

AGCO Seminar

Speaker: Andrés Cristi, CMM, Uchile.

Title: Prophet Inequalities Require Only a Constant Number of Samples.

Abstract:

In a prophet inequality problem, n independent random variables are presented to a gambler one by one. The gambler decides when to stop the sequence and obtains the most recent value as a reward. We evaluate a stopping rule by the worst-case ratio between its expected reward and the expectation of the maximum variable. Because of its connections with resource allocation and posted-price mechanisms, this problem has been intensively studied, and several variants have been introduced. While most of the literature assumes that distributions are known to the gambler, recent work has considered the question of what is achievable when the gambler has access only to a few samples per distribution. We provide a unified proof that for all three major variants of the single-selection problem (i.i.d, random-order, and free-order), a constant number of samples (independent of n) for each distribution is good enough to approximate the optimal ratios. Prior to our work, this was known to be the case only in the i.i.d. variant.

Previous works relied on explicitly constructing sample-based algorithms that match the best possible ratio. Remarkably, the optimal ratios for the random-order and the free-order variants with full information are still unknown. Consequently, our result requires a significantly different approach than for the classic problem and the i.i.d. variant, where the optimal ratios and the algorithms that achieve them are known. A key ingredient in our proof is an existential result based on a minimax argument, which states that there must exist an algorithm that attains the optimal ratio and does not rely on the knowledge of the upper tail of the distributions.

Based on joint work with Bruno Ziliotto that will appear in STOC'24.

When: May 15, 3:00pm.

Where: Sala de Seminario John Von Neuman, 7th floor, CMM, Av. Beauchef 851, Torre Norte.