduction: for every feasibility constraint, the RoE and the EoR are at most a constant factor apart. This implies a wealth of EoR results in multiple settings where RoE results are known.

This is joint work with Tomer Ezra, Stefano Leonardi, Rebecca Reiffenhäuser, and Matteo Russo.

When: August 17, 15:00 hrs.

Where: Sala de Seminario John Von Neuman, CMM, Beauchef 851, Torre Norte.

