

Statistics Seminar  
Department of Mathematical Sciences

<b>DATE:</b>	Thursday, Dec. 2, 2021
<b>TIME:</b>	1:15pm - 2:15pm
<b>LOCATION:</b>	Zoom meeting
<b>SPEAKER:</b>	Zhou Wang, Binghamton University
<b>TITLE:</b>	Testing for Outliers with Conformal p-values

### Abstract

This paper studies the construction of p-values for nonparametric outlier detection, taking a multiple-testing perspective. The goal is to test whether new independent samples belong to the same distribution as a reference data set or are outliers. The authors propose a solution based on conformal inference, a broadly applicable framework which yields p-values that are marginally valid but mutually dependent for different test points. They prove these p-values are positively dependent and enable exact false discovery rate control, although in a relatively weak marginal sense. They then introduce a new method to compute p-values that are both valid conditionally on the training data and independent of each other for different test points; this paves the way to stronger type-I error guarantees. Their results depart from classical conformal inference as they leverage concentration inequalities rather than combinatorial arguments to establish their finite sample guarantees. Furthermore, their techniques also yield a uniform confidence bound for the false positive rate of any outlier detection algorithm, as a function of the threshold applied to its raw statistics. Finally, the relevance of results is demonstrated by numerical experiments on real and simulated data.

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