

1096-62-2468

Elias Bareinboim* (eb@cs.ucla.edu), Computer Science Department, Los Angeles, CA 90095-1596, and **Judea Pearl** (judea@cs.ucla.edu), Computer Science Department, Los Angeles, CA 90095-1596. *Mathematical Challenges in Causal Inference with Emphasis on Transportability and External Validity.*

Recent advances in graphical models and the calculus of actions have given rise to mathematical problems that are not easily formalized, let alone solved in the conventional language of probability and statistics. We exemplify this challenge through one such problem – transportability – which aims to determine when it is feasible to generalize experimental findings from one or several environments to another, potentially different from the rest. This problem is at the heart of every scientific investigation since, invariably, experiments performed in one environment (or population) are intended to be used elsewhere, where conditions may differ considerably. Using a graphical representation of differences and commonalities among two or more environments, we provide a formal characterization and complete algorithmic solution to the problem of whether a specific causal effect is transportable across environments and, if the answer is affirmative, what measurements need be taken in the various populations and how they ought to be combined to produce a consistent estimate of the causal effect in the target environment. Related problems concerning generalization across populations will be outlined. (Received September 17, 2013)