Department of Mathematics and Statistics
Colloquium Lecture Series

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MOST POWERFUL BAYESIAN TESTING FOR REPRODUCIBLE SCIENCE

Scienti c research is validated by reproduction of the results, but efforts to reproduce spurious claims drain resources. I focus on one cause of such failure: false positive statistical test results caused by random variability. Classical statistical methods rely on p-values to measure the evidence against null hypotheses, but Bayesian hypothesis testing produces more easily understood results, provided one can specify prior distributions under the alternative hypothesis. I describe new tests, UMPBTs and RMPBTs, which are Bayesian tests that provide default speci cation of alternative priors, and show that these tests also maximize statistical power.

I then derive RMPBTs for linear models by restricting the class of possible alternative hypotheses to g-priors. An important feature of the resulting class of tests is that their rejection regions coincide with the rejection regions of usual frequentist F-tests, provided that the evidence thresholds