

DEPARTMENT OF MATHEMATICAL SCIENCES

Applied Math Seminar

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Title: An Automatic Finite-Sample Robustness Check: Can Dropping a Little Data Change Conclusions?

Abstract: Practitioners will often analyze a data sample with the goal of applying any conclusions to a new population. For instance, if economists conclude microcredit is effective at alleviating poverty based on observed data, policymakers might decide to distribute microcredit in other locations or future years. Typically, the original data is not a perfect random sample from the population where policy is applied --- but researchers might feel comfortable generalizing anyway so long as deviations from random sampling are small, and the corresponding impact on conclusions is small as well. Conversely, researchers might worry if a very small proportion of the data sample was instrumental to the original conclusion. So we propose a method to assess the sensitivity of conclusions to the removal of a very small fraction of the data set. Manually checking all small data subsets is computationally infeasible, so we propose an approximation based on the classical influence function. Our method is automatically computable for common estimators. We provide error bounds on approximation performance and a low-cost exact lower bound on sensitivity. We find that sensitivity is driven by a signal-to-noise ratio in the inference problem, does not disappear as data accrues, and is not decided by misspecification. Empirically we find that many data analyses are robust, but the conclusions of several influential economics papers can be changed by removing (much) less than 1% of the data, and dropping just 0.003% of human preferences can change the top-ranked large language model on Chatbot Arena.

Thursday, October 1

1:00 – 2:00 pm

Stratton 313



WPI