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PLENARY LECTURE

Modeling Fairness Through the Lenses of Ordered and Bilevel Optimization

KEYNOTE SPEAKER

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PLENARY LECTURE ABSTRACT

Fairness has become an increasingly important consideration in contemporary societies, which are marked by growing economic and social inequalities. Consequently, policymakers and decision-makers are placing greater emphasis on incorporating fairness considerations into their decision-making processes. In this talk, we establish a connection between fairness modeling in optimization problems and bilevel optimization.

We present a unifying and flexible modeling framework based on the principles of ordered optimization that captures a broad class of fairness measures proposed in the literature. These include both linear and nonlinear notions of fairness, such as the range, the Gini index, least absolute deviations, least squares deviations, and several others. Many of these practically relevant fairness measures are inherently non-monotone, which necessitates the imposition of appropriate optimality conditions. This observation naturally leads to a bilevel optimization perspective.

To illustrate the practical implications of the proposed framework, we consider its application to vehicle routing problems, highlighting how bilevel optimization can be leveraged to model and solve fairness-aware optimization problems in real-world settings. This presentation is based on joint work with Justo Puerto and Alberto Torrejon.

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